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The Road to Zero Emissions: Policy Innovation and Electrification in Freight Transport

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Executive Summary

The European transport sector is facing an unprecedented wave of legislative initiatives from the EU, collectively requiring swift adaptation and strategic action. Failure to navigate these changes risks undermining both competitiveness and the credibility of climate goals. Reaching a fossil-free freight sector by 2050 demands transformative policy innovation to drive electrification and sustainable logistics. Drawing on the Triple F initiative, this paper explores how policy innovation can be used as a lever to support the further build-up of a resilient, electrified transport ecosystem. By championing a policy driven approach, Europe can lead the way to a zero-emission future, setting a global standard in sustainable freight.

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1 Introduction

The decarbonization of freight transport is emerging as one of the most critical—and complex—frontiers in the EU's transition to a fossil-free economy by 2050. While the technological maturity of electric vehicles (EVs) is advancing rapidly, the pace of adoption in the freight sector remains slow, hindered by deep structural, infrastructural, and regulatory barriers. Electrifying freight is not only a matter of deploying new vehicle technologies; it requires a fundamental reconfiguration of how energy, transport, and policy systems interact. Given the urgency of the climate crisis and the long lead times for transforming vehicle fleets and building enabling infrastructure, conventional regulatory approaches are proving inadequate. There is a pressing need to rethink how policy is designed, governed, and implemented—moving beyond linear, siloed frameworks to more iterative, adaptive, and cross-sectoral models of policy innovation that can respond to the complexities of large-scale electrification. This paper argues that regulatory innovation is not a peripheral concern, but a central enabler of the systemic transformation required for fossil-free freight transport.

Sweden's Triple F (Fossil Free Freight) program (1) provides a relevant context for exploring how policy innovation can address these challenges. Triple F is the Swedish Transport Administration's research and innovation initiative aimed at accelerating the transition of the Swedish freight transport system to fossil-free operations. It is hosted by Lindholmen Science Park in collaboration with the Swedish National Road

and Transport Research Institute (VTI) and Research Institutes of Sweden (RISE). The program, which runs from 2018 to 2030, brings together actors from industry, academia, and the public sector in collaborative research and innovation projects designed to generate new knowledge and drive systemic change. Triple F's approach addresses the transition through three key dimensions: technology, policy, and logistics. This includes promoting a more transport-efficient society, supporting the development and uptake of energy-efficient and fossil-free vehicles, and facilitating the shift to renewable fuels.

The work presented in this paper is conducted within the TripleF Policy-track, addressing system-wide challenges and opportunities in the freight sector. It involves the establishment and implementation of a *policy lab aimed at gaining a deeper understanding of, and effectively addressing, the regulatory challenges and opportunities associated with achieving fossil-free freight transport.*

2 The Role of Policy Innovation

In light of the EU's increasingly ambitious and expansive legislative agenda—driven by the *Green Deal* (2), *Fit for 55* (3), and the broader aim of achieving climate neutrality by 2050—there is a growing imperative to harness policy innovation as a strategic lever. Such innovation is not only essential for reaching decarbonization targets but also for ensuring that supporting infrastructures evolve in concert with emerging regulatory frameworks. Rather than treating regulation as a static compliance mechanism, policy innovation repositions it as a dynamic tool for enabling systemic change, particularly in complex domains such as freight transport electrification.

One of the most pressing and persistent barriers to the large-scale adoption of electric freight vehicles is the lack of sufficiently distributed, high-capacity charging infrastructure. The challenge is not merely technical but deeply infrastructural and institutional, involving questions of land use, energy grid capacity, financing models, and inter-organizational coordination. Traditional policy instruments—such as mandates or prescriptive infrastructure expansion targets—often fall short in this context, especially given the scale of capital investment, the fragmented nature of the freight sector, and the uneven spatial distribution of charging needs between dense urban zones and sparsely populated rural corridors.

Policy innovation offers a way to rethink the roles and responsibilities of public and private actors and to experiment with new governance models that can unlock coordinated action. One promising avenue is to develop incentive structures that stimulate collaboration between government authorities, logistics companies, energy providers, and infrastructure developers. Public-private partnerships (PPPs), if designed with adequate safeguards and flexibility, can serve as accelerators for infrastructure roll-out by distributing financial risk and aligning divergent interests.

Targeted policy instruments could include public subsidies earmarked for the installation of megawatt-scale charging stations at logistics hubs in remote regions, where market-driven investment would otherwise be unlikely. Simultaneously, municipal governments could enact zoning policies or low-emission zones that reward early adopters of electric heavy-duty vehicles (HDV's), thus generating local demand for charging infrastructure. Beyond financial tools, regulatory sandboxes or temporary exemptions could be employed to test novel business models and technology configurations under real-world conditions, offering both learning opportunities and a faster route to scale.

Crucially, such a multi-tiered and adaptive policy architecture acknowledges that electrification is not a one-size-fits-all process. Freight operations vary widely in terms of route patterns, vehicle turnover cycles, and operational margins. Effective policy innovation must therefore be grounded in a deep understanding of the sector's heterogeneity and must be capable of tailoring interventions to different geographic, economic, and logistical contexts.

In sum, the role of policy innovation in this space is not simply to facilitate compliance with climate targets but to actively shape the conditions under which a viable, inclusive, and scalable electrification pathway becomes possible. It entails reconfiguring how infrastructure investment decisions are made, how value is

distributed among stakeholders, and how regulatory frameworks can support rather than stumble behind technological and organizational change.

3 Policy Lab Methodology: Innovating through Service Design

With the European Union generating an ever-increasing stream of legislative initiatives—often with far-reaching implications for sustainability, digitalization, and cross-border coordination—there is a growing need for regulatory development processes that are not only responsive but also resilient in the face of future uncertainties. This calls for innovative, structured approaches that enable policymakers and stakeholders to engage in the design of regulatory frameworks that are adaptive, context-sensitive, and capable of evolving alongside technological, societal, and environmental transformations.

In response to the complex regulatory challenges tied to the transition toward fossil-free freight transport, we are applying a methodologically grounded and practice-oriented process inspired by the widely recognized double diamond model from service design (4). This framework divides the innovation process into four distinct yet interrelated phases—*Discover, Define, Develop,* and *Deliver*—each serving a particular function in balancing open-ended exploration with the formulation of targeted, implementable solutions. The strength of this approach lies in its ability to support both divergent and convergent thinking, allowing us to understand the problem space comprehensively before moving toward concrete regulatory strategies.

Having just completed the *Discover* phase, which aimed to cast a wide net and develop a nuanced, system-level understanding of the problem landscape, we are now entering the *Define* phase. In Discover, we mapped the current policy and regulatory ecosystem (5), identified systemic barriers, and uncovered hidden assumptions that may hinder progress toward decarbonization goals. This phase involved stakeholder mapping, semi-structured interviews, exploratory workshops, and trend analyses to gather qualitative insights from actors across the freight value chain—including logistics providers, public authorities, infrastructure owners, and technology developers.

Now, in the Define phase, we are synthesizing the insights gathered to clearly define the core regulatory challenges and priorities that need to be addressed. This stage is crucial for framing the problem space in such a way that it supports the development of targeted, feasible, and implementable solutions in subsequent phases.

The purpose of these early phases is not to rush into solutions but to ground future ideation in a deep, empirically informed understanding of stakeholder needs, regulatory frictions, and broader socio-technical dynamics. These insights help us surface both urgent regulatory bottlenecks and more subtle misalignments between policy goals and operational realities.

By anchoring our work in an iterative process that emphasizes learning, reflection, and responsiveness to new insights, our policy lab remains agile and inclusive. This ensures that the regulatory prototypes developed in later phases are not only theoretically sound but also practically viable and sensitive to the needs and constraints of those expected to implement them. Ultimately, this methodology equips us to co-create regulatory frameworks that can better support the system-level shifts required for a sustainable and fossil-free freight transport sector

4 Aligning Infrastructure Development with Policy Objectives

The transition to electric freight transport hinges on the development of robust, strategically placed charging infrastructure that aligns with both climate objectives and the operational needs of logistics actors. While technological advancements in battery range and vehicle performance continue at a rapid pace, the rollout of public and semi-public charging infrastructure—particularly for heavy-duty vehicles (HDVs)—lags behind. This misalignment between vehicle electrification goals and infrastructure readiness presents a critical governance challenge.

Recent regulatory developments in the European Union are beginning to address this. The *Alternative Fuels Infrastructure Regulation* (AFIR), adopted in 2023 as part of the broader *Fit for 55* package, mandates minimum infrastructure requirements across the trans-European transport (TEN-T) network, including HDV-compatible chargers with high power output at regular intervals (6). However, the regulation's implementation relies heavily on national execution plans, which in many Member States, including Sweden, remain under development or lack sufficient detail regarding freight-specific needs.

In Sweden, the National Electrification Strategy (7) set an overarching direction but do not provide binding commitments regarding freight corridors, logistics hubs, or intermodal terminals. Furthermore, the strategy lacks explicit integration with the Swedish Transport Administration's planning processes, raising concerns about coherence between national climate goals and spatial infrastructure development.

This fragmented landscape underscores the need for policy innovation that goes beyond the traditional, linear planning and procurement models. Electrification of freight transport requires anticipatory and adaptive governance mechanisms capable of navigating complexity, coordinating multiple actors, and aligning disparate policy domains—climate, transport, energy, and regional development. One promising approach is to establish strategic coordination platforms that operate across administrative levels and policy sectors. These platforms would ensure that grid expansion, charging deployment, and logistics planning are synchronised and mutually reinforcing.

A particularly urgent issue is the alignment of infrastructure investment with electricity grid capacity and permitting processes. Currently, the long lead times for grid connection and the lack of priority rules for freight-relevant infrastructure create a systemic bottleneck. Innovative regulatory approaches—such as dynamic prioritisation of grid access for zero-emission logistics nodes—could help overcome this hurdle.

In sum, aligning infrastructure development with electrification goals requires a paradigm shift in how we govern large-scale transitions. It is not merely a question of funding or technology deployment, but of reconfiguring the institutional and regulatory architecture that shapes long-term planning decisions. Only by fostering systemic coordination and regulatory foresight can infrastructure provision match the pace and ambition of freight electrification policies.

5 Rethinking Economic Incentives and Funding Mechanisms

As electrification transforms the road freight sector, it simultaneously reveals the limitations of treating transport modes in isolation. To achieve the full climate mitigation potential of zero-emission vehicles, electric freight must be embedded within an optimized, intermodal logistics system. This entails not only the physical coordination of trucks, rail, and maritime transport, but also the seamless exchange of data across platforms, operators, and authorities.

Currently, policy frameworks tend to regulate different transport modes in silos, with limited integration of digital infrastructure planning or shared governance mechanisms. The result is a fragmented data landscape where logistics operators must navigate inconsistent standards, closed proprietary systems, and limited interoperability between public and private actors. This fragmentation is particularly problematic for electric heavy-duty vehicles (HDVs), which have range and charging constraints that require careful coordination with rail or sea legs to optimize delivery routes and minimize idle time.

At the EU level, several policy instruments are attempting to address these gaps. The revised *TEN-T Regulation*, under negotiation as of 2024, includes explicit goals for digitalisation and modal shift, encouraging Member States to develop "smart and sustainable logistics corridors." (8) Furthermore, the *Regulation on Electronic Freight Transport Information* (eFTI), which enters into application in 2025, mandates that public authorities accept freight information in digital form, thereby facilitating smoother information flows (9). However, these regulatory changes focus primarily on compliance and data format standardisation, not on incentivising proactive data sharing or intermodal optimisation.

The Swedish context reflects similar limitations. Although national strategies recognizes the need for intermodal coordination, there is limited regulatory or financial support for the digital systems and collaborative structures that would enable it. Pilot projects have demonstrated the potential of shared logistics data to improve planning and emissions tracking, but these remain isolated initiatives without systemic policy backing.

To move beyond pilot fatigue, policy innovation is needed in several directions. First, *incentive structures for data sharing* could be developed, particularly for actors in the logistics value chain who perceive data as a competitive asset. One option is to tie access to public funding or permits to participation in common data platforms, thereby aligning private incentives with collective intelligence. Another is to support neutral data intermediaries that can ensure secure and equitable access to transport data without risking market distortion.

Second, *digital intermodal planning tools*—such as digital twins or AI-supported routing algorithms—could be formally integrated into transport policy and infrastructure planning. These tools require harmonised data inputs across modes and jurisdictions, which in turn necessitates regulatory alignment and long-term institutional support. The inclusion of such tools in environmental permitting or strategic transport planning processes could dramatically improve the precision and resilience of the logistics system.

Third, *regulatory alignment with sustainability reporting* obligations - such as those under the EU *Corporate Sustainability Reporting Directive (CSRD)* (10) - can serve as a catalyst for standardised emissions accounting across modes. By linking CSRD reporting requirements to publicly supported logistics platforms or open data initiatives, policymakers could create positive feedback loops that improve both compliance and system-level efficiency.

Ultimately, enabling intermodal integration through data is not merely a technological issue but a question of institutional design and policy foresight. It requires shifting from reactive compliance-based approaches to proactive ecosystem-building, where data is treated as a shared infrastructure for sustainable mobility. Through targeted regulatory reform and coordinated public investment, data-driven intermodality can become a central pillar in the transition to fossil-free freight transport.

6 Data-Driven Governance and Intermodal Integration

As freight electrification accelerates, it becomes increasingly evident that technical upgrades to individual vehicle fleets are insufficient. Systemic decarbonisation of freight transport depends on more than shifting fuel sources—it requires a holistic reconfiguration of logistics chains, modal choices, and digital coordination mechanisms. In this context, data-driven policy emerges as both an enabler and a prerequisite for efficient, electrified, and intermodal transport systems.

Currently, most policy frameworks treat transport modes in isolation. Road, rail, and sea logistics are governed by distinct regulatory logics, data infrastructures, and administrative silos. Yet the electrification of freight—especially for long-distance or cross-border operations—demands seamless coordination between these modes, with electric trucks often serving as the first or final link in a multimodal logistics chain. To support such integration, policy must shift focus from static modal infrastructure to dynamic, data-informed logistics ecosystems.

One of the most critical needs is for interoperable data systems that allow different stakeholders—freight operators, charging providers, port authorities, rail operators, and public agencies—to exchange real-time information on vehicle status, energy consumption, congestion, and emissions. Without this visibility, electric freight vehicles risk being underutilised, or worse, becoming bottlenecks in otherwise efficient systems. Policies must therefore support the development of shared digital infrastructure, including standardised APIs, secure data-sharing protocols, and governance models for cross-sectoral data trust.

The CSRD and other EU-level sustainability disclosure requirements are beginning to nudge companies toward better emissions tracking. But reporting alone is not enough—regulatory frameworks must incentivise the operational use of data to drive low-emission logistics decisions. For example, dynamic route planning based on real-time energy availability, predictive maintenance of EV fleets, or emissions-based access policies in urban logistics zones all require robust, standardised data flows. Policymakers could support this through public funding for digital infrastructure, regulatory mandates for open data, and sandboxes for testing new forms of algorithmic decision-making in freight operations.

Intermodal coordination also has a spatial and infrastructural dimension. Strategic electrification of intermodal hubs—such as ports, rail terminals, and logistics parks—could act as anchor points for zero-emission freight corridors. These hubs must be equipped not only with appropriate charging infrastructure, but also with the digital capacity to orchestrate vehicle movements, grid interactions, and scheduling in a way that optimises energy and asset use. Here, national and regional governments have a key role to play in aligning land-use planning, energy policy, and transport regulation.

Finally, a data-driven approach to intermodal electrification can contribute to more just and inclusive policy outcomes. By analysing freight flows at a granular level, policymakers can identify underserved regions, labour impacts, and infrastructural gaps—and design interventions that promote both climate and social equity goals. This could include targeted electrification incentives for SMEs, rural freight corridors, or high-emission urban zones with vulnerable populations.

In sum, data must be recognised as infrastructure—as critical to electrification as roads or charging stations. Enabling its use requires not just technical tools, but legal and institutional innovation. Only by embedding data into the heart of freight policy can we unlock the full system benefits of electrification, from emissions reduction to resilience and cost efficiency.

7 Regulatory Sandboxes for Technological and Policy Innovation

The rapid pace of technological change in the freight sector—particularly in relation to electric heavy-duty vehicles (HDVs), charging infrastructure, and digital logistics platforms—has outstripped the traditional capacities of regulatory systems to adapt. Regulations, designed for stability and predictability, tend to lag behind innovations that challenge existing norms, technical standards, and risk assumptions. In this context, regulatory sandboxes offer a vital policy innovation tool: controlled environments in which new technologies, business models, or regulatory ideas can be tested in dialogue with authorities before full-scale implementation.

While sandboxes are increasingly used in sectors like fintech and healthcare, their application in the transport and mobility domain remains underdeveloped. Yet the freight sector is especially well-suited to this approach, given its mix of public and private actors, capital-intensive infrastructure, safety-critical operations, and strong path dependencies. By creating spaces for experimentation, sandboxes can support the transition to fossil-free freight transport in several key ways.

First, *technical pilots for zero-emission freight corridors* - including ultra-fast charging hubs for HDVs, battery-swapping infrastructure, or hybrid stations combining hydrogen and electric charging - could be deployed under temporary exemptions or tailored regulatory frameworks, if applicable. These setups allow for real-world stress-testing of interoperability, payment systems, safety protocols, and power grid impacts. Data collected in these sandboxes would then inform future regulation and investment priorities, reducing the risk of stranded assets or misaligned standards.

Second, sandboxes can serve as *platforms for experimenting with governance and rulemaking itself*. For instance, freight operators, municipalities, grid companies, and national agencies might co-design adaptive regulations for night-time deliveries using electric trucks, balancing noise ordinances with climate benefits. This type of collaborative sandbox could pilot new models for public-private rulemaking, testing how

dynamic regulations (e.g. time- or location-specific exemptions) might be scaled without undermining legal certainty or public trust.

Third, sandboxes could be used to evaluate *cross-border regulatory alignment*, particularly as EU Member States implement divergent national rules around charging, permits, and emissions reporting. A sandbox anchored in a European freight corridor—such as the TEN-T core network—could test how harmonised rules for electric freight operation affect logistics performance, legal compliance, and emissions outcomes. This would support not only technical innovation but also the EU's broader ambitions for the Single Market for Green Transport.

Importantly, sandboxes are not simply "relaxed" regulatory spaces—they must be designed with clear entry and exit criteria, robust evaluation mechanisms, and mechanisms for scaling insights into permanent regulation. Establishing such a strategy would require clarifying the legal authority for temporary regulatory exemptions, defining risk-sharing mechanisms, and creating permanent institutional nodes for sandbox governance.

In sum, sandboxes represent a powerful instrument to align technological feasibility, regulatory agility, and stakeholder trust. They allow public authorities not just to permit innovation, but to co-create it.

8 Strengthening Institutional Capacity and Regulatory Foresight

The electrification of freight transport not only challenges existing technologies and market structures but also places significant demands on the institutional machinery responsible for governance. Policymakers, regulators, and public authorities are often expected to respond swiftly to technological change—yet in many cases, their institutional capacity, legal mandates, and organisational cultures are not calibrated for the pace or complexity of the current transformation. This disconnect threatens to slow down or misalign electrification efforts, particularly in sectors like heavy-duty freight, where interdependencies between actors, infrastructures, and jurisdictions are particularly pronounced.

A key insight is that no single authority currently holds the mandate or overview to steer the system-level transition of freight electrification (11). Responsibilities are fragmented across transport agencies, environmental regulators, energy authorities, and municipal actors, each operating under different legal frameworks and planning logics. This siloed structure makes it difficult to coordinate actions, align regulations, or anticipate how new technologies—such as megawatt charging systems, electric road systems, or dynamic pricing for electricity—will interact with each other in practice.

To meet the challenge, we argue that institutional capacity must be understood and developed in three interconnected dimensions: coordinative, anticipatory, and adaptive.

First, *coordinative capacity* refers to the ability of institutions to work across traditional policy domains and governance levels. Electrification requires not only technical compatibility between vehicles and infrastructure, but also legal compatibility between zoning laws, permitting procedures, taxation regimes, and procurement rules. Institutions must therefore develop mechanisms for horizontal and vertical coordination, including joint roadmaps, cross-agency working groups, and shared investment strategies. Here, national governments can play a key role by mandating coordination platforms or establishing "transition mandates" that extend beyond siloed authority structures.

Second, *anticipatory capacity* involves the ability to foresee emerging regulatory needs and proactively design frameworks that can accommodate innovation. This is particularly important in areas like grid integration, battery recycling, and platform-based freight services, where legal gaps or outdated norms can create systemic bottlenecks. Foresight tools such as scenario planning, technology impact assessments, and policy labs can help regulators move from a reactive posture to one of regulatory preparedness.

Third, *adaptive capacity* addresses the need for legal and institutional flexibility as technologies and practices evolve. Traditional regulatory models often assume stability and linear progress, whereas the electrification of freight is characterised by rapid iteration, multi-actor experimentation, and shifting business models. Policymakers must therefore be able to experiment, learn, and revise in real time. Regulatory sandboxes, sunset clauses, and evaluation-based policymaking are all tools that can enable more iterative, evidence-based approaches. Importantly, these adaptive mechanisms must be institutionalised, rather than ad hoc or reliant on individual champions within agencies.

Moreover, investing in institutional capacity also includes knowledge infrastructure—that is, the internal competence of public agencies to understand and govern complex systems. This entails recruitment of multidisciplinary expertise (e.g., in systems thinking, digitalisation, or behavioural economics), development of new regulatory skillsets (e.g., agile policymaking, public-private facilitation), and partnerships with academic and civil society actors who can supply independent analysis and reflexivity. Without these competencies, even well-designed regulations risk poor implementation or unintended consequences.

Finally, strengthening institutional foresight is also about governance legitimacy. Electrification will require difficult trade-offs—between short-term costs and long-term gains, between competing technologies, and between actors with different risk profiles. Institutions that lack transparency, inclusiveness, or credibility may struggle to make and sustain these decisions. Participatory foresight processes, such as scenario-based stakeholder dialogues or regional transition forums, can help build political and social support for bold policy shifts.

In short, electrification is not only a technical or economic transition—it is a profound governance challenge. By investing in regulatory foresight and institutional capacity, governments can not only remove barriers but actively shape the direction of innovation, ensuring that the transition is both effective and equitable.

9 Long-Term Vision and Cross-Sectoral Collaboration

Achieving the electrification of the freight transport system—and its overarching goal of becoming fossil-independent—requires more than technological breakthroughs or isolated policy instruments. It demands a shared, long-term vision that transcends legislative cycles and administrative boundaries. This vision must serve not only as a strategic compass for public authorities, but also as a coordinating force across sectors, governance levels, and time horizons.

Freight electrification differs fundamentally from the electrification of passenger vehicles. It involves a wider and more fragmented set of actors, from national road authorities and logistics providers to energy companies, municipal planners, vehicle manufacturers, and property owners. It also entails significantly higher investment risks, longer lead times, and complex operational integration between infrastructure, energy systems, and logistics chains. In this context, the absence of a shared, long-term vision leads to fragmented investments, misaligned incentives, and suboptimal infrastructure deployment.

A long-term vision must be politically anchored yet operationally concrete. At the national level, this could involve the establishment of binding targets for the electrification of freight transport, akin to renewable energy goals. These targets could be sector-specific (e.g. percentage of electric heavy-duty trucks by 2035), geographically differentiated (e.g. electrification corridors), or linked to procurement and investment criteria in public infrastructure planning. National roadmaps should outline infrastructure development over 10–15 years, integrating energy and transport planning with attention to charging needs, grid capacity, and multimodal integration. Importantly, these roadmaps must also be dynamic, allowing for regular updates based on technological developments and market shifts.

However, vision-setting alone is insufficient. Effective implementation hinges on cross-sectoral collaboration, both horizontal (across sectors and agencies) and vertical (across governance levels). Currently, many

public institutions operate under distinct planning logics and regulatory frameworks that inhibit integrated action. For example, as observed in Swedish policy practice, municipalities are responsible for spatial planning and permitting yet lack the legal tools or financial mandates to invest in regional freight infrastructure. Similarly, energy authorities plan grid development based on static demand projections, often misaligned with the ambitions of transport electrification. Overcoming these gaps requires new forms of institutional bridging and governance innovation.

Furthermore, collaboration must extend to non-traditional partners, including property developers, port authorities, and retail chains—actors whose decisions around land use, logistics hubs, and supply chains can either enable or obstruct electrification. Policy instruments such as incentivised local agreements, green freight zones, or co-funded logistics innovations can catalyse joint action across sectors.

From a policy innovation perspective, long-term vision and collaboration are not only means to an end; they also serve as preconditions for adaptive governance. When actors share a strategic direction and understand their interdependencies, they are more capable of handling uncertainty, experimenting with new approaches, and adjusting to change. In this sense, a coherent vision functions as a platform for flexibility, rather than rigidity.

Finally, maintaining momentum over time requires institutional memory, political continuity, and strategic alignment. Governments must ensure that visionary goals survive beyond electoral cycles, which calls for embedding long-term targets in legal frameworks, aligning them with EU-level commitments, and linking them to stable financing mechanisms. Only then can the freight sector move from fragmented pilot projects to systemic transformation.

10 10. Conclusion: From Fragmentation to Strategic Governance

The electrification of freight transport represents one of the most complex and consequential transitions facing European societies today. It challenges traditional silos of policymaking, stretches the boundaries of existing regulatory frameworks, and requires coordination across infrastructure, logistics, and energy systems. This article has explored how policy innovation—anchored in foresight, flexibility, and collaboration—can support this transition in a way that is both effective and legitimate.

We have argued that success depends not only on technological readiness or economic incentives, but also on the *institutional capacity to govern complexity*. This includes the ability to anticipate future needs, to experiment with new regulatory approaches such as sandboxes and adaptive frameworks, and to engage diverse actors in co-creating viable solutions. It also demands long-term vision and cross-sectoral coordination, particularly as the freight sector is governed through a patchwork of municipal responsibilities, national roadmaps, EU-level mandates, and private investments.

The emerging EU legislative landscape—from AFIR to CSRD and the revised TEN-T framework—offers both pressure and opportunity. These instruments can act as accelerators, but only if national and regional governments are prepared to translate legislative intent into actionable strategies. Without such translation, there is a real risk that regulatory complexity will stall progress, particularly among municipalities and smaller freight operators that lack capacity to navigate or act on new requirements.

What is needed now is a strategic shift—from fragmented, reactive governance to a more anticipatory and systemic approach. Policymakers must rethink the role of regulation not merely as a compliance tool, but as an enabler of transition. This means designing policy instruments that are dynamic, scalable, and sensitive to real-world experimentation. It also means investing in the institutional structures that make such policies possible: cross-sectoral platforms, data-sharing infrastructures, and public–private partnerships with clear mandates and shared goals.

Looking ahead, the window of opportunity is narrow. The next five years will be decisive in setting the path toward—or away from—a fossil-independent freight system by 2030 and beyond. Failing to act now risks not only falling short of climate targets, but also missing the opportunity to position Europe as a global leader in sustainable logistics and transport innovation.

In sum, electrifying freight is not simply a technological project—it is a governance challenge. Meeting that challenge will require courage, coordination, and creativity in equal measure.

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Biography

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Kristina has worked for the Swedish government in various positions including drafting the proposal for legislation regarding autonomous vehicles driving on public roads. Her research at RISE focuses on legal challenges with innovations and digitalization in the transport sector. She is a member of RISE's policy lab working on identifying what amendments to existing policies, regulations and rules that are necessary to facilitate introduction of new technology on the market. She is also a member of the TripleF program board working with promoting fossil free freights.

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