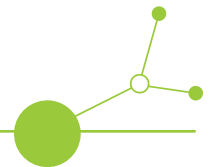


DELIVERABLE D.2.2.2 - part 2

Action Plan of Gdynia Bus Transport Company, Poland

Action Plan to optimise delivery of
infrastructure by cooperation and sharing
between public providers, as update of
municipal strategy for electromobility



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Abbreviations of project partners

Abbreviation	Partner name
LVB	Leipzig Public Transport Company, Germany
PKA	Gdynia Bus Transport Company, Gdynia, Poland
UG	University of Gdańsk, Poland
SZKT	Szeged Transport Company, Hungary
Kruch	Kruch Railways Innovations, Austria
MOM	Municipality of Maribor, Slovenia
UM	University of Maribor, Slovenia
ATB	ATB Mobility Bergamo, Italy
Redmint	Redmint social enterprise, Italy
Mobilissmus	Mobilissimus Ltd., Hungary
TM	trolley:motion association, Austria



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1. Executive summary

The CE4CE project empowers circular economy system thinking for actors in public transport from Central European countries to reduce waste and create value along new life cycles of infrastructure and rolling stock. To do so, CE4CE jointly develops solutions that increase knowledge and capacities for the sector, help reduce barriers and costs, and initiate the development of new services and skilled jobs, as well as strategies and action plans that improve policy development, learning and exchange on the regional and transnational level. CE4CE aims at bringing circular economy principles into the public transport sector and, thus, reduce waste, increase efficiency in the sector and improve the ecological footprint of public transport.

Furthermore, stakeholders from the public transport community will cooperate in CE4CE to jointly develop and adapt processes and solutions as key enablers for the integration of circular economy principles, like data sharing concepts, new (innovation) procurement guidance, product and business model designs, extended life-cycle assessment, and cost-benefit analysis methodologies.

CE4CE will jointly develop outputs based on co-creation and peer reviews for take up by the public transport sector, e.g. pilot actions and solutions such as the CE4CE Circularity Compass for public transport, the CE4CE Circularity Knowledge platform, a web-based second-hand marketplace, strategies and pilot actions to increase resource-efficiency and pilots demonstrating use more, reuse and recycle approaches for the public transport sector.

CE4CE's partnership reflects the whole value chain and transport sector system perspective including 11 project partners from 6 Central European countries, ranging from public transport authorities/operators, industry and research to interest groups. To enlarge this cooperation, associated partners like the international active networks ICLEI, UITP and EIT Urban Mobility/Raw Materials are strategically involved to maximise communication outreach and knowledge transfer of project results.

This document is Deliverable D.2.2.2 - part 2: the Gdynia Bus Transport Company Ltd Action Plan, developed within CE4CE. Its aim is to convert the pilot, solution and strategy results into a practical roadmap for circular electrification, smarter infrastructure delivery and stronger cooperation between municipal public providers in Gdynia.

The Action Plan addresses ageing assets, energy cost pressure, growing service demand, battery lifecycle risks, and the need to move from ad hoc spreadsheet-based decisions to repeatable KPI-based planning (key performance indicators).

It is centred on five priority measures: electrification of line 194, institutionalisation of the Digital Twin and KPI workflow, depot eco-efficiency, on-site photovoltaic generation with storage-ready design, and circular procurement with lifecycle battery management.



The Plan supports environmental, social and governance objectives at the level of Gdynia Bus Transport Company Ltd (PKA) and the wider municipal capital group: lower emissions and noise, better service reliability, clearer ownership of decisions, and auditable monitoring of circularity and electromobility performance.

This document is organised as follows:

Chapter 2 introduces the Gdynia Action Plan and the problems it is designed to solve.

Chapter 3 summarises the strategic and regulatory background at local, national and EU level.

Chapter 4 explains how the Action Plan was developed, presents the measures, the monitoring logic, risks and the approval path. Chapters 5 to 7 present the main outcomes, next steps and annexes.

2. Introduction to the Gdynia Action Plan

Gdynia already has a strong base for zero-emission road public transport: a long-established trolleybus system, experience with in-motion charging, and electric buses introduced in 2022. Further fleet decarbonisation now requires better prioritisation of investments, because different corridors and lines need different technical solutions. The Action Plan was initiated to respond to five practical needs identified by PKA and partners: ageing assets, rising electricity and lifecycle costs, the need for circular procurement, lack of robust decision-support tools for investment choices, and the need to align future electromobility measures with city-wide mobility and climate goals. The agreed scope therefore combines infrastructure, vehicles, energy use, procurement and governance rather than treating electrification as a vehicle-only issue.

The Action Plan addresses operational and strategic vulnerabilities highlighted by the CE4CE pilot. These include congestion-related energy demand, the risk of oversizing batteries and charging infrastructure, uncertainty about future funding, data fragmentation between institutions, and the danger of locking the city into suboptimal solutions for 12 to 30 years. The expected outcome is a staged implementation roadmap that reduces investment risk, improves resource efficiency, and enables Gdynia to scale electromobility in a more circular and resilient way.

3. Strategic background and context for the Action Plan development

At local level, the Action Plan is anchored in the Strategy of Development of the City of Gdynia 2030 and in Gdynia's Sustainable Urban Mobility Plan, which treat public transport, low-emission mobility and integrated planning as core instruments of urban policy. It also fits the ongoing SUMP for BSR work, which strengthens monitoring and evaluation practice for SUMP implementation in Gdynia. At operational level, the Plan complements the city's existing electromobility pathway built on trolleybuses, IMC know-how and recent electric-bus deployment.

At national level, the Plan is consistent with Poland's Act on Electromobility and Alternative Fuels, which sets the framework for zero-emission buses, charging infrastructure and public-sector responsibilities in this field. It also responds to the financing logic of Polish zero-emission transport support schemes, under which vehicle procurement, charging infrastructure, training and technical documentation can be combined. For Gdynia, this means that the Action Plan is not a stand-alone concept document but a bridge between strategy, procurement readiness and future funding applications.



At EU level, the Plan is aligned with the European Green Deal, the Clean Vehicles Directive, AFIR, the Energy Efficiency Directive, the Renewable Energy Directive and the Batteries Regulation. In practical terms, this means the Action Plan must address not only fleet replacement, but also lifecycle emissions, renewable electricity, battery durability, data availability, interoperability and end-of-life management. Strong synergies exist with CE4CE Output O2.2 on infrastructure circularity, the battery deliverable on lifetime extension and second-life use, the Gdynia pilot on digital-twin-based electrification scenarios, and the CE4CE solution for KPI-based circular business planning.

4. Development of the Action Plan for circular and resilient electromobility in Gdynia

4.1. The methodology used in the Action Plan development process

The Action Plan was developed using the CE4CE common methodology for strategies and action plans. The starting point was the Circularity Compass and its avoid-extend-transform logic, which was translated into local investment and operational choices for PKA. The work combined evidence from the Western Corridor pilot, the battery lifetime and charging strategy analysis, local operational data, and strategic review of city, national and EU frameworks.

Measures were screened and prioritised against five criteria: circularity impact, implementation readiness, relevance for service reliability, financing plausibility, and contribution to ESG objectives at municipal capital-group level. The Digital Twin and the KPI planning tool were used not as stand-alone outputs, but as decision-support instruments for selecting measures that can be justified technically, financially and institutionally.

4.2. Stakeholder engagement process

The stakeholder process was organised in two layers. The core development team consisted of PKA Gdynia, the University of Gdansk and KRUCH, who worked on the technical evidence base, local applicability and measure design. Around this core, a broader stakeholder map was prepared covering the Municipality of Gdynia, ZKM Gdynia, PKT Gdynia and other relevant public providers and city units responsible for mobility, energy, procurement and strategy. Local discussions focused on corridor selection, infrastructure options, KPI ownership, funding logic and practical implementation constraints.

From September 2023 onwards, the pilot and action-plan work progressed through collaborative problem definition, scenario testing, internal review and CEO consultation. By March 2026 the draft Action Plan, stakeholder mapping and KPI framework had been completed; measure refinement, prioritisation and alignment with city strategies were in progress; and final approval, responsibility allocation and launch of priority actions were identified as the next steps.

4.3. The Gdynia Action Plan

4.3.1. The main thematic area(s) covered

The Action Plan covers four mutually linked thematic areas:

- Circular electrification planning for lines and corridors, with preference for solutions that reduce battery size, lifecycle cost and material demand.



- Eco-efficient depot and charging infrastructure, including smart energy management, photovoltaic generation and storage-ready design.
- Circular procurement and asset lifecycle management for vehicles, batteries and infrastructure components.
- KPI-based governance, data sharing and cooperation between PKA, the city and other public providers.

4.3.2. Vision, objectives and targets

Vision: by 2030, PKA Gdynia operates as a more circular, lower-emission and investment-ready public transport provider that uses shared data, lifecycle thinking and inter-institutional cooperation to scale electromobility without locking in unnecessary material and energy use.

- By 2026, institutionalise a common KPI set, ownership model and annual reporting routine for electrification and circularity decisions.
- By 2027, prepare and launch the first implementation package, starting with line 194 electrification, subject to funding decisions.
- By 2027, complete a depot eco-efficiency and photovoltaic investment package, including smart charging and storage-ready design.
- From 2026 onward, apply circular procurement criteria and battery lifecycle requirements in all relevant tenders.
- By 2030, use Digital Twin and KPI assessment for all major fleet and infrastructure electrification decisions in PKA.

4.3.3. List of proposed measures, their prioritisation and the timeline for their implementation

- Measure 1 - Electrify line 194 (high priority; 2026-2028): use the line as the first demonstrator for circular, data-backed expansion of zero-emission service.
- Measure 2 - Institutionalise the Digital Twin and KPI planning tool (high priority; from 2026): make scenario testing and KPI ownership a standard input to investment decisions and reporting.
- Measure 3 - Upgrade depot eco-efficiency (high priority; 2026-2028): improve metering, smart charging logic, peak-load management and supporting technical retrofits.
- Measure 4 - Prepare depot PV deployment (medium-high priority; 2026-2029): implement photovoltaic generation with storage-ready design and future second-life battery integration where feasible.
- Measure 5 - Introduce circular procurement and structured cooperation arrangements (medium priority; from 2026): embed lifecycle battery management, reusable specifications and data-sharing with public providers and city units.

4.3.4. Estimated measure implementation cost(s), financing plan and funding sources

At this stage, costs are best expressed as order-of-magnitude bands; detailed CAPEX and OPEX estimates will be prepared during feasibility, design and procurement.



- Measure 1 requires high capital expenditure for vehicles, charging or traction infrastructure, grid connection, design and staff training.
- Measure 2 requires low to medium expenditure for software maintenance, data integration, staff training, KPI governance and analytical support.
- Measure 3 requires medium expenditure, but can generate relatively early operating savings through better energy management.
- Measure 4 requires medium to high expenditure for PV installation, potential storage, connection works and control systems.
- Measure 5 requires limited capital expenditure but continuous organisational effort for procurement templates, contract clauses, due diligence and monitoring.

The financing plan should combine PKA and municipal funds with external sources such as national zero-emission transport support, NFOsIGW instruments including Zielony Transport Publiczny, KPO- and cohesion-type funding, EU regional and cooperation projects, and where justified ESCO or PPP models for energy infrastructure.

4.3.5. Estimated impact(s) aligned with the municipality's targets and objectives

The Action Plan is grounded in evidence that infrastructure-aware electrification can cut lifecycle cost and resource demand compared with battery-only approaches. In the Western Corridor simulations, pure battery-bus options on lines 140, 147, 160 and 190 required more vehicles than IMC-based operation; on Route 141, the battery requirement falls from around 700 kWh in a pure overnight-charging concept to about 60 kWh in an IMC plus OPP concept. For Gdynia this translates into four strategic impacts:

- Environmental: lower local emissions and noise, lower embedded battery-related emissions, higher renewable-electricity share and lower material intensity of electrification.
- Social: better service robustness on demanding corridors, quieter operation and a clearer skills agenda for drivers, dispatchers and maintenance staff.
- Economic: lower risk of oversizing batteries and charging infrastructure, better total cost of ownership and stronger funding readiness.
- Governance and ESG: auditable indicators, better cooperation across the municipal capital group and more credible investment decisions.

4.4. Monitoring & evaluation plan

4.4.1. The monitoring plan

The monitoring system should use a small, stable KPI set derived from the CE4CE planning tool and linked, where relevant, to SUMP and urban-node reporting. The core indicators proposed for PKA are: share of zero-emission vehicle-km in service; annual electricity consumption per vehicle-km; average battery capacity in procured vehicles on affected lines; share of electricity generated internally; implementation status of priority measures; and share of relevant procurements containing circular and lifecycle clauses.

Data should be collected quarterly and consolidated annually. Operational data will come from vehicle telematics, depot chargers, energy meters and timetable systems; investment and procurement data from project files and contract registers; and ESG and governance data from management reporting. PKA should maintain the central KPI register, with ZKM and municipal departments providing supplementary inputs where indicators overlap with city mobility and climate reporting.



A short annual implementation note should classify each measure as not started, in progress, completed or delayed, explain deviations from plan, and trigger corrective decisions. From 2026 onward, the KPI dashboard should also serve as a common reporting layer for PKA management, the municipality and CE-related project follow-up.

4.4.2. The evaluation methodology

The evaluation approach should combine process evaluation and outcome evaluation. Process evaluation will check whether the agreed measures were launched on time, funded, assigned to clear owners and embedded in procurement and operational routines. Outcome evaluation will compare observed effects against the 2025/2026 baseline and against the scenarios developed in the Digital Twin, focusing on energy use, battery demand, infrastructure efficiency, service robustness, funding leverage and circularity outcomes.

A mid-term review in 2028 and a fuller review in 2030 are recommended. Where exact quantitative attribution is difficult, the evaluation should use contribution analysis: what the Action Plan changed in decisions, investments and governance compared with the pre-plan situation.

4.4.3. Institution(s)/ department(s) responsible for measure implementation, monitoring and evaluation

The following institutions should own implementation, monitoring and evaluation:

- PKA Board - formal approval, strategic oversight and annual review.
- PKA operations, technical and investment units - implementation of line 194, depot and charging measures.
- PKA procurement and finance - circular tendering, contract monitoring and funding applications.
- University of Gdansk - methodological support, KPI architecture and evaluation support.
- KRUCH and other technical partners - Digital Twin maintenance and scenario support as needed.
- ZKM Gdynia and the Municipality of Gdynia - network coordination, strategy alignment, permits and funding interface.
- PKT Gdynia and other public providers - cooperation on shared standards, knowledge and, where justified, infrastructure or data.

4.5. Risks associated to the implementation of measures

The main implementation risks are insufficient internal ownership, changes in management priorities, data gaps, underestimation of capital and operating costs, congestion effects on energy demand, and delayed grid or infrastructure approvals. The mitigation logic should remain pragmatic and staged:

- keep management sponsorship visible and link each measure to a named owner and reporting deadline;
- maintain the Digital Twin and KPI baseline so that funding and procurement decisions stay evidence-based;
- use phased investment packages instead of one large rollout, so lessons from early measures can be incorporated;
- build conservative financial assumptions for batteries, charging infrastructure and grid connection;



- prepare cooperation and communication routines early to reduce institutional friction and local resistance.

4.6. The process of Action Plan approval

As of March 2026, the draft Action Plan has been prepared, internally reviewed, discussed with management and matched with the CE4CE KPI framework. Stakeholder mapping has also been completed.

The remaining steps are final measure refinement, confirmation of financing logic, formal allocation of responsibilities and approval by the PKA Board, followed by integration of selected measures into company and city implementation documents.

The document should therefore be treated as implementation-ready but not yet fully closed from a governance perspective; formal approval is itself one of the first actions after CE4CE delivery.

5. Main outcomes, lessons learned and conclusions

5.1. Main outcomes of the Action Plan development process

The development process produced three concrete outputs: a prioritised Action Plan for PKA Gdynia, an evidence base from the Digital Twin and battery analyses, and a repeatable KPI governance framework for future electrification decisions. It also translated CE4CE's circularity logic into an operator-level roadmap that is specific enough to guide funding, procurement and organisational decisions.

5.2. Lessons learned

The main lessons are clear. First, internal buy-in is critical; without early management ownership, technically sound measures lose pace. Second, data quality matters as much as technology quality. Third, circularity cannot sit in a single department: operations, energy, procurement, finance and strategy all need shared ownership. Fourth, phased implementation is preferable to a single large investment package, because it allows Gdynia to learn, adjust and scale.

5.3. Conclusions

The Action Plan confirms that Gdynia should prioritise infrastructure-aware and lifecycle-aware electrification rather than replacing vehicles line by line without a system view. Digital tools reduce investment risk, but only if they are embedded in governance. Cooperation between PKA, the city and other public providers is therefore not an add-on; it is a condition for delivering circular electromobility in a financially credible way.

6. Next steps

The next agreed steps are:

- ✓ obtain final internal approval;
- ✓ allocate owners and decision deadlines for each priority measure;
- ✓ launch KPI tracking;



- ✓ begin the preparation of the first implementation package, with line 194 electrification and depot eco-efficiency as the leading actions.

To implement the Plan, PKA will need additional support in four areas: external funding, technical design and grid studies, procurement and legal support for circular criteria, and staff capacity for data integration and KPI management. Continued cooperation with the University of Gdansk, KRUCH and city departments is recommended during this scale-up phase.

From an ESG perspective, the Action Plan contributes to the environmental pillar through lower emissions, lower energy and material intensity and better battery lifecycle management; to the social pillar through more reliable and quieter service and workforce upskilling; and to the governance pillar through clearer ownership, auditable KPIs and integration with municipal capital-group reporting.

Identified and potential funding sources include municipal and company own funds, national support for zero-emission public transport and electromobility, NFOsIGW instruments such as Zielony Transport Publiczny, KPO- and cohesion-type sources, regional funds and future EU cooperation projects. The financing logic should prioritise mixed packages that combine vehicles, infrastructure, digital tools, training and renewable-energy components.

The Action Plan should also be linked to the implementation and update of Gdynia's SUMP and to further EU-funded work on sustainable urban mobility, digital planning and circular battery and infrastructure management. Secured funding should be used first for ready-to-implement measures; external project funding should then scale up the full rollout.

7. Annexes

The annexes below summarise the priority measure portfolio and the proposed KPI and governance set to be used in the first implementation cycle.

7.1. Annex 1: Priority measures and indicative phasing

Indicative implementation package:

- 2026 - final approval, KPI governance launch, funding preparation, detailed concept for line 194 and a depot energy audit.
- 2026-2027 - procurement and design preparation for line 194; installation of metering, smart charging and supporting depot upgrades.
- 2027-2028 - launch of the first infrastructure and fleet package; preparation of PV deployment with storage-ready design.
- 2028-2030 - extension of data-backed electrification decisions to additional lines and corridors; annual review and corrective action cycle.
- Cross-cutting from 2026 onward - circular procurement clauses, battery lifecycle requirements and inter-provider data-sharing routines.

7.2. Annex 2: Proposed KPI and governance set

Recommended first-cycle KPI set and owners:

- Share of zero-emission vehicle-km in service - owner: PKA and ZKM - frequency: quarterly and annual.



- Electricity consumption per vehicle-km - owner: PKA technical and energy units - frequency: monthly and quarterly.
- Average battery capacity in new zero-emission vehicles - owner: procurement and technical units - frequency: per procurement.
- Share of self-generated renewable electricity - owner: facility and energy management - frequency: monthly and annual.
- Share of relevant tenders with circular and lifecycle clauses - owner: procurement - frequency: annual.
- Implementation status of priority measures - owner: management and project coordination - frequency: quarterly.
- Annual ESG and circular mobility implementation note issued - owner: PKA management with city liaison - frequency: annual.