



Global Sustainable Transport Good Practices

--- in support of the UN Decade of Sustainable Transport (2026-2035)



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Introduction

In an era marked by rapid globalization and increasing environmental awareness, the importance of sustainable transport cannot be overstated. Transport systems are not only vital for economic growth and social development but also play a crucial role in addressing the pressing challenges of climate change, urban congestion, and social equity. The Global Sustainable Transport Best Practices is a testament to the collective efforts of nations, organizations, and individuals around the world to transform our transport systems for the better.

The journey towards sustainable transport began with the First UN Global Sustainable Transport Conference in 2016, hosted by Turkmenistan in Ashgabat, and continued with the Second UN Global Sustainable Transport Conference in 2021, hosted by China in Beijing. These conferences set the stage for a global transformation in transport, emphasizing the need for innovative solutions and collaborative efforts. In December 2023, the UN General Assembly declared 2026 –2035 as the United Nations Decade of Sustainable Transport, calling for a comprehensive implementation plan to accelerate progress.

The primary objective of this initiative is to promote sustainable transport technology, innovation, and the adoption of best practices globally. The UN General Assembly, in its Resolution 78/148, underscored the importance of integrating science, technology, and innovation into sustainable, multimodal transport systems. By sharing best practices and fostering international cooperation, we aim to enhance transport connectivity and drive transformative change across the sector.

Transport is a cornerstone of the United Nations' Sustainable Development Goals (SDGs)by2030. The Global Sustainable Transport Best Practices seeks to collect and showcase the best practices from around the world, highlighting achievements in sustainable transport development. These practices cover a broad range of areas, including transport connectivity, digital development, green and low-carbon initiatives, public transportation, and safety and inclusiveness. They provide innovative and replicable policies, projects, initiatives, technologies, mechanisms, and organizational activities that offer valuable insights for global transport development,aligned with sustainable transport values, demonstrating innovation, measurable impact, scalability, and synergy across economic, social, and ecological progress.

As we embark on this journey, we recognize the significance of each contribution. The Global Sustainable Transport Best Practices initiative is not just a collection of case studies; it is a beacon of hope and a roadmap for a sustainable future. We invite all stakeholders—governments, international organizations, NGOs, academia, and the private sector— to join us in this endeavor. Together, we can transform our transport systems and build a world that is more sustainable, equitable, and prosperous for all.

We hope this forward sets the stage for the inspiring stories and innovative solutions that follow in this compilation.

GSTIKC
supported by UN DESA

Foreword

Rooted in the UN Charter and guided by the 2030 Agenda for Sustainable Development, the UN Department of Economic and Social Affairs (UN DESA) upholds the UN's development pillar, serves as a pioneer of sustainable development and the home of the Sustainable Development Goals (SDGs), and uses its expertise to support Member States in implementing the 2030 Agenda during multiple crises, building their capacities for a transformative recovery and resilience. It contributes to the realization of international development goals and showcases its role in gauging trends, building capacities, and shaping solutions. With significant challenges in achieving the SDGs, the SDG Summit's political declaration must be turned into actions, bold action must be taken now to create a better more sustainable and inclusive world by 2030.

Sustainable transport systems are crucial for achieving a 2030 agenda for sustainable development and the Paris agreement on climate change. Recognizing this, In 2023, the UN General Assembly declared 2026–2035 as the United Nations Decade of Sustainable Transport, calling for accelerated actions to transform the transport sector and align it with the SDGs.

In this spirit, we welcome the initiative of the Global Sustainable Transport Best Practices launched by the Global Sustainable Transport Innovation and Knowledge Center. We believe that learning from each other and sharing innovative solutions will inject the boost we need to make efficient progress in reaching the SDGs. These best practices serve as a powerful tool to showcase remarkable achievements in global sustainable transport and expand their impact through replication and dissemination.

I call upon all UN member states, international organizations, and relevant stakeholders to actively participate in and support the Global Sustainable Transport Best Practices initiative. By joining forces and contributing to this endeavor, we can collectively drive progress toward the UN Sustainable Development Goals and forge a more sustainable and inclusive future for all.



Li Junhua
Under-Secretary-General for Economic
and Social Affairs



Remarks

Asia and the Pacific is home to 60 per cent of the world’ s popula- tion and has become the engine of the global economy, account- ing in recent years for around two-thirds of global growth. Safe, efficient, sustainable and accessible transport and logistics net- works are the backbone of that performance. They determine whether goods reach markets on time, and whether people can reach jobs, health care and education.Yet these networks are under mounting pressure. The region now accounts for more than 40 per cent of global transport-related carbon dioxide emis- sions, and the transport emissions from the region have more than doubled since 2000. Some 700,000 people are killed on our roads every year. For landlocked developing countries and small island developing States, high transport costs and unreliable con- nectivity limit market access and constrain the movement of people. The region is also generating solutions, and at remarkable speed: safer road design and enforcement, electric mobility, modernized railways, digital freight corridors, greener shipping and more resilient infrastructure.

Our member States are advancing this agenda together. In April 2026, they adopted resolution 82/3 on strengthening cooperation on transport connectivity and logistics in Asia and the Pacific. From 17 to 20 November 2026, ESCAP will convene the fifth Min-

"I warmly welcome the Global Sustainable Transport Good Prac- tices 2026 as a timely and valuable contribution to the growing body of knowledge supporting the United Nations Decade of Sustainable Transport (2026–2035). By bringing together practi- cal experiences from countries, international organizations, busi- nesses and development partners, this compendium demon- strates how innovation and cooperation can help build transport systems that are more sustainable, resilient, inclusive and accessi- ble: with people at the centre. The examples featured here remind us: truly "sustainable" trans- port is not simply about moving people and goods. It is about building transport solutions that expand opportunity, strengthen communities, advance gender equality, improve public health, support economic development, accelerate climate action. From green shipping corridors and low-carbon mobility systems to digital solutions and community-based initiatives, the good prac- tices discussed in this volume illuminate some of the many path- ways through which transport can contribute to the achievement

" As China's Special Envoy for Climate Change and former Under - Secretary - General of the United Nations , I commend this " Col- lection of Good Practices of Global Sustainable Transport " for its robust representativeness. The cases span diverse geographies and transport modalities, effectively mirroring the global land- scape of efforts to achieve the 2030 Sustainable Development Goals (SDGs). They vividly capture the evolving trajectory of sus- tainable transport—from urban transit innovations to rural mobil- ity solutions—highlighting how inclusive mobility systems under- pin climate resilience and equitable development.

isterial Conference on Transport to consider a new Ministerial Declaration and a Regional Action Programme for 2027–2031, aligned with the United Nations Decade of Sustainable Transport (2026–2035). Regional cooperation, peer learning and knowledge sharing lie at the heart of ESCAP’ s mandate, and they underpin our continuing partnership with the Global Sustainable Transport Innovation and Knowledge Center. ESCAP is pleased to have contributed to this edition, recom- mending good practices from Asia and the Pacific for inclusion. Global Sustainable Transport Good Practices 2026 brings a global perspective to bear on practical examples of what already works, giving policymakers and partners solutions they can adapt, repli- cate and scale. I welcome Global Sustainable Transport Good Practices 2026 as a valuable contribution to our shared effort to turn good practice into common practice — across Asia and the Pacific and beyond.

Under-Secretary-General of the United Nations and Executive Secretary of the Economic and Social Commission for Asia and the Pacific (ESCAP)

of the Sustainable Development Goals. One of the greatest strengths of this compilation is its emphasis on learning and replication. The challenges facing transport systems differ across countries and regions, yet the spirit of inno- vation and partnership reflected in these case studies offers valu- able lessons for all. By sharing what works, we can accelerate progress, avoid duplication of effort and foster stronger South-South and triangular cooperation which, again, place people at the heart. As the international community works to deliver on the 2030 Agenda, knowledge products such as this play an important role in turning ambition into action. I commend all contributing part- ners for their leadership and I encourage policymakers, practi- tioners and stakeholders worldwide to draw inspiration from these good practices and adapt them to their own contexts."

United Nations Resident Coordinator in China

This Collection aligns perfectly with the UN's mandate to foster multilateral cooperation for sustainable development. By show- casing tangible examples of policy integration, technological innovation, and community engagement, it provides a vital road- map for all countries to accelerate progress toward 2030 and beyond. I fully endorse this initiative and encourage its continued advancement as a catalyst for global action."

Special Envoy for Climate Change Affairs of China

" Green transport stands as a pivotal domain in the global transi- tion toward green and low-carbon development, playing an indispensable role in environmental and climate governance as well as sustainable development. The Global Sustainable Trans- port Good Practices Cases compiled by the GSTIKC systematically documents cutting-edge innovations in sustainable mobility worldwide, offering vital references for low-carbon development. This initiative embodies the spirit of the Global Development Initiative (GDI), i.e. fostering international cooperation to bridge infrastructure gaps, advancing climate-resilient solutions, and collectively accelerating progress toward shared green develop- ment goals. Knowledge-sharing and experience-exchange are fundamental to achieving global sustainable development goals. This compen- dium presents 22 rigorously selected cases from five continents, covering aviation, railways, highways, and urban mobility. These cases demonstrate strong regional synergies and offer diverse solutions to drive the green transport transition. The compendium

"Transport connects people, powers economies, and shapes the future of our planet. This compilation of Global Sustainable Trans- port Good Practices comes at a time when evidence-based approaches to sustainability are urgently needed. It brings together practical examples of what is being done and what can be done to make transport systems cleaner, fairer and more efficient. Much of the work featured in this compilation addresses diverse challenges, including rising freight emissions, unsafe roads, unequal access to public transport,and urban congestion. Climate policy, economic development and social inclusion are intercon- nected through transport. None of these initiatives stands alone. Each one has been shaped by cooperation across institutions,

" As someone closely engaged with the International Science Council (ISC) and the UN's Intergovernmental Panel on Climate Change(IPCC), I fully recognize the urgent need for global coop- eration in addressing climate change. The Global Sustainable Transportation Good Practices Case Collection is a timely and valuable initiative that strongly aligns with the ISC's mission to promote international collaboration for a more sustainable future. In my research on climate dynamics and global environmental change, I have consistently emphasized the importance of transi- tioning to sustainable systems. The cases presented in this collection clearly illustrate how innovative transport solutions—such as the widespread adoption of electric vehicles and improvements in public transit—can play a crucial role in reducing greenhouse gas emis- sions. These examples reflect the kind of systemic transformation that I have long argued is essential for climate change mitigation. The ISC has consistently advocated for mobilizing the global scientific community and other stakeholders to tackle complex, interconnected challenges. This collection reflects that vision by

will serve as a critical resource for developing countries in balanc- ing economic growth with environmental protection while advancing green development. The launch of this report at the UN High-Level Political Forum carries profound significance. It is my hope that this collection will become a key tool to accelerate the global transition in green transport by informing policymakers and practitioners, so as to support the 2030 Agenda for Sustainable Development and the Paris Agreement goals, and contribute wisdom and actionable solutions toward a future of harmony between humanity and nature."

President of BRI International Green Development Coalition (BRIGC) , Former Vice Minister of the Ministry of Ecology and Environment (MEE) of The People’s Republic of China

sectors, and borders. The ITF will continue supporting this effort by enabling peer learning, facilitating exchanges, and helping countries apply insights to local contexts. There is still much to be done, but we are not starting from zero. This compilation shows that practical progress is already underway and that good practices can travel far when shared."

Secretary-General of the International Transport Forum

showcasing successful efforts from around the world. It offers a valuable platform for sharing knowledge, allowing countries to learn from one another and scale up proven approaches. In doing so, it not only supports progress toward the Sustainable Develop- ment Goals but also promotes replicable models that enhance climate resilience in the transport sector — an essential contribu- tion to our shared efforts against climate change."

Distinguished Chair Professor Department of Earth System Science Tsinghua University

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Thank you all for your contributions to the *2026 Global Sustainable Transport Good Practices*. Together, we are paving the way for a more sustainable and equitable future in transport.



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Transport Department of Guangxi Zhuang Autonomous Region, China

Pinglu Canal—A World-Class Inland Waterway Connecting Rivers to the Sea

 **Location:** Guangxi, China



A Concise Overview of the Good Practices

Overview

The Pinglu Canal is the flagship project of China's New Western Land-Sea Corridor and the first canal since the founding of the People's Republic of China to link its rivers to the sea. The 134.2 km waterway runs from Nanning to the Beibu Gulf, built to national Class I inland waterway standards for 5,000-tonne vessels. Construction began on 28 August 2022 with investment of about RMB 72.7 billion, and it opened to navigation on 16 September 2026.

Solutions

- Three cascade hubs—Madau, Qishi and Qingnian—lift vessels across a 65-metre drop, with double-lane locks for 5,000-tonne vessels.
- Madau's three-tier water-saving basin cuts water use by over 60% and holds two world records, including the fastest lock-valve cycle.
- Built to four environmental standards, the project reduced mangrove incursion by 22%, transplanted 9,572 mangroves, reopened a 65-year-sealed migration route via a 480-metre dual fishway, and reused over 98% of excavated material.
- As China's first full-lifecycle smart waterway, it combines 20,000+ sensors, a digital twin and an integrated river-sea-rail platform enabling one-declaration whole-line transit.

Major Achievements

- The canal makes the New Western Land-Sea Corridor China's third corridor with end-to-end river-sea intermodal capability.
- It shortens inland voyages by over 560 km, cuts logistics costs by 18–30% and saves over RMB 5 billion annually, while Beibu Gulf Port efficiency is projected to rise by over 30%.
- Strategically, it links the Silk Road Economic Belt and the 21st Century Maritime Silk Road, deepens China-ASEAN trade, and spurs port industries, cold-chain logistics, cross-border e-commerce and railway-waterway intermodal freight along the Pinglu Canal Economic Belt.

Chongqing Municipal Commission of Transport, China

Tech-empowered Inland Water Transport: Chongqing's Practices for Greener and Smarter Logistics

Location: Chongqing, China



Overview

As the world's leading inland shipping artery, the Yangtze underpins the Yangtze River Economic Belt, yet traditional long-haul shipping suffers long cargo-waiting times, high empty-running rates and poor trunk-tributary connectivity. Chongqing launched the 'Qianli Qingzhou' scheduled liner brand across 1,225 km of high-grade waterways, adopting a standardized 'five-fixed', bus-style service. By pairing digital platform resource integration with liner-service reshaping, it links trunk and tributaries and offers a replicable Chinese solution for river basins worldwide.

Solutions

- Model reconstruction: a 'water bus' five-fixed liner offers advance cabin booking and matches small-batch cargo; a 'right-size vessel' strategy lifts 1,000-tonne vessel share to 45%, linking 50+freight terminals.
- Green transition: retrofit-first fleet renewal with new-energy vessels; 12 key terminals upgraded to closed cargo operation, zero wastewater and near-zero dust; a 1.7-million-tonne road-to-water shift in 2025.
- Smart upgrading: the 'Qianli Qingzhou' platform integrates route release, online booking, cargo tracking and ship credit profiling for 450+firms; AI drafting cuts order time 66%.
- Collaborative governance: a three-tier ministry-municipal-regional-local mechanism and four-province joint lock scheduling raise passage efficiency 40%.

Major Achievements

- By 2025 Chongqing's port throughput reached 245 million tonnes (+6.7%), with over half of transshipped cargo from neighbouring provinces; the logistics-cost-to-GDP ratio fell to 13.3%.
- The five-fixed liner plus multimodal model cut corporate logistics costs 25-30%; joint dispatch gives 'one declaration, full-line passage', trimming Guangyuan-Chongqing transit from 15 to 7 days.
- Climate gains: the road-to-water shift avoided 3,300 tonnes of diesel, 10,000 tonnes of CO2 and 7,300 tonnes of sulfides in H1 2025; night navigation halved sailing times.
- Digital integration and bus-style liner reshaping offer a highly replicable model for basins like the Mekong, Amazon and Nile.

Transport Department of Qinghai Province, China

Eco-Construction Technology for Highways in Special Plateau Regions: Qinghai Solution for Ecological Protection

Location: Qinghai, China



Overview

The Qinghai-Tibet Plateau is the 'Asian Water Tower' and 'Third Pole', with an extremely fragile ecosystem above 4,000 m altitude. Traditional highway construction readily triggers soil erosion and permafrost thaw. Applying 'ecological priority and green development', Qinghai pioneered eco-construction technology in the Three-River-Source area, using in-situ pavement recycling and ecological restoration to minimize disturbance. By resolving the tension between ecological protection and transport infrastructure expansion, it provides a Chinese solution for ecologically fragile regions worldwide.

Solutions

- Policy and top-level design: following 'no destruction is the best protection', Qinghai issued a 2023 pilot work plan, set up a rural-road leading group and issued construction guidelines for eco-highway technology.
- Innovative mechanization: a 'cold recycler-motor grader-water sprinkler-road roller' train completes milling, mixing and paving in one pass (Version 1.0); Version 2.0 adds tailored additives to lift strength and cut dust.
- Phased scaling: 1,000 km piloted across 13 counties in 2023; scaled to 5,000 km on 212 township roads in 2024 with RMB 100 m investment; a further 2,000 km completed in 2025 via 'experiment-pilot-promotion'.

Major Achievements

- Environmental: across 8,000 km, in-situ recycling cut sand-and-gravel mining and long-haul transport, protecting 3,600 mu of grassland and avoiding~100,000 tonnes of CO2 a year while curbing permafrost and vegetation damage.
- Economic: cost fell to RMB 15,000-20,000/km versus RMB 150,000-200,000 for traditional sandy roads—a 90% reduction—with construction time cut 40% and easier long-term maintenance.
- Social: upgraded roads beat cement roads in extreme weather, raising skid resistance 30% and cutting rain/snow accidents 40%; transport costs fell 40% and characteristic-industry incomes rose 50%.
- Replicable across plateau, permafrost and ecologically sensitive regions along the Belt and Road, demonstrating green infrastructure delivery without compromising ecological integrity.

NDB

Protecting the Yangtze River while Connecting Communities: The G3 Bridge Model for Water Sensitive Sustainable Transport

Location: Anhui, China



Overview

The Tongling G3 Road-Rail Bridge spans the Yangtze within the Tongling Freshwater Dolphin National Nature Reserve, where it must ease severe congestion on the existing G3 expressway while protecting the critically endangered Yangtze finless porpoise and vital drinking-water sources. Using a 'water-sensitive' design, the single-span, pier-free bridge preserves the riverbed and migratory corridors. Delivering a resilient, people-centred corridor, it reconciles regional connectivity with ecological conservation.

Solutions

- Radical design: a world-first 988 m cable-stayed-suspension hybrid on a single span eliminates mid-river piers, preserving the riverbed and unobstructed migratory corridors for the porpoise.
- Water quality: a strict zero-discharge policy with cofferdam isolation and a U-shaped bottomless steel-concrete cofferdam; underwater works confined to the dry season (Oct-Apr) and on-site wastewater recycling.
- Noise and habitat: an Aquatic Life Conservation Plan with a dedicated porpoise expert and real-time acoustic early-warning system keeps underwater noise below harmful thresholds, plus navigation controls and riverbank restoration.
- People-centred integration: a dual-deck structure carries a six-lane expressway and four railway tracks, cutting Yangtze crossing time from 17.1 to 6.4 minutes; ~150 former fishermen patrol as conservation volunteers.

Major Achievements

- Ecological: zero water-quality deterioration; three years of surveys confirmed stable aquatic biodiversity and a stable finless-porpoise population with uninterrupted migration; the bridge opened in November 2025, six months early.
- Socio-economic: RMB 8.7 bn investment (incl. RMB 2.19 bn from NDB) makes it Anhui's 11th Yangtze crossing, serving 235 million people and cutting passenger travel time 63% and bulk logistics costs 10–15%.
- Technological: an invention patent for the underwater-noise/porpoise early-warning system plus 14 other patents and an all-in-one smart-bridge platform integrating six digital systems.
- Replicability: the monitoring model was adopted by a Nanjing bridge and the ALCP adapted for an NDB wharf in Wuhan; documented by NDB as a biodiversity good practice aligned with the UN Sustainable Transport Decade.

Towngas

Green Methanol as an Engine for Desert Reclamation and Global Maritime Decarbonization: VENEX Green Methanol Project

Location: Hong Kong, China



Overview

Located in Ordos, Inner Mongolia, VENEX retrofits a conventional coal-to-methanol plant to turn end-of-life tyres and agricultural/forestry waste into 50,000 tonnes of bio-methanol a year, an immediate drop-in marine fuel ahead of IMO 2050 goals. It will phase out coal entirely by 2028 and scale to 300,000 tonnes of 100% bio-methanol. As China's first commercial-scale green-methanol plant, it holds ISCC EU, ISCC PLUS and ISO 14067 certifications while sourcing waste from local farmers and returning by-products as organic fertilizer.

Solutions

- Multi-feedstock technology: a proprietary process of waste pretreatment, co-gasification and methanol synthesis converts tyres and biomass; a localized Ordos supply chain flexibly blends feedstocks to hedge price volatility.
- Full traceability and safety: intelligent equipment retrofitting plus chain-wide traceability meet ISCC standards, while specialized high-pressure handling, training and risk controls govern flammable fuel storage and transport.
- Market bridge: long-term agreements with marine-fuel traders enabled Asian-port bunkering; a March 2025 milestone delivered 2,900 tonnes of green methanol to Shanghai Yangshan, forming a closed waste-to-marine-fuel loop.
- Local desert partnership: biomass is sourced directly from farmers, pruning vegetation to curb desertification in Inner Mongolia, while bio-by-products are returned as fertilizer to restore soil and lift crop yields.

Major Achievements

- Market leadership: ~17,000 tonnes of green methanol output in 2025, capturing ~80% of China's total green-methanol sales; ISCC EU/PLUS held for five years and ISO 14067 obtained in 2025.
- First-of-kind bunkering: the 2,900-tonne Shanghai Yangshan operation was China's first large-scale made-in-China green-methanol commercial port bunkering, accelerating maritime decarbonization.
- Industrial upgrading: proves the viability of retrofitting high-carbon chemical assets, supports 'waste-free cities', consumes municipal and agricultural waste and creates local employment.
- Replicability: mature tech, stable feedstock supply and standardized bunkering offer a practical template for coastal regions with existing chemical infrastructure to transition to low-carbon marine fuels.

Mediterranean Shipping Company (MSC)

The Ningbo–Valencia Green Corridor Project

 **Location: Spain**



Overview

The Ningbo–Zhoushan–Valencia Green Shipping Corridor advances the green, low-carbon transition of China–Europe maritime transport. Launched in 2025 by Zhejiang Seaport Investment and the Port Authority of Valencia, with support from the China Waterborne Transport Research Institute and Fundación Valenciaport, it was joined by MSC and its terminal arm TiL in 2026. Linking Ningbo–Zhoushan’s Beilun Third Terminal—11.51 million TEUs in 2024—with MSC’s JADE service to the Mediterranean’s largest container port, the corridor promotes cleaner ports, lower-emission shipping and stronger supply-chain cooperation.

Solutions

- Terminal decarbonization: distributed wind and solar, energy storage and integrated energy systems; expanding charging and alternative-fuel infrastructure with pilot methanol-and hydrogen-powered handling equipment.
- Vessel decarbonization: upgraded shore power and a coordinated green-marine-fuel supply system; MSC evaluates low-and zero-carbon vessels and applies wind-assisted rotor sails and air-lubrication systems.
- Digital organization: automated container terminals with remote-controlled cranes, a port-shipping-trade digital platform, smart gates and an instant-arrival mechanism rewarding on-time, economical-speed sailings.
- Institutional arrangements: a full life-cycle carbon-accounting system and a data-sharing mechanism covering standards, responsibilities and security across ports, shipping lines and other stakeholders.

Major Achievements

- Renewable energy: two 6.25 MW wind turbines (24 million kWh/yr, 90% on-site), 6.3 MW storage and a 3.8 MW PV array (3.43 million kWh/yr, 95% self-consumption) run stably at Beilun Third.
- Clean operations: major machinery electrified and shore power covers the whole terminal;~100,000 m³ of LNG was supplied to MSC vessels in 2025; a new 100%-green-electric MSC automated terminal opens in Valencia around 2030.
- Impact: an estimated 33,940 tonnes of CO2e cut annually today, rising to 132,000 tonnes after the Valencia terminal, with~RMB 3.15 bn in annual direct and indirect economic output.
- Replicability: the model has been extended to the Ningbo–Zhoushan–HAROPA corridor and attracted interest from other international ports, offering a blueprint for green shipping routes.

Rajamangala University of Technology Isan, Thailand

China–Thailand Joint Platform for Professional Skills Training of Electric Vehicle Industry Talents

 **Location: Thailand, China**



Overview

Thailand’s NEV fleet has passed 500,000 units but fewer than 5,000 certified maintenance technicians, a bottleneck to localizing the industry. Aligned with the Global Development Initiative, GSTIKC launched its first Thailand–based overseas Transport Technology Hub in Nakhon Ratchasima in July 2026—the second such hub worldwide. Centred on ‘Capacity Building of Skilled Talents for the China–Thailand NEV Industry’, it brings together government, industry, universities, research institutes and users to train EV specialists and support Thailand’s energy and green-transport transition.

Solutions

- Co-sponsored by GSTIKC, Rajamangala University of Technology Isan, ISA, Tianjin Transportation Technical College and GAC Group, the four-day, 40-hour programme runs trainer and student tracks on high-voltage safety, battery diagnostics and smart-chassis maintenance.
- Blended delivery: live streaming, MOOCs, offline lectures and hands-on lab practice balance theory and operation; bilingual Chinese–Thai instruction enables seamless skill transfer.
- Certification: a standardized competency evaluation and co-accredited certificates from the five host entities boost graduates’ employability; open-access courseware is shared with partner institutions.

Major Achievements

- The inaugural session trained 28 Thai professionals—11 instructors and 17 students—directly easing the NEV-technician shortage in Nakhon Ratchasima and supplying talent to Chinese firms operating in Thailand.
- A multi-party network of governments, universities, industry associations and enterprises lays groundwork for future work on heavy-duty electric trucks and low-carbon transport.
- As Thailand’s first transport-focused overseas Technology Hub (after Vietnam), it forms a replicable brand model for Belt and Road capacity building and deepens China–Thailand people-to-people trust.
- Its low-cost government–industry–university–research–user framework offers developing countries a practical route to closing the skilled-talent gap in the clean-energy transition.

University of Transport Technology, Vietnam

China and Vietnam Join Hands to Build a Government-enterprise-research Dialogue Platform for Innovative Sustainable Transport Policies and Exchanges in Vietnam

 **Location: Vietnam**



Overview

Vietnam's rapid growth demands huge transport investment, yet high-grade highways are under 10% of its 600,000 km network, urban rail is nascent and charging infrastructure lags EV adoption. Marking the 75th anniversary of bilateral ties, GSTIKC and the University of Transport Technology, Vietnam opened the world's first overseas Transport Technology Hub in Hanoi in June 2026. Under the 'One Network and Four Modernizations' framework, it links policy dialogue, technical exchange, talent cultivation and industrial docking to support Vietnam's green, low-carbon infrastructure upgrade.



Solutions

- Held 1–4 June 2026 under the 'One Network & Four Modernizations' framework, the Hub delivered keynotes and seminars on green highways, rail digitalization and financing, with experts from AIB, Chang'an and South-west Jiaotong universities and Chinese SOEs.
- Targeted participants: 47 division-level professionals from 12 institutions, including 17 from government and 30 from universities, 46 affiliated to the Ministry of Construction, covering traffic administration, engineering, research and teaching.
- A four-in-one platform combines centralized lectures, thematic seminars and experience-sharing with a return-visit forum, rail-standard-alignment promotion and enterprise matchmaking under strict management protocols.



Major Achievements

- Trained 47 high-calibre Vietnamese professionals, deepening bilateral trust and laying a foundation for mutual recognition of standards and joint project delivery.
- Built an active dialogue platform bridging Vietnamese agencies, universities, Chinese enterprises and international organizations; China Communications News covered the launch on its front page on 9 June 2026.
- As the world's first overseas Transport Technology Hub, it pioneered an integrated model of executive training, field study and industrial matchmaking, validating the Hub model for international cooperation.
- Its scalable policy-plus-exchange-plus-industry-docking approach offers developing nations a practical path to infrastructure upgrading, low-carbon transition and intelligent transformation.

UNESCAP

EV Battery Recycling and Second Life – Solutions for Asia and the Pacific

 **Location: Asia and the Pacific region**



Overview

As the EV transition sweeps across Asia-Pacific, governance must shift from vehicle adoption to end-of-life batteries: large cohorts retire between 2025 and 2035, with India projecting 3.7 million recyclable packs by 2030 and China expecting over one million tonnes a year. Rapid growth—compounded by archipelagos lacking hazardous-materials capacity, fragmented rules, unsafe informal disposal and orphan batteries—calls for coordinated policy, infrastructure and investment. This good practice sets out a closed-loop, circular-battery framework of producer responsibility, digital passports, safe reverse logistics, second-life repurposing and high-recovery recycling.



Solutions

- Policy and traceability: unified Extended Producer Responsibility laws shift post-consumer liability to producers and importers, while QR-coded digital battery passports track chemistry, state-of-health and ownership via central registries.
- Safe reverse logistics: licensed collection and hazardous-materials-compliant transport observe IATA's 30% state-of-charge limit and the Basel Convention's prior informed consent for cross-border shipments.
- Second-life and recycling: packs retaining 70–80% capacity are certified (UL 1974) for microgrids, telecom backup and low-speed EVs; the rest go to hydrometallurgical and direct recycling recovering over 95% of lithium, cobalt and nickel.
- Regional coordination: harmonize ASEAN standards, align China's traceability, EU recycled-content targets and US incentives to attract private investment and replicate mature recycling models across developing Asia-Pacific.



Major Achievements

- Institutional breakthrough: enforceable EPR and battery-recycling regulations have been promoted in Viet Nam, Indonesia, Malaysia and China, setting replicable policy benchmarks for emerging Asia-Pacific economies.
- Infrastructure scaling: mature commercial recycling capacity in China, Malaysia and the US proves high metal-recovery rates and the economic viability of industrial-scale battery recycling.
- Second-life demonstrations: piloted grid energy storage and commercial backup-power projects are ready to scale on Asian remote islands and in underserved areas, extending battery value.
- Environmental and social gains: recycling cuts virgin-mining emissions by 20–40%, avoids soil and groundwater contamination, and creates green skilled jobs while protecting vulnerable waste workers.

ITDP

Ministry of Road Transport and Bridges, Bangladesh

From Busway to Brisbane Metro — Bus Rapid Transit for a Public-Transport-First Brisbane 2032 Games

Location: Australia



Overview

South East Queensland, Australia's fastest-growing region and host of the 2032 Olympic and Paralympic Games, has committed to a public-transport-first Games in a historically car-dependent metropolis. Building on 25+km of grade-separated busways, Brisbane delivered Brisbane Metro: an~AUD 1.55 billion upgrade converting the busway spine into a metro-style, turn-up-and-go service using 60 battery-electric bi-articulated vehicles, a new city-centre tunnel and flash charging. M2 entered service in January 2025, over seven years before the Opening Ceremony, with venues concentrated along the transit spine.

Solutions

- Upgraded the busway corridor with 60 battery-electric bi-articulated vehicles (~24 m, 170 passengers), level boarding, overnight depot charging and~6-minute terminal flash charging -no overhead wiring.
- Removed the city-centre bottleneck through a new underground Adelaide Street busway tunnel, a green Victoria Bridge and rebuilt Cultural Centre precinct.
- Replaced overlapping suburban routes with two trunk lines (M1, M2) running every 3–5 minutes, turn-up-and-go, with all-door boarding and Queensland's permanent 50-cent fares.
- Designed the Games concept around transit: venues concentrated along mass-transit spines, with rubber-tyred BRT flexibility for event surges and Paralympic accessibility.

Major Achievements

- M2 entered revenue service on 28 January 2025, with M1 progressively introduced during 2025—the core Games transit spine operating more than seven years early.
- Each electric vehicle carries~170 passengers, over twice a conventional bus; 100+peak-hour buses removed from surface streets; patronage climbed to record levels.
- Zero tailpipe emissions eliminated diesel NOx and particulate pollution;~2,000 direct and indirect jobs supported.
- Offers two transferable models: a BRT-to-electric-metro upgrade pathway and a venue-around-transit template for future mega-event hosts.

Multi-Lane Road Tunnel under the River Karnaphuli: Advancing Integrated Cross-River Transport Development in Chattogram, Bangladesh

Location: Bangladesh



Overview

Chattogram, Bangladesh's principal seaport, had long been divided by the Karnaphuli River, with only two congested bridges linking the urban core to industrial zones on the east bank. The Karnaphuli Tunnel—South Asia's first multi-lane underwater road tunnel—is a twin-tube, four-lane expressway extending 3.32 km beneath the river (full corridor~9.3 km). Delivered under a USD 705.8 million EPC turnkey contract through Bangladesh–China intergovernmental cooperation, it opened in October 2023, cutting river-crossing time from 30–40 minutes to~3–4 minutes.

Solutions

- Constructed the 3.32 km twin-tube, four-lane tunnel (10.8 m diameter, 18–31 m below riverbed) using a 12.16 m slurry-shield TBM, with 2,452 precast segmental rings shipped from China.
- Delivered as an EPC turnkey project under a G2G framework, financed by Bangladesh funds plus a concessional EXIM Bank of China loan, with SMEC/COWI independent review and supervision.
- Built~5.3 km of approach roads, a 727 m viaduct, a 16-booth toll plaza and weigh stations, integrating the tunnel into the Dhaka–Chattogram–Cox's Bazar highway network.
- Equipped with comprehensive safety systems: three ground-freezing emergency cross-passages, firefighting, ventilation, drainage, lighting and integrated monitoring.

Major Achievements

- Since opening in October 2023, river-crossing time fell from 30–40 minutes to~3–4 minutes; the Chatto-gram–Cox's Bazar distance shortened~40 km;~1.4 million vehicle crossings in year one.
- Completed to international quality standards verified by independent consultants; the contractor received the Performance Certificate in August 2025 after a successful defect liability period.
- Catalyses the 'One City, Two Towns' strategy, opening Anwara and the east bank to development; generat-ed~1,600 peak construction jobs with local hiring and technology transfer.
- As South Asia's first multi-lane underwater road tunnel, it offers a replicable model for deltaic port cities, with an EPC turnkey+G2G+concessional financing template transferable beyond Bangladesh.

Port of Antwerp-Bruges

Engines of Sustainable Development: APEC and Port of Antwerp-Bruges Enable Port Transformation

Location: Belgium



Overview

Ports are strategic engines for sustainable economic growth, yet face geopolitical shifts, digitalisation and the energy transition. The APEC–Antwerp/Flanders Port Training Center and sister company Port of Antwerp–Bruges International (PoABI) provide a Total Partnership Approach to help ports navigate these transitions, combining APEC’s peer-to-peer knowledge transfer with PoABI’s on-site expertise. The collaboration spans four strategic pillars–Port Strategy & Governance, Digital & Business Analysis, SHEQ & Sustainability, and Operations & Hinterland Connectivity–addressing seven global transitions.

Solutions

- Holistic knowledge-transfer framework addressing seven global transitions through four strategic pillars covering strategy, digitalisation, safety-sustainability and operations.
- APEC’s 49-year legacy of direct knowledge exchange–Annual Courses, tailored programmes and Capacity Building Plans–equips port workforces from executives to operational staff.
- Localised training ecosystems via regional centres (Guangzhou, India, Suriname, Egypt), grounding global methodologies in local contexts and offering gamified tools like the Port Endeavor Game.
- PoABI adds on-site implementation–Management, Strategic Advisory and Co-Investment–building physical infrastructure and optimising daily port operations.

Major Achievements

- Cultivated an alumni network of over 21,000 port professionals across five continents, fostering global collaboration and expertise exchange over nearly five decades.
- Deployed innovative learning tools including the 'Port Endeavor Game' with IAPH and UNCTAD, teaching professionals to balance profitability with the SDGs.
- Demonstrated a proven model for transforming ports into engines of inclusive growth by synchronising infrastructure development with human-capital empowerment.
- The total partnership–APEC building institutional capacity, PoABI assisting on-site implementation–equips ports to serve as resilient drivers of regional and global supply-chain development.

The National Electric Mobility Association of Brazil, Rio de Janeiro City Hall, 99 Tecnologia LTDA

Enhancing Sustainable Transportation Development and Social Welfare in Brazil through Digital Innovation and Green Energy

Location: Brazil



Overview

Brazil's transport sector faces heavy fossil-fuel reliance, safety hazards, weak new-energy infrastructure and uneven urban-rural coverage. Launched in 2022 by Brazil's Ministry of Transport and mobility platform 99, the Sustainable Mobility Alliance unites over 30 enterprises across automotive, energy, charging, finance and car-rental sectors, building a full-scenario, life-cycle ecosystem centred on intelligent safety governance, transport electrification and inclusive flexible employment–a replicable benchmark for emerging-economy urban transport.

Solutions

- Digital intelligent safety system: facial recognition, real-time positioning, anomaly alerts and a 24/7 safety centre; big-data high-risk-zone warnings and standardized driver training for ride-hailing and delivery.
- Cross-sector digital platform connecting vehicle supply, financial services and charging; expanding interoperable charging network and promoting EVs, motorcycles and e-bikes via tailored rental and credit schemes.
- Intelligent order-matching balances supply and demand; low-interest credit and subsidies; e-mobility connects remote communities, including targeted medical-travel support.
- An industry-wide coalition of 30+enterprises creates a full-scenario, life-cycle sustainable mobility ecosystem.

Major Achievements

- Safety: over 50 intelligent safety features covering 1.5 million drivers and 55 million users; safety complaints down 67%, high-risk exposure down 40%.
- Low-carbon: 16,000 charging stations deployed by end-2025 (31% funded by members);~210,000 of Brazil's 570,000 NEVs launched via the Alliance; 46,300 tonnes CO2 cut.
- Inclusion: 1.5 million flexible jobs; services cover 55 million users in 3,300 municipalities; e-hailing energy costs down up to 80%; 2 billion e-bike/e-motorcycle trips.
- Platform 99 donated BRL 1 million in mobility vouchers for residents requiring medical travel, a replicable model aligned with the SDGs.

UNECE

Mobility Green Label-Factory for Non-Ferrous Metals inPlovdiv

Location: Bulgaria



Overview

The Factory for Non-Ferrous Metals (FNM) is an industrial zone~10 km from Plovdiv, Bulgaria, with ten companies and~2,500 employees. Before the project, 67% of workers used public or collective buses, 20% drove and 8% were car passengers; the challenge was improving an existing mobility system. Part of MoMa.BIZ, a European project (2011-2014) across six countries, the Energy Agency of Plovdiv worked with site management to develop a Transport and Mobility Improvement Plan, promoting better services, organised parking and safer, more efficient transport at industrial-zone scale.

Solutions

- Formed a Local Mobility Group and secured executive adoption of a Transport and Mobility Improvement Plan, after a mobility survey identified poor services, inadequate parking, weak carpooling and limited flexible work.
- Upgraded public transport via new quality requirements in operator tenders and information boards at stops, improving reliability and reducing the incentive to drive.
- Parking-management map covering 223 spaces (15 carpooling, 4 reduced-mobility); online carpooling platform with preferential parking and a guaranteed-ride-home safety net.
- Tested cargo bicycles for internal deliveries; organised Mobility Week and Information Day, combining operational improvements with communication.

Major Achievements

- Recognised by UNECE as the first industrial area in Bulgaria to formally adopt a Mobility Management Plan and translate it into operational measures.
- Delivered a parking map of 223 spaces, new tender rules, bus-stop boards, an online carpooling platform and cargo-bike trials.
- Upgraded from MoMa.BIZ Mobility Label Class B to Class A after full implementation-the most significant verified performance result.
- The MoMa.BIZ methodology was designed for replication across business and industrial zones in six European countries, integrating transport quality, parking and shared mobility.

IATA

CADO Sustainable Aviation Fuel Registry System: Digital Platform for Transparent SAF Tracking

Location: Canada



Overview

Aviation has committed to net-zero by 2050, aligned with ICAO's Long-Term Aspirational Goal; Sustainable Aviation Fuel (SAF) is expected to deliver~65% of those reductions. Yet production is just 1.9 million tonnes (0.6% of global jet-fuel demand), SAF costs 3-5 times conventional fuel, and transparency and double-counting concerns constrain deployment. IATA therefore developed the SAF Registry, launched in April 2025 and transferred to the Civil Aviation Decarbonization Organization (CADO)-a global, non-profit digital platform using a Book and Claim mechanism to decouple physical fuel from its environmental attributes.

Solutions

- Global 'Book and Claim' chain-of-custody: airlines purchase SAF credits from any producer and apply them to any flight, regardless of the physical fuel used.
- Anti-fraud integrity: all redemptions and environmental claims are verified and retired on use, preventing double counting.
- Cost-sharing and free access: corporations co-finance decarbonisation; free access with zero transaction fees until April 2027.
- Cross-platform interoperability pilots in 2026; close collaboration with ICAO; operated by CADO as a not-for-profit.

Major Achievements

- Backed by over 50 organisations-airlines, fuel producers and State authorities-providing a scalable, purpose-built system for transparent SAF tracking.
- Trusted not-for-profit governance under CADO ensures an impartial, globally accepted framework for all value-chain stakeholders.
- Connects global supply and demand to incentivise new production investment, driving scale-up of SAF capacity and innovation.
- Critical infrastructure for CORSIA compliance and corporate Scope 3 reporting, supporting aviation's clean-energy transition.

Croatian Roads Ltd.

Pelješac Bridge and Access Roads: Connecting South Dalmatia through Sustainable Transport Infrastructure

 **Location:** Croatia



Overview

The Road Connection with South Dalmatia project, implemented by Croatian Roads Ltd. (2017-2023) with EU Cohesion Fund co-financing, resolved a long-standing discontinuity: southern Croatia, including Dubrovnik, was linked to the rest of the country only through the Neum corridor requiring two border crossings, or by ferry. The project comprises the 2.44 km Pelješac Bridge, access roads and the Ston bypass-over 31 km of infrastructure-built by a CCCC-led consortium across a statutorily designated marine protected area, improving cohesion, accessibility and resilience.



Solutions

- Integrated connectivity: the 2.44 km bridge, 10.5 km access roads and 18.09 km of Ston bypass sections create a continuous domestic and EU road link, removing two border crossings.
- Evidence-based EU-standard traffic and cost-benefit analysis throughout the lifecycle, with ex-post re-evaluation using observed traffic data.
- Safe, resilient infrastructure adapted to coastal conditions: emergency lanes, wind-protection measures, tunnels, viaducts and safety facilities.
- Comprehensive marine protection: bubble curtains for pile-driving noise, oil-containment booms, sedimentation control and process-water recycling.



Major Achievements

- Bridge opened July 2022 and the Ston bypass in April 2023, on schedule, delivering over 31 km of new and upgraded road infrastructure.
- 2.77 million hours of annual travel-time savings (2023); average daily traffic of 6,667 vehicles at the bridge; border-crossing traffic sharply reduced.
- Ex-post re-evaluation confirmed positive economic NPV of EUR 30.8 million, economic rate of return of 5.55% and benefit-cost ratio of 1.08.
- Won the 2023 Gustav Lindenthal Medal and was Highly Commended at FIDIC Project Awards 2023; promoted local employment and university collaboration.

IRU

The IRU Green Compact: A Holistic Approach to Decarbonising Commercial Road Transport

 **Location:** Europe



Overview

Meeting the Paris Agreement's 1.5° C target requires an 84% cut from 2019 levels. Commercial trucks and buses account for ~23% of transport-sector GHG emissions (~1.8 GtCO₂e), yet 90% of EU transport firms have fewer than ten employees, limiting transition resources. Launched by IRU in 2021, the Green Compact is a holistic, evidence-based initiative structured around four workstreams—efficiencies, alternative fuels, collective mobility and enabling conditions—helping road transport reach carbon neutrality by 2050 while maintaining economic sustainability.



Solutions

- Efficiencies: eco-driver training (up to 15% fuel savings), vehicle retrofits (low-rolling-resistance tyres, aerodynamic devices), European Modular System and eTIR digital border crossings.
- Alternative fuels: battery-electric vehicles offer zero tailpipe emissions while advanced biofuels like HVO give immediate 75-90% carbon cuts without costly engine modifications.
- Collective mobility: modal shift from cars to buses and coaches through congestion charges and integrated ticketing, lowering carbon intensity per passenger-km.
- Enabling conditions: the AFEM telematics model and Decarbonisation Roadmap Maker (DRM) support data-driven planning, deployed via 21-language surveys and confidential roundtables.



Major Achievements

- Efficiency measures alone could cut cumulative industry energy consumption by 77%; DRM modelling maps batteries supplying two-thirds of EU road-transport energy by 2050.
- 2025 survey revealed critical gaps: 82% of European operators worry about decarbonisation; only 40% have implemented eco-driving.
- TCO analysis ensures transition viability for SMEs; IRU RoadMasters certification improves driver job quality; influenced cancellation of German road-user charges.
- Technology-neutral approach lets nations leverage local energy resources; AFEM and DRM tools expanded to Africa, Asia and Latin America via 100+associations.

UNECE

Strasbourg Sustainable Urban Mobility Plan (SUMP)

Location: France



Overview

Strasbourg, a historic cross-border city on the Rhine, experienced severe congestion, pollution and road-safety pressure as motorisation intensified from the 1980s, with some 240,000 vehicles entering the city centre daily. Rather than a single project, it adopted an integrated urban mobility strategy combining tram investment with traffic management, parking policy, pedestrianisation, cycling, park-and-ride and urban regeneration-coordinated through France's PDU approved in 2000 and evolving through later policies including the Active Mobility Action Plan.

Solutions

- Integrated tramway and public-space programme: tram lines offered high-capacity alternatives, with traffic-free precincts, one-way loops, higher inner-city parking fees and pedestrian/cyclist zones.
- Combined infrastructure with urban regeneration: park-and-ride sites extended suburban reach; landscaping turned transport changes into visible urban improvements.
- Multi-level governance and stable financing: PDU ratified by municipalities, metropolitan council and national authorities, funded by national, regional and local sources including a transport levy.
- Active-mobility targets: convert 50% of sub-1 km car trips to walking/cycling by 2030, backed by a EUR 100 million cycling master plan.

Major Achievements

- Delivered 30 jointly developed projects (15 on environmental protection); by 2000 city-centre vehicle numbers fell 16%, a third below expected levels.
- Tramline A carried~68,000 passengers daily in year one; over two decades car use fell from 53% to 37% of trips while public transport rose from 9% to 16%.
- Urban regeneration: higher property values and trading activity, 125 jobs created, visible quality-of-life improvements.
- Highly replicable integrated method: long-term multimodal strategy, cross-jurisdiction governance, stable financing and continuous engagement, adapted to new climate and equity challenges.

Batumi Navigation University,Georgia

Enhancing Maritime Competences through Internationalization and Global Partnerships: A Sustainable Capacity-Building Model from Georgia

Location: Georgia



Overview

Located in Batumi, Georgia, Batumi Navigation University (BNU) plays an important role in developing maritime education and human capital for the country's maritime sector. As global shipping is transformed by digitalisation, decarbonisation and technological innovation, maritime institutions face rising demand for qualified professionals, advanced training and international cooperation. Since 2019 BNU has pursued an internationalization-driven development model, expanding long-term partnerships with universities, maritime organisations and industry stakeholders worldwide. Through global partnerships, knowledge exchange and practical training, the initiative builds an educational eco-system where students, staff and seafarers share international experience, promoting safety, quality education, resilience, inclusiveness and the SDGs.

Solutions

- Aligns curricula with the STCW Convention, ISO 9001 quality management and European Higher Education Area standards, integrating navigation simulators and digital learning platforms so graduates match international maritime labour-market needs.
- Runs Erasmus+student and staff mobility and projects such as DUGEOR, partnering with 70+institutions across Europe and Asia, and engages masters, chief engineers and experienced seafarers in teaching to bridge theory and industry practice.
- Holds active membership in IAMU, IMLA, BSAMI, EVTA and EVBB; hosts international guest lectures and conferences, and encourages women's participation and mobility access to advance gender equality and inclusion.

Major Achievements

- Expanded its international partner network from 5 institutions to more than 70 worldwide, giving students and staff access to mobility programmes, joint projects, training and academic exchanges across three continents.
- Implemented ISO 9001-based quality assurance and aligned programmes with national and international requirements, securing accreditation, raising academic quality and strengthening the institution's reputation.
- Enhanced the competitiveness of Georgian seafarers in the global labour market while promoting inclusion and equal opportunity; the integrated model is replicable for maritime institutions in developing countries and Small Island Developing States.

DHL Group

Green Logistics Revolution: From Sustainable Aviation Fuel to Solar – Bold Steps toward Net-Zero by 2050

 **Location: Germany**



Overview

DHL Group, operating in over 220 countries with~600,000 employees, set the sector's first quantified climate target in 2007 and committed to net-zero logistics GHG emissions by 2050, embedding 'Green Logistics of Choice' in Strategy 2030. In 2025-2026 it advanced five levers-sustainable fuels in air and ocean, fleet electrification, hydrogen pilots for long-haul road and renewable-energy facilities-making concrete progress toward net-zero.

Solutions

- Signed a multi-year Phillips 66 agreement for over 240,000 tonnes of SAF, cutting~737,000 t CO2e; lifted SAF in its air fleet to 10% in 2025.
- With CMA CGM, used~8,800 tonnes of UCOME marine biofuel under GoGreen Plus, saving~25,000 t CO2e; ordered 300 SAIC Maxus electric vans.
- Extended hydrogen-truck pilots to the Middle East; launched a 4.2 MWp solar warehouse in Thailand with on-site battery storage.
- Offers customers GoGreen Plus insetting via SAF/SMF and book-and-claim; over half of Chinese customers adopted it by 2025.

Major Achievements

- Reached a 10% SAF share in its aircraft fleet in 2025 with a scalable upstream supply partnership, leading global SAF adoption.
- Built one of the world's most comprehensive low-carbon logistics networks, with large-scale EV fleets, alternative fuels and renewable-powered facilities across major trade regions.
- Anchored 'Green Logistics of Choice' in Strategy 2030 and publishes the annual Global Connectedness Report, shaping thought leadership on trade, supply chains and sustainable logistics.

UNECE

Munich's "Gscheid Mobil" Smart Mobility Programme

 **Location: Germany**



Overview

Munich's fast-growing population generates heavy urban travel pressure that cannot be solved by infrastructure alone. Launched formally in 2006, Gscheid Mobil is the city's demand-side mobility-management complement to capital transport investment, run by the municipality and MVG transit operator under the brand 'München unterwegs'. Its core principle is the 'mobility biography': people are most open to changing travel habits at pivotal life events-relocation, school enrolment, childbirth, career change, retirement.

Solutions

- Applies a life-event logic rather than one-size-fits-all advertising, combining personalised consultation, practical trials and long-term evaluation to build multimodal habits.
- New Citizen Project: newly registered households receive route maps, fare guides and free trial tickets, with optional telephone advice, refined since the 5,000-household pilot.
- Layered life-stage programmes: pre-school mobility games, walking buses, climate workshops, cycling training, cargo-bike offers via maternity clinics and workplace packages.
- Co-designs all measures with schools, transit firms, retailers and medical providers as trusted local intermediaries.

Major Achievements

- New residents receiving orientation used public transit 7.6 percentage points more than a control group; on 85,000 annual newcomers this adds~6,460 daily transit commuters.
- Pilot modelling shows annual cuts of 4.7 million car-km and 700 t CO2; scale-up projects 80 million fewer vehicle-km and 12,000 t CO2 per year.
- The council upgraded the pilot into a permanent programme; the life-stage model was transferred to Almada, Portugal and won the 2014 EPOMM award.

WHO

Comprehensive Speed Management as a Core Principle for Sustainable and Safe Mobility

Location: global



Overview

Despite major investment in infrastructure, electrification and urban design, many transport systems still produce unsafe, inequitable outcomes, because travel speed—a decisive system variable—remains weakly governed. Road deaths remain ~1.19 million annually, and road injuries are the leading killer of people aged 5–29, with the burden falling hardest on low- and middle-income countries. WHO's framework makes safe, survivable speeds the governing constraint of the system, aligning limits, design and enforcement so that predictable human error does not lead to death.

Solutions

- Distinguishes safe speed (survivability boundary) from allowed speed (legal limit) and actual speed, making safe speed the governing principle for law and design.
- Survivability thresholds: below 30 km/h where pedestrians may be struck; side-impact survivability collapses above 50 km/h; higher speeds only where conflicts are fully separated.
- Self-enforcing urban design—traffic calming, raised crossings, 30 km/h zones—with automated enforcement and in-vehicle technology reinforcing safe design.
- Institutional responsibility: national governments set standards, local authorities set context-sensitive limits, employers treat speed as an organisational duty.

Major Achievements

- Frames speed as a system outcome, showing small reductions generate large safety gains at low cost—among the most powerful levers in transport policy.
- Co-benefits beyond safety: well-managed speeds cut energy use and emissions, reduce noise and make walking and cycling safe, improving liveability and equity.
- Provides a governance framework aligning legal limits, design and operating speeds toward human survivability, supporting Vision Zero and the Safe System approach.

FIATA

FIATA Electronic Multimodal Bill of Lading (eFBL): A Paperless Global Trade Project

Location: Global (deployed in 27+ territories)



Overview

The digital negotiable FIATA Multimodal Bill of lading (eFBL) is a global initiative led by FIATA and deployed through FIATA's worldwide network of national freight forwarder associations and their member companies. Rather than a single-corridor or single-country deployment, the eFBL is an interoperable digital standard. It is supported by FIATA's 106 Associations members representing over 50' 000 companies in more than 150 countries. The solution is delivered through a growing ecosystem of more than 50 transport management system (TMS) and software providers.

Solutions

- The solution is built around a five-step workflow designed to fit into freight forwarders' digital tools:
1. Data entry: freight forwarders input FBL data through their everyday TMS or other operational software, with no separate portal.
 2. Secure transmission: the software shares the FBL data, together with the identity of the document issuer, with FIATA through a dedicated API.
 3. Identity verification and registration: FIATA checks the issuer's identity and registers the digital FBL, stamping it with a unique QR code.
 4. Flexible usage: forwarders choose whether to share the document as a printed copy or as a secured digital BL.
 5. Verification by any stakeholder: any party can scan its QR code to access the immutable audit trail.

Major Achievements

- Project outcomes:
- Proof of Concept (Feb–Aug 2021): 7 software providers and 19 freight forwarders (FIATA / national association members) tested the full eFBL lifecycle.
 - Ecosystem growth: the eFBL is now integrated with more than 50 TMS and software providers globally, up from 7 at the POC stage.
 - Global usage: The eFBL is used in day-to-day operations by freight forwarders across all continents.

- Project's contribution to the socio-economic aspect:
- Cost savings: electronic bills of lading can cost up to three times less.
 - Time savings: operational users report issuing, amending, and sending secured FBLs within minutes.

UPU, ITU, Pos Indonesia

Leveraging Postal Logistics Networks to Enable Reverse Flows for Circular Electronics

 **Location:** Indonesia



Overview

As Southeast Asia's largest e-waste generator, Indonesia produced~1.886 million tonnes of WEEE in 2022, yet collected only 2.82% and recycled 2.61%, with formal capacity covering 1.5% of projected generation. Within this gap, PT Pos Indonesia developed an integrated reverse-logistics model embedding e-waste collection, transport, warehousing and distribution into existing delivery routes, safely leveraging national postal capacity for a circular electronics value chain.

Solutions

- Built on Pos Indonesia's network~4,000 post offices and 8,000 delivery staff across 17,000+islands-collecting WEEE by backhaul to transit warehouses and licensed recycling partners.
- 16 pilot post offices in Jabodetabek with fire-resistant drop boxes and protective systems, with differentiated workflows for small electronics (barcode drop-boxes) and large appliances.
- Digital tools for real-time tracking, traceability, compliance reporting and future EPR accounting across the postal route network.
- Financial sustainability anchored in EPR-aligned producer fees (~EUR 2.8 million gross annual profit), material-recovery revenue and B2B contracts, targeting 12,000 tonnes/year.

Major Achievements

- Addresses a severe gap-only 2.82% of e-waste collected against 1.886 million tonnes generated in 2022-with 16 pilot post offices linking households to licensed processors.
- Strengthens the circular-electronics chain by connecting informal collectors to formal facilities, improving compliance and raising backhaul efficiency.
- Highly replicable: rides on existing postal infrastructure, scales incrementally without major investment, transferable to other developing countries.

MOST, Italy

Institutional Innovation Driving Sustainable Transport Development: Italian Centre for Sustainable Transport

 **Location:** Italy



Overview

Italy's transport system serves 60 million people and 13% of national GDP, facing decarbonisation, digitalisation, ageing infrastructure and congestion. The National Centre for Sustainable Mobility (MOST), established in 2022, is a public-private partnership backed by~EUR 394 million of PNRR funding, uniting 25 universities, CNR, 24 leading enterprises and nearly 700 researchers across 163 organisations (60% SMEs), connecting innovation from TRL 2 to TRL 9 across all transport modes.

Solutions

- National 'Hub & Spoke' partnership of 25 universities, CNR, 24 firms and~700 researchers across 163 organisations, organised into 14 research lines.
- Links TRL 2 to TRL 9 through shared labs, living labs, real-world testbeds and open-innovation calls, moving research into market-ready solutions.
- Two parallel tracks: digitalisation (CAV, CCAM, MaaS, IoT infrastructure) and a technology-neutral energy transition (hydrogen, biofuels, electrification, next-gen batteries).
- Four sectoral observatories (SUNRISE, IOSCA, FREIGHT INSIGHTS, MOBISCO) plus funding channels linking consortia to Italian and European finance.

Major Achievements

- Delivered 91 projects in 2023-2025, engaged 2,800+experts, and selected 57 start-ups (50 granted EUR 8.5 million; 7 attracted EUR 2 million equity).
- Demonstrators include eVTOL and U-Space drones, a battery-swap electric city car, hydrogen delivery van, the Emilia 5 solar vehicle and Italy's first certified smart road.
- Set a 318 km/h autonomous record with the Maserati MC20; exceeded the Emilia-Romagna MaaS pilot adoption target by 54.6%; a transferable national model.

UNIDO

Multi-Dimensional Low-Carbon Transport Governance Model in Malaysia

 **Location:** Malaysia



Overview

Implemented nationwide by UNIDO with GEF and Malaysian government funding (2015–2020), this project transforms Malaysia's transport sector into a low-carbon, energy-efficient system. Transport has become the country's largest GHG emitter, driven by private-vehicle dependence and fuel subsidies, yet EV adoption was limited by fragmented governance, missing charging infrastructure and weak awareness. The project integrates policy, infrastructure, capacity building and engagement to create an enabling environment for large-scale EV adoption.

Solutions

- Developed Malaysia's Low Carbon Mobility Blueprint and a joint cross-ministry cabinet paper, translating barriers into EV-friendly regulations and fiscal incentives.
- Deployed~350 EV charging stations under ChargeEV with a centralised digital monitoring system for real-time location, tariffs and grid integration.
- PV-integrated charging pilots on the PLUS Highway, Sunway BRT depot and Langkawi Island, combining solar with storage to build investor confidence.
- National Occupational Standards for EV-charging installation with certified training; designed the Low Carbon Langkawi Island Plan as a scalable model.

Major Achievements

- ~350 ChargeEV stations cover roughly 70% of Malaysia's public charging infrastructure, with pilots across major urban centres and corridors.
- Attracted EV infrastructure investment, developed new value-chain markets and created certified green jobs through national skills standards.
- Laid a long-term decarbonisation foundation through electric mobility and renewables; the top-down/bottom-up model is replicable for emerging economies.

AIIB

Duqm Port Commercial Terminal and Operational Zone Development: Integrated Logistics Ecosystem

 **Location:** Oman



Overview

Located in the Duqm Special Economic Zone, Oman, the Duqm Port Commercial Terminal and Operational Zone is a strategic logistics hub tied to economic diversification. Greenfield ports face a typical bottleneck: terminal structures cannot operate without a complete ecosystem of roads, yards, utilities and buildings. AIIB provided USD 265 million to deliver this enabling infrastructure as a package, adopting a 'port-as-a-system' approach, embedding environmental and social management and strengthening the logistics base for private-sector activity and mineral exports.

Solutions

- USD 265 million (92.6% disbursed) for~3 km of internal dual-carriageway roads, container yards, cargo stacking and paved facilities for seamless circulation.
- Full utility and safety backbone-water, firefighting, stormwater, sewerage, electrical and telecoms-plus terminal and operational buildings with crane works.
- 'Port-as-a-system' planning packages roads, storage, utilities and safety together, linking infrastructure to SEZ demand and mineral exports.
- Category B environmental and social management on reclaimed land with zero land acquisition; construction EMP recorded zero grievances.

Major Achievements

- Transformed Duqm Port from greenfield asset into a functional logistics platform, with roads and buildings substantially completed and costs below estimate.
- Improved operational readiness of a strategic gateway, supporting Omani diversification, mineral exports and SEZ supply chains.
- A replicable blueprint for greenfield ports: package enabling infrastructure, manage sequencing and embed responsible construction delivery.

C40 Cities

Decarbonizing Shipping: Los Angeles – Long Beach – Singapore Green and Digital Shipping Corridor

Location: Singapore and Los Angeles , US



Overview

Shipping contributes nearly 3% of global GHG emissions, a share that could surge to 17% by 2050 without action. Green Shipping Corridors (GSCs) have emerged as a collaborative framework to advance zero-emission shipping through coordinated technical, commercial and regulatory action. First proposed under the 2021 Clydebank Declaration, GSCs are dedicated trade routes catalyzed by public and private stakeholders, with 84 initiatives launched to date. The Singapore–Los Angeles–Long Beach Green and Digital Shipping Corridor (GDSC) was announced at COP27 in 2022 and formalized via MoU in April 2023. Spanning 14,000 km across the Pacific and handling about 7% of global container trade, it promotes low-and zero-carbon marine fuels and uses digital solutions to optimize voyage and route efficiency.

Solutions

- Published an official Partnership Strategy in December 2023, aligned with the 2023 IMO GHG Strategy, to accelerate maritime decarbonization, set unified green shipping standards, scale digital solutions and synergize with other first-mover corridors.
- Established joint collaboration frameworks among Singapore MPA, Port of Los Angeles and Port of Long Beach, focusing on zero-and near-zero fuel transition, technology upgrading, industry standard-setting and global advocacy.
- Adopted a three-tier governance of Founding Partners, Participants and Supporters; completed an April 2024 baselining study by the American Bureau of Shipping forecasting trans-Pacific trade and energy demand to 2050.

Major Achievements

- Restructured working mechanisms in December 2024 and launched four parallel workstreams: net-zero fuel transition, digital port-to-port link, digital ship-to-port link, and energy-efficiency technology demonstrations.
- In 2025, Singapore MPA completed bunkering trials and issued methanol bunkering licenses, while POLA and POLB commissioned a Clean Fuels Study and prepared for a 2026 methanol pilot project.
- Advanced digital connectivity with completed API and data-exchange testing, and partnered with Mitsui O.S.K. Lines for initial pilot trials; MPA will launch a maritime data-exchange platform in late 2026.

UNIDO

Policy-Infrastructure Synergy for Low-Carbon Transition: South Africa’s Multi-Faceted Approach

Location: South Africa



Overview

Implemented by UNIDO with GEF funding (2015–2020), this project worked with South African national authorities and cities including Johannesburg and Durban to accelerate the low-carbon mobility transition. Road transport contributes~91% of national transport emissions, while electric mobility remains immature, with limited EV stock and scarce charging infrastructure. The project applies a systematic approach of policy improvement, infrastructure expansion, public engagement and capacity building, delivering a replicable decarbonisation model for emerging economies.

Solutions

- Integrated electric mobility and non-motorised transport into national and urban strategies through multi-stakeholder consultations uniting SANEDI, transport and energy departments and NAAMSA.
- Cross-sector coordination platforms unify government, industry and institutional resources; national dialogues and exhibitions raise EV awareness.
- Expanded public charging from 60 (2016) to~120 stations (2019); electric-bike sharing and urban mobility pilots build experience.
- Targeted professional training for engineers and technicians bridges the skills gap for EV and renewable-energy integration.

Major Achievements

- National EV fleet grew from~200 (2016) to~870 battery EVs (2019); public charging doubled to 120 stations, attracting global automakers.
- Drove green industrial upgrading, EV-related investment, local technical talent and inclusive non-motorised options.
- Reduced road-transport GHG, urban air pollutants and motorcycle black carbon, with wide climate and public-health benefits.
- A scalable dual-track low-carbon model combining electric and non-motorised solutions, replicable for fast-urbanising economies.

WEF

Demand Aggregation as a Catalyst for Scale: First Movers Coalition for Freight Decarbonization

 **Location:** Switzerland



Overview

Launched in 2021, the First Movers Coalition (FMC) unites leading global corporations to decarbonise hard-to-abate sectors such as road freight. Members pledge over \$19 billion in low-carbon product demand by 2030 through 130+offtake agreements and investments, bridging the 'valley of death' by aligning corporate ambition with policy. For heavy-duty trucks, members commit that 30% of new purchases-or 15% of road freight-will be zero-emission by 2030, sending clear market signals to manufacturers and infrastructure developers.

Solutions

- Demand-driven multi-stakeholder approach uniting corporations, suppliers and 15 government partners, turning climate pledges into reliable market signals.
- Long-term offtake agreements and innovative financing (pay-per-use, Truck-as-a-Service, blended finance) share risk and narrow the diesel-to-zero-emission cost gap.
- Book and Claim mechanisms complement limited infrastructure; the First Suppliers Hub maps low-carbon providers and coordinates charging hubs.

Major Achievements

- The \$19 billion in 2030 demand could cut~26 million tonnes of CO2, with operational pilots already verifying reductions.
- Pilots include PepsiCo-XPO's 6 UK electric trucks, SSAB and Cemex electric fleets, Toll's \$43 million Asia-Pacific deployment and Fortescue's \$2.8 billion zero-emission mining commitment.
- Expanded zero-emission trucking improves air quality, cuts noise and creates green jobs.
- Technology-neutral, demand-led model recognised by the UN Decade of Sustainable Transport, a scalable blueprint for SDGs 9, 11 and 13.

UNIDO

Replacing Diesel with Solar+Storage: Serengeti's PV-ESS Integrated Solution for Clean Energy

 **Location:** Tanzania



Overview

Launched in January 2018 in the ecologically fragile Serengeti National Park, Tanzania, this project is led by solar integrator Asantys Systems with Tanganyika Expeditions. In this remote off-grid reserve, energy relied on diesel generators, with a 60-km fuel-supply haul driving high costs while air and noise pollution disturbed wildlife. The project integrates decentralised solar-plus-storage with customised electric-vehicle retrofitting, cutting fossil-fuel dependence and forming a sustainable mobility model for remote, ecologically sensitive areas.

Solutions

- Off-grid renewable system: two 55 kWp solar PV arrays with inverters and 440 kWh battery storage fully replace diesel generators for lodges and EV charging.
- Retrofitted Toyota Landcruiser safari vehicles with 40-80 kWh LiFePO4 batteries, delivering 130-240 km range suited to daily safari operations.
- Smart energy management charges EVs during peak solar generation, maximising renewable use and minimising waste.
- Local training builds technician capacity for solar systems and EV maintenance, ensuring community ownership.

Major Achievements

- 110 kWp of solar PV and 440 kWh of storage achieve self-sufficient clean energy, fully powering daily electric safari operations.
- Eliminated diesel pollution and noise, protecting wildlife and enhancing eco-tourism while cutting fuel logistics.
- Generated local O&M employment and renewable-energy training, strengthening regional partnerships.
- A modular, scalable, low-cost solar-plus-storage model replicable for off-grid reserves and eco-tourism destinations worldwide.

UPU

Leveraging the Postal Network for Public Health Goals

Location: Thailand



Overview

While WHO and UNICEF recommend six months of exclusive breastfeeding, Thailand's rate remains far below the 50% target (14% in 2019, 29% in 2023), partly due to women's labour migration causing parent-child separation. The 'Partnership for Love' project, led by the Ministry of Public Health with Thailand Post, leverages the nationwide postal network to offer free, standardised delivery of frozen expressed breast milk-integrating transport infrastructure with public health to advance health equity and gender inclusion.



Solutions

- 2018 pilot in Khon Kaen partnering with local transport firms and a public health centre to provide free breast-milk delivery for separated migrant families.
- LINE digital platform for one-stop registration and standardised pre-service guidance, reducing user errors and widening access.
- Standardised passive cold chain-unified low-temperature packaging, official inspection and 24-hour traceable delivery.
- Expanded nationwide via Thailand Post's 1,200+outlets with predictable schedules, overcoming geographic gaps identified in the pilot.

Major Achievements

- The pilot grew from 40 users and 268 inquiries (year one) to 1,488 applicants and 4,224 service uses (year two), with 100% satisfaction.
- Scaled nationally with 6,595 registered participants (2020-2024), improving breastfeeding access for migrant mothers (SDGs 3, 5, 9, 10).
- An inclusive mobility model repurposing existing logistics networks to deliver essential health services.
- Low-cost, replicable model for countries facing female labour migration across Asia, Africa and Latin America.

ICTD

Digital Global Transit Network™ (dNet™): Digital Infrastructure for Resilient Global Supply Chains

Location: Turkmenistan



Overview

Despite advances in logistics, international transport remains burdened by paper-based documentation and manual processes that can account for up to 15% of total logistics costs. The Digital Global Transit Network (dNet) addresses this by establishing a secure digital infrastructure for global supply chains. At its core is the Global Transit Document (GTrD), a unified digital authorization that leverages blockchain to let cargo move seamlessly across multiple borders. Currently in Pilot Phase II (Customs Transit), the project connects Central Asian and Caucasian nations, replacing redundant paperwork with a tamper-resistant digital ledger to enhance transparency, security and speed in multi-modal transport corridors.

Solutions

- Blockchain-based digital documentation replaces paper invoices, manifests and declarations with a secure, reusable digital ledger (GTrD), cutting administrative duplication and preventing data tampering.
- Real-time cargo tracking gives authorized stakeholders—customs, forwarders, insurers—live visibility of container movements across borders, improving supply-chain reliability.
- Integrated customs facilitation enables electronic transit declarations, digital customs guarantees and advance cargo information exchange to streamline border management and risk analysis.
- Regional AEO mutual recognition establishes a framework among participating nations granting preferential border treatment to authorized operators, lowering transaction costs and accelerating crossings.

Major Achievements

- Completed Phase I (Digital Transit) with 247 shipments and 229 border crossings across 10 countries on 77 routes, 98.8% of them multimodal, proving the platform's multimodal tracking capability.
- Secured long-term technology collaboration with IBM to build the dedicated dNet application on Hyperledger Fabric after transition from TradeLens, ensuring enterprise-grade security and scalability.
- Demonstrated economic efficiency by replacing paper administration with secure digital exchange, accelerating cargo processing and generating logistics data for evidence-based policymaking.
- Established a scalable regional customs-cooperation model as a blueprint for landlocked developing countries seeking deeper integration into global trade networks.

Ministry of Energy and Mineral Development, Uganda

Green Power and Cold Chain Integration for Reducing Post-harvest Losses in Uganda

Location: Uganda



Overview

Uganda, the 'Pearl of Africa,' has abundant aquatic and agricultural resources but faces severe post-harvest losses and limited market access due to unstable electricity and a near-absence of cold-chain infrastructure. This project builds an integrated industrial model combining utility-scale renewable energy with modern cold-chain logistics. By deploying a hybrid wind-and-solar system to fuel cold storage, processing facilities and green transport corridors, it addresses the root cause of energy deficiency. It transforms Uganda's economy from raw commodity exports toward high-value processed goods, creating a sustainable, zero-emission supply chain that raises local GDP and improves food security for agriculture and fisheries.

Solutions

- Utility-scale renewable energy deploys a wind-and-solar hybrid tailored to Uganda's harsh climate, underpinned by 25+year power purchase agreements to ensure stable 24/7 green power that replaces fossil fuels and unlocks cold-chain infrastructure.
- Integrated cold-chain infrastructure builds agricultural deep-processing parks, regional cold-storage centres and green cold-chain corridors to reduce post-harvest spoilage, extend shelf life and enable branded, high-value exports.
- Green logistics corridors establish low-carbon transport networks connecting production areas to urban centres and cold storage, supported by reliable electricity for refrigerated logistics.
- Localized talent development runs professional training and technical mentoring to transition local workers from manual labor to skilled technical and managerial roles across energy, cold chain and green transport.

Major Achievements

- Creates a core industrial-synergy platform that attracts investment and shifts Uganda's agriculture, livestock and fishery sectors toward technology-driven, high-value, branded production.
- Generates substantial local employment across power O&M, cold-chain warehousing and processing, raising incomes and narrowing the urban-rural development gap.
- Significantly reduces regional carbon emissions by replacing fossil fuels with utility-scale green electricity, supporting Uganda's Nationally Determined Contributions (NDCs).
- Establishes a 'Green Power+Cold Chain+Industry' model balancing growth with environmental protection, offering a replicable blueprint for sustainable development in developing nations.

UNDP

A low-carbon transport option for urban areas in Uruguay (MOVÉS Project)

Location: Uruguay



Overview

Uruguay's electricity system, ~98% renewable, created favourable conditions for transport electrification, yet transport remained the largest national CO2 source (~40% of emissions 1990–2017). The MOVÉS Project (2017–2022), implemented in Montevideo by MIEM with GEF and national co-financing totalling USD 33.4 million, promoted low-carbon urban mobility through electric buses, freight electrification, charging infrastructure and policy reform–targeting the entire e-mobility ecosystem.

Solutions

- Redirected fossil-fuel subsidies under Law 19.670 to close the electric-bus purchase gap, supporting Montevideo's initial 33 electric buses and later expansion to 150.
- Expanded charging and maintenance networks via public-private partnerships: depot charging, UTE preferential tariffs and a national public charging corridor.
- Engaged 130+car-rental firms in real-world EV trials and launched urban freight pilots and a Green Fleet Plan to scale electrification.
- Strengthened planning capacity, advanced the 'Tu Calle' active-transport programme and introduced eco-labeling and battery-management rules.

Major Achievements

- 33 electric buses cover 1.58 million km annually plus electric freight running 165,296 km/year, offsetting 1.47 million litres of diesel and 3,888 t CO2 in two years.
- Avoided 278.9 kt CO2 over the project horizon and cut annual urban PM10 emissions by 4.6% (~300 kg of particulates).
- EV trials with 130+rental firms helped double annual EV sales; fossil-fuel subsidies fully repurposed for fleet renewal.
- A transferable policy and operational model now scaled across Latin America through the CAF-GCF E-Motion programme.

AIIB

Uzbekistan: Bukhara Road Network Improvement Project

 **Location: Uzbekistan**



Overview

The USD 214.7 million Bukhara Road Network Improvement Project (BRNIP), co-financed by AIIB and the Government of Uzbekistan, rehabilitates a 78-km section (km 150–228) of the 1,204-km A380 highway. As a strategic freight and passenger corridor, it connects rural communities with regional markets. Deteriorated pavement, heavy freight and extreme climate had caused poor riding quality, high operating costs, safety risks and ecological pressure on the protected Jeyran Eco-Center. BRNIP delivers a modern, climate-resilient and safer link.



Solutions

- Replaced deteriorated asphalt with a 27-cm rigid concrete pavement on Lots 1 and 2 for longer life, retaining flexible asphalt on urban Lot 3.
- Upgraded to Category I standards (up to 120 km/h): divided four-lane carriageway, median barriers, six rebuilt bridges, sidewalks, cycle lanes and safe crossings.
- Dedicated under-road wildlife crossing and fencing for the 17 km crossing the Jeyran Eco-Center; ~17,500 saxaul trees removed offset by ~435,000 planted (1:10).
- Milled and recycled existing pavement; saline-, wind- and heat-resistant structures withstand extreme desert conditions.



Major Achievements

- Substantially completed Lots 1 and 2: smoother riding quality, higher reliable speeds, lower operating costs and reduced head-on collision risk.
- Mobilised communities—especially women—for seasonal saxaul planting, generating income and supporting landscape recovery.
- Inclusive design—sidewalks, cycling, lighting and safe crossings—improved pedestrian and cyclist mobility.
- Replicable lessons in pavement selection, road safety and ecological management now informing Uzbekistan's M37 corridor and beyond.



An In-Depth Exploration of the Good Practices

1.Pinglu Canal — A World-Class Inland Waterway Connecting Rivers to the Sea

I. Overview

The Pinglu Canal is the flagship project of China’s New Western Land-Sea Corridor, a landmark under the national strategy of building a strong transport country, and the first canal in the history of the People’s Republic of China to link its rivers to the sea. The 134.2 km waterway, the three hubs, 27 bridges over the canal, two full-service areas and six special-ised anchorages shows what a mega waterway project can achieve when world-class engineering, ecological stewardship and smart digitalisation are combined. Built to national Class I inland waterway standards, it is navigable by 5,000-tonne vessels — the largest class any Chinese canal can handle. Work started on 28 August 2022 on a total investment of around RMB 72.7 billion, and the waterway officially opened to navigation on 16 September 2026.



II. Solution

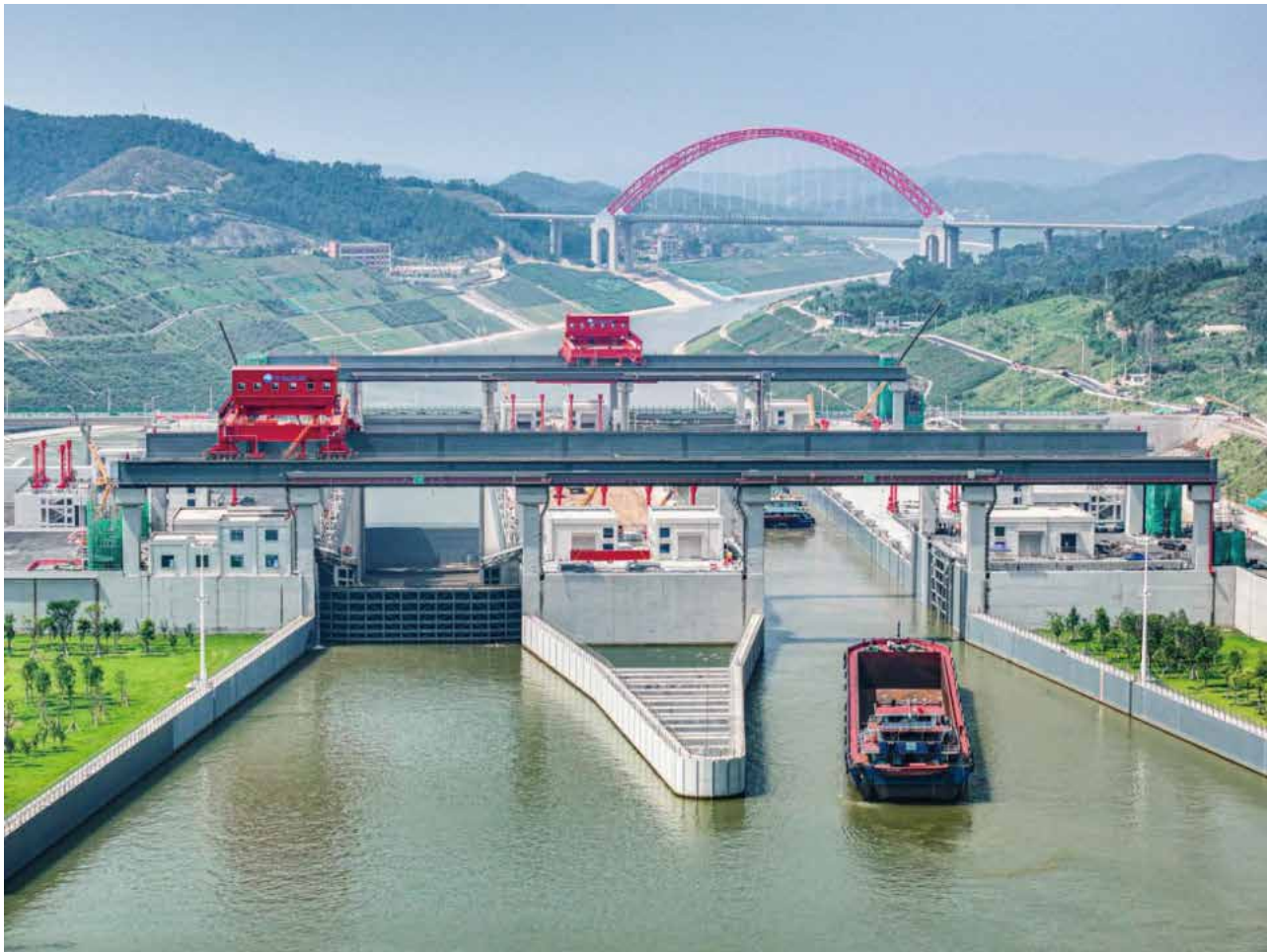
To bridge the 65-metre drop between the Pingtang River estuary and sea level at the Beibu Gulf, the project built three cascade navigation hubs — Madau, Qishi and Qingnian — that act like giant water lifts, raising and lowering vessels in stages. Each hub was constructed in a single phase with double-lane, single-flight locks sized for 5,000-tonne vessels, with usable chambers of 300 m × 34 m × 8 m. Madau pioneered a three-tier stacked water-saving basin: as vessels move down, the water they displace is stored in high, medium and low basins and drawn on again as vessels climb, cutting water use by more than 60% and conserving roughly one billion cubic metres a year. The hub also set the world’s fastest lock-valve cycle — valves open within one minute and close in 30 seconds — powered by an aerospace-inspired maze buffer refined through 3D printing and thousands of test cycles.



The waterway was built to four environmental standards: maximum protection of habitats, tight control of water and soil impacts, careful husbanding of resources, and low-carbon development. Mangroves were protected through a four-step strategy — avoid, protect in place, transplant nearby and restore off-site. The route was realigned to reduce incursion into mangrove stands by 22%; more than 80 km of turbidity curtains kept suspended sediment concentrations in the water beyond them 80% lower; 9,572 native mangroves were transplanted with an average survival rate of 84.3%; and 32.3 hectares of mangrove forest were recreated off-site on a 1:3 replacement

basis. At the Qingnian hub, a 480-metre dual fishway — part vertical-slot channel, part eel ladder, and the first river-sea fish passage of its kind in China — has reopened a migratory route that had been sealed off for 65 years. Sonar monitoring has logged more than 78,000 upstream and nearly 120,000 downstream passages. Animal crossing bridges keep wildlife corridors intact, and more than 98% of the 315 million cubic metres of excavated material has been reused for land reclamation, ecological restoration and low-carbon building materials. Dumping ship waste is banned along the entire waterway, and the service areas provide full waste-collection facilities.

The canal is also China’s first full-lifecycle smart waterway. More than 20,000 sensors along its length give vessels and shore control real-time visibility of conditions; a digital twin keeps the physical waterway and its virtual replica in dynamic synchronisation for accurate simulation; and smart-navigation pilots have demonstrated intelligent route guidance, automated berth allocation, automatic berthing and unberthing, and remote piloting. The region’s trailblazing integrated river-sea-rail smart dispatching platform lets a single declaration cover the whole transit, with algorithm-driven scheduling and seamless one-network connectivity. A carbon-accounting model tracks emissions through the construction phase, while AI-powered ‘ecological stewards’ keep round-the-clock watch over water quality, soil and mangrove health.

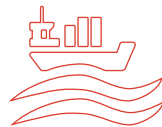


III. Achievements

As a feat of engineering with real impact, the canal holds multiple world firsts and national records. Three cascade navigation hubs — Madau, Qishi and Qingnian — manage a combined water-level difference of 65 metres, roughly the height of a 20-storey building. Madau alone claims two world records: the water-saving lock with the greatest head and the largest inland water-saving ship lock ever built. One of the most ambitious inland waterway schemes ever undertaken, it has drawn on hundreds of design and construction organisations and brings together hydraulic engineering, shipping and digital technology on an unprecedented scale.

The canal gives Guangxi and southwest China the shortest, cheapest and most convenient water route to ASEAN, and turns the New Western Land-Sea Corridor into the country’s third corridor with end-to-end river-sea intermodal capability. It shortens inland voyages by more than 560 km, trims overall logistics costs by 18–30% and saves more than RMB 5 billion a year in freight spending, while cargo-handling efficiency at Beibu Gulf Port is projected to climb by more than 30%. Strategically, the canal redraws the opening-up map of western China, joins the Silk Road Economic Belt and the 21st Century Maritime Silk Road, and will bind China and ASEAN more closely through trade — spurring port-side industries, cold-chain logistics, cross-border e-commerce and railway-waterway intermodal freight along the Pinglu Canal Economic Belt.

The canal strikes at a fundamental bottleneck in China’s transport geography. Although Guangxi sits on the coast, none of its rivers had historically been connected to the sea, and the inland provinces of the southwest — Sichuan, Yunnan, Guizhou, Chongqing and Tibet — had no direct outlet to the ocean, forcing their cargo to be hauled hundreds of kilometres east to Guangzhou. Now that the canal is open, cargo from the southwest can cut its inland voyage by more than 560 km, shave overall logistics costs by 18–30% and save more than RMB 5 billion a year in freight spending. The river-sea trip from Nanning to Qinzhou Port now takes less than a day, turning what used to be a roundabout weekly journey into a direct daily link with the sea.



2.Tech-empowered Inland Water Transport: Chongqing’s Practices for Greener and Smarter Logistics

I. Overview

As the world's leading inland shipping artery with the highest annual cargo volume, the Yangtze River serves as the core transport carrier for China's Yangtze River Economic Belt strategy and a key pillar for building a transport power. As the upper Yangtze shipping center and a core city of the Chengdu-Chongqing Twin-City Economic Circle, Chongqing boasts a strategic location connecting east and west, linking inland and sea, acting as a critical node connecting the Yangtze River Economic Belt with the New International Land-Sea Trade Corridor and China-Europe Railway Express, with 1,225 kilometers of high-grade waterways in operation. It has long been confronted with challenges such as saturated capacity of the Three Gorges Ship Locks and poor trunk-tributary connectivity. Traditional models are

plagued by long cargo waiting times, high empty-running rates, volatile cycles, and low overall efficiency, undermining water transport's core advantages, limiting the integrated logistics development of the Yangtze River Economic Belt.

To address these challenges amid China's green and low-carbon economic transformation, Chongqing launched the innovative inland waterway shipping service brand "Qianli Qingzhou". Leveraging over 1,000 kilometers of the Yangtze golden waterway above the Three Gorges Dam and over 1,000 km of high-grade tributaries (Jialing, Wujiang, Fujiang), the project adopts a standardized "five-fixed" liner model.



Through the dual innovation of "digital platform resource integration" and "bus-style liner service reshaping", it creating a green, economical and sustainable waterway paradigm connecting trunk-tributary, integrating wa-

ter-land and radiating regionally. This forms a Chinese solution and Chongqing experience, providing a highly replicable example for global river basins seeking efficiency gains and emission reductions.



II. Solution

The project establishes a comprehensive solution for the sustainable development of inland waterway shipping through four dimensions: model reconstruction, green transition, smart upgrading, and collaborative governance.

First, model reconstruction breaks the "cargo waiting and consolidation" dilemma with "water bus" services. It introduces a standardized "five-fixed" liner service, enabling advance cabin booking and precise matching of small-batch, time-sensitive cargo. The project implements a trunk-tributary adaptation standard and "right-size vessel" strategy, increasing 1,000-tonne vessel capacity share to 45%. Connecting over 50 freight terminals, it unlocks tributary potential, driving 2025 lock-passing cargo growth of 19.7% for Jialing River and

28.5% for Wujiang River.

Second, the green transition addresses road transport's high energy consumption via structural adjustment. It optimizes fleet structure through retrofit-first, new-build-second approach to resolve 1,000-tonne vessel shortages, and accelerates new energy vessel deployment. It upgrades 12 key terminals with standardized environmental facilities, realizing closed cargo operation, zero wastewater discharge and near-zero dust emission. The "road-to-water" shift transferred 1.7 million tons of freight in 2025.

Third, smart upgrading streamlines cumbersome procedures through the the "Qianli Qingzhou" smart platform, integrating route release, online booking, cargo tracking

and ship credit profiling for "one-click handling" with over 450 registered enterprises. Its AI agent generates transport plans in 2 minutes, cutting order time by 66% and providing 7×24-hour services. Partnerships with leading tech firms explore intelligent driving scenarios, boosting port transshipment efficiency by 30% and terminal loading efficiency by 25%.

Finally, collaborative governance breaks the "unilateral

effort" constraint via a "ministry-municipal-regional-local" three-tier mechanism. The Changjiang Navigation Administration signed a cooperation memorandum with Chongqing; a four-province joint meeting system realizes cross-regional ship lock scheduling, improving passage efficiency by 40%. Municipal departments launched 20 special measures, and a 110+ entity "Development Alliance" fosters an open industrial ecosystem.

III. Main Achievements

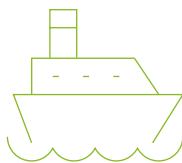
Through the innovative "five-fixed liner + multimodal transport" model, corporate logistics costs have been reduced by an average of 25%–30%. Tailored plans serve enterprises such as Southwest Aluminum and Yunnan Aluminum. In collaboration with Sichuan and Guizhou provinces, a joint dispatching mechanism for navigation structures on the Jialing River and Wujiang River has been established, enabling "one declaration, full-line passage", cutting travel time from 15 to 7 days (Guangyuan-Chongqing) and 7 to 4 days (Yuqing-Fuling). In 2025, Chongqing's port throughput reached 245 million tons (a 6.7% increase), with over 50% of transshipped goods originating from neighboring provinces. Inland waterway cargo turnover accounted for over 60% of comprehensive transportation, lowering the city's logistics cost-to-GDP ratio to 13.3%.

"Qianli Qingzhou" deeply integrates with major strategies including China-Europe Railway Express, New International Land-Sea Trade Corridor, Yangtze River Economic Belt and Chengdu-Chongqing Twin-City Economic

Circle. Key dedicated routes facilitate international "river-rail-sea" transport, new logistics for lithium batteries, and rural revitalization through Fengjie navel orange transportation.

To support climate action, the 1.7 million-ton "road-to-water" shift in H1 2025 reduced diesel consumption by 3,300 tons, CO₂ by 10,000 tons and sulfides by 7,300 tons. Tributary night navigation further cut sailing times by 50%.

Ultimately, "Qianli Qingzhou" offers a highly replicable "Chinese solution" for the global green transformation. Its core value lies in digital resource integration and bus-style liner reshaping, highly adaptable for river basins like the Mekong, Amazon and Nile to advance global sustainable development goals.



3.Eco-Construction Technology for Highways in Special Plateau Regions: Qinghai Solution for Ecological Protection

I. Overview

Amid mounting global climate change challenges, the Qinghai-Tibet Plateau, known as the "Asian Water Tower" and the "Third Pole of the Earth", serves as a critical region sustaining global ecological balance and climate stability. Located in the northeastern part of the Qinghai-Tibet Plateau, Qinghai Province is home to numerous nature reserves, including the Three-River-Source National Park, Qilian Mountains National Park, and Qinghai Lake Nature Reserve. With an average altitude exceeding 4,000 meters, Qinghai enjoys the reputation of "Water Tower of China" and plays a pivotal role in climate regulation and biodiversity conservation. The ecosystem in the Three-River-Source region is extremely sensitive and fragile. Traditional highway construction methods are highly likely to trigger severe ecological disturbances, such as soil erosion and permafrost thaw, causing irreversible damage to the local environment. To safeguard this pure plateau land, Qinghai Province has thoroughly implemented Xi Jinping Thought on Ecological Civilization, followed the fundamental principle of "ecological priority and green development", and firmly upheld the vision that "lucid waters and lush mountains are invaluable assets". Breaking away from the traditional rural highway construction model, the province has

pioneered the "Eco-Construction Technology for Highways in Special Plateau Regions" in the Three-River-Source area, utilizing innovative techniques and ecological restoration to minimize environmental disturbances. This approach successfully resolves the contradiction between ecological protection and the demand for transportation infrastructure. Ultimately, it has provided a "Chinese solution" that balances economic, social benefits and ecological security for addressing construction challenges in ecologically fragile regions worldwide.



II. Solution

Following national strategic positioning regarding Qinghai's crucial role in ecological, land territorial, and resource security, the province has integrated innovative green development concepts into the entire process of building "four-good rural roads" in the new era. Adhering to the principle that "no destruction is the best protection", the province has integrated innovative development concepts into the entire process of rural highway construction. To tackle issues such as ecological fragility and difficulties in sand and gravel extraction in the Three-River-Source region, Qinghai has actively promoted the substitution of "four new technologies" for traditional construction techniques. It has established a leading group for the high-quality development of rural roads and formed a special working team for the application of pavement cold recycling technology to coordinate the planning of technical research, development and promotion. In 2023, the province formulated and issued the *Pilot-led Work Plan for Promoting the High-Quality Development of Rural Roads*, providing policy support for the implementation of technologies, clarifying the application paths and objectives, and driving technological innovation in rural highway construction from a top-level design perspective.

To break construction bottlenecks, the project deployed an innovative mechanical combination model in 2023—featuring a "cold recycler, motor grader, water sprinkler, and road roller"—that continuously completed the milling, mixing, and paving of existing pavement materials in one single step. This reduced the exploitation of new materials and lowered damage to the ecological environment, forming "Version 1.0 of Eco-Construction Technology for Highways in Special Plateau Regions". In 2024, based on this foundation, pilots were launched in five regions including Zhiduo of Yushu and Maqin of Guoluo. Different additives—such as 4.5% cement, Bailigu, composite pavement reinforcing agents, high-efficiency hardeners for sandy soil, and green low-cost cement—were scientifically mixed into pavement materials to significantly enhance pavement strength and reduce dust pollution. This optimized the process into "Version 2.0", realizing a massive leap in technical application and road durability.

In 2023, 36 road sections totaling 1,000 kilometers across 13 counties (cities) in four prefectures including Haibei and Huangnan were selected as pilots, with a special investment of 20 million yuan for pilot applica-

tion. Through comprehensive evaluation of construction techniques, mechanical combinations and quality inspection standards, the *Technical Analysis Report on Pavement Cold Recycling for Rural Roads and Construction Guidelines for Eco-Construction Technology for Highways in Special Plateau Regions* was compiled. In 2024, investment surged to 100 million yuan to deepen application on 212 township and village gravel roads covering 5,000 kilometers, establishing a targeted construction model that matched different mechanical combinations to diverse regional geographic needs. By 2025, another 2,000 kilometers were successfully completed. Through this "experimentation—pilot—promotion—expansion" pathway, Qinghai effectively solved rural highway construction difficulties while preserving the fragile plateau ecosystem.

III. Main Achievements

After three years of exploration and practice, the project has delivered profound ecological, economic, and social impacts.

From an environmental protection standpoint, the technology realized highly efficient in-situ recycling of existing pavement materials. By drastically reducing sand and gravel mining and eliminating long-distance material transportation, the implementation across 8,000 kilometers of roads is equivalent to protecting 3,600 mu of grassland ecology and cutting approximately 100,000 tons of carbon dioxide emissions annually. It successfully curbed damage to plateau vegetation and permafrost, providing a green model for infrastructure construction in ecologically fragile regions globally.

Economically, the project delivered massive cost reductions and efficiency improvements. While traditional sandy road construction costs between 150,000 and 200,000 yuan per kilometer, this eco-construction technology costs only 15,000 to 20,000 yuan per kilometer—a staggering 90% reduction achieved purely by eliminating material procurement and transportation. The simplified construction technique further cuts time costs by 40% and ensures convenient later maintenance, allowing limited funds to be allocated to significantly more rural highway projects across farming and pastoral areas.

Socially, the technology has visibly revolutionized travel conditions. Upgraded gravel roads outperform traditional cement roads in extreme weather, boosting skid resistance by 30% and dropping rain and snow accident rates by 40% to provide reliable travel security for local herds-men. Furthermore, the improved connectivity decreased agricultural and livestock transport costs by 40% and increased characteristic industry incomes by 50%, powerfully boosting rural tourism.

By firmly refusing to compromise ecological integrity for infrastructure expansion, Qinghai successfully applied this technology to 8,000 kilometers of roads, offering highly replicable green transportation solutions for plateau, permafrost, and ecologically sensitive regions along the "Belt and Road Initiative" worldwide.



4.Protecting the Yangtze River while Connecting Communities: The G3 Bridge Model for Water Sensitive Sustainable Transport



I. Overview

The Yangtze River, China’s “Mother River”, home to critically endangered freshwater species including the Yangtze finless porpoise. The Anhui Tongling G3 RoadRail Bridge Project crosses the Yangtze in the experimental zone of the Tongling Yangtze River Dolphin National Nature Reserve, where the porpoise — IUCN Critically Endangered and a key river health indicator — is protected.

Initiated to relieve saturation of the existing G3 Expressway bridge (a major north-south corridor), the project faced a core challenge: building infrastructure in a critical habitat and protected drinking water source without harming biodiversity or water quality. This balance defines its distinctive sustainable transport value

Its 988-meter single-span design (no mid-river piers) is the cornerstone of its sustainability:

- Green: Dry-season construction avoids porpoise breeding; non-slurry static jacking cuts noise; wastewater recycling and cofferdams protect water quality.
- Safe & Resilient: Bank-located towers eliminate flood and collision risks; cable-stayed-suspension hybrid system withstands extreme conditions.
- Efficient & Inclusive: Dual-deck design integrates 6-lane highway and 4 railway tracks, cutting Yangtze crossing time from 17.4 to 6.4 minutes (surpassing targets) and serving all mobility needs.
- Economic: Hybrid structure is 10–15% cheaper than alternatives; integrated construction saves 30% land; transport costs drop by 10–20%.

II. Solution

Design Innovation and Water Quality Protection

The project’ s core solution is a singlespan bridge with no piers in the river, by a 988 metre main span — the world’ s first cablestayedsuspension hybrid system for a dualdeck publicrail bridge. This design preserves the natural riverbed and maintains unobstructed migratory corridors. To protect water quality, cofferdam isolation creates a dry working environment to prevent sediment dispersion. An innovative U-shaped bottomless steel-concrete composite cofferdam leverages local terrain to shorten the schedule. All underwater works are restricted to the dry season (October–April) to reduce suspended sediment and avoid the porpoise breeding season. The project implements a zero surface water discharge policy, where wastewater is pre-treated and recycled on-site. Additionally, low-noise equipment and reduced vessel footprints minimize fuel-related contamination risks.

Noise Monitoring and Habitat Conservation

In collaboration with biodiversity experts, the project implemented an Aquatic Life Conservation Plan (ALCP). Key measures include a dedicated porpoise expert, noise abatement devices, and a Real-time Monitoring and Early Warning System. This system integrates passive acoustic positioning to continuously monitor noise at three key locations, ensuring thresholds remain below levels harmful to the Yangtze finless porpoise. Navigation controls limit vessel passage in near-shore habitats, while reserved open waters guarantee smooth migration routes. Furthermore, natural restoration of river-banks downstream restores habitats, offering expanded dwelling and foraging spaces.

Social Impact and Stakeholder Engagement

Embodying a people-first approach, the bridge integrates a six-lane expressway, intercity railway, and freight railway into a single structure. This minimizes land use and cuts travel time across the Yangtze from 17.1 minutes to 6.4 minutes. Regarding stakeholder engagement, approximately 150 former fishermen formed the Yangtze Finless Porpoise Conservation Committee for regular patrols. Over 2,400 participants benefited from around 360 biodiversity training sessions. Collaborations with maritime authorities, NGOs, and extensive media outreach have significantly amplified public awareness of this integrated conservation approach.

III. Main Achievements

Ecological and Operational Success

The project achieved zero water quality deterioration, with cofferdams completed during the first dry season without impacting water conditions. Three consecutive years of biodiversity surveys across a 10 km radius showed stable aquatic biodiversity, with seasonal fluctuations consistent with basin-wide patterns. Similarly, triennial surveys confirmed a stable Yangtze finless porpoise population and uninterrupted migration behaviors, showing no statistically significant differences from pre-construction baselines. Operationally, the bridge was completed six months ahead of schedule, opening to traffic in November 2025.

Socioeconomic and Technological Contributions

With a total investment of RMB 8.7 billion (including RMB 2.19 billion from NDB), the bridge serves as Anhui’ s 11th Yangtze crossing, connecting the G3 Expressway and planned railways for a region of over 235 million people. It has generated significant employment and reduced logistics costs across the Yangtze River Delta. Technologically, the project secured an invention patent for the real-time underwater noise and porpoise early warning system, alongside 14 other patents. It also pioneered an all-in-one smart bridge management system, integrating six digital platforms for intelligent operation and maintenance.

Replicability and promotability

The G3 Bridge model offers high replicability. Its real-time monitoring system sets an industry benchmark already adopted by a bridge project in Nanjing. The structured Aquatic Life Conservation Plan (ALCP) has been adapted for an NDB-financed wharf project in Wuhan. Documented by NDB as a biodiversity good practice, the project aligns with the UN Decade of Sustainable Transport (2026–2035). It provides a timely, actionable example for member countries, demonstrating how to integrate water-sensitive infrastructure with people-centered mobility to protect vital freshwater ecosystems.

5.Green Methanol as an Engine for Desert Reclamation and Global Maritime Decarbonization: VENEX Green Methanol Project

I. Overview

Located in Ordos City, Inner Mongolia, the VENEX Green Methanol Project was initiated to address the high carbon intensity of the traditional chemical industry, the environmental pressure of low-value waste disposal, and the severe lack of commercial green methanol required to meet the shipping industry's IMO 2050 decarbonization targets. By retrofitting a conventional coal-to-methanol plant, the facility currently utilizes municipal End-of-life tyres (ELT) and agricultural/forestry wastes to produce 50,000 tonnes of bio-methanol annually, serving as an immediate transitional solution for marine fuel. The project plans to completely phase out coal by 2028, expanding capacity to 300,000 tonnes of 100% bio-methanol. It is China's first commercial-scale green methanol project and strictly maintains ISCC EU, ISCC PLUS, and ISO 14067 certifications.

The initiative perfectly aligns with sustainable transportation values. Green methanol is safe maritime fuel. Convenience and efficiency are secured through established regional bunkering networks in Hong Kong, Shanghai and Singapore, backed by proprietary waste-to-methanol technology. Environmentally and economically, the project drives waste-to-energy circularity. Retrofitting

established chemical assets avoids capital-intensive infrastructure builds, effectively lowering the cost barrier for green marine fuels. Furthermore, its diversified feedstock and resilient technology promote inclusiveness, providing traditional chemical enterprises with a highly replicable green transition pathway. Beyond industrial decarbonization, the project drives socioeconomic value within the local community by supporting pruning activities to prevent desertification in Inner Mongolia. By sourcing biomass wastes directly from local farmers, it establishes a sustainable revenue stream while returning bio-byproducts to them as organic fertilizer to optimize soil condition and crop yields.



VENEX Green Methanol Project, Inner Mongolia

End-of-life tyres and Agricultural/Forestry Biomass Wastes

II. Solution

The project tackles the shortage of renewable marine fuels through a comprehensive technological and operational overhaul of existing assets. The core solution relies on an independently developed multi-feedstock technology which fundamentally transforms the production logic to enable clean waste conversion. To guarantee stable production without interruptions from price fluctuations, the project established a localized, low-cost supply chain network in Ordos, enabling flexible real-time adjustments of multiple feedstocks.

The optimized production process involves specialized waste pretreatment, precise multi-feedstock slurry mixing, high-temperature co-gasification into syngas, rigorous purification, and final methanol synthesis, all backed by full traceability management to satisfy strict ISCC standards. Implementing this required intelligent equipment retrofitting, such as adding waste pretreatment units, optimizing gasification parameters, and upgrading environmental protection systems to ensure regulatory compliance.

Safety is rigorously managed through specialized operational procedures for high-pressure and flammable materials, regular training, and a comprehensive risk prevention mechanism covering the entire chain from storage to transport.

To bridge the gap between production and market application, the project targeted the shipping industry by securing long-term strategic agreements with marine fuel traders and officially launching green methanol bunkering operations across major Asian ports. A historic milestone was achieved in March 2025 when the project completed a 2,900-ton green methanol bunkering operation at Shanghai Yangshan Port, marking a breakthrough in large-scale domestic port bunkering. Ultimately, this forms a closed-loop industrial chain encompassing waste collection, green production, marine application, and carbon reduction, demonstrating how technological innovation can transform high-carbon assets into sustainable circular economy hubs.

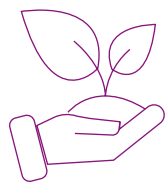
III. Main Achievements

The VENEX project has delivered highly quantifiable outcomes, establishing absolute market leadership in China's renewable fuel sector. In 2025, the facility successfully outputted approximately 17,000 tonnes of green methanol, capturing roughly 80% of China's total green methanol sales and solidifying its absolute leading position in the domestic market. The project is uniquely validated internationally, having maintained ISCC EU and ISCC PLUS certifications for five consecutive years, alongside acquiring the ISO 14067 Product Carbon Footprint certification in 2025 to ensure rigorous greenhouse gas management transparency. Operationally, the successful 2,900-ton bunkering at Shanghai Yangshan Port represents the first large-scale made-in-China green methanol commercial port bunkering, significantly

advancing the practical decarbonization of international maritime logistics.

Socio-economically, the project drives profound industrial upgrading by proving the economic and technical viability of retrofitting traditional chemical assets. It actively supports the construction of "waste-free cities" by consuming massive volumes of municipal and agricultural/ forestry waste, simultaneously generating local employment and enhancing the international competitiveness of the regional energy sector. By providing stable low-carbon fuel, it helps global shipping companies reduce carbon compliance costs and meet strict international regulatory requirements.

Crucially, the project demonstrates exceptional global replicability. Its mature technology, comprehensive supply chain management, and successful bunkering models provide an actionable blueprint for coastal nations and regions with existing chemical infrastructure that urgently need low-carbon marine fuels. Offering proven Chinese experience for industrial decarbonization, the project supports global sustainable transportation and provides a highly adaptable template for achieving UN Sustainable Development Goals worldwide.



Shanghai's First Large-scale Bunkering Operation



Hong Kong's First Green Methanol Simultaneous Operations (SIMOPS) Bunkering

6.The Ningbo-Valencia Green Corridor Project

I. Overview

The Ningbo-Zhoushan Port-Port of Valencia Green Shipping Corridor was established to promote green and low-carbon development in the global port and shipping sector. As participants in the Maritime Silk Road Port Cooperation Mechanism, Zhejiang Seaport Investment & Operation Group Co., Ltd. and the Port Authority of Valencia held extensive discussions on establishing a green shipping corridor between the two ports. With support from the China Waterborne Transport Research Institute and Fundaci3n Valenciaport, the two parties signed a cooperation initiative at the 2025 Maritime Silk Road Port Cooperation Forum. In May 2026, MSC Mediterranean Shipping Company (MSC) and its subsidiary Terminal Investment Limited (TiL) joined the initiative. Ningbo-Zhoushan Port, located in Zhejiang Province, has ranked first globally in cargo throughput for 17 consecutive years. By 2025, it operated 309 container routes connecting more than 700 ports in over 200 countries and regions. The Beilun Third Container Terminal handled 11.51 million TEUs in 2024 and operates more than 50 international routes. The Port of Valencia is the largest container port in the Mediterranean and an important gateway for China-Spain trade, with more than 50% of bilateral trade cargo passing through the port. MSC's JADE service provides a key maritime link between Asia and the Mediterranean, connecting major Chinese ports with Valencia and other European hubs. The corridor promotes sustainable maritime transport through green, efficient, economical and resilient solutions, contributing to SDG 9 and SDG 13.



ISCC EU & ISCC PLUS Certificates of VENEX Green Methanol Project

II. Solution

Terminal decarbonization

The partners are developing distributed photovoltaic and wind power, energy-storage facilities and integrated energy systems, supplemented by external green electricity where necessary. Charging and alternative-fuel infrastructure is being expanded, while terminal cargo-handling and auxiliary equipment is being progressively replaced with new-energy equipment, including pilot applications of methanol- and hydrogen-powered machinery.

Vessel decarbonization

The corridor will improve shore-power facilities and promote mobile shore-power units, intelligent power supply, standardized operations, third-party inspection and preventive maintenance, supported by a coordination platform for information sharing. A green marine-fuel supply system will be established by coordinating supply, demand and prices and planning bunkering anchorages. MSC assesses the feasibility of deploying low- and zero-carbon-fuel vessels based on route, fleet and bunkering conditions, using pilot projects to support wider application. Furthermore, the corridor will promote vessel energy-saving technologies, including wind-assisted rotor sails and air lubrication systems, to reduce sailing resistance and energy consumption.

Transport organization

The corridor will develop automated container terminals with intelligent operating systems for remote control of quay cranes and other equipment. Through a digital platform integrating port, shipping and trade services, intelligent tallying, smart gates, logistics coordination, and data connectivity will be promoted, alongside intelligent pilotage management and digital tugboat dispatching. To further optimize vessel operations, a port-shipping data-sharing platform and an instant-arrival mechanism will be established, providing operational priority for vessels maintaining scheduled arrivals. MSC will adopt economical sailing speeds to reduce schedule-related acceleration and anchorage waiting.

Institutional arrangements

The partners are establishing a full life-cycle carbon accounting system and a data-sharing mechanism covering minimum data requirements, data standards, responsibilities and security obligations, promoting coordinated planning and information sharing among ports, shipping companies and other stakeholders.



III. Main Achievements

The corridor has entered substantive implementation, with significant progress in port and vessel decarbonization. At the Beilun Third Container Terminal, two 6.25 MW wind turbines and 6.3 MW of energy-storage facilities are in stable operation. The wind turbines generate approximately 24 million kWh annually, with 90% consumed on site, while the 3.8 MW photovoltaic system generates about 3.43 million kWh annually, with a 95% self-consumption rate. Major machinery has been electrified, and shore power covers the entire terminal. In 2025, approximately 100,000 m³ of LNG was supplied to MSC vessels at Ningbo-Zhoushan Port. A new MSC automated terminal in Valencia is expected to commence operations in 2030 and use 100% green electricity.

The corridor currently delivers an estimated annual reduction of 33,940 tonnes of CO₂ equivalent, expected to reach 132,000 tonnes after the new Valencia terminal is completed. It is also estimated to generate RMB 3.15 billion in annual direct and indirect economic output. The model has been extended to the Ningbo-Zhoushan Port-HAROPA green shipping corridor and attracted interest from other international ports.



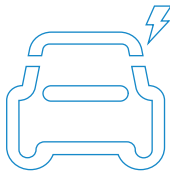
7.China-Thailand Joint Platform for Professional Skills Training of Electric Vehicle Industry Talents



I. Overview

Thailand is a pivotal automobile manufacturing and consumption market in Southeast Asia and is vigorously pressing ahead with its electrification transition. In recent years, the Thai government has rolled out a package of incentive policies covering tax reductions and exemptions, vehicle purchase subsidies as well as charging infrastructure layout planning, fuelling the rapid expansion of its new energy vehicle (NEV) market. Nevertheless, as Chinese-brand new energy vehicles keep gaining higher market shares in Thailand, the country is confronted with acute shortages in NEV maintenance services and the training of specialized technicians. This skills deficit is particularly severe in the north-eastern region, creating a major barrier to the localization of the NEV industry. Industry statistics show that Thailand’s NEV holdings has exceeded 500,000 units, while the number of certified professional maintenance technicians stands at less than 5,000, resulting in a serious imbalance between talent supply and demand. Against the backdrop of sustained export growth of China’s “three new” green exports, namely new energy vehicles, lithium batteries and photovoltaic products, Southeast Asian countries, particularly Thailand, have witnessed rising recognition and acceptance of Chinese-brand new energy vehicles, bringing about robust demands for industrial cooperation in relevant fields. However, the growing market share of domestic Chinese new energy vehicles in Thailand has exposed a glaring shortage in NEV maintenance services and the cultivation of specialized technical personnel locally, which has become a prominent bottleneck restricting the localized development of the industry.

In alignment with the Global Development Initiative (GDI), the GSTIKC launched the overseas Transport Technology Hub (Thailand Station) to bolster capacity building for countries within the Group of Friends of the Global Development Initiative, continuously innovate the implementation model of Transport Technology Hubs overseas, and facilitate high-quality exchanges and cooperation between Chinese and Thai enterprises. In July 2026, the first Thailand-based overseas Transport Technology Hub tailored for transport vocational skill training was officially inaugurated in Nakhon Ratchasima. As the second Transport Technology Hub across the globe, its launch marks the entry of overseas Transport Technology Hubs into regularized operation. With the theme of “Capacity Building of Skilled Talents for China-Thailand New Energy Vehicle Industry”, the project strives to build a professional skill training platform for the electric vehicle industry through multi-party collaboration among government authorities, industrial entities, universities, research institutes and end users, so as to boost Thailand’s energy transition and the development of green transportation. Adhering to the inclusive, efficient and green value orientation of sustainable transport, this project is aligned with the Sustainable Development Goals (SDGs).



II. Solution

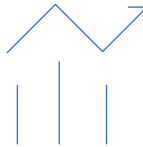
The first session of the Thailand Transport Technology Hub was held in Nakhon Ratchasima Province, Thailand in July 2026, co-sponsored by GSTIKC, Rajamangala University of Technology Isan, Thailand, ISA, Tianjin Transportation Technical College and GAC Group. The unveiling ceremony of the Thailand Transport Technology Hub was held with Mr. Piriya, former Thai Ambassador to China, and Mr. Kosit, President of RMUTI witnessing the event, which has laid an institutional foundation for the regular organization of follow-up exchange activities under the Technology Hub framework. Centered on “Capacity Building for Skilled Talents in China-Thailand New Energy Vehicle Industry” , the event set up trainer training courses and student training courses simultaneously for teachers and students from Thai universities, with a total duration of 4 working days and 40 class hours. Adopting a hybrid teaching model integrating live online streaming, massive open online courses (MOOCs), offline theoretical lectures and hands-on practical training, the program balances in-depth theoretical learning and practical operation exercises. Upon completion, participants received co-accredited certificates from the five host entities. A standardized talent competency evaluation and certification system is accordingly established to strengthen the authority of this training program and improve participants’ professional competitiveness in the job market.

III. Main achievements

The inaugural training cultivated a total of 28 skilled professionals from Thailand, including 11 university instructors and 17 student participants. The program effectively alleviates the shortage of NEV maintenance technicians in Nakhon Ratchasima Province and its surrounding areas, while building a qualified local talent pool for Chinese enterprises operating in Thailand. Furthermore, a multi-party cooperation network covering government authorities, institutions of higher education, industrial associations, Chinese colleges and enterprises has been successfully established, laying a foundation for future cooperation expansion in electric heavy-duty trucks, low-carbon transportation and other relevant fields. As Thailand’s first overseas Transport Technology Hub dedicated to vocational training, this project represents a fruitful follow-up to the inaugural hub project in Vietnam. It has initially shaped a replicable and propagable brand model for the Hub mechanism and become an important instrument to advance transport capacity building for countries along the Belt and Road. By integrating technical training with people-to-people exchanges, the initiative deepens mutual trust and

cooperation in sustainable transport between China and Thailand. The project also serves as a practical carrier for telling China’s transport stories in the new era and advancing the building of a China-Thailand community with a shared future. The project boasts high value for global scalability. Against the backdrop of global energy transition, it offers a low-cost and replicable collaborative training model featuring government-industry-university-research-user integration to help developing countries address the shortage of skilled personnel within the new energy vehicle industry.

8.China and Vietnam Join Hands to Build a Government-enterprise-research Dialogue Platform for Innovative SustainableTransport Policies and Exchanges in Vietnam



I. Overview

Vietnam is one of the fastest-growing economies in Southeast Asia, with accelerating urbanization driving increasing demand for transport infrastructure development. Nevertheless, challenges remain in multiple spheres including high-quality road infrastructure, urban rail development, intelligent transport systems, green mobility, and professional capacity building. Statistics released by the Vietnamese Ministry of Construction show that the country’s total highway mileage stands at approximately 600,000 kilometers, yet high-grade highways account for less than 10% of the overall network. Urban railway system is still in its infancy, and severe traffic congestion has become increasingly prominent in major cities including Hanoi and Ho Chi Minh City. While the stock of new energy vehicles is expanding rapidly, the country suffers from a shortage of supporting charging infrastructure and skilled professionals. These structural bottlenecks constrain the sustainable socio-economic development and regional connectivity of Vietnam.

The year 2025 marks the 75th anniversary of the establishment of diplomatic relations between China and Vietnam as well as the China-Vietnam Year of People-to-People Exchanges. Mutual trust between the two countries has been deepening continuously, bilateral development plans have achieved effective alignment, and cross-border transport projects have been implemented in a steady manner. China and Vietnam share strong cooperation demands in fields including infrastructure connectivity, green and low-carbon transport

II. Solution

The world’s first overseas Transport Technology Hub was officially launched in Hanoi, Vietnam from June 1 to 4, 2026. Jointly developed by GSTIKC and UTT, the Hub follows the “One Network & Four Modernizations” framework and focuses on sustainable transport development, green highway construction, digital upgrading of rail transit, traffic safety management. A combination of centralized lectures, thematic seminars and experience-sharing sessions was adopted for all activities. Experts from the Asian Infrastructure Investment Bank (AIIB), Chang’an University, Southwest Jiaotong University, Yunnan Communications Investment & Construction Group and Tianjin Rail Transit Group were invited by GSTIKC to share China’s transport development experience, practical cases, scientific research achievements, alongside an introduction to international financing and investment models for transport infrastructure.

The Vietnamese side selected a total of 47 division-level cadres from 12 institutions for the training programme, including the Ministry of Construction of Vietnam, Ministry of Science and Technology, National Institute for Innovation, University of Transport Technology, Hanoi Architectural University and Vietnam Railways Corporation. These participants hold core posts covering traffic administration, engineering technology, scientific research and teaching, as well as corporate

development, upgrading of railway system, and facilitation of cross-border transportation. Both sides have reached broad consensus and urgent practical needs to carry out people-to-people exchanges and capacity building within the transport sector. Against this backdrop, after repeated communication, negotiation and elaborate planning, GSTIKC and University of Transport Technology, Vietnam launched the first overseas Transport Technology Hub in Hanoi, Vietnam in June 2026.

With the theme of International Horizon Broadening and Capacity Building for Sustainable Transportation Between China and Vietnam, centering on the “One Network and Four Modernizations” framework, the project focuses on sustainable transport policies, highway engineering, traffic safety, intelligent rail transit, green infrastructure, transport investment and financing, and talent development. It aims to build a government-enterprise-research contacting platform for sustainable transportation integrating policy dialogue, technical exchange, talent cultivation and industrial docking, so as to support the upgrading of Vietnam’s transport infrastructure and its green and low-carbon transition. Embodied with the value of inclusive, efficient and green sustainable transportation, the project is well aligned with the Sustainable Development Goals (SDGs).

operation. Among them, 17 personnel are from government authorities and 30 from universities; 46 are affiliated to the Ministry of Construction and 1 to the Ministry of Science and Technology. In terms of rank distribution, there are 27 division-level cadres and 20 staff below division level.

Both sides of China and Vietnam attached great importance to the construction of the Transport Technology Hub, conducting thorough coordination and trainee recruitment. More than 95 percent of the participants are staff from subordinate entities of Vietnam’s Ministry of Construction. Several university administrators took part in relevant training activities, and promotional materials and slogans for the Hub were posted across multiple areas inside the campuses.

Alongside the training programme, a series of supporting events were held concurrently with the training, such as a return visit forum for Vietnamese trainees of previous people-to-people exchange programmes, a promotion event for the rail transit standard alignment initiative, as well as enterprise exchange seminars.

The Hub established an inclusive, efficient and green platform integrating policy dialogue, technological exchange, talent cultivation and industry cooperation for sustainable transportation. It contributes to the delivery of Sustainable Development Goal 4 (Quality Education), Goal 8 (Decent Work and Economic Growth), Goal 9 (Industry, Innovation and Infrastructure), Goal 11 (Sustainable Cities and Communities), Goal 13 (Climate Action) and Goal 17 (Partnerships for the Goals), achieving remarkable outcomes.China Communications News published a special report on the front page on June 9, 2026. Relevant competent authorities of some ASEAN member states and Chinese institutions also submitted internal briefings on this activity accordingly, generating favorable communication and publicity effects.

III. Main achievements

The first session of the training program has cultivated 47 high-caliber professional personnel from Vietnam. A diversified dialogue platform bringing together Vietnamese government authorities, institutions of higher learning, scientific research institutes, Chinese enterprises and international organizations has been successfully established, laying a solid foundation for deepening subsequent bilateral cooperation between China and Vietnam, as well as promoting mutual recognition of standards and the implementation of relevant projects. By integrating policy dialogue with people-to-people exchanges, mutual understanding and trust between the two sides in the field of sustainable transport have been further enhanced.

As the world’s first overseas Transport Technology Hub, this project has pioneered a new model for international exchanges by coordinating the integrated advancement of training and study tours, industrial exchanges, and supply-demand matching. It fully verifies that the Transport Technology Hub model is aligned with the new trends of international cooperation.Boasting high value for global replication and promotion, the project delivers

a four-in-one collaborative framework consisting of policy dialogue, technical exchange, talent cultivation and industrial docking. This solution helps developing countries tackle challenges including transport infrastructure upgrading, green and low-carbon transition as well as intelligent transformation. It stands as a valuable practice for advancing global sustainable transportation and accelerating the implementation of the United Nations 2030 Agenda for Sustainable Development.

9.EV Battery Recycling and Second Life – Solutions for Asia and the Pacific

I. Overview



1.Project context

As the electric vehicle (EV) transition accelerates across the Asia-Pacific, the focus must shift from vehicle adoption to end-of-life (EOL) battery governance. Substantial battery cohorts will reach EOL between 2025 and 2035. In South-West Asia, India projects 3.7 million recyclable packs by 2030, while China expects retired volumes to surpass 1 million tonnes annually. In Southeast Asia, rapid EV growth combined with geographic constraints (such as archipelagos lacking hazardous materials capacity) highlights an urgent, region-wide need for coordinated policy, infrastructure, and investment responses.

2.Problems the project aims to solve

- Safety and environmental risks: EV batteries pose severe fire and explosion risks if mishandled, which could undermine consumer confidence in the green transition.
- **Reverse logistics friction:** Strict international transport regulations (e.g., IATA rules) for dangerous goods raise shipping costs and delays, increasing the likelihood of battery abandonment.
 - **Resource and industrial value loss:** Discarding critical minerals (cobalt, lithium, nickel) threatens supply security. Industrial-scale recycling reduces environmental impacts by at least 58% compared to mining.
 - **Governance gaps and orphan batteries:** Expired warranties and liability gaps lead to "orphan batteries." These often leak into the informal recycling sector, where impoverished waste workers dismantle them without safety gear, causing severe toxic pollution and health hazards.

3.Basic information of the good practice

The proposed good practice combines policy reforms, digital tools and industrial investments to create a circular battery economy. The core components include:

- **Extended producer responsibility (EPR) legislation**
- **Digital battery passports**
- **Safe collection networks and logistics**
- **Diagnostics and secondlife deployment**
- **Highrecovery recycling**

4.Sustainable transportation value orientation

- This practice advances multiple sustainable transport values:
- **Safety:** Licensed collection, condition-based handling, battery passports, and Basel PIC procedures reduce fire risks and ensure safe cross-border transport.
 - **Convenience and efficiency:** Clear EPR take-back obligations and digital passports streamline the collection and sorting process.
 - **Green and economical:** Second-life usage and high-recovery recycling return vital metals to the supply chain, significantly lowering upstream emissions.
 - **Inclusiveness and resilience:** Repurposed batteries enhance energy resilience by powering microgrids in underserved communities, while the formal circular economy creates skilled, safe jobs.

II. Solution

The solution involves a coherent set of policy instruments, technical measures and operational practices that together create a closedloop system for EV batteries.

At the policy level, the system is driven by Extended Producer Responsibility (EPR) and digital traceability. EPR laws—already advancing in jurisdictions like China, the EU, and Viet Nam—assign post-consumer management liability directly to producers and importers, preventing orphan batteries and incentivizing recyclable designs. To enforce this effectively, digital battery passports utilizing unique QR-coded identifiers to track chemistry, state-of-health, and ownership data must be mandated. Managed through central registries, these interoperable passports facilitate compliance tracking, cross-border trade verification, and the implementation of eco-modulated fees.

Operationally, safe collection and reverse logistics form the backbone of the circular model. Due to severe fire risks, standardized collection networks must adhere strictly to hazardous-materials transport protocols, including IATA's 30% maximum state-of-charge limits and the Basel Convention's Prior Informed Consent (PIC) procedures for safe cross-border shipments. Once safely collected, batteries undergo rigorous non-invasive and electrical diagnostics. Packs retaining over 70-80% of their original capacity are

certified under global standards (e.g., UL 1974) for second-life applications, extending their economic utility by powering remote island microgrids, low-speed EVs, and industrial data centers.

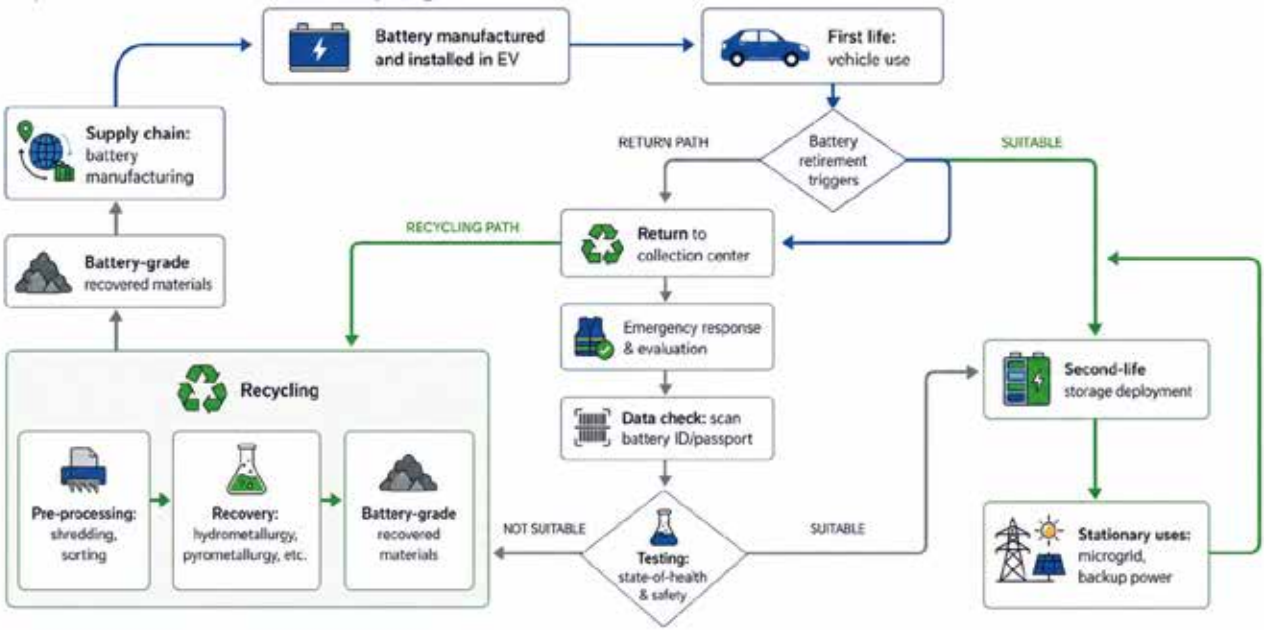
Batteries that fail diagnostics proceed directly to high-recovery recycling. Advanced hydrometallurgical and emerging direct recycling processes can recover over 95% of critical metals like lithium, cobalt, and nickel with significantly lower energy consumption than traditional smelting. Commercial viability is already proven by large-scale operations such as Redwood Materials in the U.S. and Econili in Malaysia. By strategically combining China's stringent traceability mandates, the EU's compliance-driven recycled-content targets, and the U.S.'s tax incentives, emerging markets can effectively attract private investment to scale domestic recycling infrastructure.

Ultimately, scaling this solution requires a synchronized global implementation blueprint. Governments must proactively legislate EPR and passport requirements, harmonize fragmented domestic and cross-border transport regulations, financially incentivize high-recovery recycling capacity, and strengthen international partnerships for data interoperability and customs enforcement.

Visualizing the circular battery lifecycle

EV battery lifecycle flowchart

From production to second life and recycling



Source: EV battery lifecycle flowchart (from production to second life and recycling). Adapted from IEA (2024), Global EV Outlook; UNEP (2023), Second Life of Batteries. Visualised using Claude AI (Anthropic, 2025).

The above-shown infographic illustrates the closedloop pathway from vehicle use to second life and recycling. Arrows show how batteries move through use, testing, repurposing and recycling, with materials returning to manufacturing.

III. Main Achievements

The implementation of structured end-of-life (EOL) battery governance has already yielded concrete institutional and operational milestones globally, proving that high-recovery recycling is both technically and commercially viable. At the policy level, landmark regulations such as Viet Nam’s Decree 08/2022, China’s upcoming 2026 digital identity mandates, and the EU’s passport requirements demonstrate that both emerging and major markets can successfully enforce stringent take-back channels and recycling obligations. Commercially, the scale of material recovery is expanding exponentially. Facilities like Malaysia’s 24,000-tonne Econili plant, China’s 47 licensed recyclers that processed over 200,000 tonnes in 2021 with >90% recovery rates, and Redwood Materials’ 60,000-tonne capacity in the U.S. showcase massive private sector confidence and robust domestic recycling capabilities. Furthermore, international second-life pilots—such as a 25 MWh grid storage system in California and Amsterdam’s 3 MW stadium backup power using retired Nissan Leaf packs—provide proven, cost-saving blueprints that can be readily replicated for island microgrids and community facilities across the Asia-Pacific.

Socioeconomic contribution

Socio-economically, the transition to a circular battery economy drives immense investment, generates skilled green employment, and significantly mitigates environmental degradation. The employment impact is substantial; operations like Redwood Materials employ around 1,600 people backed by over US\$4 billion in investment, while Indonesia’s integrated nickel-to-battery projects with CATL are actively catalyzing new domestic value chains. Environmentally, life-cycle analyses estimate that utilizing recycled metals slashes greenhouse gas emissions by 20–40% compared to virgin mining, while controlled hazardous waste handling directly prevents toxic soil and water contamination, firmly supporting SDG 3 and SDG 11. Crucially, formalizing the battery collection network fosters social inclusion by transitioning informal waste workers into safer, regulated jobs—advancing SDG 5 and 8—while repurposed second-life batteries dramatically improve energy access and disaster resilience for remote and underserved communities.

Replicability and promotability

The practice demonstrates exceptional global replicability and economic scalability, largely driven by the IEA’s projection of a tenfold increase in global EOL battery volumes by 2030 and the widespread adoption of standardized diagnostic certifications like UL 1974 and ISO 12405. The policy blueprint is universally adaptable; Viet Nam’s model proves that emerging economies can implement binding recycling rules with clear deadlines, seamlessly complementing the EU’s compliance-driven circularity mandates. Furthermore, market forces and green-procurement policies are enabling the creation of regional recycling hubs capable of serving neighboring countries lacking domestic capacity. With active momentum already visible in Fiji’s exploration of second-life microgrids and new automaker take-back schemes taking root in Thailand and Indonesia, these milestones prove that a circular battery economy is no longer just a theoretical concept, but a highly promotable, systemic reality being implemented today.

10.From Busway to Brisbane Metro — Bus Rapid Transit for a Public-Transport-First Brisbane 2032 Games



I. Overview

In July 2021, Brisbane was elected host of the Games of the XXXV Olympiad and the 2032 Paralympic Games — the first host chosen under the International Olympic Committee’s “New Norm” reforms, which demand cost discipline, maximum use of existing venues and a lasting legacy for the host region. Brisbane 2032 is conceived as a distributed, regional Games: venues are spread across South East Queensland (SEQ), with clusters in Brisbane, the Gold Coast and the Sunshine Coast, and the great majority of venues either existing or temporary. Transport is the thread that holds this concept together. The Games mobility strategy is explicitly public-transport-first: spectators are expected to reach venues overwhelmingly by public and active transport, venue precincts are being concentrated along the region’s mass transit spines — including a new main stadium precinct at Victoria Park in inner Brisbane, close to the trunk transit network — and transport investments made for the Games are required to serve the region’s growth needs for decades afterwards. The Games will arrive in a region already under transport stress. SEQ is Australia’s fastest-growing metropolitan region, home to around four million people and projected to approach six million by the mid-2040s. Its dispersed, low-density urban form has produced deep car dependence — roughly four out of five motorised trips are made by private vehicle — with congestion costs estimated in the billions of Australian dollars annually, and transport among the largest sources of urban greenhouse gas emissions in Queensland. The public transport network faced its own structural bottleneck: the busiest bus corridors converging on the city centre, particularly across Victoria Bridge and through the Cul-

tural Centre precinct, carried well over one hundred buses per hour in the peak, causing bus queuing, unreliable running times and overcrowding on the highest-demand routes. Onto this baseline, the Games will add concentrated surges of demand — hundreds of thousands of spectator trips a day, focused on a small number of precincts within tight event windows — that no private-car-based system could conceivably absorb. Brisbane’s response builds on two decades of bus rapid transit (BRT) leadership. Beginning with the South East Busway, opened in stages in 2000 and 2001, and extended through the Inner Northern, Northern and Eastern busways, the city developed more than 25 kilometres of fully grade-separated, bus-only roadways with enclosed, station-style stops — widely regarded as among the highest-quality BRT infrastructure in the world. Brisbane Metro, a project of approximately AUD 1.55 billion delivered by Brisbane City Council with AUD 300 million in Australian Government co-funding, converts this busway spine into a metro-style, turn-up-and-go service: 60 fully battery-electric, bi-articulated vehicles about 24 metres long, each carrying up to around 170 passengers, operate two trunk lines — M1 (Eight Mile Plains to the city centre) and M2 (Royal Brisbane and Women’s Hospital to the University of Queensland) — through a new city-centre tunnel under Adelaide Street, supported by high-power flash charging. M2 entered revenue service on 28 January 2025, with M1 progressively introduced during 2025. Together with the new underground Cross River Rail line due to open before the Games, the electric metro-BRT network is planned as the backbone of Games mass transit.

The practice embodies the value orientation of sustainable transport across every dimension relevant to a mega-event host. It is efficient, moving metro-level passenger volumes on a dedicated corridor at turn-up-and-go frequencies; green, replacing diesel operation on the trunk network with zero-tailpipe-emission electric vehicles; economical, achieving rapid-transit outcomes at a fraction of the capital cost of rail by re-using existing busway assets; accessible, offering level boarding, step-free stations and — under Queensland's flat 50-cent fare — one of the most affordable transit offers in the developed world, capabilities that matter doubly for a Paralympic host; and resilient, retaining the operational flexibility of rubber-tyred vehicles that can be re-routed, short-turned or surged around event schedules, incidents and floods in a way fixed rail cannot.

II. Solution

Brisbane's practice is best understood as an integrated strategy linking long-term corridor investment to the specific demands of Olympic and Paralympic transport planning: keep the corridor, transform the vehicles, remove the bottleneck, redesign the service — and shape the Games around the result.

A public-transport-first Games concept

Brisbane 2032's transport planning starts from a principle rather than a project: spectators will travel to venues by public and active transport, not by private car. This principle, embedded in the Games concept since candidature, drives every subsequent choice. Venue selection under the 2032 Delivery Plan concentrates competition precincts along the region's existing and committed mass transit spines — the busway/metro corridor, the suburban rail network, and the new underground Cross River Rail line through the city centre — rather than building venues first and solving access later. The new main stadium precinct at Victoria Park sits in inner Brisbane within reach of the trunk transit network, while the South Bank and Cultural Centre precinct, a focal point of Games activity, lies directly on the metro spine. Because the corridor infrastructure already exists, Games transport planning becomes a question of service scheduling and demand management rather than high-risk construction — a deliberate inversion of the pattern that has burdened many previous hosts with rushed, over-scaled transport megaprojects.

The BRT backbone: two decades of busway investment

The foundation of the practice is Brisbane's busway network, developed progressively since 2000. Unlike kerb-side bus lanes, the busways are fully grade-separated roadways reserved exclusively for public transport, with their own bridges, tunnels and enclosed stations featuring platform-style waiting areas, real-time information, lifts and weather protection. This infrastructure gave Brisbane bus operations a level of speed and reliability normally associated with rail, and — crucially — was designed with capacity headroom, which meant that two decades later the corridor could be upgraded to carry much larger, higher-capacity vehicles without land acquisition or major realignment. Brisbane Metro therefore represents a deliberate "infrastructure re-use" model, fully aligned with the IOC's New Norm: rather than duplicating the corridor with a new rail line at many times the cost, the city invested selectively in the specific assets — vehicles, charging systems, stations and one city-centre tunnel — needed to lift the corridor to metro standard in time for the Games.

Upgrading the corridor: electric metro vehicles and flash charging

At the heart of the upgrade is a fleet of 60 bi-articulated, fully battery-electric vehicles, each approximately 24 metres long with three cabins, multiple wide double doors and capacity for up to around 170 passengers — more than double that of a conventional rigid bus. The vehicles offer level boarding at rebuilt station platforms, dedicated wheelchair and pram spaces, on-board USB charging and air-conditioning suited to Queensland's subtropical climate. Traction batteries are recharged through overnight depot charging at a purpose-built depot and high-power "flash" charging at route terminals, where a rooftop-mounted connection delivers a top-up charge in roughly six minutes during normal driver breaks — allowing continuous all-day operation without long layovers or oversized batteries. Because the vehicles are rubber-tyred, no electrified track or overhead wiring was required along the corridor, dramatically reducing capital cost, construction disruption and delivery risk in the critical pre-Games decade.

Removing the city-centre bottleneck

High-frequency trunk services are only as reliable as their weakest link, and for Brisbane that link was the city centre — precisely where Games demand will concentrate. The project delivered a new underground busway tunnel beneath Adelaide Street, taking metro vehicles off congested surface streets and connecting them directly to the existing King George Square and Roma Street busway stations. Victoria Bridge, previously a general-traffic bridge carrying the trunk corridor across the Brisbane River, was converted into a "green bridge" reserved for public transport, pedestrians and cyclists, and the Cultural Centre precinct on the South Bank — a future hub of Games-time activity — was rebuilt to untangle conflicting bus movements. Together these works removed the network's most severe congestion points, cut several minutes from peak journeys and made running times consistent and predictable across the whole day: the precondition for the high-volume, clockwork operations an Olympic city requires.

Turn-up-and-go services and 50-cent fares

Brisbane Metro replaces a tangle of overlapping suburban routes on the trunk corridor with two simple, legible lines operating on a turn-up-and-go basis — as frequently as every three to five minutes in the peak, with long hours seven days a week — so passengers no longer need timetables. Suburban bus routes are progressively redesigned to feed metro stations rather than duplicate the trunk, and all-door boarding with validators at every door keeps station dwell times short. The infrastructure has been matched by a demand-side breakthrough: in August 2024 the Queensland Government introduced flat 50-cent fares per journey across the entire state-wide Translink network — bus, metro, rail and ferry — made permanent in early 2025 after a successful trial. Metro-quality service and near-free fares together removed both classic barriers to public transport use, and SEQ patronage has since grown strongly to record levels — building, years ahead of the Opening Ceremony, exactly the public transport habit on which the Games concept depends.

Legacy beyond 2032

Brisbane 2032 is bound by its host contract and its own legacy strategy to deliver benefits for a generation, and transport is central to that commitment. The metro-BRT investment is deliberately sized for the region's long-term growth — not for a sixteen-day event — and the Games function as a deadline and accelerant rather than the rationale. Planning is under way for network extensions toward growth corridors and major precincts, for transit-oriented development along the busway spine, and for locking in the mode-shift gains of 50-cent fares and metro-quality service well beyond the Games. The stated ambition is that the Games leave behind not stranded venues and empty lanes, but a permanently changed travel culture in a historically car-dependent region.

Games-time operations: flexibility as a strategic asset

For Games planners, the defining advantage of metro-style BRT over fixed rail is operational flexibility. Rubber-tyred vehicles can be surged, short-turned or re-routed to match session schedules, extended late into the night after evening finals, and redeployed between precincts as the competition calendar moves — none of which a fixed-guideway system can do. The segregated busway also offers reliable, protected running for dedicated athlete, official and workforce shuttles, complementing the Games Route Network on the ordinary road system and reducing pressure on it. Busway park-and-ride stations at corridor termini, such as Eight Mile Plains, can serve as spectator staging points intercepting car trips well outside the event precincts. For the Paralympic Games, the fleet's level boarding, step-free stations and generous interior circulation space provide accessible mass transit at scale without special retrofitting. Metro operations will mesh with Cross River Rail's new underground city-centre stations, giving Games precincts two independent high-capacity transit systems and genuine redundancy — a resilience feature few previous hosts have enjoyed.

Governance and partnership

The practice demonstrates effective multi-level cooperation of the kind Olympic delivery demands. Brisbane City Council — the largest local government in Australia — planned and delivered Brisbane Metro and owns the fleet; the Australian Government co-funded the project with AUD 300 million; and the Queensland Government integrates metro services into the state-wide Translink network, fares and customer information, while leading Games infrastructure coordination through dedicated delivery authorities alongside the Brisbane 2032 Organising Committee. Vehicle technology was procured internationally through a competitive process, paired with local fit-out and maintenance arrangements that build domestic capability in zero-emission heavy vehicles. This clear role separation — infrastructure delivery, service integration, funding and Games coordination — offers a governance template for other federated countries and future event hosts.

III. Main achievements

Project outcomes

The first line, M2, entered revenue service on 28 January 2025, with M1 progressively introduced during 2025 — meaning the core of the 2032 Games transit spine is in daily public operation more than seven years before the Opening Ceremony, an unusual degree of early delivery for an Olympic host that materially de-risks Games transport. Each bi-articulated electric vehicle carries up to around 170 passengers — more than twice the capacity of the conventional buses replaced — so the corridor now moves substantially more people per hour with fewer vehicle movements. Turn-up-and-go frequencies of three to five minutes have effectively eliminated timetable anxiety on the trunk, while the Adelaide Street tunnel and rebuilt Cultural Centre precinct removed the network's worst reliability bottleneck. Early results show strong, growing patronage on both metro lines, and SEQ public transport patronage has climbed to record levels under the combined effect of metro-quality service and 50-cent fares. The fleet operates with zero tailpipe emissions along the entire corridor, eliminating diesel combustion — and its nitrogen-oxide and particulate pollution — from the most heavily used transit streets and enclosed stations in the city.

Socio-economic contribution

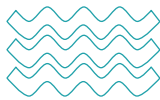
The project supported around 2,000 direct and indirect jobs through construction and has created a new skilled workforce in electric heavy-vehicle operations and maintenance — capabilities that will underpin Games-time operations and outlast them. For households, faster and more reliable services combined with flat 50-cent fares deliver meaningful cost-of-living relief: a regular commuter who previously drove or paid dis-

tance-based fares can save on the order of a thousand Australian dollars or more each year, with the largest relative benefits flowing to lower-income and outer-suburban residents. By converting Victoria Bridge to a green bridge and removing more than one hundred peak-hour buses from surface streets, the project returned street space to pedestrians and cyclists and reinforced the revitalisation of the South Bank cultural precinct — itself the legacy of a previous mega-event, World Expo 88 — extending Brisbane's tradition of using global events to reshape the city for the better.

Replicability and promotability

The practice offers two transferable models. For the many fast-growing cities across Asia, Africa and Latin America that already operate BRT corridors, it demonstrates a proven upgrade pathway: build a segregated busway at modest cost; operate it with conventional buses while demand matures; then convert to high-capacity, battery-electric, metro-style operation without abandoning any original investment. Every element — bi-articulated electric vehicles, terminal flash charging, all-door boarding, trunk-and-feeder redesign and simple flat fares — is commercially available and requires neither rail construction nor exotic technology. For future hosts of Olympic Games and other mega-events, Brisbane models a different sequencing: choose venues around existing transit, deliver the transit upgrade early, use the event to accelerate — not distort — the long-term transport strategy, and let flexible, electric BRT carry the surge. Brisbane's busways have been studied by city delegations worldwide for two decades; Brisbane Metro and the 2032 preparations extend that demonstration effect into the zero-carbon, mega-event era, contributing directly to SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action).

11.Multi-Lane Road Tunnel under the River Karnaphuli: Advancing Integrated Cross-River Transport Development in Chattogram, Bangladesh



Inside vision of the tunnel

I. Overview

Chattogram (Chittagong) is Bangladesh's principal seaport and second-largest city, home to the country's busiest harbour and a growing industrial base. For decades, the Karnaphuli River has acted as a physical barrier separating the metropolitan area: the west bank hosts the port, city centre and established urban neighbourhoods, while the east bank — comprising Anwara and Karnaphuli Upazilas — hosts the Chattogram Export Processing Zone, the Chinese Economic & Industrial Zone (CEIZ), the Korean Export Processing Zone (KEPZ), the Karnaphuli Fertiliser Company (KAFCO), and the coastal highway leading towards Cox's Bazar and the Matarbari deep-sea port currently under development. Historically, only two road bridges further upstream connected the two banks. As a result, freight and passenger traffic had to make lengthy detours through the already congested city centre, creating a persistent bottleneck for regional trade and urban development.

As Chattogram’s economy expanded, the two existing bridges reached capacity, constraining freight movement to and from the port, slowing commuter travel, and limiting the development potential of the eastern bank. There was no direct, weather-resilient crossing near the river mouth, and the metropolitan area lacked an integrated urban structure spanning both banks of the river. The tunnel project was conceived to relieve this structural bottleneck, shorten the Chattogram–Cox’s Bazar road distance by approximately 40 kilometres, and lay the foundation for a “One City, Two Towns” development model, enabling both banks of the Karnaphuli River to develop as an integrated economic and urban system. The Karnaphuli Tunnel is a twin-tube, four-lane underwater expressway tunnel extending approximately 3.32 kilometres beneath the Karnaphuli River, with an internal diameter of 10.8 metres and at a depth of 18–31 metres below the riverbed. Including approach roads and the east-bank viaduct, the full corridor extends to about 9.3 kilometres. It is the first underwater road tunnel in South Asia. The project was delivered under an EPC (Engineering, Procurement, Construction) turnkey model with a total contract value of USD 705.8 million. Construction commenced in December 2017 and the tunnel was for-

mally inaugurated on 28 October 2023. The project was implemented by the Bangladesh Bridge Authority and designed and built by China Communications Construction Company (CCCC) under an intergovernmental cooperation framework. The project embodies all seven dimensions of sustainable transport value orientation. Safe: it replaces weather-dependent ferry crossings and reduces accident exposure on congested detours, with comprehensive firefighting, emergency cross-passages and monitoring systems. Accessible: it opens a direct, all-weather link between the port city and previously less-connected eastern-bank communities and industrial zones. Efficient: river-crossing time has fallen from 30–40 minutes by detour to about 3–4 minutes. Green: shorter travel distances and reduced congestion lower fuel consumption and per-vehicle emissions. Economical: it catalyses industrial and real-estate development on the Anwara side, underpinning the “One City, Two Towns” growth model. Inclusive: it improves access to jobs, services and economic opportunity for residents on both banks. Resilient: it provides a flood- and weather-independent alternative crossing, strengthening overall transport redundancy for the city.

II. Solution



TBM FAT Ceremony



TBM assembling on site

Given the sandy, silty deltaic soil conditions of the Karnaphuli riverbed, the tunnel was constructed using the slurry shield tunnel-boring method. The slurry hydro-shield Tunnel Boring Machine (TBM) used for the project was independently developed and manufactured by China Communications Construction Company. With a diameter of 12.16 metres, a main body length of 13.58 metres and a total length of 94.23 metres, the machine weighs over 2,200 tonnes and has a driving power of 3,000 kW. The TBM was launched from the Patenga (west) end and advanced beneath the river to the Anwara (east) end over a distance of 2,450 metres, assembling precast concrete segmental rings to form the twin tubes. A total of 2,452 rings (each 2 metres wide and composed of eight segments) were prefabricated in Jiangsu Province, China, under supervised quality control, then shipped to Chattogram for installation. Each tube carries two lanes of traffic, giving four lanes overall, with a maximum operating speed of 80 km/h and a design service life of 100 years. The project addressed four major technical challenges inherent to the coastal deltaic environment. First, deep foundation pit excavation in the coastal area involved high water levels, deep pits and highly permeable soil layers, carrying considerable excavation risk. Second, precise control of the TBM shield’s alignment and management of shield tail deformation were critical to

achieving accurate excavation for both tunnels. Third, the launching, reception and U-turn of the TBM in water-saturated silty sand formations presented significant safety risks, which were mitigated through a combination of ground freezing, jet grouting reinforcement and steel sleeve techniques. Fourth, cross-passage construction in permeable silty sand with high chloride-ion content, low freezing temperatures, rapid groundwater flow and tidal heat loss required high-quality effective frozen-soil sealing and robust freezing performance. All four challenges were successfully overcome through systematic engineering design and rigorous construction management.



Viaduct on the east bank

On the surface, the project delivered approximately 5.3 kilometres of approach roads, a 727-metre viaduct at the Anwara end with 24 spans of pre-stressed concrete box girders, and connecting links to integrate the tunnel seamlessly into the Dhaka–Chattogram–Cox’ s Bazar highway, the city’ s Outer Ring Road, the Elevated Expressway, Airport Road and Patenga Beach Road network. A toll plaza with 16 booths and weigh stations on both banks were built to support semi-automatic toll collection and overload control, helping recover operating and maintenance costs over the project lifecycle.



Segment yard

Safety and operational reliability were integrated throughout the tunnel. Three cross-passages connect the two tubes for emergency evacuation, constructed using ground-freezing and underground excavation techniques adapted to the permeable, high-chloride silty sand formation. The tunnel is equipped with comprehensive mechanical and electrical systems, including power supply, firefighting, drainage, ventilation, lighting, and integrated communication and monitoring systems. The tunnel cross-section is divided into three chambers: two for traffic and a lower gallery for emergency evacuation, utility pipelines and drainage pumps. During construction, the contractor heavily localised its workforce by employing local engineers and workers, creating a large number of jobs and cultivating local tunnelling talent through structured on-site training and mentorship. The contractor also delivered formal training and technology-transfer programmes for the employer’ s team in China and on site in Chattogram, building long-term local capacity in road tunnel design, construction and operation.



Slurry treatment plant

The project was delivered under a government-to-government (G2G) arrangement between Bangladesh and China, with CCCC serving as the EPC turnkey contractor. Financing combined Bangladesh government funds with a concessional loan from the Export-Import Bank of China. The Bangladesh Bridge Authority acted as the implementing agency, while an international consultant joint venture — SMEC and COWI, supported by local firms ACE Consultants and DevConsultants — provided independent design review and construction supervision. As a landmark cross-river infrastructure project, the Karnaphuli Tunnel exemplifies sustainable transport in action. It aligns with SDG 9 (Industry, Innovation and

Infrastructure) by deploying advanced tunnelling technology to build critical connectivity infrastructure; SDG 8 (Decent Work and Economic Growth) by generating construction employment and catalysing industrial and port-related economic activity; SDG 11 (Sustainable Cities and Communities) by supporting the integrated “One City, Two Towns” development of the Chattogram metropolitan area; SDG 13 (Climate Action) by reducing per-trip distances and associated transport emissions; and SDG 17 (Partnerships for the Goals) through its South-South G2G cooperation and concessional financing model.

III. Main achievements



Toll plaza

Since its opening to traffic on 29 October 2023, the Karnaphuli Tunnel has transformed cross-river mobility in Chattogram. Travel time across the Karnaphuli River has been cut from approximately 30–40 minutes by bridge detour or ferry to roughly 3–4 minutes through the tunnel, and the Chattogram–Cox’ s Bazar road distance has been shortened by around 40 kilometres. In its first year of operation, the tunnel recorded approximately 1.4 million vehicle crossings. As a brand-new corridor serving areas still undergoing planned development, early traffic volumes are growing progressively as industrial and urban activities on the eastern bank expand, with a long-term design capacity of 17,000–18,500 vehicles per day. The project was completed with construction quality met international quality standards, as independently verified by the international supervision consultants. In August 2025, the contractor received the Performance Certificate from the employer, confirming that the tunnel had successfully passed the defect liability period with verified high quality and reliable performance.



On-site construction photo

The socio-economic impact of the tunnel extends well beyond travel time savings. As one of Bangladesh’s largest transport infrastructure projects, it generated substantial employment during the construction phase: around 1,600 workers were on site at peak construction, including a large proportion of locally hired engineers and labourers. The project also delivered significant technology and knowledge transfer to Bangladeshi engineers and operators, building local capacity for future infrastructure projects. By providing direct access to the Chattogram Export Processing Zone, KEPZ and KAFCO, and by serving as a key corridor for freight moving to and from the upcoming Matarbari deep-sea port, the tunnel strengthens Bangladesh’s overall trade logistics competitiveness. The tunnel also supports the “One City, Two Towns” spatial development strategy, enabling balanced urban and industrial growth on both banks of the Karnaphuli River and reducing pressure on the overcrowded west bank.



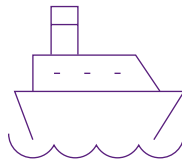
Overload control station on the west bank

As South Asia’s first multi-lane underwater road tunnel, the Karnaphuli Tunnel project offers a highly replicable model for other fast-growing port cities divided by major rivers — particularly in the Ganges-Brahmaputra delta and across South and Southeast Asia, where soft deltaic soils and tidal rivers present similar engineering challenges. The project demonstrates that large-diameter slurry-shield tunnelling is technically and economically feasible under such geological conditions, and that the four key technical challenges of deep foundation pits, TBM alignment control, TBM launching/reception and cross-passage construction can be systematically addressed. Its EPC turnkey delivery model, combined with G2G cooperation, concessional South-South financing, international design-build expertise and independent third-party supervision, provides a practical template for other developing countries seeking to deliver complex cross-river infrastructure. At the same time, the project’s experience also underscores the importance of complementary urban planning and phased demand growth for mega-infrastructure, offering a balanced, evidence-based reference for agencies worldwide planning similar sustainable transport connectivity projects.



The port of the tunnel

12.Engines of Sustainable Development: APEC and Port of Antwerp-Bruges Enable Port Transformation



I. Overview

Global ports have evolved from passive cargo hubs into vital backbones of supply chains and strategic platforms driving regional economies and innovation. To thrive in this expanded role, they require advanced institutional models and highly skilled workforces capable of navigating complex macro-environmental shifts.

Addressing this need, the APEC – Antwerp/Flanders Port Training Center and its sister company, Port of Antwerp-Bruges International (PoABI), leverage a “Total Partnership Approach” to transfer elite maritime expertise worldwide. This collaboration empowers international ports to adapt to modern challenges—ranging from geopolitical turbulence to digitalization—and transform into enduring engines for sustainable, inclusive regional growth.



By combining APEC’s decades of peer-to-peer knowledge transfer with PoABI’s on-site implementation capabilities, the initiative creates a comprehensive ecosystem that supports ports in managing global transitions while fostering continuous learning and operational excellence across the maritime sector.

II. Solution

To help international ports navigate seven distinct global transitions—including geopolitical shifts, infrastructure stress, and the global energy transition—APEC and PoABI share field-tested know-how from Europe’s sec-

ond-largest port through four strategic pillars: Port Strategy & Governance, Digital & Business Analysis, SHEQ & Sustainability, and Port Operations & Hinterland Connectivity.



Since 1977, APEC has empowered over 21,000 professionals across five continents using a peer-to-peer philosophy. Its extensive training programs are delivered through three flexible formats:

- Yearly Annual Courses covering cutting-edge trends;
- Tailored Programmes customized for specific client operations;
- Comprehensive Capacity Building Plans that design tailored training trajectories for entire workforces, from executives to operational labor.

Furthermore, APEC expands its reach through strategic alliances by establishing localized training centers in

regions like China, India, Suriname, and Egypt, and utilizes innovative tools like the 'Port Endeavor Game' to simulate balancing profitability with UN Sustainable Development Goals. Complementing this human-centric approach, PoABI provides direct on-site mechanisms, offering hands-on management support, strategic advisory for master planning, and financial co-investment partnerships to build and optimize physical port platforms globally.

III. Main Achievements

The collaborative ecosystem of APEC and PoABI has established a proven blueprint for sustainable port growth and capacity building. Over nearly five decades, APEC has successfully transferred specialized maritime

knowledge directly from port professional to port professional, cultivating a massive global alumni network spanning five continents.



A key achievement is the localization of expertise; rather than forcing all training to occur in Europe, the initiative has successfully grounded core methodologies within regional economic contexts through partnerships in Guangzhou, India, Suriname, and Egypt. The introduction of interactive tools like the 'Port Endeavor Game' has further demonstrated how to effectively train professionals on balancing commercial goals with sustainability targets.

Ultimately, the synergy between the two organizations

ensures a holistic impact: while APEC prepares local talent and builds institutional capacity, PoABI assists in constructing and investing in the necessary physical and operational frameworks. This total partnership approach equips ports to handle global pressures, enabling them to serve as resilient drivers of development within their regions and the broader global supply chain.

13.Enhancing Sustainable Transportation Development and Social Welfare in Brazil through Digital Innovation and Green Energy



I. Overview

The transportation industry in Brazil faces severe structural challenges, including high reliance on fossil fuels, prominent traffic safety risks, inadequate new-energy infrastructure, and uneven urban-rural service coverage. To implement the 2030 Agenda for Sustainable Development and the climate goals of COP30, the Ministry of Transport of Brazil, together with local mobility platform “99” established the Sustainable Mobility Alliance in 2022. The Alliance has brought together partners from automobile manufacturers, financial companies, energy, charging infrastructure, and car rental sectors to create

an integrated, full-scenario, life-cycle-supporting sustainable mobility ecosystem. Leveraging digital technology for safety, promoting low-carbon development through new-energy solutions, and expanding employment opportunities via an industry-wide coalition, the Alliance addresses key mobility challenges faced by developing economies and lays a solid foundation for building a safer, more efficient, low-carbon, inclusive and resilient urban transport system in Brazil. As of April 2026, over 30 enterprises have joined the Alliance.



II. Solution

I. Leveraging Digital Technologies to Establish a Smart Traffic Safety Network

To establish a smart traffic safety network, the Alliance integrates data-driven technologies with localized operations, deploying a comprehensive security system across ride-hailing, motorcycle taxis, and on-demand delivery. Platform “99” implemented 33 smart protection measures—including facial recognition, real-time location tracking, anomaly alerts, and a 24/7 Portu-

guese-language safety center for rapid incident response—while utilizing big data to help drivers proactively avoid high-risk zones. These measures have significantly improved the sense of safety for drivers and passengers, enhanced the resilience of transport networks, and offered a replicable model for transport safety governance.

II. Promoting New Energy Transition Across Multiple Transport Modes Through the Sustainable Mobility Alliance

To advance the electrification transition, the Alliance developed a unified cross-sectoral digital platform consolidating vehicle supply, financial services, and charging infrastructure across core mobility segments. By launching a dedicated Electrification Program and collaborating with automakers on tailored electric vehicles, the Alliance is rapidly accelerating the construction of Brazil's largest interoperable charging network. It is accelerating the construction of the largest interoperable charging network in the country and has launched “Electric Pro”, a

dedicated service for electric ride-hailing vehicles, using IoT technology to accurately calculate carbon credits. The Alliance has also introduced rental and credit schemes for electric motorcycles and electric bicycles. These electrification initiatives have significantly reduced energy and maintenance costs for drivers and riders, making a strong contribution to lowering carbon emissions and optimizing the energy resource structure in the transport sector.

III. Industrial Ecosystem Co-construction: Delivering Diverse Employment Opportunities and Inclusive Livelihood Benefits

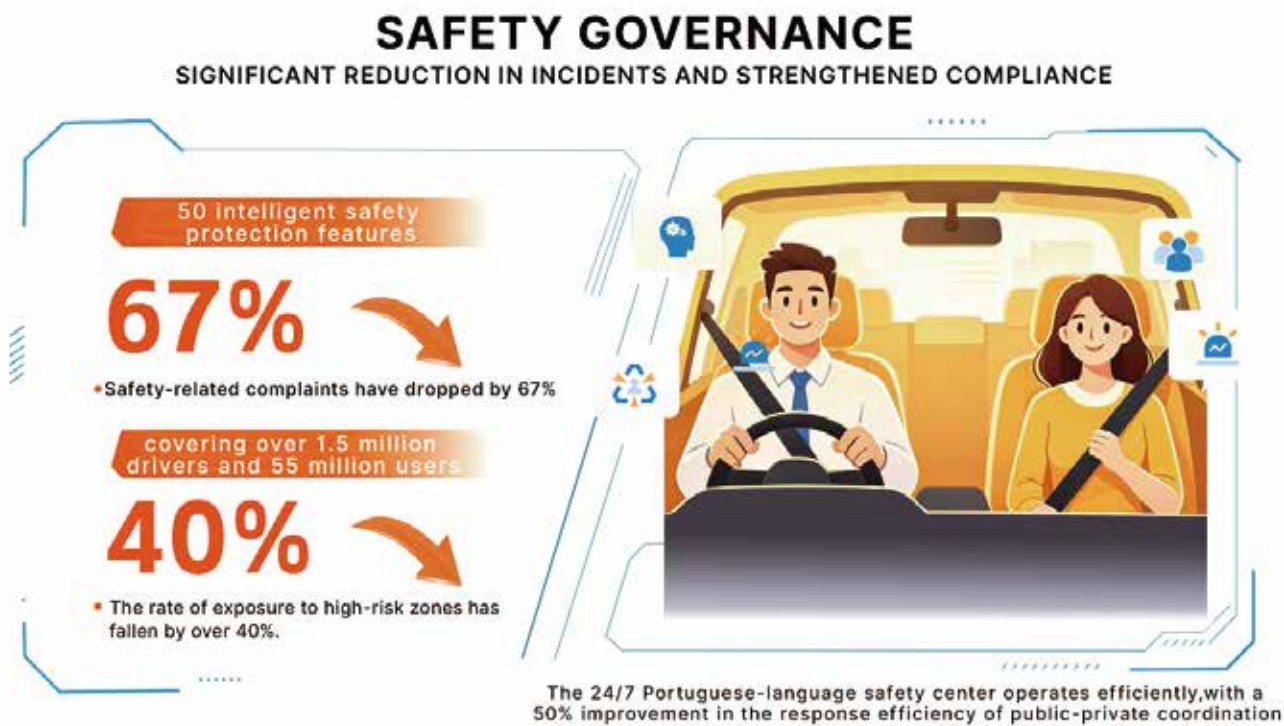
Through ecosystem co-construction, the Alliance delivers inclusive, accessible mobility services that narrow urban-rural disparities and provide ample flexible employment spanning full-time or part-time ride-hailing and delivery roles. An intelligent order-matching system precisely balances supply and demand to boost operational efficiency, while strategic collaborations with financial institutions provide low-interest credit, rental, and purchase subsidies that lower entry thresholds and

raise driver incomes. To address local contextual needs, the Alliance vigorously promotes motorcycle and e-bike mobility to connect remote communities lacking public transport, alongside delivering targeted support for residents' medical travel, thereby expanding the reach of inclusive livelihood benefits.

III. Main Achievements

I. Safety Governance: Significant Reduction in Incidents and Strengthened Compliance

More than 50 intelligent safety protection features have been launched, covering over 1.5 million drivers and 55 million users. Safety-related complaints have dropped by 67%, and the rate of exposure to high-risk zones has fallen by over 40%. The 24/7 Portuguese-language safety center operates efficiently, with a 50% improvement in the response efficiency of public-private coordination. Strong adherence to safety standards has greatly elevated safety assurance for drivers and riders, underpinning the construction of a secure, sustainable and resilient urban transport ecosystem in Brazil.



II. Low-Carbon Transition: Expanded New-Energy Infrastructure and Cleaner Mobility

By the end of 2025, a total of 16,000 charging stations had been deployed across Brazil, of which 5,000 (accounting for 31%) were funded and developed by Alliance members. Brazil’s new energy vehicle fleet totals approximately 570,000 units, among which around 210,000 units (accounting for 37%) have been launched via the joint efforts of Alliance members. These tangible outcomes underscore the sustained investment commitment of participating enterprises, which have collectively mobilized over BRL 410 million for electrification initiatives in the first three years following the Alliance’s founding.

Thus far, a total of approximately 36,000 new energy vehicles and 3,000 electric motorcycles have been registered on the 99 Platform. Over the past three years, these vehicles have served more than 314 million passenger trips, of which electric motorcycles alone have contributed over 9.3 million trips. Through the widespread adoption of electric vehicles, the Alliance has achieved a cumulative carbon emission reduction of 46,300 metric tons, an environmental benefit equivalent to planting 364,000 trees.

Low-Carbon Transition: Expanded New-Energy Infrastructure and Cleaner Mobility



Reduced carbon emissions by 46,300 tons – equivalent to planting 364,000 trees



III. Inclusive Livelihoods: Creation of Millions of Jobs and Improved Welfare

The Alliance has generated over 1.5 million flexible employment positions across Brazil, supporting stable income growth for hundreds of thousands of families. Its services cover more than 55 million active users in over 3,300 municipalities — nearly 60% of Brazil’s urban areas — effectively bridging mobility shortages in small and medium-sized cities.

Leveraging intelligent scheduling systems, the platform has lifted overall operational capacity utilization by 40%, thereby driving up drivers’ average daily income by approximately 15 BRL. The ongoing electrification of online mobility services has reduced energy expenditure for ride-hailing operators by up to 80% and raised their overall income by around 60%. Meanwhile, electric motorcycle riders have reduced their operational cost of up to 35%.

Over the past three years, electric bicycle and motorcycle mobility services have registered a cumulative total of over 2 billion trips. This has significantly enhanced travel accessibility for low-income populations and advanced more equitable and inclusive transport services. As a core member of the Alliance, the Platform “99” donated mobility vouchers valued at 1 million BRL under this initiative, exclusively for residents requiring medical travel, allowing them to make trips to medical institutions at low cost with convenience and reliability.



This practice is closely aligned with the United Nations Sustainable Development Goals. It offers an effective model combining coalition-based collaboration, financial instruments, infrastructure development, and digital empowerment, providing a benchmark for sustainable transport transition and livelihood improvement in emerging economies worldwide.



On-Demand Delivery Service of Alliance Member “99” Platform

14.Mobility Green Label-Factory for Non-Ferrous Metals inPlovdiv

I. Overview

The Factory for Non-Ferrous Metals (FNM) is an industrial and business zone about ten kilometres from Plovdiv and eight kilometres north of Asenovgrad. The MoMa.BIZ archive describes a 0.9 km² site with ten companies and approximately 2,500 employees. Before the project, 67 per cent of employees used public or collective buses, while 20 per cent drove and 8 per cent travelled as car passengers. The zone already organised and co-financed collective transport, indicating that the challenge was to improve an existing mobility system rather than create public-transport use from scratch.

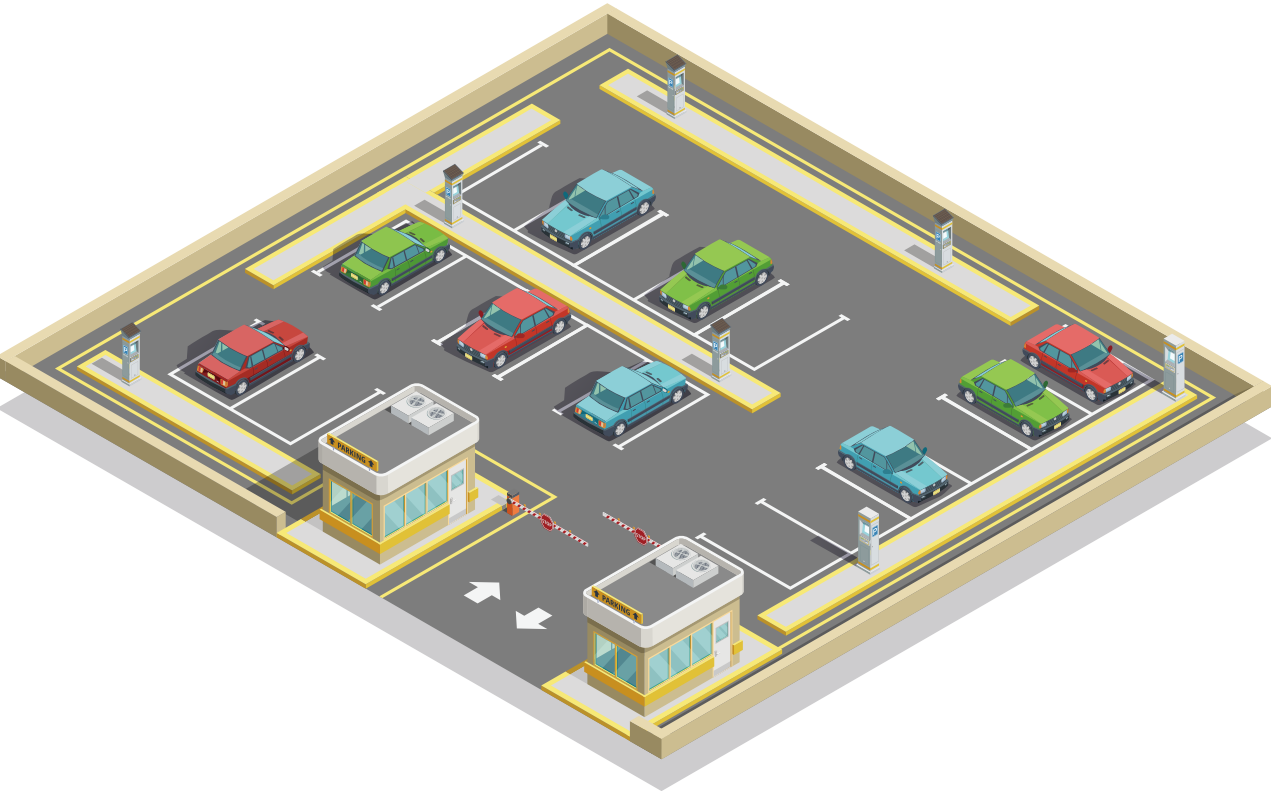


Figure 1. The FNM/KCM industrial site and its regional setting.
Image source: KCM AD Sustainability Performance Data 2021.

A mobility survey identified four main problems: low-quality transport services, inadequate parking management, weak carpooling, and limited flexibility through telework or flexible hours. The road linking FNM with Plovdiv and Asenovgrad also lacked bicycle lanes and carried heavy traffic, making cycling access unsafe. Shift work and the site’s peripheral location further increased reliance on employer-organised transport and private cars.

The intervention formed part of MoMa.BIZ, a European project implemented from 2011 to 2014 across six countries to reduce private motorised mobility through workplace mobility management. At FNM, the Energy Agency of Plovdiv worked with site management and stakehold-

ers to establish a Local Mobility Group and develop a Transport and Mobility Improvement Plan. Formally adopted by senior management, the plan promoted better transport services, organised parking, safer and more accessible mobility, and more efficient use of transport resources. The approach emphasised employer commitment, stakeholder dialogue and practical measures suited to an industrial-zone context.



II. Solution

The solution was based on a background study and mobility survey covering the site’s geography, workforce, modal split, collective transport, parking and barriers to cycling and flexible work. A Local Mobility Group used these findings to develop a Transport and Mobility Improvement Plan. FNM senior management formally adopted the plan and committed to implementation and dissemination beyond the MoMa.BIZ project, providing institutional support for coordinated action across the ten-company site.

As 67 per cent of employees already used public or collective buses, the project prioritised improving this mode. New quality requirements were incorporated into transport-operator tenders, while bus stops received information boards displaying the Mobility Label, destinations and schedules. These measures aimed to improve service quality, reliability and accessibility and reduce incentives to shift toward private cars. The project also developed a parking-management map covering 223 spaces, including 15 spaces for carpooling, four for people with reduced mobility, and 20 for senior management and visitors. The map also identified information points, renovated bus stops and bicycle spaces. A carpooling scheme and online matching platform were introduced, with preferential parking for participating vehicles, while vanpooling options were also explored. A guaranteed-ride-home arrangement provided a backup for employees facing overtime, emergencies or missed connections, reducing the perceived risk of using shared transport.

Cargo bicycles were introduced and tested for deliveries within the business zone, where internal cycling conditions were relatively suitable. The project also organised a Mobility Week and Information Day, supported by newsletters and information materials, to promote public transport, carpooling and other sustainable mobility options. Communication was combined with concrete operational improvements rather than relying on awareness campaigns alone.

The MoMa.BIZ Mobility Label provided an overall assessment of sustainable accessibility. After implementing the measures, FNM improved from Class B to Class A, and the A-Class Mobility Label Certificate was awarded at the Information Day. Overall, the solution combined improvements to public transport, parking management, carpooling, guaranteed return options, low-carbon internal logistics, communication and performance assessment, providing a practical mobility-management model for industrial zones.

III. Main achievements

The project established a formal mobility-management system at the Factory for Non-Ferrous Metals (FNM), which UNECE identifies as the first industrial area in Bulgaria to develop a Mobility Management Plan. The plan was formally adopted by senior management and translated into operational measures covering collective transport, parking, carpooling, internal logistics and awareness.

Key outputs included a parking-management map covering 223 spaces, with 15 reserved for carpooling, four for people with reduced mobility, and 20 for senior management and visitors. The project also introduced new transport-quality requirements, bus-stop information boards, a carpooling platform, a guaranteed-ride-home arrangement and cargo-bike trials for internal deliveries. These measures improved transport accessibility and supported more efficient and lower-carbon mobility without relying solely on private cars.

The most significant verified performance result was FNM’s upgrade from Mobility Class B to Class A after implementing the measures in its improvement plan. The project also contributed to more inclusive parking management, better commuting information and low-emission internal logistics. However, available sources do not provide a quantified post-project modal split or emissions reduction; therefore, no specific percentage reduction in car use or carbon emissions can be claimed.

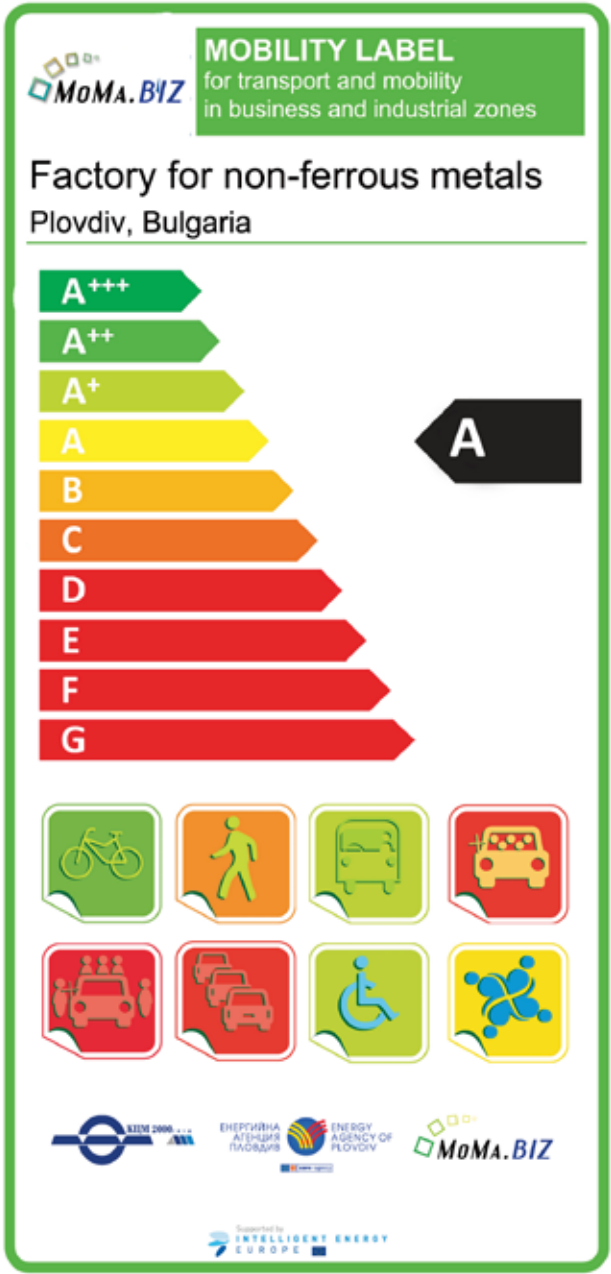
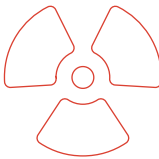


Figure 4. A-Class Mobility Label awarded to the Factory for Non-Ferrous Metals.
Image source: MoMa.BIZ mobility-labelling archive and Plovdiv case page.

The MoMa.BIZ methodology was designed for replication across business and industrial zones in six European countries, demonstrating the potential for mobility management to integrate transport quality, parking, shared mobility and sustainable logistics at employment sites.



15.CADO Sustainable Aviation Fuel Registry System: Digital Platform for Transparent SAF Tracking



I. Overview

Climate change is a critical challenge, and the aviation industry has committed to achieving net zero carbon emissions by 2050, aligning with ICAO's Long-Term Aspirational Goal (LTAG). Sustainable Aviation Fuel (SAF) is a key decarbonization lever, expected to deliver around 65% of emissions reductions by 2050.

However, scaling SAF faces significant hurdles. Current production is insufficient, estimated at just 1.9 million tonnes in 2025, representing only 0.6% of global jet fuel consumption. SAF is also geographically limited and lacks a proper pricing mechanism. Consequently, SAF costs three to five times more than conventional jet fuel, while eSAF is nearly ten times higher. This massive "green premium," combined with challenges in transparency and fairness regarding environmental benefits, severely constrains its deployment.

To address these issues, IATA developed the SAF Registry.. Launched in April 2025 and released to the Civil Aviation Decarbonization Organization (CADO), this global system aims to accelerate aviation's clean energy transition.

The CADO SAF Registry provides a robust governance framework ensuring impartiality and transparency. It registers SAF and records transactions accurately, tracking environmental benefits across the value chain. Crucially, it allows airlines to record purchases and claim emissions reductions against various obligations, including CORSIA and corporate Scope 3 reporting. This system supports fuel suppliers in demonstrating compliance, enables states to validate claims, and facilitates global cooperation toward a sustainable aviation future.

II. Solution

The CADO SAF Registry addresses the critical challenge of limited SAF supply by connecting airlines with global producers through a "Book and Claim" solution. This chain of custody model effectively decouples the physical fuel from its environmental benefits, enabling the transfer of carbon emission reductions without requiring a physical link between the producer and the end-user. Players along the value chain can register fuel amounts and attributes, allowing buyers to claim reductions for any flight regardless of the actual fuel used. To ensure absolute integrity, all fuel redemptions and environmental claims are verified and retired from the registry to strictly avoid double counting or fraud.

By enabling this approach, the system significantly

reduces logistical complexities, storage costs, and transportation emissions. It grants buyers the flexibility to purchase SAF attributes from any producer, irrespective of feedstock, technology, or location. This efficient matching of supply and demand incentivizes the scale-up of new production capacity and innovation in SAF technologies. In addition, the Registry empowers corporate customers and freight forwarders to co-finance decarbonization, directly helping to reduce the high green premium along the value chain. To minimize administrative burdens and foster adoption, all users will have free access to the system with no transaction fees until April 2027, before transitioning to a cost-recovery model.

To build a robust system with high integrity, interoperability is a core design element aimed at increasing transparency and streamlining certificate management. The Registry will offer interoperability with other providers following a pilot demonstration in 2026, and collaboration with ICAO remains essential. Operated by CADO, a not-for-profit entity representing all SAF value chain stakeholders, the system ensures impartiality and global acceptance. By engaging fuel producers, corporates,

and government bodies, the Registry creates a win-win situation that alleviates cost burdens for airlines while ensuring compliance and accelerating the aviation industry's clean energy transition.

III. Main Achievements

The CADO SAF Registry has been online over 1 year and continues its extended development phase. It has provided the aviation sector with a scalable, purpose built system for tracking SAF across the entire value chain. As SAF adoption accelerated through regulation, airline commitments, and increased production, a consistent and aviation specific platform was needed to support transparent and agnostic accounting. The Registry was

developed to meet that need. This first year marks the initial implementation of the system and its role in supporting the sector's transition.

The development of the IATA SAF Registry is supported by over 50 organizations, including airlines, fuel producers, and State authorities.



16. Pelješac Bridge and Access Roads: Connecting South Dalmatia through Sustainable Transport Infrastructure

ROAD CONNECTION WITH SOUTH DALMATIA - PELJEŠAC BRIDGE, ACCESS ROADS AND STON BYPASS



Panoramic view of the Pelješac Bridge.

I. Overview

The Road Connection with South Dalmatia project was implemented by Croatian Roads Ltd. between 2017 and 2023 and co-financed by the European Regional Development Fund under the Operational Programme Competitiveness and Cohesion. The project addressed a long-standing transport discontinuity: the southernmost part of Croatia, including the Dubrovnik area, was previously connected with the rest of the country either through the Neum corridor, requiring two external EU border crossings, or through ferry connections. The selected option created a continuous road connection within Croatian and EU territory, improving territorial cohesion, accessibility, reliability and resilience of the transport system.

The project comprises three main infrastructure components: the Pelješac Bridge with access roads, the Dubovka-Sparagovići/Zaradeže access road, and the Ston bypass on the Sparagovići/Zaradeže-Prapratno and Prapratno-Doli subsections. The Pelješac Bridge is 2.44 km long including abutments, while the access roads and Ston bypass add approximately 28.6 km of new or upgraded road infrastructure. The project also includes tunnels, viaducts, bridges, road-safety facilities and associated project-management, land-acquisition, visibility and risk-management components. Among them, the Pelješac Bridge with access roads—distinguished by its exceptional technical complexity and its alignment through a statutorily designated marine protected area—represents the most strategically critical infra-

structure component and was undertaken by a Contractor Consortium led by China Road and Bridge Corporation (CRBC), within which all the Consortium members are subsidiaries of China Communications Construction Company (CCCC).

The practice is relevant for sustainable transport because it combines major infrastructure delivery with measurable social and economic benefits. The ex-post traffic and cost-benefit re-evaluation analysed ferry traffic, border-crossing flows, regular annual traffic, higher summer-season traffic and traffic-model scenarios. It confirmed substantial travel-time savings, improved traffic flow and positive socio-economic performance. In 2023, the project generated an estimated 2.77 million hours of travel-time savings, with average

annual daily traffic of 6,667 vehicles recorded at the Pelješac Bridge counter and 5,549 vehicles at Prapratno. The re-evaluation showed a positive economic net present value of EUR 30.8 million, an economic rate of return of 5.55% and a benefit-cost ratio of 1.08.

The project also applied environmental protection measures during marine construction, including noise-mitigation measures during pile driving, pollution-prevention measures, process-water management and controlled disposal of drilling waste. This makes the project a good practice in integrated, evidence-based and partnership-driven infrastructure for geographically separated coastal regions.

II. Solution

The project delivered an integrated sustainable transport solution, combining route planning, preparation under the EU co-financing framework, traffic and cost-benefit analysis, major bridge and road construction, environmental protection during marine works, and long-term socio-economic appraisal into one coherent connectivity intervention.

Integrated connectivity solution:

The project implemented the preferred route and infrastructure solution identified during project preparation, consisting of the Pelješac Bridge, access roads and the Ston bypass. This combined solution creates a continuous road connection between the Croatian mainland, the Pelješac Peninsula and South Dalmatia. By bypassing the Neum corridor, the project removes the need for regular domestic road travel through two border crossings and reduces reliance on ferry alternatives. As a result, it improves accessibility for residents, businesses, tourists, public services and emergency access, while strengthening the territorial continuity of Croatia and the European Union.

Evidence-based planning and appraisal:

The project was prepared and later re-evaluated through detailed traffic and cost-benefit analyses in line with the requirements for EU co-financed infrastructure projects. The ex-post re-evaluation used observed traffic data, including data from the Ploče–Trijanj ferry line, the Klek and Zaton Doli border crossings, and Croatian Roads traffic counters. The updated traffic model assessed the project’s effects under both regular yearly traffic patterns and higher summer-season traffic conditions. This allowed the project’s benefits to be assessed across the wider transport network, rather than only at the level of the bridge itself. The re-evaluation confirmed that the project generates positive socio-economic results, with a positive economic net present value, an economic rate of return above the applied social discount rate and a benefit-cost ratio above 1.

Safe and resilient infrastructure:

The project provided modern road infrastructure adapted to a demanding coastal environment. The Pelješac Bridge and connected road sections include modern traffic lanes, emergency lanes, curb lanes, road-safety facilities, tunnels, viaducts, bridges and protective elements. Wind-protection and traffic-safety measures support reliable operation in local conditions where strong coastal winds and maritime conditions can affect other modes of access. This strengthens the resilience of South Dalmatia by ensuring a more stable and predictable road connection for daily mobility, public services, supply chains, tourism and emergency access.

Environmental and marine protection during works:

During marine construction, the project applied environmental and marine-protection measures designed to reduce impacts on the surrounding environment and marine life. These included the use of bubble curtains during pile-driving works to reduce underwater disturbance and noise impacts on marine life and nearby residents; oil containment booms to reduce spill risks; sedimentation systems and process-water recycling during drilling; wastewater-network upgrades; and controlled transport of drilling waste to designated disposal locations. These measures supported the green and marine-protection dimensions of the project. Environmental awareness and resource-efficient construction practices were also promoted through project-level initiatives such as “Quality Month”, “Safety Month” and “Technology Month”.

Local capacity and skills:

The project contributed to local employment, professional development and knowledge transfer. Local workers participated in construction and project implementation activities, including technical and administrative roles. Cooperation with local academic institutions, including the Faculty of Civil Engineering at the University of Zagreb, supported professional development for young Croatian staff and contributed to the development of locally rooted technical expertise. This strengthened the local skills base while supporting the successful delivery of a complex international infrastructure project.

Socio-economic usefulness:

The project improves connectivity to an economically important tourism and service region and strengthens the cohesion of national and EU territory. It is not primarily a revenue-generating commercial infrastructure scheme; its public value lies in accessibility, time savings, reduced waiting, improved reliability, regional cohesion, safer mobility and wider economic benefits for residents, businesses, and visitors. The permanent road connection with South Dalmatia improves everyday mobility and supports long-term regional development.

Replicability and partnership value:

The practice can serve as a reference for other territorially separated coastal, island, border or peripheral regions where transport discontinuity creates social, economic and administrative barriers. It demonstrates how a national road authority, EU Cohesion Policy support, international construction expertise, environmental safeguards and evidence-based project appraisal can jointly deliver a complex transport intervention under strict technical, environmental and governance requirements.

III. Main Achievements

The Road Connection with South Dalmatia project was successfully implemented between 2017 and 2023. The Pelješac Bridge with part of the access roads was opened to traffic in July 2022, while the overall project was completed with the opening of the Ston bypass in

April 2023. The completed infrastructure includes the 2.44 km Pelješac Bridge, 10.5 km of access roads and 18.09 km of Ston bypass sections, together with associated tunnels, viaducts, bridges and road-safety facilities.



Construction works in the marine environment during the Pelješac Bridge project.

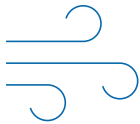
The project delivered measurable and lasting transport benefits. It created a continuous domestic and EU road connection between South Dalmatia and the rest of Croatia, removing the need for regular road travel through the Neum corridor and reducing dependence on border crossings and ferry connections. In 2023, average annual daily traffic of 6,667 vehicles was recorded at the Pelješac Bridge counter and 5,549 vehicles at Prapratno. The updated traffic model estimated annual travel-time savings of 2.77 million hours in 2023, with benefits expected to increase over time. The project also contributed to a significant reduction in traffic through the Klek and Zaton Doli border crossings, illustrating the shift from a fragmented cross-border route toward a continuous national and EU transport connection.

The ex-post cost-benefit re-evaluation confirmed the socio-economic justification of the investment, with an

economic net present value of EUR 30.8 million, an economic rate of return of 5.55% and a benefit-cost ratio of 1.08. Beyond monetised indicators, the main achievement is the permanent territorial connection of South Dalmatia with the Croatian mainland, strengthening accessibility, regional cohesion, transport resilience, safety and everyday mobility for residents, businesses and visitors.

The quality and international relevance of the project have also been recognised through professional awards. The Pelješac Bridge received the 2023 Gustav Lindenthal Medal at the International Bridge Conference. It was also recognised as Highly Commended in the Outstanding Project of the Year category at the FIDIC Project Awards 2023. The project was additionally recognised in 2022 for international engineering green supply chain management.

17.The IRU Green Compact: A Holistic Approach to Decarbonising Commercial Road Transport



I. Overview

Under the 2015 Paris Agreement, nations committed to keeping global warming below 2 ° C above pre-industrial levels, ideally limiting the increase to 1.5 ° C. Meeting this target requires an 84% reduction from 2019 emission levels, demanding rapid, coordinated action across all sectors, including road transport.

Commercial trucks and buses account for roughly 23% of the transport sector's global greenhouse gas emissions (about 1.8 GtCO₂e), yet the industry's extreme fragmentation—with 90% of EU transport companies having fewer than ten employees—severely limits the resources available to transition the 6 million trucks operating on European roads. Compounding this challenge, EU truck and bus emissions have increased by 30% since 1990, even as overall EU emissions fell by 30%. Furthermore, operators

face severe structural hurdles, including alternative-fuel vehicles that are two to three times more expensive than diesel equivalents, vastly insufficient public charging infrastructure, varying regional energy realities, and a world-wide driver shortage.

To address these interconnected challenges, the International Road Transport Union (IRU) launched the Green Compact in 2021 as a holistic, evidence-based initiative to help the commercial road transport sector reach carbon neutrality by 2050 while maintaining economic sustainability. Grounded in data collection and scientific modeling, the project embodies comprehensive sustainable transport values and is structured around four complementary workstreams: efficiencies, alternative fuels, collective mobility, and enabling conditions.

II. Solution

The IRU Green Compact adopts a multi-angle approach adaptable to diverse national baselines, ensuring that decarbonization is treated as part of broader sector modernization.

Workstream 1 (Efficiencies) targets the energy intensity of transport through driver training programs that cut fuel consumption by 15%, vehicle retrofits like low-rolling-resistance tires (saving up to 10 liters per 100 km) and aerodynamic devices, alongside logistics optimizations including the European Modular System, trailer swapping, and digital border-crossing tools like eTIR.

Workstream 2 (Alternative Fuels) investigates pathways to reduce carbon intensity, establishing that while battery-electric vehicles (BEVs) offer zero tailpipe emissions, advanced biofuels like HVO provide an immediate 75–90% carbon reduction without requiring costly engine modifications.

Workstream 3 (Collective Mobility) drives a modal shift from private cars to buses and coaches, utilizing push measures like congestion charges and pull measures like integrated ticketing to significantly lower carbon intensity per passenger-kilometer.

Workstream 4 (Enabling Conditions) monitors transition prerequisites such as grid readiness, utilizing the Alternative Fuels and Efficiency Model (AFEM) for precise telematics-based cost analyses, and the Decarbonisation Roadmap Maker (DRM) to help governments build data-driven, macro-level decarbonization plans.

To operationalize these strategies globally, the Green Compact deploys an extensive survey in 21 languages, hosts confidential stakeholder Roundtables, and integrates an eleven-point decarbonization policy toolkit into the Road Transport Services Reform framework developed alongside the World Bank.

III. Main Achievements

Since 2021, the Green Compact has delivered measurable, data-driven outcomes that advance the global decarbonization agenda. Research modeling demonstrates that efficiency measures alone can reduce the industry's cumulative energy consumption by 77%, effectively cutting emissions by half before alternative fuels are even fully deployed. The DRM modeling mapped a precise transition pathway for Europe, indicating that batteries could supply two-thirds of road transport energy by 2050, dropping total energy consumption from 800 TWh to 230 TWh. The 2025 global survey revealed critical industry gaps, notably that 82% of European operators are worried about decarbonization, over half of operators worldwide do not monitor their carbon emissions, and only 40% of operators globally have implemented eco-driving programs.

Socio-economically, the project ensures transition viability for SMEs through rigorous Total Cost of Ownership (TCO) analysis—revealing fuel cell vehicles remain 60% more expensive—improves driver job quality through IRU Road-Masters certification, and helps effectively channel an estimated EUR 8 trillion European transition investment via

green financing mechanisms. These outcomes directly advance multiple Sustainable Development Goals, specifically Climate Action (SDG 13), Industry and Innovation (SDG 9), Decent Work (SDG 8), Affordable and Clean Energy (SDG 7), Sustainable Cities (SDG 11), and Partnerships (SDG 17). Policy impacts are also tangible, successfully influencing the cancellation of road user charges in Germany to accelerate TCO parity for electric powertrains.

The Green Compact ensures high global replicability through its technology-neutral approach—allowing nations to leverage specific local energy resources like solar or biofuels—and its modular AFEM and DRM tools, which have already expanded to regions like Africa, Asia, and Latin America via IRU's vast network of over 100 national associations.

18.Strasbourg Sustainable Urban Mobility Plan (SUMP)

I. Overview

Strasbourg, a historic cross-border city on the Rhine in northeastern France, experienced increasing congestion, air and noise pollution, and road-safety pressures as rapid motorisation intensified during the 1980s. Its dense historic centre, regional role and location on a major transport corridor between Baden and Alsace generated heavy traffic, with approximately 240,000 vehicles entering the city centre each day. Seasonal visitor traffic added further pressure on the urban transport system.



Figure 1. Tram, cycling and pedestrian movement share central Strasbourg’s public realm.
Image source: EBRD Green Cities, integrated multi-modal transport case study .

To address these challenges, Strasbourg adopted an integrated urban mobility strategy rather than relying on a single infrastructure project. The approach combined tram investment with traffic management, parking policy, pedestrianisation, cycling infrastructure, park-and-ride facilities and urban regeneration. These measures were coordinated through France's Plan de déplacements urbains (PDU), approved in 2000 as a long-term framework linking transport planning with air quality and urban development, while building on measures introduced during the 1990s. The strategy sought to reduce private-car dependence while maintaining accessibility for residents, businesses and visitors. Implementation required coordination among municipalities, transport authorities and other stakeholders, together with public consultation to address concerns over traffic restrictions and changes to public space. The integrated approach combined improvements to public transport with measures that reduced the convenience of through-traffic and encouraged walking and cycling. Over time, Strasbourg continued to expand and refine this approach through successive metropolitan mobility policies. The practice demonstrates how integrated planning, multimodal transport, coordinated governance and long-term investment can support greener, more efficient, accessible, safe and resilient urban mobility.

II. Solution

Strasbourg’s solution centred on a deliberate reallocation of street space and access rights, organised around an integrated multimodal strategy rather than isolated infrastructure investments. The core of the approach was a combined tramway and public-space programme. Tram infrastructure provided a visible, high-capacity alternative to car travel, while complementary circulation rules prevented the new service from being undermined by through-traffic. The city extended traffic-free precincts, reorganised motor-vehicle access into one-way loops so drivers could reach destinations but not traverse the historic core as a shortcut, increased inner-city parking fees, introduced cyclist-only and pedestrian-only zones, and positioned park-and-ride sites along tram lines. Each component reinforced the others: tram attracted riders, restrictions changed driving incentives, park-and-ride extended reach to suburban commuters, and landscaping converted transport change into visible urban improvement.



Figure 2. ADEUS retrospective on Strasbourg’s 2000 urban mobility plan. Image source: ADEUS, “Le Plan de déplacements urbains strasbourgeois: faire bouger les lignes”.

Governance and financing were equally critical. The PDU required ratification by municipalities, the metropolitan council, and regional and national authorities, a demanding process that ultimately aligned policy across jurisdictions. The metropolitan authority served as organising authority, coordinating mass transit with urban planning, while the Compagnie des Transports Strasbourgeois (CTS) and tramway department assessed implementation and impacts. Financing combined national, regional, and local sources, including a local transport levy on private-sector wages. Early system costs were reported at EUR 97 million. Political leadership was paired with extensive consultation to overcome business and resident opposition. The city launched a sustained awareness campaign featuring



Figure 3. Official active-mobility action-plan objectives for walking and cycling. Image source: Eurométropole de Strasbourg, PAMA brochure, page 6.

The policy framework has continuously evolved. Current measures include a low-emission mobility zone, mobility advice services, shared mobility, employer mobility plans, and household mobility accounts, demonstrating that the original PDU established a durable method rather than a fixed list of works, adapting to new climate, air-quality, and social-equity challenges over decades.

III. Main achievements

Strasbourg’ s integrated mobility programme produced measurable transport and urban outcomes. EBRD reports that the PDU programme generated 30 jointly developed, managed and funded projects, including 15 focused exclusively on environmental protection. By 2000, vehicle numbers in the city centre had fallen by 16%, approximately one third below the level expected from population growth. However, some traffic may have shifted to surrounding roads, so the result should not be interpreted as a city-wide reduction.

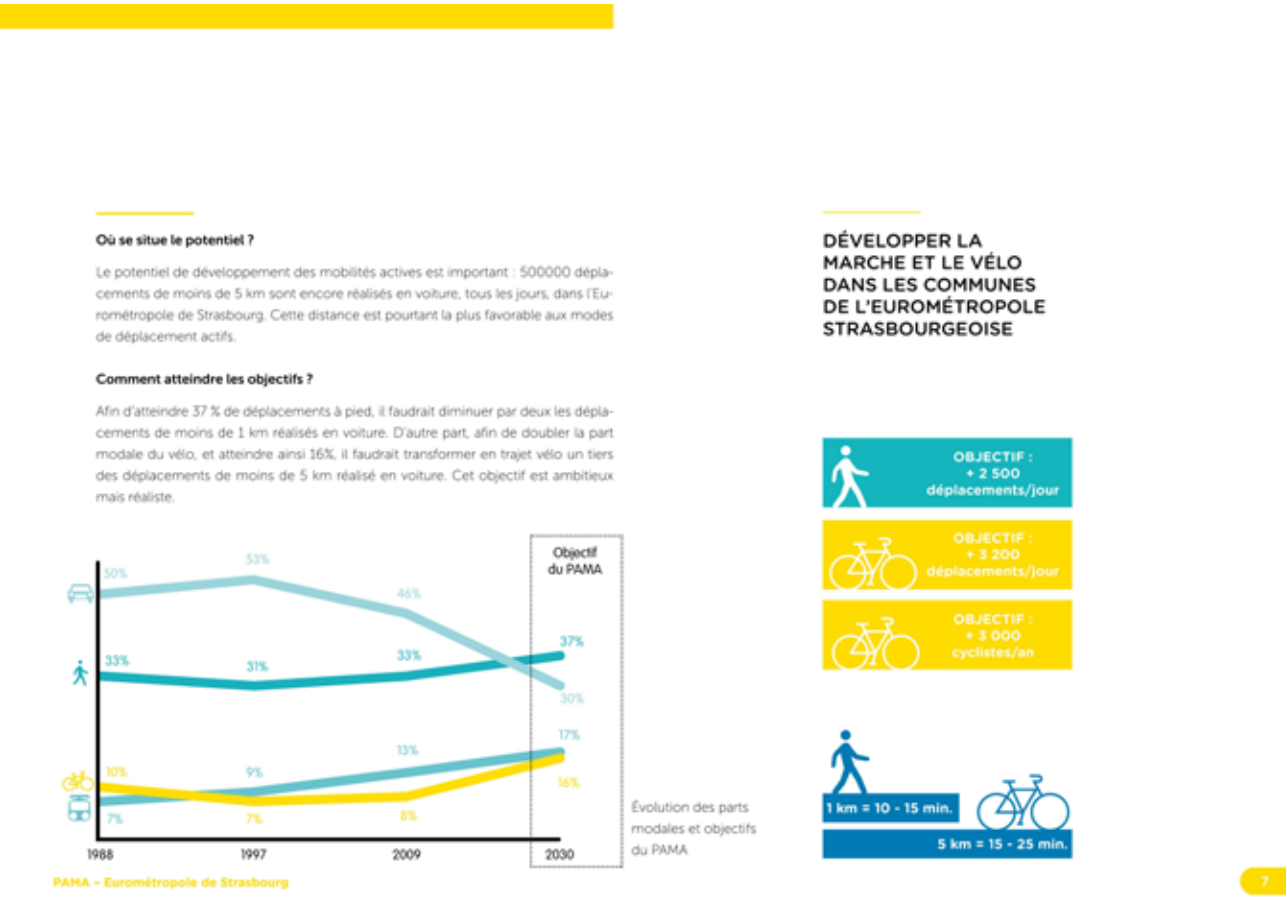


Figure 4. Evolution of mode shares and the 2030 active-mobility targets. Image source: Eurométropole de Strasbourg, PAMA brochure, page 7.

Public transport use also increased. Tramline A carried approximately 68,000 passengers per day in its first year and may have contributed to a 17% reduction in traffic entering the area. Because tram investment was implemented alongside pedestrianisation, access restrictions, parking measures and park-and-ride, the change cannot be attributed to the tram alone. Over the following two decades, the Eurométropole recorded a broader modal

shift: car use fell from 53% to 37% of daily trips, while public transport rose from 9% to 16%, cycling from 7% to 11% and walking from 31% to 36%. These figures demonstrate a sustained transformation, although they cannot be attributed solely to the 2000 PDU.

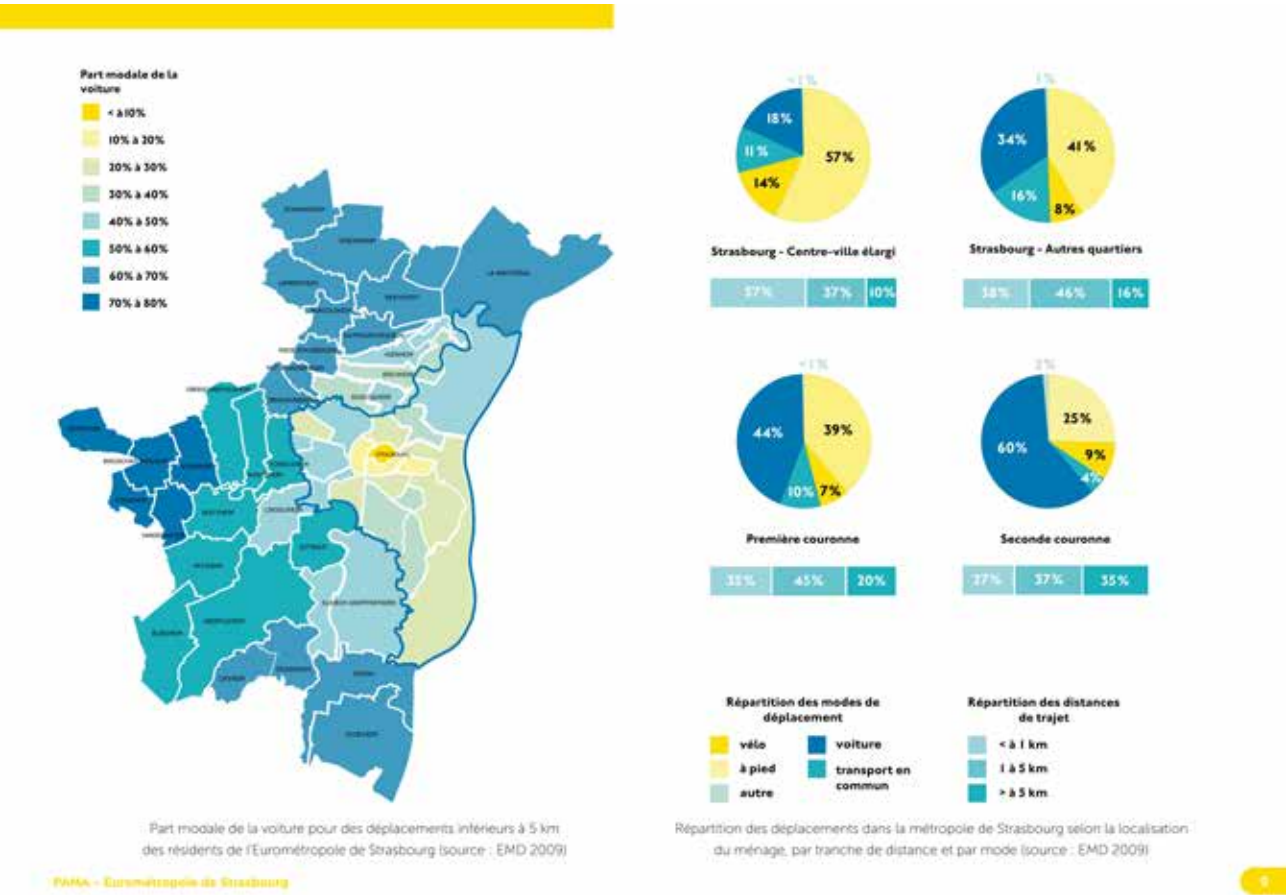


Figure 5. Metropolitan map and mode-share patterns for trips under five kilometres. Image source: Eurométropole de Strasbourg, PAMA brochure, page 9.

The programme also contributed to urban regeneration. EBRD reports increased property values and trading activity following pedestrianisation, while 125 jobs had been created across programme projects by 2015. The case is replicable primarily as a planning method rather than a fixed model: its key lessons are integrated long-term planning, strong governance, stable financing, attractive alternatives to car use, continuous public engagement and monitoring of possible traffic displacement. The evidence reviewed does not verify the previously cited 13% reduction in transport-related CO2 emissions, so this figure is excluded.

19. Enhancing Maritime Competences through Internationalization and Global Partnerships: A Sustainable Capacity-Building Model from Georgia



I. Overview

Located in Batumi, Georgia, Batumi Navigation University (BNU) plays an important role in developing maritime education and human capital for the country's maritime sector. As global shipping undergoes transformation driven by digitalization, decarbonization and technological innovation, maritime education institutions face growing demands for qualified professionals, advanced training and international cooperation. For developing countries, limited access to international expertise, advanced technologies, research resources and mobility opportunities presents additional challenges. In this context, BNU has adopted an internationalization-oriented approach to strengthen maritime competencies, improve education quality and support sustainable development of the maritime workforce.

Recognizing these challenges, Batumi Navigation University adopted an internationalization-driven development model aimed at strengthening maritime competencies, improving educational quality, and promoting sustainable capacity building. Since 2019, the university has systematically expanded its international engagement and developed long-term partnerships with universities, maritime organizations, and industry stakeholders worldwide.

The initiative seeks to create an educational ecosystem where students, academic staff, researchers, and maritime professionals can benefit from international knowledge exchange, innovation, and practical experience. It reflects the principles of sustainable maritime development by promoting safety, quality education, resilience, inclusiveness, and international cooperation.

Furthermore, the initiative contributes directly to the achievement of the United Nations Sustainable Development Goals (SDGs). In particular, it supports SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 17 (Partnerships for the Goals), while also contributing to SDG 5 (Gender Equality), SDG 9 (Industry, Innovation and Infrastructure), SDG 10 (Reduced Inequalities), and SDG 14 (Life Below Water).

The experience of Batumi Navigation University demonstrates that internationalization and cooperation can serve as effective tools for strengthening maritime education and developing resilient maritime human resources in developing countries.

II. Solution

Understanding that maritime education must evolve alongside the global shipping industry, Batumi Navigation University introduced a comprehensive strategy based on internationalization, digital transformation, and continuous capacity building.

The university continuously aligns its educational activities with the requirements of the STCW Convention, national quality assurance standards, ISO 9001 quality management principles, and the values of the European Higher Education Area. This approach ensures that graduates possess the knowledge and competencies required by the international maritime labour market.

Modern educational technologies have been integrated into the learning process. Navigation simulators, digital learning platforms provide students and academic staff with access to contemporary educational resources and practical training. Participation in international webinars and virtual learning events has further strengthened the university's capacity to deliver flexible and innovative education.

One of the cornerstones of institutional development has been international cooperation. Through Erasmus+ mobility programmes, students and staff are given opportunities to study, teach, train, and exchange experiences with international partners. Such mobility activities contribute significantly to the development of intercultural competencies, professional skills, and lifelong learning.

Batumi Navigation University has also actively promoted research and innovation. Academic staff participate in international conferences, publish scientific papers, and cooperate with researchers from different countries. International guest lectures and scientific events organized by the university contribute to knowledge dissemination and encourage the exchange of best practices.

An important feature of the university's model is the active involvement of experienced seafarers and maritime officers in the educational process. Masters, chief engineers, and officers with extensive practical experience contribute to teaching activities, ensuring that education remains closely linked to industry needs and international standards.

The university has developed strong partnerships with maritime organizations and international academic networks. Batumi Navigation University is an active member of the International Association of Maritime Universities (IAMU), the International Maritime Lecturers Association (IMLA), the Balck Sea Association of Maritime Universities (BSAMI), the European Vocational Training Associa-

tion (EVTA), and the European Association of Institutes for Vocational Training (EVBB).

In addition, BNU actively participates in international projects and initiatives. Through Erasmus+ Capacity Building projects such as DUGEOR and other international initiatives, the university promotes innovation, digitalization, quality enhancement, and sustainable development.

Today, Batumi Navigation University cooperates with more than 70 international partner institutions across Europe, Asia and other regions, becoming a key driver of institutional development and also enhancing the university's international visibility and capacity. The initiative also promotes gender equality and inclusiveness by encouraging women's participation in maritime education and expanding access to international opportunities. Continuous professional development through international training programmes, mobility activities, workshops and conferences further strengthens institutional capacity and supports educational modernization.

III. Main achievements

The internationalization strategy has transformed Batumi Navigation University into an internationally oriented centre for maritime education and cooperation. Over the years, the university has expanded its international partner network from five institutions to more than 70 worldwide, providing students and staff with opportunities for mobility programmes, joint projects, training and academic exchanges.

Participation in international projects has strengthened institutional capacities and facilitated the introduction of innovative educational approaches. Collaboration with international organizations and universities has enhanced academic quality and promoted the exchange of knowledge and expertise. The university has successfully implemented quality assurance mechanisms based on ISO 9001 principles and continuously aligns its educational programmes with national and international requirements. These efforts have contributed to the accreditation and continuous improvement of maritime programmes and strengthened the reputation of the institution.

Beyond academic achievements, the initiative has generated important socio-economic benefits. By preparing highly qualified maritime professionals, the university contributes to the competitiveness of Georgian seafarers in the international labour market and supports the sustainable development of the national maritime sector. The initiative also promotes social inclusion and equal opportunities. Through mobility programmes and international cooperation, students and staff from a developing country gain access to world-class educational opportunities and international experience. Such opportunities help reduce inequalities and strengthen human capital. Research and innovation have become integral elements of institutional development. Through scientific cooperation and participation in international projects, the university contributes to addressing contemporary challenges in maritime education and sustainable maritime development.

The BNU model has demonstrated strong potential for replication. By integrating international partnerships, quality assurance, industry engagement, mobility programmes and continuous professional development, it provides a practical framework for maritime institutions in developing countries and Small Island Developing States (SIDS). The experience of Batumi Navigation University clearly demonstrates that international partnerships and knowledge sharing can become powerful drivers of institutional transformation and sustainable development. In an era characterized by technological change and global challenges, investment in human capital and international cooperation remains one of the most effective instruments for strengthening maritime education and enhancing maritime innovation. Through its commitment to excellence, innovation, and international cooperation, Batumi Navigation University continues to contribute to the achievement of the United Nations Sustainable Development Goals and to the development of a resilient, inclusive, and sustainable maritime future for Georgia and beyond.



20.Green Logistics Revolution: From Sustainable Aviation Fuel to Solar – Bold Steps toward Net-Zero by 2050

I. Overview



The logistics industry is a backbone of the modern integrated transport system and a critical lever for global decarbonization. While supporting economic growth, freight movements by air, ocean and road remain major energy users—making the sector’s lowcarbon transition essential to addressing climate change, advancing the UN 2030 Sustainable Development Goals, and building a sustainable, efficient, and resilient global transport ecosystem.

DHL Group (“DHL”) is a global leader in logistics with operations in over 220 countries and territories with ap-

proximately 600,000 employees. DHL set the sector’s first quantified climate target in 2007 and committed to achieve netzero logisticsrelated greenhouse gas (GHG) emissions by 2050; in Strategy 2030, DHL further embedded “Green Logistics of Choice” as a strategic priority across the Group.

In 2025–2026, DHL advanced five decarbonization levers—sustainable fuels in air and ocean, fleet electrification, hydrogen pilots for longhaul road transport, and renewableenergy facilities—marking substantive progress toward netzero by 2050.

II. Solutions for Sustainable Transportation Development

1. Scaling clean fuels in aviation: DHL signed a multiyear agreement with Phillips 66 for over 240,000 metric tons of Sustainable Aviation Fuel (SAF) to be delivered over three years. Lifecycle emissions reductions are ~737,000 metric tons CO₂e. This supports DHL’s strategy to lift sustainable fuels across transport modes toward the 2030 target.	2. Lower carbon ocean freight: DHL Global Forwarding and CMA CGM agreed to jointly use ~8,800 metric tons of UCOME secondgeneration biofuel, enabling an estimated ~25,000 metric tons CO₂e reduction on a wellt wake basis for container shipments under DHL’s GoGreen Plus service—demonstrating a scalable pathway for lowcarbon maritime transport.
3. Electrification of lastmile delivery: DHL continues largescale electrification of last-mile fleet. In 2025, DHL placed an order for 300 SAIC (Shanghai Automotive Industry Corporation) Maxus eDELIVER 3 fully electric logistics vehicles, with about 100 units delivered in the first batch via DHL’s multi-model rail services. This order marks the largest procurement of Chinese new-energy logistics vehicles by DHL in Europe.	4. Hydrogen pilots for longhaul road transport: To decarbonize longerrange trucking where batteries may face constraints, DHL extended its hydrogen truck testing from Europe, North America, and Asia Pacific to the Middle East through. In 2025, DHL signed an MoU with Hyperview (Saudi Arabia), accompanied by a hydrogen infrastructure feasibility study aligned with Saudi Vision 2030.
5. Renewableenergy logistics infrastructure: Beyond operational carbon neutrality, DHL is exploring facilities that produce or source renewable energy on-site, combining sustainability with energy self-sufficiency. In Thailand, DHL launched a solar-powered warehouse expected to generate 100% of its energy on-site through a 4.2 MWp solar array and advanced battery storage. This facility eliminates reliance on fossil-based grid electricity and sets a blueprint for future logistics infrastructure worldwide.	6. Customer facing green solutions: DHL’s GoGreen Plus solution enables customers to reduce Scope 3 emissions via insetting through SAF/SMF and “book & claim”. By 2025, GoGreen Plus had already been adopted or signed by more than half of Chinese customers. This progress marks another important milestone for DHL in supporting customers in achieving logistics-related emissions reduction and advancing sustainable development.



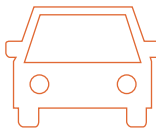
III. Main Achievements

Over the past years, DHL has made significant progress in advancing sustainable logistics and accelerating lowcarbon transformation. These achievements are reflected not only in the deployment of sustainable solutions, but also in the tangible impact delivered across the aviation, ocean, road, and warehousing aspects.



1. Strengthening global thought leadership and market readiness DHL has played an influential role in shaping global understanding of sustainable logistics and international connectivity. Through the annual Global Connectedness Report, DHL provides customers, policymakers, and international organizations with authoritative, data-driven insights on global trade flows, supply chain trends, and the evolving dynamics of globalization. The 2026 Report shows that despite escalating geopolitical tensions, the continued shift toward protectionism in some countries’ trade policies, and unprecedented uncertainty surrounding the future of global trade rules, the level of globalization remains near its historical peak.
2. Global leadership in SAF adoption DHL is leading in SAF adoption globally. In 2025, the share of SAF used in DHL’s own aircraft fleet (Scope 1) reached as high as 10%. As sustainable logistics becomes increasingly critical to the future of global supply chains, longterm reliability of SAF production and distribution is essential. To strengthen upstream availability and create a scalable supply model, DHL has entered into a collaboration agreement with Envision, a leading Chinese new energy company. Under this partnership, DHL will procure SAF from Envision, while serving as Envision’s preferred logistics partner to support the company’s international expansion. This mutually beneficial mechanism helps advance SAF development in China and demonstrates a replicable model for building secure and resilient lowcarbon fuel supply chains.
3. Worldwide expansion of lowcarbon logistics infrastructure DHL has built one of the most comprehensive lowcarbon logistics networks globally. This includes large-scale deployment of electric vehicles, transition to alternative fuels, energyefficient hubs, and facilities powered by renewable energy in major trade regions. These investments have strengthened both operational decarbonization and the resilience of global supply chains.

21.Munich's "Gscheid Mobil" Smart Mobility Programme



I. Overview

Munich's fast-growing population and robust economy generate heavy urban travel pressure, where traffic congestion, limited road space and transport carbon emissions cannot be resolved solely through infrastructure expansion. Even complete multi-modal transport networks often fail to shift private car reliance, as residents lack targeted guidance and motivation to adjust ingrained travel routines.

Launched formally in 2006, Gscheid Mobil serves as the city's demand-side mobility management complement to capital transport investments, operated jointly by Munich municipal government and MVG transit operator under the permanent municipal brand "München unterwegs".

The programme's core behavioural principle centres on "mobility biography": people are most receptive to changing travel habits during pivotal life events including relocation, school enrolment, childbirth, career transition and retirement. Timely, customised support delivered at these junctures locks in low-carbon travel preferences before car-dependent routines solidify. Three structural system gaps drove the initiative's design. First, fragmented transit information left new residents, migrant groups and families unable to navigate ticketing, cycling and shared mobility options. Second, generic environmental publicity failed to resolve deep behavioural inertia among local residents. Third, governance silos across schools, medical facilities, transport firms and municipal departments created inconsistent mobility outreach activities.



Figure 1. Family cycling illustrates the programme's life-stage and household focus.
Image source: URBACT, "Smart mobility management" good-practice page .

II. Solution

The core operational logic centres on segmented, life-event-based outreach instead of one-size-fits-all city advertising. Every service bundle combines personalised consultation, practical vehicle trials and long-term evaluation, aiming to build residents' ability to pick multi-modal transport instead of defaulting to private cars.

The New Citizen Project stands as its most thoroughly tested component. All newly registered households receive a welcome folder filled with route maps, fare guides and free transit trial tickets, paired with optional one-on-one telephone advice. The original 5,000-house pilot collected continuous feedback via surveys and focus groups, prompting a full redesign of printed materials in 2012 to cut excessive text. This test-adjust-repeat cycle remains the core mechanism for refining all public-facing resources.



Figure 2. Official "Munich - my new city" welcome and orientation material.
Image source: Münchner Verkehrsgesellschaft (MVG), New Citizen Project webpage.

Layered educational programmes serve children and teenagers across age brackets, from pre-school mobility games and primary school walking buses to secondary school workshops linking travel choice to climate action. Cycling skill training builds independent road competence long before youth can legally drive, gradually shifting family school-run habits over time. Supplementary schemes target expecting families via maternity clinics, introducing cargo bikes and shared transit to avoid unnecessary second car purchases; workplace mobility packages and municipal staff electric vehicle access cut corporate private travel demand. Multilingual materials remove language barriers for migrant and refugee communities.

All projects are co-designed with schools, transport firms, bicycle retailers and medical providers, relying on trusted local intermediaries to reach hard-to-engage groups. User feedback from questionnaires and group discussions shapes every new measure, eliminating disconnected technical designs that fail to match real household travel needs. The whole scheme operates as ongoing municipal public service rather than short-term promotional campaigns.

III. Main achievements

Independent assessments deliver clear quantifiable behavioural outcomes. New residents receiving full orientation support registered public transit use 7.6 percentage points higher than the control cohort. Based on the annual intake of 85,000 new citizens, this translates to 6,460 extra daily commuters choosing buses or metro over private vehicles each year. Pilot modelling calculates annual cuts of 4.7 million car kilometres and 700 tonnes of CO₂, with citywide projected reductions reaching 80 million vehicle kilometres and 12,000 tonnes of emissions.



Figure 3. Official URBACT Good Practice application summary, page 1.
Image source: URBACT / City of Munich project summary.

Modal Split	Kontrollgruppe (n=324)	Experimental- gruppe (n=297)	Veränderung
Rad / Fuß	32.9 %	29.4 %	- 3.5 %
ÖV	33.7 %	41.3 %	+7.6 %
MiV	30.3 %	27.0 %	- 3.3 %
Sonstige	3.1 %	2.3 %	- 0.8 %
Gesamt	100 %	100 %	0 %

Figure 4. Pilot evaluation: public-transport use was 7.6 percentage points higher in the experimental group.
Image source: MVG, pilot evaluation graphic based on Bamberg and City of Munich data.

Long-term institutional consolidation marks a landmark success. City council reviewed verified modal shift data and upgraded the original pilot into a permanent programme fully embedded within urban transport planning cycles, with regular material updates proving sustained capacity to iterate services around resident feedback. Socially, tailored outreach expands equal low-carbon travel access for seniors, migrants and young households, while allowing households and businesses to weigh full mobility costs against car ownership expenses.

The framework carries strong cross-border transfer value. Its life-stage intervention model was successfully adapted for Almada, Portugal, winning the 2014 EPOMM award. The methodology does not depend on specific vehicle technology, relying only on cross-department coordination and targeted resident engagement, making it adaptable for other mid-sized European cities.

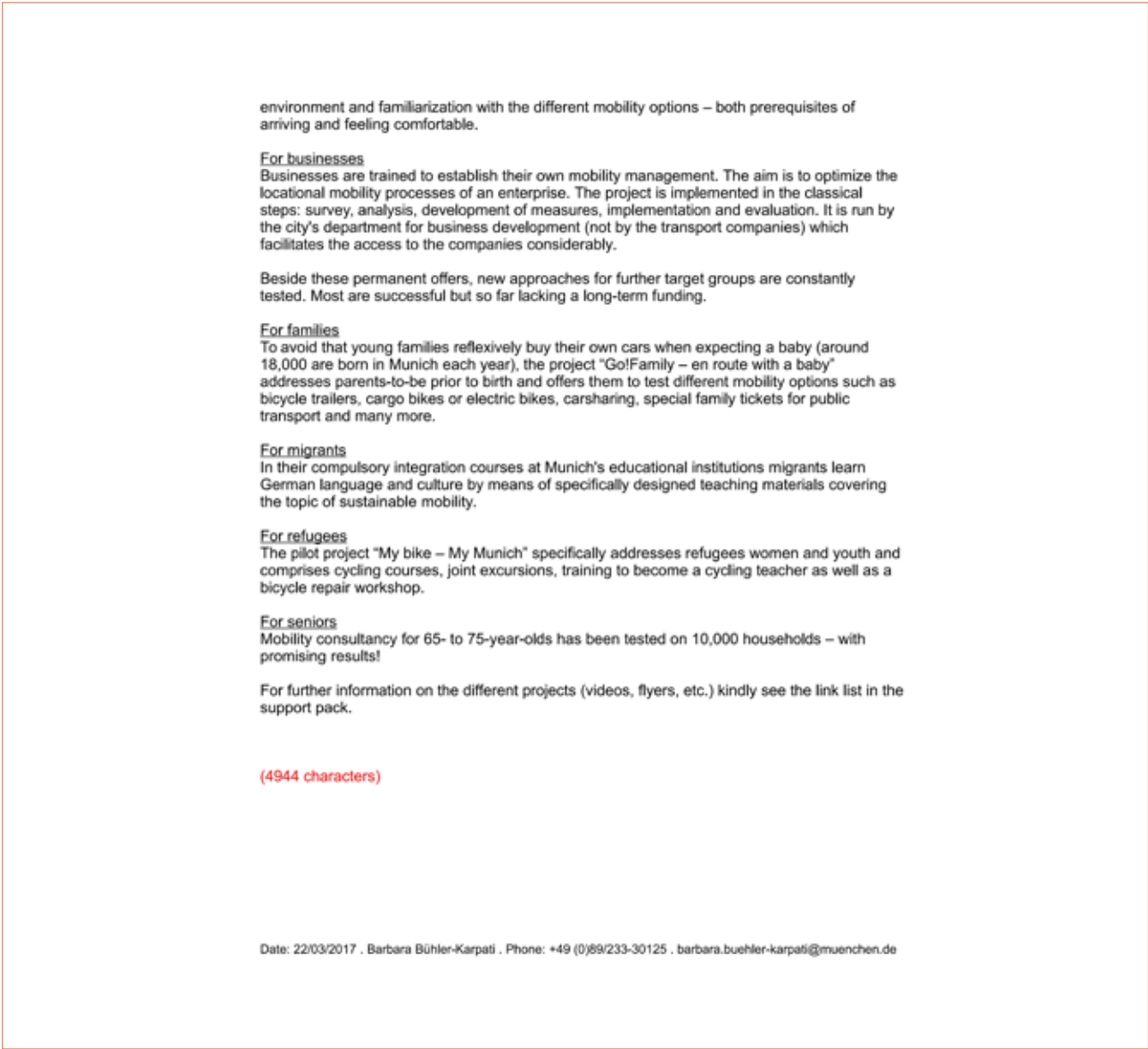
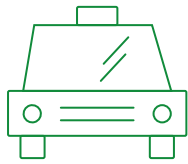


Figure 5. Official URBACT summary describing target groups, transferability and contact details, page 2.
Image source: URBACT / City of Munich project summary.

22.Comprehensive Speed Management as a Core Principle for Sustainable and Safe Mobility



I. Overview

Road traffic deaths remain around 1.19 million annually, with the burden falling disproportionately on low- and middle-income countries. Road traffic injuries are the leading cause of death among people aged 5–29 years. Progress remains far too slow.

The core problem is not simply “speeding” as individual non-compliance, but a broader failure of speed governance. Roads in many contexts serve both as movement corridors and public spaces where people walk, cycle, work and access services. Yet motorized speeds are often incompatible with these uses.

In many countries, rapid motorization has not been matched by safe infrastructure, coherent speed policies

or effective enforcement. However, this challenge is not unique to low-income settings. High-income countries faced similar conditions and achieved improvements only by systematically reducing speeds in areas with unresolved conflicts and strengthening system design.

Speed is often treated as a behavioral issue, but in reality, it is a system outcome. Infrastructure, road design, vehicle capability, enforcement and institutional priorities together determine how fast traffic moves. As long as these elements are not aligned with human vulnerability, unsafe speeds will persist. In this sense, speed is not chosen by individual drivers alone—it is produced by the system.

II. Solution: Speed as a HealthBased System

Comprehensive speed management should be understood as a system of governance, design and implementation aimed at ensuring that travel speeds are compatible with human survivability when crashes occur. The objective is not to optimize speed for traffic flow, but to establish safe speeds: speeds at which predictable human error does not lead to death or serious injury.

A useful distinction can be made between three related but different concepts	
Safe speed	the health-based principle derived from injury science and human tolerance to kinetic energy
Allowed speed	the legal speed limit
Actual speed	the operating speed produced in reality

Actual (operational) Speed

Posted (allowed) Speed Limits

Safe Speed Limits

These are not equal. Safe speed is the governing principle. It defines the boundary conditions for the system and should guide both legal standards and design. Safe speed is not an aspirational concept, but a scientifically defined boundary condition for system design.

In practice, these speeds are often misaligned. Legal limits may exceed what is survivable, and actual speeds may exceed legal limits due to system design or weak enforcement. Comprehensive speed management is therefore a process of progressive system realignment:

- allowed speeds must be brought into line with safe speeds
- infrastructure, vehicles and enforcement must ensure that actual speeds follow

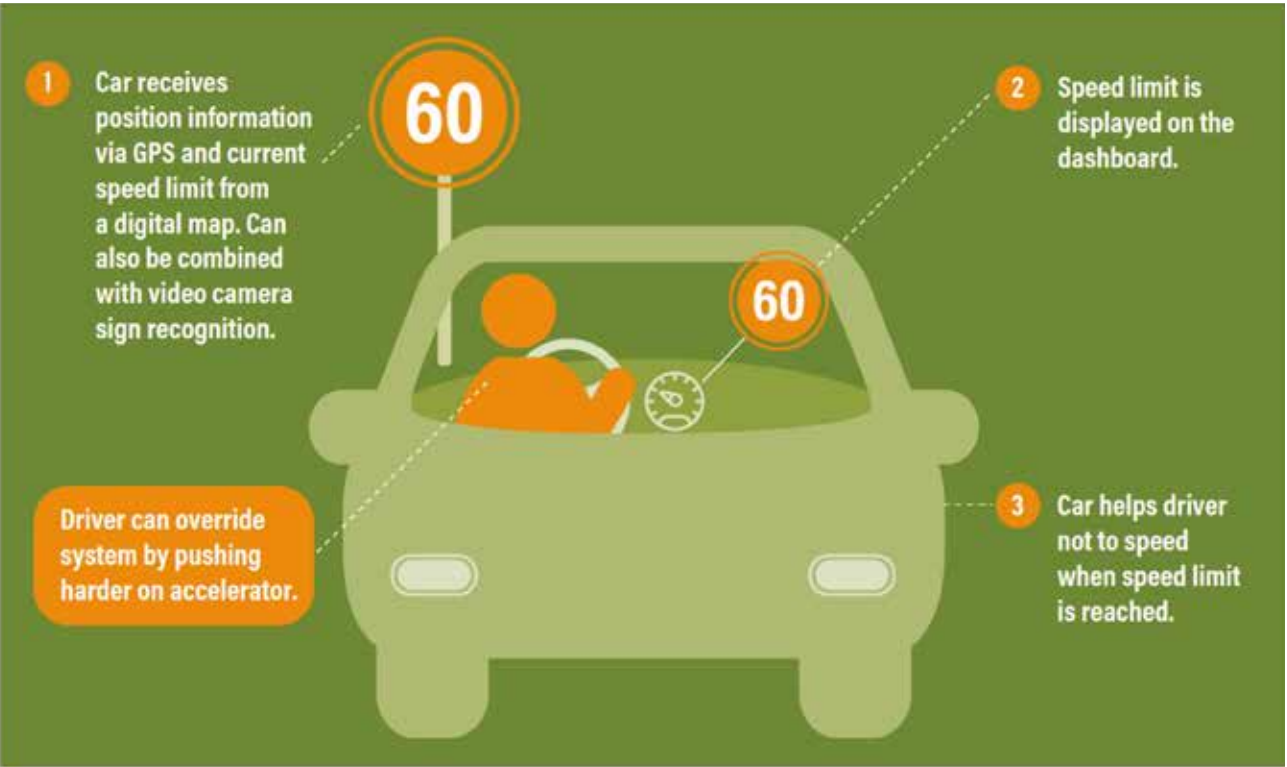
This transition may take time, but the direction is clear: speed limits, road design and operating speeds should converge toward safe speeds. Delayed alignment does not reduce risk; it only prolongs exposure to preventable harm.

Table 1 Survivable impact speeds for different crash scenarios

Type of road/road section	Safe System speed
Roads/road sections with possible crashes between cars and vulnerable road users	Max. 30 km/h
Roads/road sections with intersections with possible side-on crashes between cars	Max. 50 km/h
Roads/road sections with possible frontal (head-on) crashes between cars	Max. 70 km/h
Roads/road sections with no likelihood of side-on or frontal crashes between cars	Max. 100 km/h

Safe speeds depend on expected crash types and protection levels. Where vehicles may strike pedestrians or cyclists, survivable speeds are below 30 km/h. Where side impacts between cars are possible, survivability drops above 50 km/h. For frontal collisions, thresholds are around 70 km/h. Higher speeds are only acceptable where conflicts are effectively prevented through separation and high-standard design.

Safety therefore sets the upper boundary for speed—not as one objective among many, but as the defining constraint for the system.



Governance, Equity and Responsibility

Speed should not be determined by convention, market forces or the preferences of the most powerful road users. It requires clear institutional responsibility. National governments must provide direction and standards, while local authorities must be empowered to set context-sensitive limits based on road function and user mix.

Equity is central. Higher speeds typically benefit a limited group of motorized users while transferring risk onto pedestrians, cyclists, children, older people and local communities.

Without appropriate infrastructure and protection, faster speeds systematically shift harm onto those least able to bear it.

Responsibility must extend beyond individual drivers. Employers, fleet operators and public agencies influence speeds through schedules, incentives and vehicle use. Speed compliance should therefore be treated as an organizational responsibility, not only an individual one.

From Limits to RealWorld Speeds

Speed limits alone are rarely sufficient. Actual speeds are shaped by infrastructure, enforcement, communication and vehicle technology. Crucially, speeds are not primarily controlled at the point of enforcement—they are produced upstream by system design.

In many cases, roads are designed to encourage high speeds and then retrofitted with calming measures. A Safe System approach reverses this logic by integrating

speed control into design from the outset.

In urban and mixed-use environments, this includes self-enforcing infrastructure such as traffic calming, raised crossings and area-wide 30 km/h zones. Automated enforcement and vehicle technologies can support compliance, but they should reinforce—not compensate for—safe design.

Why Speed Must Be Central to Sustainable Transport

Speed is often overlooked in sustainable transport strategies, which focus on infrastructure, electrification and modal shift. This is a critical gap. Without deliberate speed management, many sustainability objectives are undermined. This omission is not neutral—it systematically undermines safety, equity and liveability outcomes.

Speed determines whether walking and cycling are safe and attractive, whether streets function as public spaces, and whether vulnerable groups can move freely. It also shapes the distribution of benefits and risks within transport systems.

Higher speeds typically reduce travel time for some

users while increasing injury risk, noise and environmental impacts for others. This raises fundamental equity concerns. Treating speed as a given embeds these inequalities into the system.

Speed is also a key factor in energy use and emissions. Higher speeds increase energy consumption even in electrified systems. Conversely, well-managed speeds enhance safety, enable active mobility, improve urban quality and support public health.

Recognizing speed as a governance issue means treating it as a collective choice about how transport systems balance mobility, safety and quality of life.

Main Achievements and Lessons

Speed management is one of the most powerful and cost-effective tools in transport policy because it affects both crash risk and injury severity. Small reductions in speed can generate large safety gains.

Its benefits extend beyond safety. Better-managed speeds reduce emissions and noise, improve urban liveability and support inclusion. Yet current practice remains inconsistent, with systems often designed for speeds above what is safe or necessary.

The key lessons are clear. Speed management must be

treated as a core governance issue. Speed-setting should be based on survivability. Infrastructure, enforcement and technology must work together to align actual speeds with safe and legal speeds. Responsibility must extend beyond individuals to institutions and organizations.

Ultimately, speed management is about aligning transport systems with human life. It requires deliberate choices about what speeds are acceptable, who benefits, and who bears the risk. For sustainable transport, this is not a secondary issue—it is a foundational one.

23.FIATA Electronic Multimodal Bill of Lading (eFBL): A Paperless Global Trade Project

I. Overview

The digital negotiable FIATA Multimodal Bill of lading (eFBL) is a global initiative led by FIATA and deployed through FIATA's worldwide network of national freight forwarder associations and their member companies. Rather than a single-corridor or single-country deployment, the eFBL is an interoperable digital standard. It is supported by FIATA's 106 Associations members representing over 50'000 companies in more than 150 countries. The solution is delivered through a growing ecosystem of more than 50 transport management system (TMS) and software providers.



Figure 1. A modern, digitalised container terminal — the context of global multimodal trade served by the eFBL
Source: Illustrative container terminal (Royal HaskoningDHV, smart-port imagery)

The problems the eFBL aims to solve are :

- Fraud and document security risks: paper BL's are vulnerable to forgery, unauthorised amendment, and disputes over the issuer's identity.
- Slow, costly, and duplicative processes: paper-based issuance requires printing, courier and manual re-entry of data into partners' systems, creating delays and double data entry between freight forwarders and their stakeholders.
- Lack of interoperability: freight forwarders' software and TMS platforms lacked a shared, standardised digital format for a multimodal transport document.
- Industry-wide digitalisation gap: the transport and logistics sector's shift toward paperless trade requires electronic equivalents of core trade documents.

Basic information of the project :

The FIATA Negotiable Multimodal Transport Bill of Lading (FBL) is the industry's paper standard launched in 1968, and conforms to UNCTAD/ICC rules.

A seven-month pilot phase (Feb–Aug 2021) tested feasibility with 7 software providers and 19 freight forwarders.

Sustainable transportation value orientation reflected by the project:

- Safety: the immutable, hash-based audit trail and FIATA Verified Digital Identity mitigate fraud risk.
 - Convenience: forwarders issue and send secured digital FBLs within minutes via their everyday TMS.
 - Efficiency: API-based exchange removes double data entry between forwarders and stakeholders.
 - Green: less reliance on printed documents and courier transport supports sustainability goals.
 - Economy: according to a DCSA study cited by
- FIATA, e-BLs can cost up to three times less than paper processing

 - Inclusiveness: the eFBL data model is published as an open-source standard, free of charge to software providers, and aligned with UN/CEFACT semantics, allowing forwarders and providers of any size or region to adopt it.
 - Resilience: interoperability across 50+ independent platforms avoids reliance on a single vendor.

II. Solution

The eFBL sits within FIATA's Digital Strategy, adopted in June 2020, which set out six projects. The digitalisation of the Negotiable FBL was selected as the first of these. FIATA led the project from Geneva, coordinating with software providers, and a distributed ledger technology partner.

The solution is built around a five-step workflow designed to fit into freight forwarders' digital tools:

- Data entry: freight forwarders input FBL data through their everyday TMS or other operational software, with no separate portal.
 - Secure transmission: the software shares the FBL data, together with the identity of the document issuer, with FIATA through a dedicated API.
 - Identity verification and registration: FIATA checks
- the issuer's identity and registers the digital FBL, stamping it with a unique QR code.

 - Flexible usage: forwarders choose whether to share the document as a printed copy or as a secured digital BL.
 - Verification by any stakeholder: any party can scan its QR code to access the immutable audit trail.

Trust and security architecture :

Each secured digital FBL is registered with a unique hash on a private distributed ledger, operated in partnership with Trakk. The resulting audit trail displays the date and time the document was registered by FIATA; the issuing company's name, national associa-

tion membership; and a screenshot of the document as originally registered. This architecture targets the fraud and trust gaps without requiring stakeholders to adopt new software.

Interoperability and open standards:

Rather than building a closed, single-vendor platform, FIATA published the eFBL data model and API specification as an open-source standard, provided to software and TMS providers. Its alignment with UN/CEFACT semantics is intended to facilitate interoper-

ability across freight forwarding software systems. This approach has enabled the eFBL to be integrated into more than 50 TMS and software platforms including CargoWise.

Testing and validation:

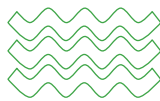
The eFBL's feasibility was validated through a Proof of Concept (February–August 2021). Seven software providers tested the technical implementation of the eFBL data model and API, while 19 freight forwarders tested the full document lifecycle. Since the POC,

real-world adoption has been reported by operational users: OAPCE (Multitrans Group) described issuing its first eFBL as taking only a few minutes, integrating with its existing edoxOnline platform without double data entry.

Access model for freight forwarders:

To begin issuing eFBLs, a freight forwarder must first obtain a FIATA Digital Identity, which verifies the existence of appropriate liability insurance coverage. The company must then ensure that its Transport Manage-

ment System (TMS) has integrated the eFBL solution. Finally, the freight forwarder purchases eFBL credit packages.



III. Main Achievements

Project outcomes:

- Proof of Concept (Feb–Aug 2021): 7 software providers and 19 freight forwarders (FIATA / national association members) tested the full eFBL lifecycle.
 - Ecosystem growth: the eFBL is now integrated with more than 50 TMS and software providers
- globally, up from 7 at the POC stage.

 - Global usage: The eFBL is used in day-to-day operations by freight forwarders across all continents.

Project’s contribution to the socio-economic aspect:

- Cost savings: electronic bills of lading can cost up to three times less.
- Time savings: operational users report issuing, amending, and sending secured FBLs within minutes.

Replicability and promotability :

The eFBL was designed from the outset for global replication: it is a standard, not a jurisdiction-specific system. This has allowed the same standard to be adopted across markedly different markets without adaptation, as reflected in the geographic diversity of its current integration partners. Because any FIATA or

national-association member freight forwarder can obtain a FIATA Digital Identity and any software provider can integrate the open-source kit at no cost, the model is inherently promotable to further countries and regions.

24.Leveraging Postal Logistics Networks to Enable Reverse Flows for Circular Electronics



I. Overview

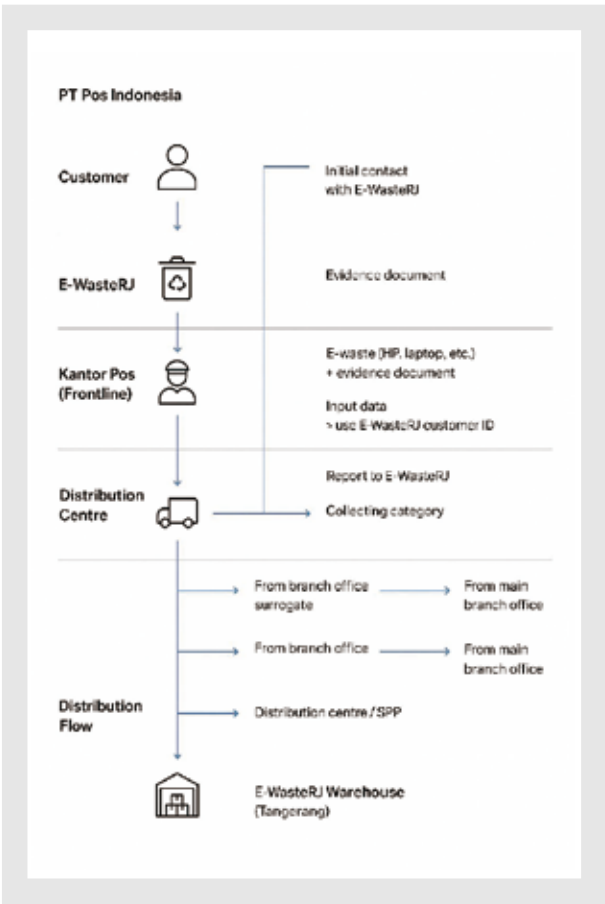
Indonesia is a major generator of waste electrical and electronic equipment (WEEE), facing a pronounced reverse logistics gap. In 2022, it generated approximately 1.886 million tons of e-waste, primarily concentrated in Java Island. While policy recognizes the need to safely move used electronics to licensed facilities, current systems capture only a fraction of this waste. Baseline indicators show an e-waste collection rate of 2.82% and a recycling rate of 2.61%. Despite a regulatory framework establishing procedures for hazardous waste management and Extended Producer Responsibility (EPR) in its development, recovery capacity stands at just 31,400 tons annually—covering only 1.5% of projected generation. Together with more recent governance mechanisms such as temporary storage sites, cooperation with licensed treatment companies and minimum operational requirements, those rules emphasize traceable handling, staged transport, and accountability in the reverse movement of hazardous electronic products. At the city level, early models have

emerged; for example, Jakarta operates a household e-waste collection program linked to licensed processors to handle its estimated 75.63 tons of daily e-waste. However, much of the reverse flow is mediated through informal networks, complicating traceability and environmental compliance.

Within this context, Indonesia’s postal infrastructure offers a critical bridge. The Postal Law includes logistics activities, effectively codifying reverse flows and establishing mechanisms for tracking shipments, assigning custody, and managing contractual responsibilities across a nationwide network. Operating through dense service points and delivery routes, the postal system provides a ready-made infrastructure for integrating reverse logistics into the circular electronics value chain, aligning with sustainable transport values by safely and efficiently leveraging existing capacity.

To operationalize this, pilot projects were launched in the Jabodetabek metropolitan region via 16 strategically selected post offices in the network. They are equipped with dedicated WEEE handling facilities, including fire-resistant drop boxes, temporary storage areas, and protective systems for hazardous components, all governed through standardized operational procedures (SOPs). At the same time, digital tools are being developed to support real-time shipment recording, logistics tracking, traceability, compliance reporting, and future EPR accounting functions, while differentiated workflows manage small consumer electronics through barcode-enabled drop-box systems and larger household appliances through dedicated service counters with data collection prior to transport to licensed recycling partners. The initial targets include 12,000-tonne annual B2B e-waste collection and approximately 3,960 tons of household device collection according to data at the pilot stage. Following pilot evaluation, Pos Indonesia plans to scale this ecosystem approach nationwide, introducing incentive mechanisms to encourage consumer participation.

Through the integration of physical infrastructure, digital systems, and structured operational workflows, Pos Indonesia is establishing a robust foundation for WEEE reverse logistics implementation. This approach ensures operational safety, efficiency, transparency, and scalability, while supporting broader objectives such as the development of a circular economy and the effective implementation of future EPR frameworks in Indonesia.



II. Solution

To address this gap, PT Pos Indonesia developed an integrated reverse logistics model leveraging its nationwide infrastructure, which covers over 17,000 islands with approximately 4,000 post offices and 8,000 delivery personnel. The architecture integrates collection, transportation, warehousing, and distribution. First, collection points at postal or partner locations gather WEEE from households, businesses, and informal collectors. Next, Pos Indonesia transports these devices through its national network to transit warehouses, utilizing backhaul journeys.

Finally, items are distributed to licensed downstream actors for repair, refurbishment, or recycling. By embedding this into existing delivery networks, the model avoids building entirely new transport infrastructure while ensuring traceability, custody, and regulatory compliance. Financial sustainability relies on upcoming EPR aligned producer fees, yielding an estimated EUR 2.8 million gross annual profit, supplemented by material recovery revenue and B2B contracts.



- III. Main Achievements
- The project successfully demonstrates how a national postal network can address Indonesia’s WEEE reverse logistics gap.
 - The Jabodetabek pilot established 16 designated post offices as collection points, introducing a structured logistics chain linking households and businesses with licensed processing facilities.
 - By targeting 12,000 tons of corporate e-waste and 3,960 tons of household e-waste annually at the pilot phase, the initiative directly addresses the infrastructure gap where existing collection facilities previously remained limited.
 - Pos Indonesia’s coverage of over 17,000 islands with approximately 4,000 post offices and 8,000 delivery personnel representing a substantial infrastructure base for reuse, refurbishment, and material recovery.

Socio-economically, the initiative strengthens the circular electronics value chain by increasing the share of devices entering formal recovery channels. By acting as a logistics integrator, the postal network connects informal collection systems with formal infrastructure, contributing to improved working conditions and environmental compliance. Furthermore, integrating reverse flows into existing routes improves transport efficiency, increases load factors, and reduces operational costs and emissions.

These outcomes directly advance multiple Sustainable Development Goals, specifically SDG 12 (Responsible Consumption and Production), SDG 8 (Decent Work and Economic Growth), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). Crucially, the reverse logistics model demonstrates strong replicability. Because it relies on existing infrastructure, it can scale incrementally within Indonesia without significant new investments. The model is also highly applicable to other developing countries with nationwide postal networks, offering a blueprint to strengthen circular economy activities while improving the sustainability of national transport systems.



25. Institutional Innovation Driving Sustainable Transport Development: Italian Centre for Sustainable Transport

I. Overview

Italy’s transport system involves 60 million people and accounts for 13% of national GDP, while facing challenges ranging from decarbonisation and digitalisation to ageing infrastructure, urban congestion and road safety. The National Centre for Sustainable Mobility (MOST, Centro Nazionale per la Mobilità Sostenibile) was established in response. MOST brings together Italy’s research, academic and industrial capabilities to drive the green and digital transition, strengthen technological capabilities in strategic areas, and connect the innovation pathway from TRL 2 to TRL 9, accelerating the transfer of research into market-ready solutions. Through this approach, MOST fosters technology transfer, entrepreneurship and evidence-based policymaking, with the ambition of making mobility more sustainable, safe and accessible across Italy. Built around a public-private partnership, MOST brings together 25 universities, the Italian National Research Council (CNR), 24 leading enterprises and nearly 700 researchers. Supported by approximately €394 million in PNRR funding, the network comprises 163 member organisations, 60% of which are SMEs, and operates across five transport domains—air, road, water, rail, and light and active mobility—through 14 research lines. Its activities include collaborative projects, laboratories and testbeds, open innovation initiatives and observatories, supporting the development and transfer of innovative mobility solutions.



II. Solution

Innovation Trajectories

Under the digitalisation pillar, work focuses on connected and autonomous vehicles (CAV), cooperative connected and automated mobility (CCAM), Mobility-as-a-Service (MaaS), and IoT-enabled smart infrastructure supported by real-time data platforms. The technology-neutral energy transition pillar covers hydrogen, biofuels and biomethane, electrification, and next-generation battery systems, while sustainable intelligent materials address lightweighting, recyclability, and components with integrated electronics.





Complementary Mechanisms

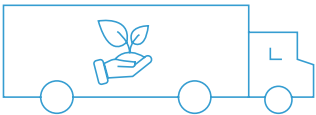
Turning these technological priorities into market-oriented solutions, MOST draws on a combination of research infrastructure and collaborative networks. Its national and international network connects academic, scientific and industrial expertise, while shared laboratories, living labs and real-world testbeds provide the infrastructure needed to develop, test and validate new technologies. Open-innovation initiatives bring start-ups, SMEs and large enterprises into collaborative project development, complemented by sectoral observatories that monitor emerging trends and support scenario analysis. Dedicated funding channels further connect project consortia with Italian and European funding opportunities, creating an ecosystem that links research, experimentation, entrepreneurship and technology transfer.



III. Main Achievements

Over its PNRR-funded cycle (2023–2025), MOST delivered 91 projects across all transport modes. The programme also fostered a growing start-up community, with 57 start-ups selected, 50 of which received €8.5 million in grants, while 7 attracted €2 million in equity investment. Four sectoral observatories, respectively, SUNRISE, IOSCA, FREIGHT INSIGHTS and MOBISCO, were established to monitor developments in transport, providing data-driven support for policymaking. Its research and innovation activities have produced a range of technology demonstrators and prototypes, including eVTOL aircraft and U-Space drone management platforms, a modular battery-swap electric city car with a range of 200 km in urban conditions and 250 km in extra-urban use, and a hydrogen fuel-cell vehicle for last-mile delivery. Other outputs include the Emilia 5 solar-powered light vehicle and low-environmental-impact hydrogen and fully electric boats. Alongside these technological developments, MOST has achieved several national firsts and European-scale breakthroughs, including Italy’s first certified smart road, an over-target MaaS pilot, and major EU-funded 5G initiatives. MOST’s experience demonstrates how coordinated public-private collaboration can connect research, industry, technology development and investment within a national mobility innovation ecosystem, offering a transferable model for advancing sustainable transport through innovation.

26. Multi-Dimensional Low-Carbon Transport Governance Model in Malaysia



I. Overview

FIGURE 33. MAJOR BARRIERS TO ELECTRIC MOBILITY ADOPTION IN MALAYSIA

Lack of in-depth coordination	Awareness barriers	Policy barriers	Infrastructure barriers
■ Lack of comprehensive co-ordination among stakeholders implementing initiatives. However, early implementation has been initiated by Greentech Malaysia and the Ministry of Energy, Science Technology, Environment and Climate Change.	■ General consumers still lack knowledge on EVs and the policies in place for their development, which has meant that policy application has been limited to two-wheeler fleet users such as the delivery companies and traffic police patrols.	■ There are few incentives in place for electric vehicles to encourage uptake among consumers and manufacturers. Current policy initiatives are more focused on HEVs and PHEVs.	■ To date, only 350 charging stations have been installed in Malaysia and there is a lack of testing facilities or support applications.

The project is a nationally implemented initiative aimed at transforming Malaysia’s transport sector into a low-carbon and energy-efficient system. The project was implemented between 2015 and 2020 by UNIDO, with funding support from the Global Environment Facility (GEF) and the Government of Malaysia, and in collaboration with the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) and Malaysian Green Technology Corporation (Greentech Malaysia).

Malaysia has experienced rapid urbanization and motorization over the past decades, leading to a significant increase in energy demand in the transport sector. The sector has become the largest contributor to national greenhouse gas (GHG) emissions, driven by high dependence on private vehicles, relatively low fuel prices due to subsidies, and strong growth of the domestic automotive industry. Despite Malaysia’s advanced automotive manufacturing base, the adoption of electric vehicles (EVs) has remained limited.

The project addresses several key structural challenges: a lack of stakeholder coordination resulting in fragmented development; policy frameworks historically prioritizing hybrid vehicles over fully electric mobility; insufficient charging infrastructure lacking technical standards; and low public awareness of EV technologies. To tackle these interconnected issues, the project adopts a comprehensive approach integrating policy development, infrastructure deployment, capacity building, and stakeholder engagement, aiming to create an enabling environment for large-scale EV adoption while demonstrating the technical feasibility of low-carbon solutions. From a sustainable transport perspective, the project reflects multiple value orientations. It promotes green development by reducing emissions through EV deployment and renewable energy integration, enhances economic transformation by fostering innovation in the automotive industry, and strengthens resilience by diversifying energy sources and building institutional capacity. Overall, the project provides a comprehensive and scalable model for transitioning towards low-carbon mobility in emerging economies.

II. Solution

The project adopts a comprehensive solution framework combining policy reform, technological innovation, infrastructure deployment, and institutional capacity building to accelerate the transition towards low-carbon transport in Malaysia.

A central component is the development of a Low Carbon Mobility Blueprint and Action Plan for Malaysia, which outlines long-term decarbonization pathways. Through extensive stakeholder engagement involving government ministries, transport associations, automotive manufacturers, and energy providers, key barriers were translated into actionable policy measures emphasizing EV-friendly regulations, fiscal incentives, and the integration of transport and energy policies. Additionally, the project supports the preparation of a joint cabinet paper involving multiple ministries, significantly enhancing policy coherence at the national level.

To address infrastructure gaps, the project implemented several pilot demonstration projects focusing on EV charging systems integrated with renewable energy. Key examples—such as PV-based EV charging stations along the PLUS Highway, PV-integrated charging systems at the Sunway BRT depot, and the deployment of slow chargers on Langkawi Island—combine solar photovoltaic generation with energy storage to reduce grid reliance. These demonstration projects serve to validate technical feasibility, build investor confidence, provide operational experience, and enable future scaling.

III. Main Achievements

The project has delivered substantial achievements across environmental, economic, and institutional dimensions, contributing significantly to sustainable transport development in Malaysia.

Key measurable outcomes include the nationwide installation of approximately 350 EV charging stations and PV-integrated systems, successfully covering 70% of the national charging infrastructure through the ChargeEV programme and establishing pilot projects in major transport corridors. These results demonstrate the successful establishment of a foundational EV infrastructure network in Malaysia.

Economically and industrially, the project has supported the transformation of Malaysia’s automotive and energy sectors by promoting EV technologies and related services. By increasing investment interest in EV infrastructure, developing new market opportunities within EV value chains, and enhancing workforce skills through specialized

Furthermore, the project expands EV charging infrastructure through Greentech Malaysia’s ChargeEV programme. By installing approximately 350 charging stations covering major urban and transport corridors, and integrating them with a centralized digital monitoring system, the project empowers users to locate chargers and access real-time data while providing planners with critical metrics for tariff design and grid integration.

Recognizing the importance of human capital, the project developed National Occupational Standards for EV charging station installation and maintenance, creating certification frameworks and collaborating with national skills institutions to ensure the long-term sustainability of the EV ecosystem. In parallel, structured stakeholder engagement platforms, including workshops and industry consultations, were established to enhance coordination among government agencies, private sector actors, and research institutions.

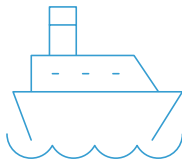
The project also includes the Low Carbon Langkawi Island Plan. Serving as a localized model for sustainable transport and energy integration, this initiative assesses local energy demand and emissions to design tailored transport solutions, allowing for experimentation and providing scalable lessons for national implementation. By successfully overcoming policy, infrastructure, and coordination barriers, the project demonstrates a systemic approach that combines top-down policy support with bottom-up technological innovation.

training and certification, the initiative directly contributes to robust economic growth and industrial upgrading.

Environmentally, the project lays a critical foundation for long-term sustainability. The transition to electric mobility and the integration of renewable energy sources directly reduce GHG emissions from the transport sector and improve air quality in urban areas. While mass EV adoption is still developing, these initial steps are absolutely vital for meeting national climate targets.

Finally, the project demonstrates strong replicability and promotability. Driven by the proven technical feasibility of PV-based charging systems, a scalable policy framework, and modular infrastructure design, replication is already underway with additional charging stations planned. The localized modeling and integrated energy-transport solutions make this initiative particularly relevant and highly adaptable for other emerging economies and regions experiencing rapid urban transport demand growth.

27.Duqm Port Commercial Terminal and Operational Zone Development: Integrated Logistics Ecosystem



I. Overview

Located in the Duqm Special Economic Zone in the Sultanate of Oman, the Duqm Port Commercial Terminal and Operational Zone Development Project serves as a strategic logistics and industrial hub positioned along major regional and international trade routes. Its development is closely linked to Oman’s economic diversification agenda, the growth of industrial activities in the Special Economic Zone, and the need to strengthen efficient, resilient and sustainable logistics connectivity.

To address the critical challenge facing many greenfield ports—how to effectively transition from basic physical infrastructure development to actual operational readiness—AIIB provided USD 265 million in financing to deliver a comprehensive package of enabling infrastructure. A port cannot function effectively through isolated assets

alone. It requires an integrated ecosystem of access roads, cargo yards, storage areas, utilities, safety systems, operational buildings, gate facilities and cargo-handling support infrastructure.

By focusing on this integrated ecosystem rather than stand-alone assets, AIIB added immense system-level value, ensuring scalable infrastructure planning while embedding stringent environmental and social management into the construction delivery. The project strongly reflects sustainable transport value orientations: it supports operational efficiency, establishes climate-resilient scalable infrastructure for future trade growth, ensures environmentally sound delivery, and strengthens the logistics foundation for private sector activity and mineral exports.

II. Solution

The core solution of the project was to deliver the enabling infrastructure required for a greenfield port to function as a complete logistics system. With a highly efficient 92.6 percent disbursement ratio of the USD 265 million commitment, the project financed critical road and paving works, including approximately 3 km of two-lane dual carriageway internal roads, alongside essential container yards, cargo stacking areas, and related paved facilities essential for seamless cargo circulation and storage.

This physical foundation was comprehensively supported by key utility and safety infrastructure, encompassing potable water supply, firefighting systems, stormwater and

sewerage networks, electrical systems, and telecommunications. In addition, it supported terminal and operational buildings, including administration facilities, training and amenities centers, emergency and firefighting facilities, electrical service buildings, multipurpose terminal facilities, container terminal facilities, dry bulk terminal facilities, workshop and maintenance buildings, and gate houses. Complementing these with essential crane beam and track works, the project successfully transformed Duqm Port from a developing greenfield asset into a fully functional logistics platform utilizing a pioneering "port-as-a-system" approach.

This integrated approach is crucial because logistics efficiency strictly depends on the smooth interaction of access, storage, utilities, and safety systems. By financing this complete ecosystem, the project directly supported Duqm Port's critical role as a gateway for the Special Economic Zone, reducing logistics friction, improving investor confidence, and optimizing the operational environment for industries dependent on import, export, and supply-chain services.

Furthermore, AIB ensured sustainable delivery by deeply embedding environmental and social management into the construction phase. Classified as a Category B project with site-specific impacts on reclaimed land, it successfully avoided all land acquisition and resettlement, managing construction-related risks—such as dust, noise, waste, and

worker safety—through a strict construction environmental management plan that resulted in zero recorded grievances. This proves that responsible logistics infrastructure delivery is just as critical as the asset itself. Finally, the solution highlights the importance of practical operational indicators for greenfield ports. Recognizing that long-term economic outcomes depend heavily on wider market factors and hinterland connectivity, the project established a robust model for monitoring direct operational indicators like cargo volumes, container throughput, and vessel calls, ensuring that enabling infrastructure progressively translates into actual service readiness.

III. Main Achievements

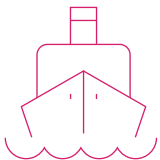
The project’s main achievement was the delivery of an integrated enabling infrastructure package for Duqm Port’s commercial terminal and operational zone. The initiative reached a remarkably high level of physical completion, with roads and building infrastructure substantially completed and certified, while actual project costs came in significantly lower than originally estimated due to lower bid prices and unused contingencies. This demonstrates the highly efficient use of financing while bridging the critical gap between constructing physical assets and creating a functioning logistics platform. By delivering these supporting facilities, the project drastically improved the operational readiness of a strategic logistics node, directly supporting Omani economic diversification, mineral exports, and regional trade connectivity.

From a sustainability perspective, the project serves as an exemplary model for responsible construction management. By effectively utilizing environmental mitigation, continuous monitoring, and robust grievance arrangements, the project ensured that the infrastructure was delivered with rigorous attention to environmental protec-

tion, worker safety, and active stakeholder engagement.

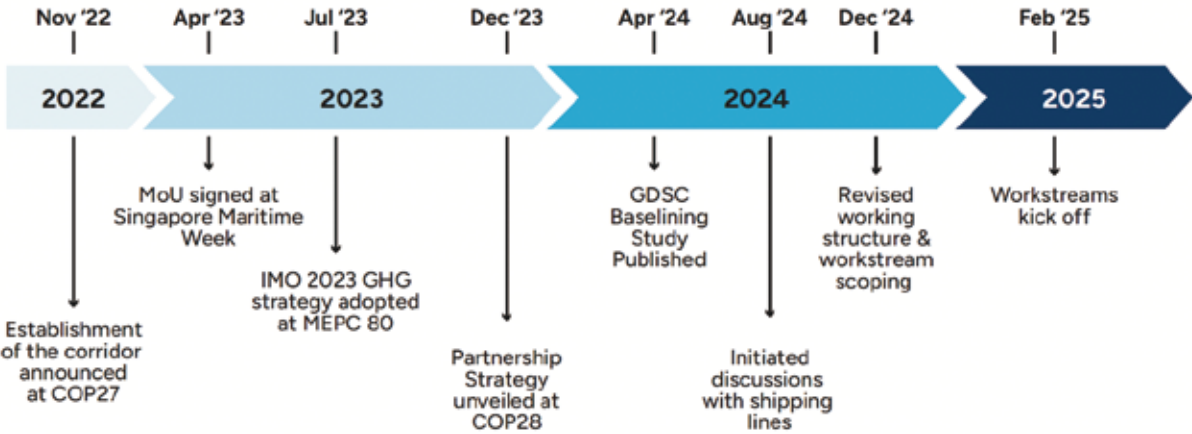
The case is highly replicable for other greenfield ports, special economic zones, industrial gateways and emerging trade corridors. It offers a definitive, actionable blueprint: ports must be planned as integrated logistics systems where enabling infrastructure is packaged together, intrinsically linked with hinterland industrial demand, and built with operational readiness as a core implementation goal. Sequencing, interface management, and institutional coordination are essential to move from construction completion to actual service delivery. Ultimately, the Duqm Port project proves that financing an integrated package of supporting infrastructure is the most effective way to transform a greenfield site into a thriving, sustainable logistics gateway that serves broad economic and industrial development.

28.Decarbonizing Shipping: Los Angeles – Long Beach – Singapore Green and Digital Shipping Corridor



I. Overview

- The shipping industry currently accounts for nearly 3% of global GHG emissions, a figure that could rise to 17% by 2050 without action
- As the shipping decarbonization is advancing, Green Shipping Corridors (GSC) have emerged as a collaborative space for catalysing the technical, commercial, and regulatory feasibility of zero emission shipping.
- Introduced by the Clydebank declaration in 2021. Green Shipping Corridors are generally defined as “specific trade routes where the feasibility of zero-emission shipping is catalyzed by public and private action” . These projects can act as catalysts for shipping decarbonization by testing innovative collaboration models and helping scale zero emission ships and the use of zero emission fuels.



According to the Global Maritime Forum, 84 active green corridor initiatives have been launched. An early adopter of this model, the Maritime and Port Authority of Singapore (MPA), Port of Los Angeles (POLA), and Port of Long Beach (POLB), supported by C40 Cities, established a Green and Digital Shipping Corridor (GDSC). Announced at COP27 in 2022 and formalized via an MoU in April 2023, this corridor spans 14,000 km across the Pacific Ocean and handles approximately 7% of the world's container trade. The GDSC supports the uptake of low- and zero-carbon fuels and identifies digital solutions to enhance route optimization.

II. Solution

In December 2023, the partners published a Partnership Strategy to communicate their vision, define governance, and mobilize value-chain stakeholders. The GDSC’s vision is to accelerate decarbonization of the maritime shipping industry by enabling first movers to achieve net-zero GHG emissions by the earliest feasible date, supporting the goals defined by the 2023 IMO GHG Strategy. The partners aim to catalyze net-zero emissions, build consensus around green shipping standards, accelerate the deployment of digital solutions for supply chain efficiency, and actively work with other corridors to scale zero-emission technologies. POLA, POLB, and MPA agreed to collaborate across facilitating the transition to marine fuels, technology advancement, standard setting, and advocacy.



To ensure efficient decision-making, the GDSC established a three-tier governance structure. Founding Partners (POLA, POLB, and MPA) lead strategic decision-making and program management, while C40 supports through convening and coordination. Participants, such as shipping lines and fuel suppliers, take an operational role in working groups to execute specific deliverables. Supporters provide external advocacy or consultation without committing to specific implementation activities. In April 2024, the GDSC completed a comprehensive baselining study. Conducted by the American Bureau of Shipping, the study analyzed Pacific maritime trade flows and provided a baseline of activities and energy demand requirements through 2050. This study forecasted more green jobs, health improvements for local communities, and economic benefits, emphasizing the future demand for zero and near-zero emission fuels.

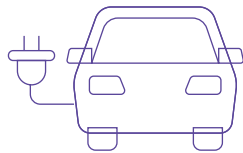
III. Main Achievements

In December 2024, the corridor revised its working structure to enable the kick-off of four distinct workstreams. These workstreams run in parallel with each other and are organised in separate meetings. These include the Net and near-zero fuels transition workstream for marine fuel supply and standards, the Digital Port-to-Port link for supply chain efficiencies, the Digital Ship-to-Port link for interoperability and cybersecurity, and the Energy efficiency technology demonstrations for pilot projects.



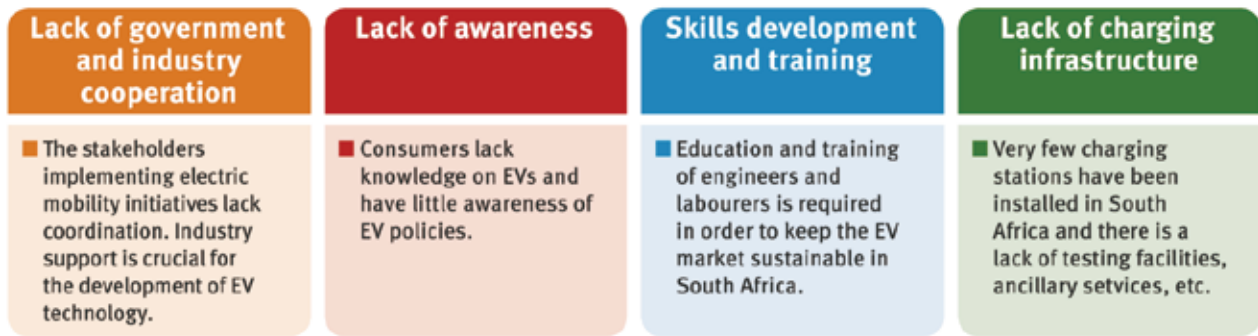
In 2025, MPA completed bunkering trials and awarded methanol bunkering licenses. Simultaneously, POLA and POLB commissioned a Clean Fuels Study to assess providers and prepared for a 2026 methanol pilot project. In addition, the corridor made significant progress on the Digital workstream as the ports conducted connectivity and API testing for the P2P data exchange and formalized partnerships with Mitsui O.S.K. Lines for initial pilot testing. In late 2026, MPA will also launch a data exchange platform designed to foster ecosystem connectivity and empower stakeholders to co-develop innovative solutions that enhance port productivity and efficiency.

29. Policy-Infrastructure Synergy for Low-Carbon Transition: South Africa's Multi-Faceted Approach



I. Overview

FIGURE 34. MAJOR BARRIERS TO ELECTRIC MOBILITY ADOPTION IN SOUTH AFRICA



Implemented between 2015 and 2020 by UNIDO with financial support from the Global Environment Facility (GEF), the project involves a wide range of stakeholders, including the South African National Energy Development Institute (SANEDI), the Department of Transport, the Department of Energy, the Department of Environmental Affairs, and major metropolitan cities such as Durban and Johannesburg.

Despite possessing one of Africa's most developed automotive industries with a significant role in the global value chain, South Africa's transport sector remains heavily dependent on fossil fuels, with road transport generating approximately 91% of total transport-related emissions amid rising urbanization and deteriorating air quality. Furthermore, the electric vehicle (EV) market remains at an early stage of development; by 2019, the country had only around 870 battery EVs and 120 public charging stations. In addition, emissions from motorcycles and other transport modes continue to pose environmental challenges, particularly due to high levels of black carbon emissions.

This slow transition has been severely constrained by weak government-industry coordination, low public awareness, insufficient charging infrastructure, and a critical lack of technical workforce capacity.

To overcome these systemic barriers, the project adopts a comprehensive approach integrating policy development, infrastructure support, stakeholder engagement, and capacity building to promote both electric mobility and non-motorized transport (NMT). From a sustainable transport perspective, it reflects multiple value orientations. It promotes green transport and strengthens energy resilience by reducing fossil fuel dependence, enhances economic efficiency by supporting EV industry growth, and fosters inclusiveness by promoting accessible mobility solutions. Overall, it provides a comprehensive framework for transitioning towards low-carbon transport in emerging economies.

II. Solution



The project adopts an integrated solution approach combining policy support, infrastructure development, stakeholder engagement, and capacity building to accelerate the transition towards energy-efficient and low-carbon transport in South Africa.

A core component involves strengthening the regulatory framework by integrating electric mobility and NMT into national and urban strategies through extensive multi-stakeholder consultations and policy dialogues. To bridge the coordination gap, the project established robust engagement platforms that unite key entities like SANEDI, the Department of Transport, NAAMSA, and the uYilo E-Mobility Programme. Through organized workshops, conferences, and industry dialogues, these platforms enable critical knowledge exchange and align historically fragmented policy and private sector efforts.

Simultaneously, the initiative aggressively tackles the public awareness barrier by organizing national energy dialogues, public exhibitions, and technical workshops,

effectively increasing consumer understanding of EV technologies, building market confidence, and driving behavioral change. On the infrastructure front, the project supported the steady expansion of the EV charging network from 60 stations in 2016 to approximately 120 public charging points. In addition, demonstration projects under the uYilo programme provide practical, real-world insights into large-scale EV deployment and future infrastructure needs.

A distinctive feature of this solution is its dual focus on electrification and accessible mobility, demonstrated through pilot initiatives like electric bicycle sharing schemes and urban mobility tests that generate vital data for scaling up NMT policies. The project has significantly strengthened market development by increasing the participation of automotive manufacturers, facilitating the entry of major global brands into the local market, and fostering the growth of local EV service providers.

Finally, recognizing the necessity of human capital, the project systematically addresses the skills gap through targeted training programs and knowledge-sharing platforms for engineers and technicians, ensuring a sustainable workforce for the broader energy transition. By promoting EVs and renewable energy integration, the project

directly contributes to South Africa’s broader energy goals, reducing reliance on fossil fuels and enhancing energy security while supporting climate mitigation efforts.

III. Main Achievements

The project has delivered important achievements across environmental, economic, and institutional dimensions, laying the foundation for a low-carbon transport system in South Africa.

Key quantitative outcomes demonstrate steady progress, highlighted by the growth of the national EV fleet from approximately 200 units in 2016 to around 870 battery EVs by 2019, alongside the strategic expansion of the public charging infrastructure from 60 to 120 stations. These tangible infrastructure improvements facilitated the successful implementation of pilot projects across multiple cities and attracted significantly increased participation from global automotive manufacturers.

Socio-economically, the project has stimulated economic development by supporting new green investments, expanding industry participation, and cultivating local technical skills, while the concurrent promotion of NMT ensures that these new mobility options remain inclusive and accessible to the broader public. Environmentally, the transition directly mitigates greenhouse gas emis-

sions and improves urban air quality. Furthermore, by specifically addressing harmful black carbon emissions from motorcycles and promoting cleaner transport technologies, the initiative offers significant, wide-reaching climate and public health benefits.

Crucially, the project demonstrates strong global replicability. Its integrated multi-stakeholder coordination model, combined with a highly scalable policy framework and a dual focus on EVs and NMT, provides a robust template for replication. With lessons learned from pilot projects already being shared across multiple municipalities to support wider national adoption, this holistic model proves particularly relevant for emerging economies and regions experiencing rapid urban transport demand that seek integrated low-carbon mobility solutions.

30.Demand Aggregation as a Catalyst for Scale: First Movers Coalition for Freight Decarbonization



I. Overview

Established in 2021, the First Movers Coalition (FMC) has rapidly grown into one of the world’s most significant private-sector demand signals for deep industrial decarbonization. By mobilizing leading global companies to commit to purchasing low-carbon products and services, the coalition plays a critical role in accelerating the commercialization and scale-up of emerging clean technologies across hard-to-abate sectors, including road freight. Together, FMC members have pledged over \$19 billion in demand for low-carbon products by 2030, underpinned by more than 130 offtake agreements and strategic investments that shift momentum from ambition to implementation and send credible signals across value chains.

A core strength of the FMC lies in its ability to align corporate ambition policy frameworks, de-risking innovation to overcome the so-called “valley of death” that often prevents promising clean technologies from reaching commercial scale. By offering early movers privileged access to emerging innovation cycles and fostering cost-sharing procurement partnerships, the coalition enables companies to collectively absorb early-stage cost premiums and gain competitive advantages in rapidly evolving low-carbon markets.

In the trucking sector, FMC members have made specific and measurable commitments to support the transition to

zero-emission freight. By 2030, members commit that 30% of new heavy-duty truck purchases—or 15% of road freight transported—will be zero-emission, including battery-electric and hydrogen fuel-cell vehicles. In parallel, there is a commitment toward a full transition to zero-emission medium-duty trucks. These targets are particularly significant given the structural challenges facing the sector, including high upfront costs, operational uncertainties, and the current lack of widespread charging infrastructure.

Despite these challenges, the outlook for zero-emission trucking is improving rapidly. Charging networks are expanding across key transport corridors, vehicle performance is advancing, and total cost of ownership is becoming increasingly competitive. FMC reinforces and accelerates these trends by aggregating corporate demand for zero-emission trucks. This aggregation sends strong and consistent market signals to manufacturers, logistics providers, and infrastructure developers, enabling them to invest with greater confidence and scale up production and deployment.

From a sustainable transport perspective, the project strongly aligns with green, efficient, inclusive, and resilient value orientations by bridging the gap between innovation and market adoption, catalyzing system-wide transformation to build a more sustainable global transport network.

II. Solution

The First Movers Coalition (FMC) addresses the systemic barriers to zero-emission trucking through a demand-driven, multi-stakeholder approach that translates corporate climate commitments into tangible market signals, investments, and deployment. FMC operates as a coordination platform that aligns demand, supply, and policy to accelerate the transition toward sustainable

freight systems. At the core of this approach is demand aggregation; by mobilizing leading global companies to commit early and at scale to procure zero-emission vehicles, FMC creates predictable demand signals that drastically reduce market uncertainty and justify massive supplier investments in manufacturing and infrastructure.

To translate commitments into action, the development of offtake agreements between buyers and suppliers is instrumental. These agreements provide long-term revenue certainty for manufacturers and logistics providers, enabling them to scale production and operations. The growing number of such agreements within the FMC ecosystem demonstrates increasing market maturity and confidence. In the trucking sector, offtake agreements can take the form of long-term procurement of zero-emission vehicles or logistics services or partnerships between shippers, carriers, and OEMs.

These help bridge the cost gap between conventional and zero-emission solutions by providing guaranteed demand and facilitating risk-sharing among stakeholders. Furthermore, FMC actively surfaces and supports innovative financing models, including pay-per-use, Truck-as-a-Service, asset-sharing arrangements, and blended public-private finance mechanisms, which significantly reduce early-stage financial barriers and enhance long-term project bankability.

In addition to physical deployment, FMC is exploring the use of Book and Claim mechanisms as a complementary tool to accelerate decarbonization in the trucking sector.

III. Main Achievements

The FMC has delivered highly quantifiable outcomes, accelerating the deployment of zero-emission trucking solutions through concrete pilot projects and massive global investments. Collectively, the staggering \$19 billion in demand commitments by 2030 represents a potential reduction of approximately 26 million tonnes of CO₂ emissions, a demand signal that has already translated into tangible deployments across global supply chains.

For instance, PepsiCo, in partnership with XPO Logistics in the United Kingdom, has introduced six electric heavy-duty trucks, replacing more than 1 million diesel kilometres annually and reducing emissions by around 1,200 tonnes of CO₂ per year. Concurrently, pilot operations like SSAB's electric Scania semi-trailers for local deliveries in Finland and Cemex's expansive deployment of electric ready-mix concrete trucks across Europe, the Middle East, and Africa decisively prove the operational applicability of zero-emission solutions in heavy and specialized transport segments. Large-scale investment commitments are also surging across regions, highlighted by Toll Group's \$43

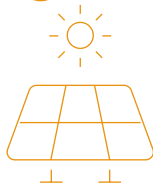
By separating the environmental benefits of zero-emission transport from the physical movement of goods, this mechanism allows companies to claim emissions reductions independently, offering crucial flexibility and scalability while regional infrastructure and vehicle availability remain constrained. The coalition also actively collaborates with 15 government partners to align private demand with public strategies, directly addressing infrastructure gaps and reducing early deployment cost burdens.

To overcome the critical lack of visibility on supply availability, FMC introduced the First Suppliers Hub, a transparency tool that maps low-carbon logistics providers, electric truck availability, and regional deployment opportunities, enabling companies to precisely align their Scope 3 procurement strategies with actual market readiness. Recognizing that infrastructure deployment must parallel operational requirements, the coalition strategically coordinates the development of charging hubs along key freight corridors to ensure interoperability and prevent underutilization. Ultimately, this integrated ecosystem approach seamlessly aligns vehicles, infrastructure, financing, and policy, tackling barriers simultaneously rather than in isolation to accelerate the global transition from pilot projects to widespread adoption.

million deployment of 28 electric trucks with charging infrastructure in Asia-Pacific, and Fortescue Metals Group's unprecedented \$2.8 billion commitment to procure 475 zero-emission trucks and equipment for mining operations.

The coalition's impact also extends to broader economic and social benefits. Increased deployment of zero-emission trucks contributes to improved air quality, reduced noise pollution, and better public health outcomes, particularly in urban and industrial areas. At the same time, the transition supports job creation in sectors such as clean energy, infrastructure development, and digital logistics services. Demonstrating exceptional global replicability, the FMC's technology-neutral, demand-driven model leverages corporate purchasing power to drive systemic change across various sectors, providing a highly scalable pathway recognized by the UN Decade of Sustainable Transport (2026–2035) to achieve SDGs 9, 11, and 13 worldwide.

31.Replacing Diesel with Solar+Storage: Serengeti's PV-ESS Integrated Solution for Clean Energy



I. Overview

The project is implemented in Serengeti National Park, Tanzania, a globally significant ecological reserve characterized by rich biodiversity and fragile ecosystems. Due to its remote location, the area is not connected to the national electricity grid, and energy supply traditionally relied heavily on diesel generators and fossil-fuel-based transportation. This dependency posed significant environmental, economic, and operational challenges, including exorbitant fuel transportation costs across long distances, severe noise and air pollution, and direct ecological disturbances to wildlife and visitors.

Initiated in January 2018, the project is led by Asantys Systems, a solar system integrator, in partnership with Tanganyika Expeditions, which operates safari lodges in the park. Additional key partners include energy consultant Harald Olk and Elektro Fleck, a provider of customized EV conversions. To overcome the unsustainable reliance on fossil fuels in an environmentally sensitive area, the project successfully integrates decentralized renewable energy (DRE) systems with electric mobility solutions, providing clean electricity for lodge operations and vehicle charging.

From a sustainable transport perspective, the project

strongly aligns with multiple value orientations. It promotes green transport and strengthens resilience by significantly reducing emissions and enabling true energy independence, while simultaneously improving economic sustainability by drastically cutting fuel and maintenance costs over time. Finally, it fosters inclusiveness through active engagement with local stakeholders, serving as an innovative, scalable solution that addresses critical environmental challenges while supporting economic viability and community engagement in remote regions.



II. Solution

The project adopts an integrated technical and operational approach that combines decentralized renewable energy systems with electric mobility solutions. The implementation focuses on three core components:

renewable energy generation and storage, electric vehicle conversion and deployment, and system integration for off-grid operations.



At the heart of the project is a robust DRE system meticulously designed to meet both stationary and mobility-related energy demands. The infrastructure features two 55 kWp solar PV systems equipped with SMA Tripower inverters, coupled with two 220 kWh lead-acid battery storage units utilizing SMA Sunny Island inverters to ensure continuous, reliable power supply during nighttime or periods of low solar irradiance. Lead-acid batteries were specifically selected for stationary storage due to their cost-effectiveness and proven robustness in harsh environments. This integrated solar-plus-storage system effectively eliminates the need for diesel generators as the primary energy source, significantly reducing emissions and operational costs.

A key innovation of the project is the conversion of conventional diesel-powered safari vehicles into electric vehicles (EVs). Partnering with Elektro Fleck, traditional Toyota Landcruiser safari vehicles—favored for their durability and off-road capability—were retrofitted with 40 kWh to 80 kWh lithium iron phosphate (LiFePO₄) batteries, delivering a driving range of 130 to 240 kilometers per charge that perfectly suits daily safari operations. This retrofitting approach not only significantly reduces upfront costs compared to purchasing new EVs but also extends the lifecycle of existing vehicles, directly supporting resource efficiency and circular economy principles.

To maximize overall system efficiency, the solar PV and battery systems are intelligently managed to simultaneously power the safari lodges and charge the electric vehicles during off-peak periods or times of peak solar generation.

The implementation also places a strong emphasis on local community engagement and capacity building, heavily facilitated by Tanganyika Expeditions. Through comprehensive needs assessments, specialized training programs on solar systems and EV operations, and targeted capacity building for local technicians, the project ensures long-term sustainability and local ownership. By deploying fully self-sufficient energy systems and utilizing tailored technical conversions, the initiative successfully navigated complex logistical constraints, mitigated the high environmental impact of diesel transport, and validated the viability of eco-tourism driven by low-impact, renewable technologies.



III. Main Achievements

The project has achieved significant environmental, economic, and social outcomes since its implementation, demonstrating the feasibility and effectiveness of integrating renewable energy with electric mobility in off-grid settings.

Technical milestones include the successful installation of 110 kWp of total solar PV capacity and 440 kWh of battery storage, robustly powering retrofitted safari vehicles that consistently achieve a 130 to 240 km electric driving range. These technical achievements have enabled the complete replacement or significant reduction of diesel usage across both stationary energy generation and mobile transportation operations.

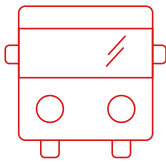
Environmentally and economically, the impacts of this transition are profound. By eliminating diesel generators and combustion engine vehicles, the project drastically cuts CO₂ emissions, reduces harmful air pollutants, and entirely removes noise pollution, thereby vastly enhancing wildlife conservation efforts and significantly elevating the overall eco-tourism visitor experience. Financially, it slashes the exorbitant fuel logistics costs—previously exacerbated by the challenging 60-kilometer transportation distance to the nearest petrol station—and minimizes long-term vehicle maintenance expenses due to the fewer moving parts inherent in electric vehicle powertrains.

Socio-economically, the project generates tangible local benefits that support broader community development goals. It creates valuable local employment opportunities in system operation and maintenance, drives technological capacity building through renewable energy training programs, and strengthens regional partnerships, particularly with local operators like Tanganyika Expeditions.

Finally, the project demonstrates exceptionally strong potential for global replication. Driven by its modular and scalable system design, proven technical feasibility, and clear-cut economic and environmental benefits, this integrated energy-mobility model is highly promotable for other remote or off-grid areas, protected natural reserves, and eco-tourism destinations worldwide. By proving that sustainable transport can thrive outside conventional grid infrastructures, it provides an actionable, highly adaptable blueprint for regions seeking to balance economic growth with strict ecological preservation.



32.Leveraging the Postal Network for Public Health Goals



I. Overview

Thailand’s Ministry of Public Health has teamed up with Thailand Post and other partners to deliver a logistics solution that supports mothers working away from their children to continue breastfeeding. The "Partnership for Love" project leverages the nationwide postal network to offer free delivery of frozen expressed breast milk.

The WHO and UNICEF recommend that children initiate breastfeeding within the first hour of birth and be exclusively breastfed for the first six months of life. In Thailand, the Ministry of Public Health has set a national target of at least 50% of infants exclusively breastfed for their first six months, in line with international recommendations. However, despite these policies, breastfeeding rates remain below targets: national data show that only 14% of infants were exclusively breastfed in 2019, increasing to about 29% in 2023 surveys.



Internal labour migration in Thailand is a structural barrier to achieving the national breastfeeding target. Thailand has a long-established pattern of internal labour migration, particularly from rural regions such as the north and north-east to urban and industrial centres like Bangkok. Women make up almost half of all internal migrants (approximately 48%), and social norms often position them as key financial providers supporting their families. As a result, estimates show that approximately a quarter of children in Thailand grow up separated from one or both parents. This geographic separation makes direct breastfeeding difficult or impossible, especially when combined with short maternity leave entitlements and limited workplace support for milk expression and storage.

II. Solution

The project began in Kohn Kaen province as a regional pilot programme in 2018. The local public health centre partnered with private transportation companies to establish a network providing free breast milk delivery services between mothers and children. The goal of this initiative was to facilitate exclusive breastfeeding for the first six months of an infant’s life, and continue until two years of age or older. The programme was developed in collaboration with healthcare professionals, who provided input on the project’s establishment, policies and network coordination.

The programme harnessed simple and accessible digital technologies to facilitate broad access to the service. The mobile app “Line” was used as a registration platform, providing an accessible way for users to receive information. Instructional videos on the preparation of breast milk and checklists prior to delivery reduced user errors and increased uptake of the service.

Since the initial pilot, the project has expanded nationally. The inclusion of Thailand Post helps address geographic coverage challenges identified in the pilot. With over 1,200 post offices nationwide and predictable schedules, Thailand Post is a critical partner for increasing service accessibility. It harnesses existing express mail services, with strict cut-off times and packaging requirements for passive cold chain delivery, to ensure that breast milk is delivered in a timely manner and avoid spoilage.

The delivery process has the following requirements:

1. Registration through an LINE Official Account to complete an online shipping label.
2. Frozen expressed breast milk must be packaged in ziplock bags, wrapped in paper and packed into a foam cooler with ice or cooler packs, with a total weight no greater than 10 kg per box.
3. The packaged breast milk and shipping label must be taken to the post office, where the package is inspected by staff and then sealed for delivery.
4. Delivery is performed within 24 hours, with delivery tracking, so that the parcel can be picked up at the destination post office.



Using transport networks to improve access to breastfeeding exemplifies inclusive mobility, aligning with SDG 9 (Industry, Innovation and Infrastructure) by leveraging existing logistics networks for essential health services. It contributes to SDG 3 (Good Health and Well-being) by enabling infants to receive optimal nutrition, and SDG 5 (Gender Equality) by helping women remain in the workforce while breastfeeding. Furthermore, it advances SDG 10 (Reduced Inequalities) by providing free services to lower-income migrant workers disproportionately affected by geographic separation.

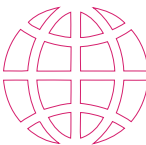
III. Main Achievements

Evaluation of the pilot programme in Khon Kaen province shows a growing interest and demand for this logistics service. In the pilot's first year, 40 people used the service, with 100% reporting good or very good satisfaction. By the second year, 1,488 people applied and the service was used 4,224 times. Evaluators estimate that mothers using the service saved 5,000–7,000 THB per month by not having to purchase formula milk.

Since the pilot, the programme’s expansion to a national service has yielded strong participation. In March 2025, the Department of Health announced that the national programme saw 6,595 participants between 2020 and 2024. Further expansion of the programme could explore new transport partnerships in order to diversify routes and modalities for the delivery of breast milk, as well as upgraded technology, such as refrigeration and freezers to maintain breast milk quality.

As internal labour migration of women increases across Asia, Africa and Latin America, leading to parent-child separation, the “Partnership for Love” model could be easily replicated in other countries. Postal networks provide strategic nationwide coverage, with regular and predictable routes and schedules. This makes them an ideal partner for public health ministries and health centres to provide time-sensitive delivery of breast milk across provinces or regions.

33.Digital Global Transit Network™ (dNet™): Digital Infrastructure for Resilient Global Supply Chains



I. Overview

Despite significant advances in logistics technologies, international transport still relies heavily on paper-based documentation. The repetition of identical information across invoices, customs declarations, and manifests increases administrative costs—which can account for up to 15% of total logistics expenses—and causes border delays. To address this, the Digital Global Transit Network (dNet) was created to facilitate secure digital data exchange and streamline multimodal transport. At the center of the system is the Global Transit Document™ (GTrD), a unified digital authorization mechanism that allows containerized cargo to cross multiple borders under simplified transit procedures. Utilizing blockchain technology, dNet ensures tamper-resistant data storage. Cargo details—such as product descriptions, weight, value, and routing—are recorded once in a digital ledger and reused across various documents. This eliminates redundancy,

improves accuracy, and grants real-time access to authorized stakeholders, including customs administrations, freight forwarders, and logistics operators. The GTrD concept originated in February 2020 during a meeting of TRACECA IGC, ICRA, and ICTD heads in Baku, Azerbaijan. Following the formation of a special Working Group and approval from the international business community, a pilot project was launched across Azerbaijan, Kazakhstan, Tajikistan, and Turkmenistan. The initiative is being implemented in three sequential phases:

- Phase I – Digital Transit (2022–2023). Phase I successfully completed.
- Phase II – Customs Transit (2024–2027)
- Phase III – Universal Transit (after 2027).

II. Solution

The Digital Global Transit Network (dNet) incorporates key operational capabilities to improve transparency in global supply chains. Its features include secure digital documentation, real-time tracking, blockchain-based data integrity, and integration with trade facilitation systems, enabling improved stakeholder coordination and efficient border management.

Phase II of the Pilot Project demonstrates dNet as a working model for digital customs transit in Eurasian markets. This phase focuses on three main areas:

- 1. Information Technology:** Enhancing the blockchain platform with functions like electronic transit declarations, customs guarantees, export logs, and real-time notifications.
- 2. Test Mode Transportation:** Organizing pilot transport under a "preferential mode" based on the Mutual Recognition of Authorized Economic Operators (AEO), with plans to introduce customs guarantee mechanisms.

3. Legal Framework: Establishing organizational structures at national and intergovernmental levels for risk insurance and simplified transit procedures.

The implementation is structured into two stages.

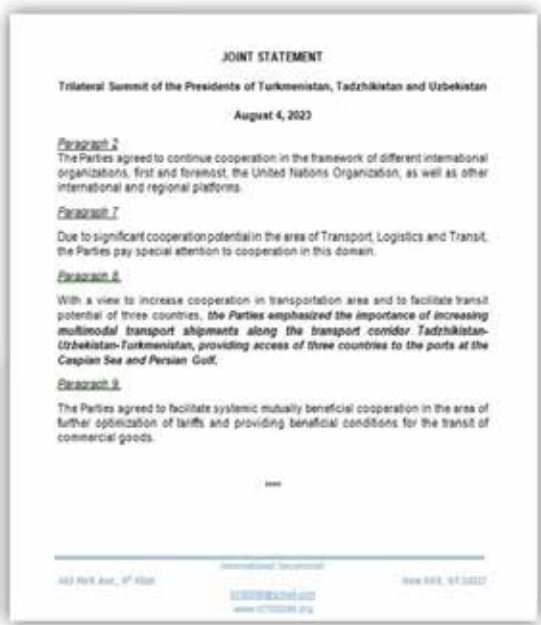
Stage 1 centers on simplifying customs regimes through a temporary Mutual Recognition Arrangement (MRA) based on WCO standards. This pioneering initiative moves beyond traditional bilateral agreements to combine national AEO systems into a regional blockchain network. Securing AEO status grants participants primary border-crossing advantages, which will be tested alongside the preparation of a comprehensive Feasibility Study by a leading global consultant within 6–9 months.

Stage 2 (scheduled for 2025) will supplement the mechanism with unconditional financial guarantees for customs authorities. It involves testing new dNet functions, including bonus points for accelerated cargo passage, enhanced information exchange, and "crisis models" (e.g., non-delivery scenarios). Successful implementation of these stages will significantly minimize transaction costs while improving information and customs security across the participating regions.

III. Main Achievements



Middle Corridor of the ancient Great Silk Road



The successful implementation of Phase I (Digital Transit) demonstrated the blockchain platform's capabilities for tracking international transit and assessing overall security and operational effectiveness. The pilot was co-organized by three international bodies (TRACECA, ICRA, ICTD) and four nations: Azerbaijan, Kazakhstan, Tajikistan, and Turkmenistan, involving their respective national transport operators.

Initially partnered with TradeLens (IBM-Maersk), the project transitioned to direct cooperation with IBM Corporation following TradeLens' market withdrawal in late 2022. IBM is currently developing a dedicated "dNet" application based on Hyperledger Fabric. The project was officially inaugurated in Avaza, Turkmenistan (August 17, 2022), with physical transportation launching in Kulyab, Tajikistan (October 17, 2022) to coincide with a new multimodal corridor connecting China to Europe.

Since its launch, Phase I has facilitated 247 shipments, including 244 (98.8%) in multimodal regimes. Operations spanned 77 routes across ten countries, crossing state borders 229 times. The total cargo volume reached 6,400 tons, comprising 165 40-foot and 103 20-foot containers, with an average transportation distance exceeding 2,100 km. Commodities ranged from machinery to consumer goods.

The adoption of such digital documentation systems offers significant economic benefits. By replacing paper with secure digital data exchange, governments and logis-

tics operators can reduce administrative burdens and accelerate border processing. Furthermore, these platforms generate valuable logistics data to support evidence-based policymaking and enhance the reliability of global supply chains.



The First dNet Certificate issued during the Phase I of the dNet Pilot Project

34.Green Power and Cold Chain Integration for Reducing Post-harvest Losses in Uganda



I. Overview

The coordinated development of green energy, green transportation, and green industry has become a defining direction for sustainable growth. With abundant natural resources and a rapidly expanding demographic dividend, Africa is emerging as an important engine of global economic growth. Yet in many parts of the continent, this potential remains constrained by structural challenges, including insufficient power supply, underdeveloped infrastructure, limited green transport systems, and relatively low-value industrial chains.

Uganda Known as the "Pearl of Africa," Home to Lake Victoria, possesses abundant aquatic and agricultural resources. However, unstable electricity supply, a near-absence of cold chain infrastructure, and insufficient green transport facilities across urban and rural areas have kept many industries at the primary production stage, limiting access to deep processing and international markets. Stable, clean electricity is the core foundation for breaking this bottleneck. By integrating clean energy with cold chain logistics, this project aims to create an integrated model for sustainable green development, aligning energy supply with industrial growth.

II. Solution

1. Strategic Implementation & Clean Power Development

Currently in full implementation, the project leverages Globelink Holding’ s international network to align closely with Uganda’ s national energy and industrial strategies. Through strong collaborations with local governments and partners—including a top-tier Chinese wind power manufacturer with 6.6 GW of proven projects—the initiative ensures effective local delivery. Anchored in utility-scale renewable energy (wind and solar), it deploys equipment tailored to Uganda's climate to ensure stable supply. Long-term Power Purchase Agreements (PPAs) secure predictable cash flows for over 25 years, directly addressing power shortages and unlocking cold chain infrastructure.



2. Cold Chain Industrial Empowerment: Unlocking Agricultural Value-Added Potential

Supported by stable green electricity, the project will establish a resilient, all-weather power supply system capable of meeting the 24-hour electricity needs of the entire cold chain, including storage, processing, and transportation. It will systematically advance the integrated development of agricultural deep-processing parks, regional cold storage centers, and green cold chain transport corridors. This will help close industrial gaps, remove distribution bottlenecks, significantly reduce post-harvest losses. This enables Uganda’s agriculture and fisheries sectors to transition from raw exports to high-value processing and branded operations, strengthening regional economic competitiveness.



3. Full-Lifecycle Sustainable Operations: Securing Long-Term Integrated Value

The project will build an end-to-end service framework covering planning and design, engineering construction, and intelligent operations and maintenance, while coordinating the integrated development of energy, industry, and green transportation. This will ensure long-term operational efficiency and sustained value creation. On the engineering side, the project will apply green manufacturing technologies adapted to extreme climates, using customized equipment with anti-corrosion, wind-sand-resistant, and high-temperature-resistant features to improve power generation efficiency, extend equipment life, and reduce long-term O&M costs. On the operations side, the project will introduce digital remote monitoring and intelligent O&M technologies, supported by localized professional teams and rapid-response mechanisms to ensure stable plant operations. Through an integrated "green power + cold chain + industry" planning model, the project will precisely match energy supply with industrial demand, enabling refined and intelligent management and ensuring coordinated, sustainable economic, social, and environmental benefits.



4. Local Co-Development and Empowerment: Creating Jobs, Cultivating Talent, and Enabling Long-Term Shared Growth

The project will create a wide range of local employment opportunities across engineering construction, power plant operations and maintenance, cold chain warehousing, green transport logistics, and industrial processing. By expanding income channels for local residents, the project will help improve livelihoods and strengthen social well-being.

At the same time, the project will establish a localized talent development system that combines professional training, technical mentoring, and hands-on practice. This system will building a strong pipeline of local professionals and supporting the transition from "localized employment" to "localized capability." By using industrial implementation to expand employment and skills development to support long-term growth, laying a human-centered foundation for balanced and sustainable regional development.

III. Main Achievements

1. Multi-Dimensional Value Creation: Strengthening the Foundation for Sustainable Green Transportation

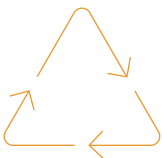
Stable green power, cold chain infrastructure, and green transport logistics will form a core platform for industrial synergy. This supports the transformation of Uganda’s agriculture, livestock, and fisheries sectors toward higher value-added development, attracting investment and cultivating new engines of economic growth. The project will create substantial local employment across various skill levels, raising incomes and narrowing urban-rural gaps to promote inclusive social development.

Furthermore, by replacing traditional fossil fuels with utility-scale green electricity and promoting low-carbon transport models, the initiative will significantly reduce regional carbon emissions, optimize energy consumption, and support Uganda’s implementation of its Nationally Determined Contributions (NDCs).

2. Low-Carbon Coordinated Development, Contributing to Global Green and Inclusive Growth

Centered on green and low-carbon development, the project integrates clean energy, cold chain industry, green transportation, and local development while balancing economic growth, employment creation, and environmental protection. Closely aligned with global sustainability principles, it helps developing countries address energy shortages, strengthen industrial foundations, and unlock endogenous growth potential. Ultimately, the project offers both practical momentum and replicable solutions for global energy transition, low-carbon transport development, industrial revitalization, and shared sustainable development.

35.A low-carbon transport option for urban areas in Uruguay (MOVÉS Project)



I. Overview

Uruguay is a high-income country in South America where close to 95 per cent of the population resides in urban areas. Over the past two decades, the country achieved an exemplary energy transition, generating approximately 98% of its electricity from renewable sources. However, while the power grid decarbonized, transport remained the largest carbon emitter, producing about 60% of energy-sector CO₂ emissions and an average of 40% of national CO₂ emissions between 1990 and 2017. Without intervention, transport emissions were projected to grow over 60% in a decade. The Montevideo metropolitan area, home to 40% of the national population, served as the primary demonstration site to address key barriers, including high upfront costs for electric buses, charging deficits, operational uncertainty, and rising private car reliance. To address these structural decarbonization challenges, the project “Toward a Sustainable and Efficient Urban Mobility System in Uruguay” (MOVÉS) was executed between 2017 and 2022. Implemented by the Ministry of Industry, Energy and Mining (MIEM) in coordination with the Ministry of Environment (MA) and the Ministry of Housing and Territorial Planning (MVOT), and supported by the United Nations Development Programme (UNDP), the initiative operated with a total budget of USD 33.4 million. This financial structure combined USD 1.7 million from the Global Environment Facility (GEF) with USD 31.6 million in national co-financing. Rather than treating technical or financial obstacles in isolation, MOVÉS targeted the entire e-mobility ecosystem. The project holistically deployed electric buses and urban logistics vehicles, established robust charging infrastructure, reformed sector regulations, and introduced institutional capacity building alongside gender-sensitive operational service standards, successfully positioning electric buses as a competitive, reliable, and scalable alternative to conventional public transport.

MOVÉS systematically operationalized core sustainable transport values. Powered by Uruguay’s 98% renewable grid, electric buses deliver near-zero operational life-cycle emissions and 77% energy efficiency, compared to 34% for diesel units. Economically, repurposing existing fossil fuel bus subsidies under Law 19.670 closed the upfront price gap without added fiscal strain, while delivering lower operating costs. For inclusiveness and convenience, the project introduced low-floor accessible buses, active travel programs like “Tu Calle”, and gender equity standards. Long-term resilience was ensured through battery circular economy regulations under Decree 227/025 and permanent institutional coordination.



Figure 1. The evolutionary trend of total national greenhouse gas emissions split by Energy, IPPU, AFOLU and Waste sectors, 1990 – 2020.
Image source: Uruguay Sixth National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change.

II. Solution

MOVÉS was designed around the premise that transitioning to electric public transport is not simply a matter of replacing diesel buses with electric ones. The project deployed three mutually reinforcing strategies addressing the financial, institutional and regulatory dimensions of the transition. A primary pillar of this multi-faceted framework focused on lowering financial entry barriers, expanding charging networks, and systematically de-risking electric vehicle adoption. To overcome the prohibitive initial purchase price of electric buses, MOVÉS championed the strategic realignment of existing fossil fuel subsidies. Under Article 349 of Law 19.670 (2018), a specialized subsidy was established to bridge the capital cost differential between conventional diesel units and equivalent electric models, funded entirely through the restructuring of legacy fuel subsidies. Harmonizing fiscal incentives with national environmental priorities mitigated the upfront financial burden for operators without creating new fiscal liabilities. In 2020, technical assistance delivered to the National Energy Directorate (DNE), covering decree drafting, program administration, information system design, and inter-agency management, facilitated the inaugural competitive call, resulting in the rollout of Montevideo’s initial 33 electric buses. Concurrently, the initiative forged public-private partnerships to scale up charging and maintenance infrastructure for both passenger and commercial electric fleets, bolstering operational confidence and alleviating operator risk perceptions. The project collaborated directly with transit companies to design tailored depot charging solutions. In parallel, state power utility UTE supported the transition by introducing reduced electricity tariffs for vehicle charging and expanding a public charging corridor along major national highways. Addressing private fleet needs alongside public transit infrastructure simulta-



Figure 2. Uruguay deployed 150 electric buses for public transportation in major cities. Photo: UNDP Uruguay.

neously resolved the dual charging demands of the urban transition. To cultivate broader market acceptance beyond public transit, MOVÉS conducted an operational trial program involving over 130 vehicle rental firms, allowing enterprise users to evaluate electric vehicles under actual commercial conditions. Furthermore, electric passenger cars were incorporated as eligible assets under the national Investment Promotion Law, pilot projects were executed for urban freight and logistics providers, and the Green Fleet Plan (Plan Flota Verde) was launched to guide corporate last-mile delivery transitions. Supplementary trials featuring electric bicycles and tricycles confirmed the versatility of electric mobility across diverse urban transportation applications. This multi-pronged demonstration logic proved essential in establishing commercial confidence in the technology. Despite launching amid reduced transit demand caused by the COVID-19 pandemic, the initial electric fleet logged approximately 15,000 kilometers per bus during its early months, earning high satisfaction marks from both operators and passengers. By the end of the first full operational year, the fleet recorded 1.5 million cumulative kilometers, offsetting 615,000 liters of diesel fuel and eliminating the corresponding carbon emissions. Rigorously collecting and disseminating this empirical data on efficiency, range, maintenance requirements, and running costs transformed a perceived technological gamble into a bankable, commercially viable business model for operators and financiers. On the infrastructure side, the project worked with operators on depot charging strategies adapted to local operating conditions, while the state utility UTE complemented the effort with preferential electricity tariffs for vehicle charging and the progressive deployment of a national public charging network along the country’s main routes. The combination of operator-level charging solutions for fleets and a nationwide public network for light vehicles addressed the two distinct infrastructure needs of the transition simultaneously. Recognizing that technological adoption hinges on organizational capability, MOVÉS enhanced the planning and execution capacity of national and municipal agencies. Technical advisory services and specialized training equipped civil servants to integrate electric mobility into long-term municipal master plans. Two foundational policy manuals were published: the Guide for Sustainable Urban Mobility Planning in Uruguay (2021, produced with Euroclima+ and GIZ) and the Guide on Urban Electric Mobility. These publications furnished subnational administrations with standardized methodologies for urban mobility integration, serving as key technical inputs for the national mobility strategy. Digital simulation tools and technical reporting platforms further enhanced administrative transparency and standardized sustainable mobility practices within the public sector.

Beyond public institutional capacity, the initiative advanced human-centric urban design through the Tu Calle (“Your Street”) program. By implementing tactical urbanism pilots that prioritized active transport modes, the project created safer environments for pedestrians and cyclists, extending its impact beyond isolated intersections to connect bicycle networks and pedestrian corridors along key thoroughfares. For private enterprise, a corporate mobility toolkit offered structured guidance for private fleet decarbonization. Crucially, financial incentives for public operators were coupled with internal organizational reforms: MOVÉS conducted gender diagnostics across four transit operators in Montevideo, conducted equity workshops, and instituted gender-sensitive operational benchmarks to embed social inclusion directly within the transit modernization agenda.



Figure 3. The impact and reach went far beyond one intersection, linking with other bike routes and providing pedestrian-friendly paths along main roads. Photos: UNDP Uruguay

To institutionalize these technological and organizational shifts, UNDP partnered with government ministries to modernize national regulatory and environmental policy frameworks. The initiative supported policy design for reforming the vehicle purchase tax (IMESI) to align taxation with environmental externalities, alongside aiding the formulation of a updated vehicle emissions standard mandating Euro V as the national baseline, which was formally adopted in 2021. To elevate public trust and service reliability, MOVÉS contributed to technical standardization bodies, assisting in the release of the updated vehicle energy-efficiency labeling framework (UNIT 1130:2020) to encompass electric and hydrogen fuel-cell vehicles. Simultaneously, new operational service protocols targeting vehicle accessibility, schedule reliability, and passenger comfort were introduced, strategically tying vehicle electrification to quality-of-service upgrades to position electric transit as a superior alternative to private vehicles. Finally, addressing the complete environmental lifecycle of electric transport, MOVÉS supported the drafting of a national battery management decree establishing legal responsibility for the repurposing, recycling, and safe disposal of used traction batteries. By embedding circular

economy principles into transport policy, the project safeguarded the environmental integrity of the electric transition while erecting a resilient regulatory foundation for sustainable, long-term market growth. Through the seamless alignment of fiscal policy, infrastructure expansion, institutional capacity building, and regulatory modernization, MOVÉS established a self-sustaining ecosystem that successfully bridged immediate operational milestones with Uruguay’s long-term climate objectives.

III. Main Achievements

Project Outcomes and Environmental Footprint

The implementation of the MOVÉS project catalyzed a structural shift in Uruguay’s public transportation ecosystem, delivering measurable environmental, operational, and regulatory milestones. The primary physical intervention established the country’s inaugural electric bus fleet in Montevideo, consisting of 33 electric buses that collectively cover 1.58 million kilometers annually. Within their initial two years of service alone, these vehicles offset over 1,473,000 liters of diesel fuel and prevented the release of 3,888 tonnes of CO₂ emissions. Over the full project horizon, the cumulative climate impact reaches 278.9 kt of avoided CO₂ emissions, an achievement equivalent to removing 65,055 fossil-fuel passenger vehicles from circulation for an entire year. Beyond carbon mitigation, the transition yielded immediate urban air-quality and public health benefits by reducing fine particulate matter (PM₁₀) emissions by 4.6 per cent annually, removing approximately 300 kilograms of particulates from baseline urban levels. The scope of electrification extended beyond public transit into commercial and private transport sectors. Electric freight vehicles were integrated into urban logistics operations, logging 165,296 kilometers annually, while a structured utility vehicle trial program facilitated 131 corporate test-drives of electric cars and vans. These enterprise trials covered 190,000 operational kilometers and avoided an additional 46,000 kg of CO₂ emissions. Furthermore, an EV trial scheme targeting over 130 vehicle rental companies directly stimulated private market adoption, driving a 100 per cent surge in annual EV sales during the active project period. Surrounding these operational outcomes was a robust regulatory transformation: fossil fuel subsidies were successfully repurposed under Law 19.670 for fleet renewal, mandatory Euro V vehicle emissions standards were established, updated energy-efficiency labeling was introduced under stan-

dard UNIT 1130:2020, reforms were proposed for the vehicle purchase tax (IMESI), comprehensive battery management regulations were drafted, and four gender-based diagnostics were executed to institute gender-sensitive operational benchmarks across public transport operators

Socio-Economic Value and Equity

The transition to electric mobility generated profound socio-economic co-benefits by aligning operational cost-efficiencies with social inclusion and clean energy strategies. In a national context characterized by some of the highest fuel prices in Latin America, each electric bus replacing a conventional diesel unit avoids the consumption of approximately 31,000 liters of diesel per year. This reduction yields direct, long-term operational savings for transit operators while shifting energy demand toward domestically produced renewable electricity, thereby insulating the national economy from volatile foreign fossil fuel prices. From a user perspective, the service improvements produced by fleet modernization are inherently progressive, benefiting the roughly one-third of urban trips made via public transit—a mobility mode relied upon most heavily by lower-income demographics and women. The newly introduced fleet features low-floor fully accessible entry, integrated air conditioning, and significantly quieter operation, directly elevating service quality. Furthermore, by incorporating comprehensive gender diagnostics and operational standards across four transit companies, the project embedded gender equality considerations into a traditionally male-dominated sector. Economically, the emerging e-mobility value chain—encompassing public charging infrastructure, specialized maintenance services, and battery lifecycle management—is fostering new skilled employment opportunities and private-sector business models, notably through emerging commercial alliances focused on the battery circular economy.

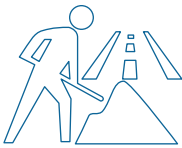
Replicability, Market Scaling, and Institutional Legacy

The true efficacy of the MOVÉS intervention is demonstrated by its post-completion trajectory following its formal close in 2022. Rather than delivering a isolated pilot project, MOVÉS established the foundational financial mechanisms, regulatory frameworks, institutional capabilities, and market confidence necessary for Uruguay’s electric mobility transition to scale autonomously. Following the initial deployment, Montevideo’s electric bus fleet expanded from 33 units to 177 units by October 2025, surpassing 200 operational units in 2026. CUTCSA,

the capital’s primary transit operator, successfully completed the first phase of its electrification roadmap—encompassing 25 per cent of its fleet, or roughly 280 electric buses—and formally committed to fully electrifying its entire 1,155-unit fleet by 2040. This post-project expansion has been sustained through diversified, commercial-scale financing mechanisms. Fleet acquisitions have been financed via a dedicated public transport fund established by the Municipality of Montevideo in 2024, alongside a landmark USD 20 million credit facility between CUTCSA and CAF under the Green Climate Fund-backed regional E-Motion program—an initiative recognized as the sustainable transport operation of the year. Building on MOVÉS’ foundations, the Renewable Energy Innovation Fund (REIF)—supported by the Joint SDG Fund, UNDP, UNIDO, and UN Women—designated electric mobility as a priority investment area upon its launch in 2022. By leveraging private capital through blended finance mechanisms derived from MOVÉS lessons, REIF has further expanded and strengthened the national sustainable mobility ecosystem. This institutional momentum accelerated a broader national market transformation. National EV sales reached 14,443 units in 2025, accounting for 20 per cent of all new vehicle registrations and representing a 147 per cent increase over 2024 figures. By May 2026, battery-electric vehicles outsold gasoline-powered cars nationwide for the first time, establishing Uruguay as the regional leader in electric vehicles per capita. Infrastructure expanded in tandem, with state utility UTE growing the public charging network past 400 points nationwide, supported by plans for 300 additional chargers in 2026. At the executive level, Uruguay formalized this transition by decreeing its National Sustainable Urban Mobility Policy in February 2025 with a horizon to 2050, alongside creating the permanent Inter-institutional Commission on Sustainable Mobility (CIMS). That same year, Decree 227/025 was approved, establishing a comprehensive circular-economy regulatory regime for traction batteries that has already prompted private-sector master plans for battery reuse and recycling. Ultimately, Uruguay offers a highly replicable model for middle-income nations worldwide. It demonstrates that repurposing existing fossil fuel subsidies, engaging incumbent operators, linking electrification with service quality, and institutionalizing inter-agency governance can unlock a self-sustaining electric mobility transition without creating large new subsidy burdens. This methodology is currently being scaled across Latin America through the CAF-GCF E-Motion program in Panama, Paraguay, and Uruguay, while serving as a global benchmark through international South-South knowledge platforms.

36.Uzbekistan: Bukhara Road Network Improvement Project

I. Overview



The Bukhara Road Network Improvement Project (BRNIP) is a USD 214.7 million initiative co-financed by the Asian Infrastructure Investment Bank (AIIB) and the Government of Uzbekistan to rehabilitate a 78-km section (km 150–228) of the 1,204-km A380 international highway in Bukhara Region. Civil works began in 2023, with completion scheduled for December 2028. The corridor carries significant passenger and freight traffic, connecting rural communities and Bukhara City with national and regional markets. Prior to reconstruction,

deteriorated pavement, heavy freight traffic and extreme climatic conditions resulted in poor riding quality, high vehicle operating costs and repeated maintenance, while mixed traffic posed safety risks to vulnerable road users and ecological pressures on the protected Jeyran Specialized Eco-Center. BRNIP addresses these challenges through a modern, climate-resilient and safer transport link serving both international logistics and local mobility needs.

II. Solution

1. Technical, Economic, and Material Innovation

The project adopted a lifecycle-oriented and context-specific pavement design. A 27-cm rigid cement concrete slab was used to extend pavement life, reduce maintenance needs and lower lifecycle costs, while existing pavement materials were reused where technically suitable to minimize construction waste and demand for new materials. In the more urbanized Lot 3, asphalt concrete was retained to better accommodate dense utilities, roadside access and the complex urban environment.

2. Geometric Upgrades and People-Centric Traffic Segregation

The 78-km section is being upgraded to Category I road standards with a design speed of up to 120 km/h, with safety measures tailored to different traffic environments. Rural sections feature a divided four-lane carriageway with median separation, while urban and semi-urban areas incorporate local access arrangements and traffic-segregation measures. At high-risk locations with significant pedestrian activity, crossings or pedestrian bridges, barriers and traffic-control measures further strengthen road safety.

3. Grade-Separated Crossings and Coordinated Infrastructure

The project includes reconstruction of intersections, overpasses, underpasses, bridges, and local access arrangements to improve the movement of both international freight and local traffic. Grade separation at selected locations helps reduce conflicts between through traffic and local movements, while six bridges over irrigation canals have also been reconstructed.



Figure 1: A380 International Corridor Rehabilitated – Before and After

4. Adaptive Environmental Design & Ecological Corridors

- **Wildlife Protection in Jeyran Eco-Center** For the 17 km section traversing this sensitive protected area, the project integrates a dedicated under-road wildlife crossing and protective fencing to maintain ecological connectivity and minimize animal-vehicle collisions.
- **Compensatory Reforestation (Lots 1&2)** To offset the removal of ~17,500 saxaul trees, the project enforced a 1:10 replacement ratio. Factoring in a harsh desert survival rate of 40%, approximately 435,000 saplings were planted to guarantee the target of surviving trees.
- **Proactive Tree Preservation (Lot 3)** By adaptively narrowing road lanes and rearranging roadside drainage, ~2,000 mature roadside trees were successfully preserved in situ.

5.Inclusive Livelihoods, Gender Empowerment, and Sanitation

In populated areas, sidewalks, bicycle facilities, crossings, lighting and local access are integrated to improve pedestrian and cyclist mobility. Local communities, including women, are also engaged in saxaul planting, creating seasonal employment and supporting landscape restoration.



Figure 2: Saxaul Compensatory Planting

6.Hydrological Resilience and Agricultural Safeguards

Operating in an environment plagued by extreme climates, fluctuating groundwater, and aggressive saline soils, the road’s profile and drainage systems were highly customized. Resilient materials for concrete structures was utilized and six reinforced concrete bridges over irrigation canals was reconstructed to maintain vital agricultural water systems.

III. Main Achievements

• Enhanced Operational Efficiency and Safety

With civil works on Lots 1 and 2 substantially completed, improved pavement conditions and upgraded road geometry have enhanced riding quality and supported higher, more reliable operating speeds while reducing vehicle operating costs. Road safety has been strengthened by reducing conflicts between local communities and high-speed traffic.

• Inclusive Socio-Economic Development

The project successfully transformed mandated environmental mitigation into tangible local economic opportunities. The massive saxaul compensatory planting program mobilized members of the surrounding communities, specifically creating valuable seasonal employment and income opportunities for local women, proving that infrastructure investments can provide benefits far beyond physical road construction.

• Replicability and Promotability

BRNIP’s experience in flexible pavement selection, road safety integration, ecological preservation and tree management is informing Uzbekistan’s wider transport modernization. The country’s Design Institute is incorporating proven A380 approaches into the detailed design of the forthcoming M37 international corridor and subsequent local road investments in Karakalpakstan and Khorezm.

Global Sustainable Transport Best Practices

Highlighting Success Stories in Sustainable Transport

DISCLAIMER

The analysis, conclusions and recommendations of this report do not necessarily reflect the views of the Global Sustainable Transport Innovation and Knowledge Center or its expert groups.

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Global Sustainable Transport Good Practices 2026

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Invitation

We welcome your recommendations of best practices in sustainable transport from around the globe. Please prepare the relevant materials in accordance with the requirements and send them to disi_li@gstikc.org.cn

Criteria

Transport is a key driving force for achieving UN’ s Sustainable Development Goals by 2030. Collecting global sustainable transport good practices will help showcase achievements in sustainable transport development, leading the global trans- port transformation and promoting the global sustainable development. Global sustainable transport good practices include but not limited to transport connectivity, digital development, green and low-carbon initiatives, public transportation, and safety and inclusiveness, provide innovative and replicable policies, projects, initiatives, technologies, mechanisms, and orga- nizational activities, to provide valuable experiences for global transport development.

1.1 Relevant: The practices should reflect the value orientation of sustainable transport—safe, convenient, efficient, green, economical, inclusive and resilient—contributing to the achievement of the United Nations Sustainable Development Goals.

1.2 Innovative: The practices should showcase innovative applications in the field of sustainable transport, including new concepts, technologies, policies, and models which should possess a certain level of foresight and serve as exemplary refer- ences for others.

1.3 Effective: The practices should have measurable results and demonstrate their effectiveness through practice, effectively promoting transport transformation and contributing to positive changes in status or trends.

1.4 Replicable: There are evidences that the practices can be or has been replicated and/or scaled up, offering experiences and lessons that can be referenced by others around the globe to promote sustainable transport development.

1.5 Synergetic: The practices should demonstrate the synergy between transport and economic, social, and cultural devel- opment, as well as a harmonious resonance with ecological progress. They should promote the common development of global transport and contribute to building a community with a shared future for humanity

Template

Location: Title

I. Overview (No less than 500 words)

This section mainly introduces the background of the case implementation, basic situation, the problems to be solved, and the sustainable transportation value orientation reflected.

1. Project implementation location situation
2. Problems the project aims to solve
3. Basic information of the project
4. Sustainable transportation value orientation reflected by the project, i.e., how it aligns with aspects of "safety, conve- nience, efficiency, green, economy, inclusiveness, and resilience."

II. Solution (No less than 1000 words)

This section mainly describes the implementation of the project, technical approaches, and measures taken to solve the problems, etc., which can be vividly presented through images, charts, etc.

III. Main Achievements (No less than 500 words)

This section vividly presents the achievements of the case in the form of objective facts, numbers, charts, images, etc., reflecting the support for the concept of sustainable transportation and the United Nations Sustainable Development Goals, and explains the replicability and promotability of the case.

1. Project outcomes (Numerical display required, comparable numbers are better)
2. The project's contribution to the socio-economic aspect (Numerical display required, comparable numbers are better)
3. Replicability and promotability of the case (Whether it has been promoted, and its future promotability for other coun- tries and regions)