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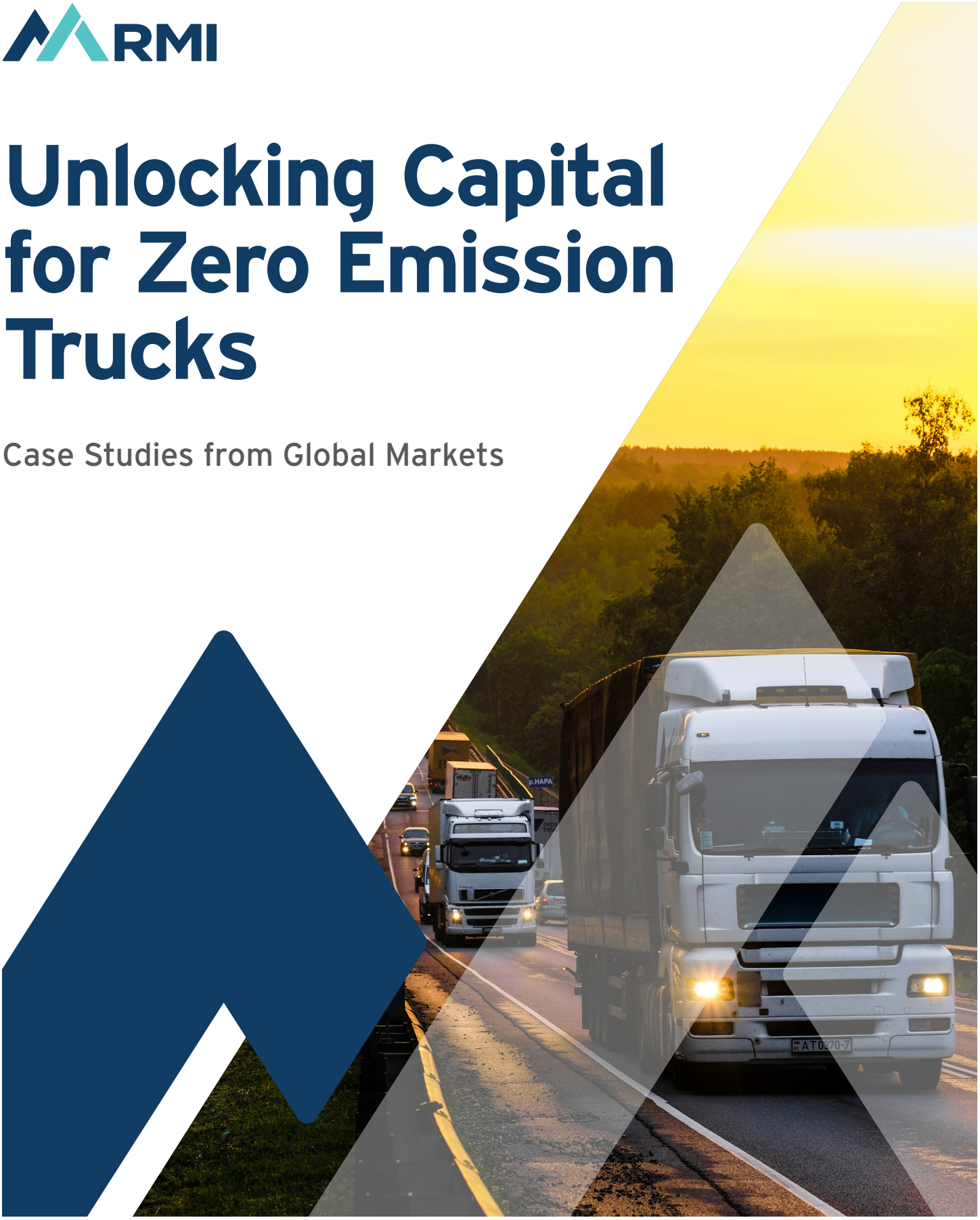
Unlocking Capital for Zero Emission Trucks

Case Studies from Global Markets



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Executive Summary

The trucking sector is responsible for 34% of CO_2 emissions and 53% of particulate matter (PM) emissions from India's road transport. As India advances toward its net-zero targets, transitioning to zero-emission trucks (ZETs) is essential, due to their significant benefits including reduced emissions, improved public health, enhanced energy independence, and lower logistics costs. One critical lever to accelerate this transition is access to affordable financing.

There is currently a lack of financing products available for ZETs in the Indian market. Obtaining loans for ZETs is also more difficult than for diesel vehicles and often comes with higher interest rates. Since the capital costs of ZETs are already two to six times higher than those of diesel counterparts, these financing challenges further hinder their market adoption.[1] The challenges stem from real risks and investors' perceived risks associated with ZET technology, including doubts about steady revenue returns, battery performance, skilled maintenance labor for ZETs, and the availability of charging infrastructure.

To tackle these challenges, financial solutions such as innovative financing tools and business models are essential for improving the accessibility and affordability of capital in the ZET market. Financial tools that mobilize private investment are essential for sourcing the capital needed to accelerate this transition at the required pace. ZET-specific business models can also play a critical role in enhancing the operational viability of ZETs, distributing risk, and strengthening the business case to attract capital.

Across the globe, markets have been piloting innovative solutions to mobilize financing to drive the ZET transition, particularly in China, Europe, and the United States. From 2020 to 2023, the newly registered electric trucks in these three geographies together accounted for 95% of the total new electric trucks sold worldwide.[2] These markets have benefited from financial interventions such as grants and tax incentives, concessional finance tools, innovative business models such as mobility-as-a-service, and de-risking practices.

This report examines how different regions are financing and de-risking the transition to ZETs and focuses on how lessons and implications can be applied to India's emerging ZET market. In 2024, RMI and The Centre of Excellence for Zero Emission Trucking (CoEZET) published the *Comprehensive Guide to Financing the Zero-Emission Trucking Transition in India,* detailing eleven ZET financing solutions for India under three categories: finance tools, business models, and de-risking practices.[3] Building on the framework introduced in the comprehensive report, this report explores three key tools — risk-sharing facilities, insurance, and mobility-as-a-service — highlighting how they have been successfully implemented globally and their implications for India. These tools were selected for their potential to address the product and technology risks associated with ZETs, thereby improving access to capital and reducing the cost of ZET ownership. Additionally, their greater market readiness in the selected geographies provides valuable

insights into how to design and implement such finance solutions on a practical level. The global examples of the three tools, along with their implications for India, are summarized below.

Risk-Sharing Facility: Risk-sharing facilities, often as loan guarantees, cover a portion of loan losses in the event of default. These guarantees enable financiers to hedge against loss in case of default to mobilize capital for ZET fleets. A leading example is California's Zero-Emission Truck Loan Pilot Project, which includes loan guarantees for both zero-emission trucks and infrastructure. This program targets small- and medium-sized fleets that face greater challenges in securing finance due to lenders perceiving them as higher risk. In India, where small fleets dominate the market, loan guarantees could serve as a catalyst to build commercial financiers' confidence in the ZET sector and unlock commercial lending.

Insurance: Insurance offers financial protection to truck owners from unforeseen risks and is often mandatory for truck operations on the road. ZET insurance is currently more expensive than diesel truck insurance and may sometimes be unavailable. Developing insurance solutions tailored to ZETs can help reduce perceived operational risks, making the sector more attractive to investors. China has been experimenting with regulatory measures to address this issue, such as capping premium rates and banning insurers from rejecting ZET insurance applications. The private sector is also developing innovative solutions, such as driving behavior databases to inform insurance pricing and low-cost ZET insurance offered by OEMs. These examples emphasize the need for collaboration among public entities, insurance companies, OEMs, and fleets to improve information transparency and refine insurance pricing.

Mobility-as-a-Service (MaaS): The MaaS model, which includes truck leasing along with additional services like charging infrastructure and maintenance, distributes ZET ownership risks to specialized parties that are better equipped to manage them. MaaS has gained traction through partnerships between OEMs, leasing companies, and development finance institutions in the United States, Europe, and China. A federal grant-funded MaaS program in the United States offers affordable ZET leasing and charging services for small drayage fleets. Europe has seen examples of a pay-per-use model, allowing fleets to lease ZETs based on kilometers driven. In China, some MaaS programs are supported by international development finance loans, enabling low-cost ZET leasing for fleet operators. These programs demonstrate that different forms of MaaS can be deployed in nascent ZET markets to lower the ZET market entry barrier for fleets.

With government subsidies for ZETs and increasing private sector interest, India is in a prime position to utilize various financial solutions to sustain ZET market growth.[4] By adapting global best practices for ZET financing to India's unique market conditions, the country can build a thriving ZET market that offers both climate benefits and long-term business viability.

Introduction

As fleets consider switching to ZETs,[i] cost competitiveness emerges as a primary concern. To sustainably drive the growth of the ZET industry, it is essential that these vehicles not only serve as zero-emission alternatives but also function as viable business solutions. In India, recent studies have shown that with no financial interventions, the up-front cost of ZETs can be two to six times that of their comparable diesel models, with the total cost of ownership being 20%–30% higher over a seven-year timeframe.[5]

The high up-front cost of ZETs and the investment needed for charging infrastructure and grid upgrades highlight the need to mobilize finance for market development. However, financial solutions for ZETs are currently either unavailable or come at higher costs. Unlike internal combustion engine trucks, which have been in the market for over 100 years, ZETs represent a new asset class that carries inherent investment risks for financiers. ZET-related risks include product risks, manufacturing risks, and risks for charging and grid infrastructure developers.[6] Among them, the risks associated with ZET products directly affect ZET's ability to secure low-cost financing, which is the focus of the solutions presented in this paper.

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i. Zero-emission trucks (ZETs) are vehicles that produce no tailpipe emissions, typically powered by hydrogen fuel cells or electricity. Globally, and in initial pilot projects in India, electric trucks have emerged as the most widely adopted technology. Consequently, in this report, the term "zero-emission trucks" predominantly refers to electric trucks unless stated otherwise.

Key ZET product risks include:

Technology Risks: Due to a lack of real-world data, consumers and investors share concerns about ZETs' operational performance in meeting business needs, including their ability to complete deliveries on time without delays due to charging, the consistency of battery performance over the years, and the impact of reduced truck payload.

Absence of Secondary Market: Since ZET is a new asset class, there is currently no active secondary market. As a result, finding affordable used parts for maintenance is challenging, and selling the truck at a reasonable price in the secondary market to recoup its value is also difficult.

Lack of Skilled Maintenance or Labor: Currently, less skilled labor is available in the ZET maintenance market than for diesel trucks, raising concerns about the timely repair and return of trucks to operations in case of a breakdown.

Infrastructure Risks: The widespread charging and refueling infrastructure network for ZETs is still under development, leading to doubts among consumers and investors about the availability of charging or refueling when needed.

Due to these perceived risks, commercial lenders are hesitant to provide low-cost financing for ZETs. Without further intervention, this creates a negative feedback loop, slowing the growth of the ZET market and allowing risks related to the lack of a used vehicle market and real-world operational data to persist. Therefore, developing financial solutions to address these risks as the ZET market grows in India can effectively initiate and sustain market growth.

In India, the ZET market has just taken off. Approximately 20 models with various battery capacities, ranges, and payloads are already available in the Indian market.[7] A growing number of electric truck pilots have been launched, with several others announced across the port, cement, mining, e-commerce, and highway corridor use cases.[8] In September 2024, the Government of India announced the PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme, which allocated INR 500 crore (US$57,814,150) for the deployment of electric trucks in India.[9] With increasing model availability, ongoing pilot programs, and government support, financing is now essential to solidify market incubation and ensure steady ZET growth. Early development of financing solutions will help ensure the economic viability of the transition to ZETs and lay the foundation for a thriving ZET market in India.

In the *Comprehensive Guide to Financing the Zero-Emission Trucking Transition in India,* RMI identified solutions to initiate and sustain the ZET market in India: (a) financing tools that leverage private and public capital to invest in the ZET market; (b) specific business models for ZET ownership and operations that effectively manage and distribute risks; and (c) de-risking practices that work to address risk uncertainty stemming from technology, regulation, market demand, and supply chain disruptions.

Although financing solutions for supporting ZET adoption in India have yet to be implemented on a large scale, they have proven effective in other regions, particularly in markets with higher ZET penetration. From 2020 to 2023, the newly registered electric trucks in China, Europe, and the United States together accounted for 95% of the total new electric trucks sold globally.[ii,10] Studying how financing solutions in these geographies have worked offers valuable best practices and a path forward for Indian policymakers and investors to leverage learnings to catalyze ZET market growth.

This report highlights three impactful ZET finance solutions and illustrates their effectiveness through case studies from the three largest ZET markets: China, Europe, and the United States.

- Risk-sharing facilities, such as loan guarantees, boost investor confidence in providing commercial loans to finance ZETs.
- Mobility-as-a-service (MaaS) reduces up-front purchase costs for fleets and lowers market entry barriers.
- ZET comprehensive insurance products can reduce insurance costs.

Together, these tools lower ZET ownership costs, unlock affordable financing, and increase investors' confidence in ZETs' ability to generate revenue.

The three solutions — risk-sharing facilities, mobility-as-a-service, and insurance — were chosen for several reasons. First, the three geographies studied provide concrete examples of how these tools can be designed and implemented in detail, offering actionable recommendations for India. Second, these tools provide market solutions for the product risks illustrated above. For example, insurance offers financial protection to truck operations and thus addresses the technology and maintenance risks. Under the MaaS model, charging and maintenance are managed by entities that are better positioned to manage infrastructure and maintenance risks. Lastly, loan guarantees help distribute lenders' liability by covering a share of their losses, ensuring that the risk of default is borne among multiple parties.

Finally, these three tools directly improve capital accessibility, reducing the financial barriers to entering the ZET market and lowering overall ownership costs.

The following sections provide an overview of the ZET finance industry in selected global markets and examine specific finance solutions deployed in these regions.

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ii. The term 'electric trucks' is specifically called out here because it is the technology highlighted in the source statistic.

Overview of ZET Finance Landscape in Key Global Markets

United States, China, and Europe account for 95% of global electric truck sales. In 2024, more than 90% of the ZET models in the market were manufactured in these three regions,[11] showcasing their significant role in both ZET supply and demand. Finance has played a crucial role in kick-starting and growing the sector. Government grants and subsidies, tax incentives, public and private finance, and innovative business models have been actively utilized in all three regions. Additional support mechanisms, such as workforce training, demand aggregation, and after-market services, have further strengthened the ZET market. These financial tools have incentivized domestic ZET manufacturing, ZET purchases, and investment in charging infrastructure, as summarized in **Exhibit 1** below.

Exhibit 1 Overview of ZET financing landscape in the United States, Europe, and China

ZET Manufacturing	ZET Purchase	Charging Infrastructure
United States		
The United States has several tax incentives, concessional loan programs, grants, and subsidies at the federal level to incentivize the manufacturing of ZETs. • **Tax incentives:** Under the Inflation Reduction Act, the Advanced Manufacturing Production Tax Credit (Section 45X) offers tax benefits for domestic battery manufacturing.[12] • **Loan programs:** Under the Advanced Technology Vehicles Manufacturing Loan Program, US$3 billion of credit subsidies are being offered to electric vehicle manufacturing,[iii] which has the potential to unlock US$40 billion in loans.[13] • **Grants:** The Domestic Automotive Manufacturing Conversion Grants program includes US$2 billion of grants to fund electric vehicle manufacturing in the United States.	With different policy details across states, purchase subsidies and tax benefits for ZETs are offered at the state and federal levels. Commercial loans are available for ZET purchase, with California being the only state that is currently offering loan guarantees for ZET commercial loans. Leasing is also a popular option offered by several mobility-as-a-service providers in the market, such as Zeem and Forum Mobility.	The United States provides subsidies and tax incentives for charging infrastructure projects, particularly along major freight corridors, through initiatives like the Bipartisan Infrastructure Act and the Inflation Reduction Act. The Loan Program Office (LPO) also offers concessional loans and loan guarantees for charging infrastructure investments. On the state level, subsidy programs like Energy Infrastructure Incentives for Zero-Emission (EnergIIZE) Commercial Vehicles in California cover 50%–75% of the total charging infrastructure costs.[14]

iii. Credit subsidy cost refers to the present value of cash flows from the government minus the present value of cash flows to the government in a loan agreement, which can be generally understood as the "cost of a loan to the government." See https://www.energy.gov/lpo/credit-subsidy for details.

Exhibit 1 Overview of ZET financing landscape in the United States, Europe, and China (continued)

ZET Manufacturing	ZET Purchase	Charging Infrastructure
Europe		
The European Investment Bank (EIB) has been providing concessional loans for ZET research and development (R&D) as well as manufacturing within Europe. In addition, the EU's Green Deal Industrial Plan seeks to boost the competitiveness of Europe's net-zero industry, including the ZET sector. The plan introduces measures such as simplifying permitting processes, providing workforce training, and unlocking existing funds to support ZET manufacturing.[15]	Similar to the United States, ZETs in Europe are primarily financed through a combination of leases, grants, and incentives, as well as loans from development finance institutions or commercial banks. For example, the Netherlands offers purchase subsidies for ZETs through the Purchase Grant for Zero-Emission Trucks (AanZET) program, which had a budget of €45 million (US$46,837,432) in 2024.[16]	The European Commission has dedicated funding to support ZET charging infrastructure investment. In addition, development finance banks also offer concessional loans for developing public charging networks. On the country-level, Norway's development agency Enova offers subsidies that cover up to 80% of ZET charging infrastructure costs.[17]
China		
China provides a range of policies at both national and subnational levels to promote ZET manufacturing. These include R&D funding, tax benefits, concessional loans, and access to low-cost land. For instance, eligible battery and truck manufacturers benefit from a reduced corporate income tax rate of 15%, compared to the standard 25%.[18] State-owned banks in China are instrumental in financing ZET manufacturing, covering activities such as raw material mining, battery production, and manufacturing business expansion.	China has been offering direct subsidies to ZET purchases at both national and subnational levels in the past decade, which have been gradually phased out.[19] For ZET-related financial services and products, the key market players in China include state-owned and privately owned commercial banks (such as China Construction Bank), OEM-owned auto finance firms (such as BYD auto finance), and independent non-banking financial institutions (such as Lionbridge Leasing).	At the city and provincial levels, China is offering a range of fiscal incentives, including direct subsidies and low-cost land, to support the development of charging infrastructure. Some of these incentives are aimed explicitly at the deployment of battery-swapping stations.

RMI graphic.

Insights into global best practices for ZET financing in these geographies can help promote knowledge sharing, build market confidence in ZET products and financing solutions, and ultimately accelerate the adoption of ZETs. Additionally, understanding the unique market conditions and regulatory environment in India is crucial for successfully implementing these tools within the Indian context. In the following sections, we will explore how financing solutions are applied in other regions and what lessons they offer for India.

Leveraging Global Insights on Financing ZETs

Risk-Sharing Facilities

Risk-sharing facilities can enhance a borrower's creditworthiness and reduce lender losses related to loan default. A loan guarantee is a common form of risk-sharing facility that covers a certain portion of losses in the event of a loan default. Loan guarantees can be designed for both ZET purchases and infrastructure investments. In global markets, loan guarantees are often supported by grants or concessional lending from public entities such as multinational banks or government agencies. A loan guarantee can be a win-win for both lenders and borrowers in the emerging ZET market, enabling ZET operators to access low-cost financing while mitigating the product and technology risks for first-mover lenders investing in this nascent technology.

CASE STUDY

California's Zero-Emission Truck Loan Pilot Project

California is a leading state in the transition to zero-emission trucks in the United States. The state has been the first in the country to set a target to achieve 100% ZETs in 2040, as well as the first state to mandate a certain percentage of trucks manufactured to be zero-emissions through the Advanced Clean Truck rule.[20] In order to achieve these targets, the state government has a series of enabling measures, including vehicle and infrastructure subsidies.[21] In May 2024, California launched a pioneering Zero-Emission Truck Loan Pilot Project, which is a first-loss loan guarantee program that aims to de-risk and incentivize private lending for ZETs in the state.

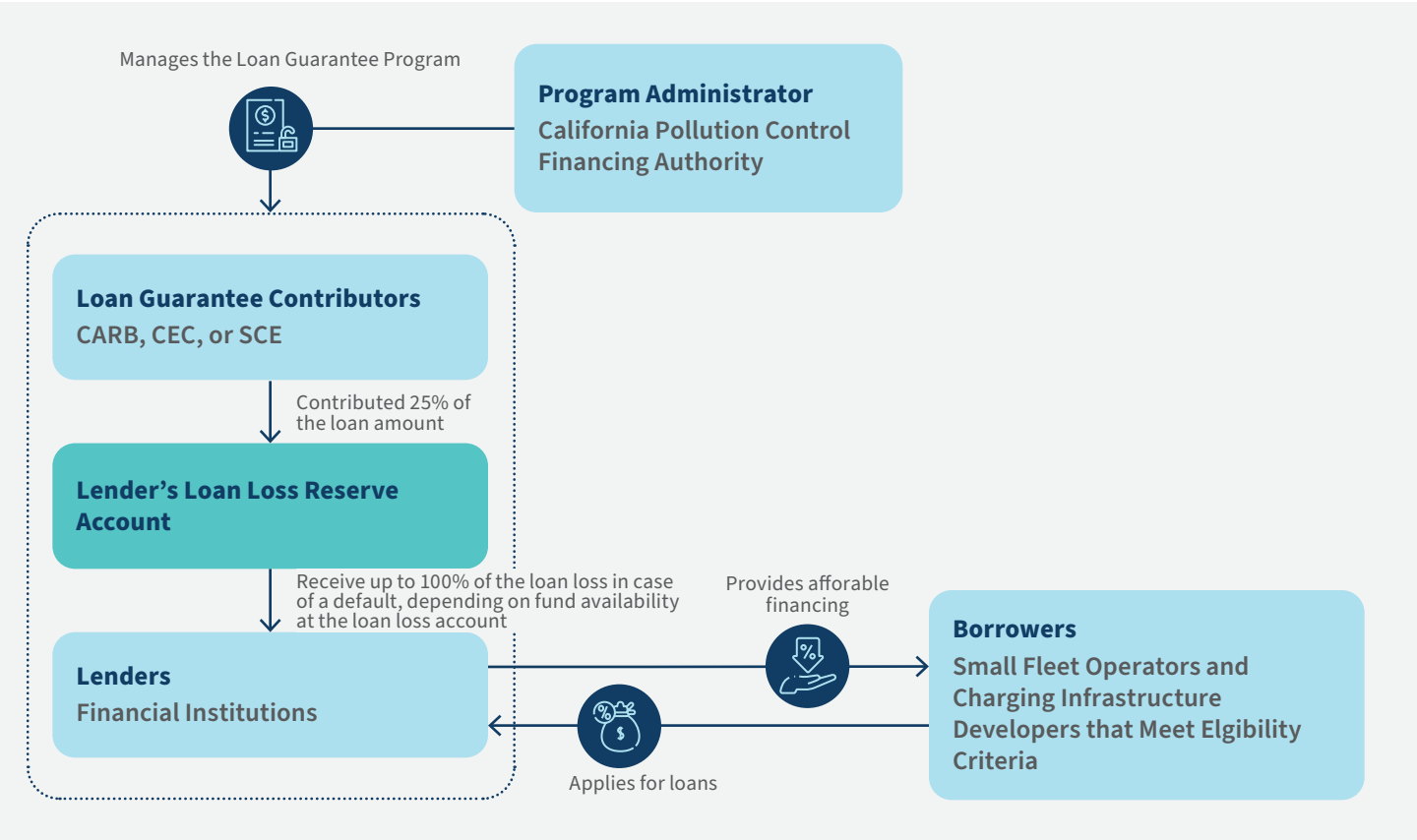
The California Zero-Emission Truck Loan Pilot Project includes three separate and parallel loan guarantee programs that share a similar structure but focus on slightly differing parts of the ZET ecosystem. The program is administered by the California Pollution Control Financing Authority.[22] **Exhibit 2** on page 13 summarizes the loan guarantee contributor, contributing amount, and the focus area of the three programs.

Exhibit 2 Summary of the three loan guarantee programs under the California Zero-Emission Loan Pilot Project

Loan Guarantee Contributor	Type	Total Contributing Amount	Loan Guarantee Focus Area	Applicable Region
California Air Resources Board (CARB)	Government agency	US$5 million	Zero-emission trucking purchase	California
California Energy Commission (CEC)	Government agency	US$5 million	Charging and refueling infrastructure	California
Southern California Edison (SCE)	Investor-owned utility	US$20 million	Vehicle purchase and infrastructure development	Utility service region

RMI graphic. **Source:** California Pollution Control Financing Authority[25]

Exhibit 3 Overview of the California Zero-Emission Truck Loan Pilot Project



RMI graphic. **Source:** California Pollution Control Financing Authority.[23]
Note: The three loan guarantee programs have different eligibility for enrollment, as listed on CalCAP's website.[24] One loan can only be enrolled in one of the three programs. Lenders can choose what program to submit the application to if they qualify for more than one program.

This ZET loan guarantee program includes four key actors: loan guarantee contributors, participating lenders, borrowers, and the program administrator, the California Pollution Control Financing Authority. Loan guarantee contributors, as summarized above, are state agencies or utility companies that contribute funding to the loan guarantee account. Participating lenders refer to financial institutions involved in the loan guarantee program. Borrowers are typically fleets, leasing companies, or charging infrastructure providers that apply for loans from the lenders.[26] **Exhibit 3** shows how these stakeholders work together to implement the loan guarantee program.

Based on the focus area of the loan, each loan is covered by one of the three programs, as highlighted in **Exhibit 2**. Under the loan guarantee program, a loan loss reserve account is established for each participating lender. For every eligible loan made by the participating lender, the corresponding contributor (either CARB, CEC, or SCE) allocates 25% of the loan amount to the lender's loan loss account. Over time, the loan loss account accumulates contributions related to all loans made by the lender, with each contribution being 25% of the respective loan amount. If a loan defaults, the lender can cover up to 100% of the loan losses during the term of the enrollment period using funds from the accumulated loan loss reserve, provided sufficient funds are available in the reserve account. If no default claim is made, the contribution remains in the lender's loan loss account. The interest rate on loans provided under these programs is capped at 20%.

For example, a fleet operator in Southern California wants to borrow US$1 million from a local bank to purchase electric trucks. Assuming the bank is eligible for loan guarantees under the SCE-funded program, SCE will dedicate US$250,000 (25% of the loan amount) to a loan loss account associated with this bank. If the bank grants three additional loans to ZET fleets of the same amount, and none of the four loans default, the bank's loan loss account will grow to US$1 million. If the bank continues to offer loans to ZET fleets, and one fleet can only repay 50% of its loan, the bank can recover the remaining 50% from this account, up to the accumulated US$1 million balance available in this example.

This program is designed to encourage smaller fleet operators and infrastructure developers to secure affordable financing for their ZET projects, given that they are more sensitive to ZET ownership and operation risks compared to larger companies.

This lender-specific loan loss account, with an upper cap that equals 25% of the total loan value, acts as a safeguard to ensure that lenders continue to perform proper lending due diligence.

It is worth mentioning that this program is designed to encourage smaller fleet operators and infrastructure developers to secure affordable financing for their ZET projects, given that they are more sensitive to ZET ownership and operation risks compared to larger companies. For example, the loan guarantee program contributed by CARB and CEC only applies to fleets with up to 20 vehicles. The Southern California Edison loan program, which covers its utility service area, does not apply to Fortune 1000 companies.

California has a history of leveraging innovative financing tools to decarbonize its freight sector. The former Truck Loan Assistance Program has unlocked US$3.2 billion in financing, financed more than 45,000 cleaner diesel trucks, and supported over 43,000 bank loans in 13 years.[27] As a continuation of an existing program, the newly launched zero-emission trucking loan guarantee has the potential to unlock financing for small- and medium-sized enterprises seeking to enter the ZET market. As of December 2024, four financial institutions have agreed to join the program to start offering loans to ZETs in California.

The program can also be combined with other state and federal ZET incentives wherever the regulation allows, collectively helping to de-risk ZET investments and stimulate market growth.

California has the most comprehensive government-backed loan guarantee program dedicated to ZETs in the world. Several other geographies also offer loan guarantees for electric vehicles, including the ZET segment. For example, the European Investment Bank issues loan guarantees along with concessional loans to ZET manufacturers.[28]

Applying Lessons Learned for the Indian Market

India has already started to pilot loan guarantee programs for other electric vehicle segments. In 2023, the Small Industries Development Bank of India (SIDBI) and the Shell Foundation announced a US$6 million risk-sharing facility to improve access to finance for electric two and three-wheelers. This demonstrates that India possesses the expertise and has recognized the benefits of using risk-sharing facilities to de-risk lending for electric vehicles. Additionally, the country has the potential to expand this approach to other vehicle segments.

The California Zero-Emission Truck Loan Pilot Project can inform how a similar risk-sharing program can be developed for the trucking sector in India. Key learnings generated from this case study include:

- Public entities, such as international and domestic development finance institutions, multinational development banks, and government ministries, are potential contributors to ZET loan guarantee programs in India. These entities have historically initiated or participated in risk-sharing programs for other emerging technologies. Public entities can accelerate ZET financing by absorbing part of the lending-related risks of ZETs until borrowing becomes as affordable as diesel truck loans.

- Loan guarantee products can be designed to cover different asset types, including ZET manufacturing, purchases, and charging infrastructure deployment.

- These loan guarantee products should be stackable with other financing solutions, such as grants or tax incentives for ZET purchases or infrastructure investment.

- California's historic loan guarantee program for cleaner diesel trucks, as well as the new ZET loan guarantee program, show that risk-sharing facilities can act as an effective catalytic tool to build commercial financier's confidence in the sector and unlock the potential of private investment.

The design of a loan guarantee program, such as types and percentages of coverages, is dependent on a variety of factors. These factors include the financial conditions and budget allocations of the loan guarantee contributor, the creditworthiness of the borrower, the maturity of the ZET market, etc. Detailed recommendations around how risk-sharing facilities can be designed for the Indian ZET market can be found in RMI and Electric Mobility Financiers Association of India (EMFAI)'s publication *Financing India's First 10,000 Zero-Emission Trucks.*[29]

ZET Insurance Products

Truck insurance, which provides protection against unforeseen events, is a key component of overall truck ownership costs. However, insurance products for ZETs are either unavailable or more expensive than those for diesel trucks because of the following reasons:

- **Lack of Historical Data:** Insurance premiums are typically based on historical risk data. Since ZETs are a new product, they do not yet have key data points that can be used to calculate the likelihood of certain future events, thereby increasing the challenges of designing ZET insurance products.

- **Higher Repair Costs:** In the event of an accident, the repair costs for ZETs can be higher than those for diesel trucks due to limited affordable parts from the used vehicle market and a lack of skilled labor.

- **Different Coverage Needs:** ZET insurance may require coverage for issues unique to electric vehicles, such as battery damage, charging-related accidents or delays, and ZET-specific vehicle maintenance and repairs.

As ZETs increasingly enter global markets, developing insurance products tailored to these vehicles is crucial. ZET-specific insurance solutions will not only create new business opportunities for the insurance industry but also help de-risk ZET investments for both investors and consumers. Communication and collaboration among OEMs, insurance companies, fleets, and banks around ZET cost, residual value, fleet performance, etc., can help initiate pilot insurance products for ZETs.

Several geographies are experimenting with innovative solutions to improve information transparency in the ZET insurance ecosystem and, therefore, make insurance products available to ZET consumers. The section below explains how public and private stakeholders in China approach challenges related to the ZET insurance market.

CASE STUDY

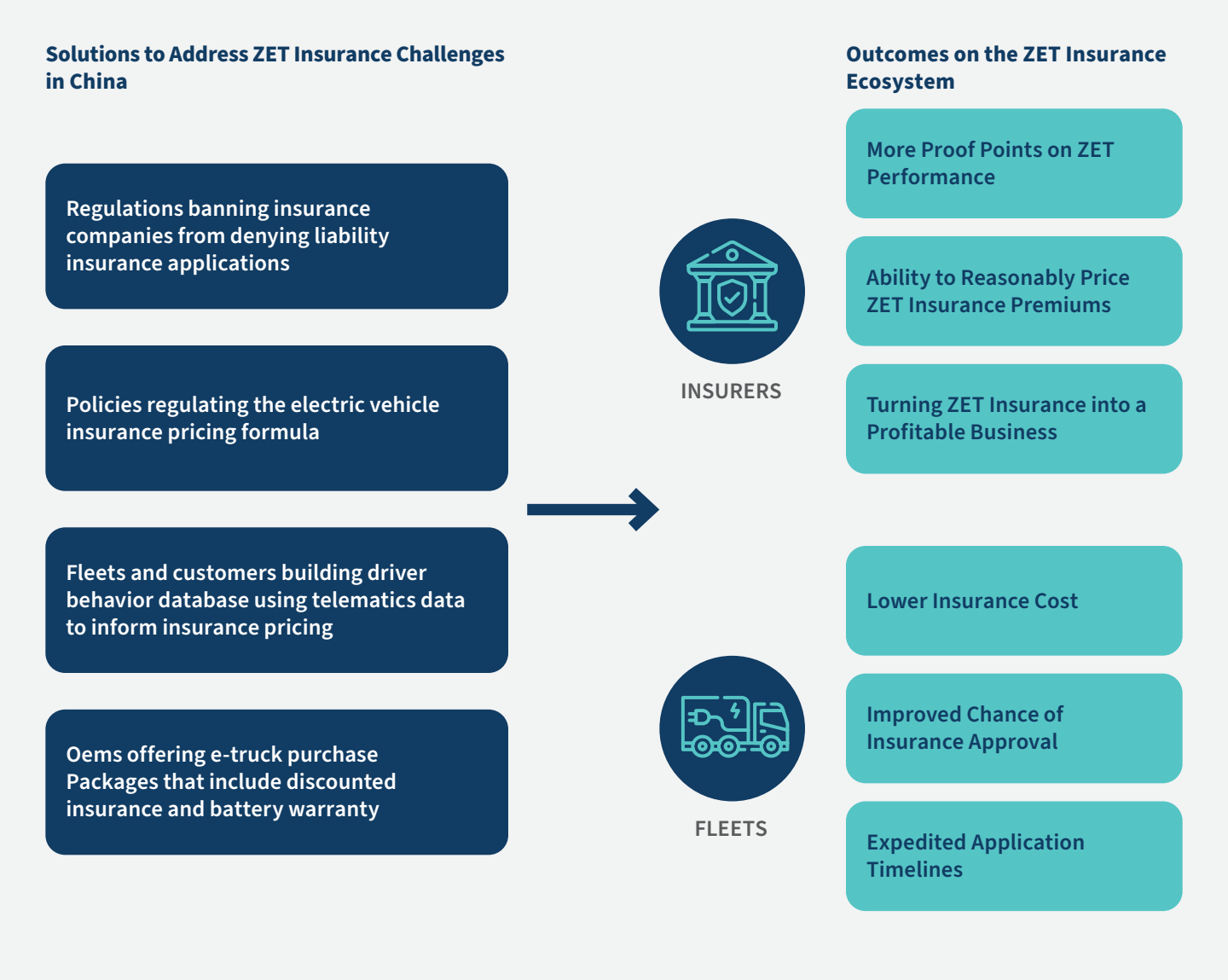
China's Solutions to Develop a Sustainable ZET Insurance Market

China has seen rapid growth in ZETs in recent years due to strong government financial support. However, recent stakeholder interviews have shown that high insurance costs are making ZETs less financially favorable, nearly offsetting the savings on fuel costs.[30] Insurance costs for ZETs in China are, on average, 80% higher than the insurance costs for diesel trucks.[31] Consumers also expressed concerns about the prolonged timeline for insurance approval and the increased likelihood of insurance rejection during renewal.

Meanwhile, insurance companies have reported that ZET insurance is a loss-making business due to the higher number of claims compared to diesel trucks, driven by drivers' lack of familiarity with the technology and higher repair costs of specific ZET components.[32] This leads to insurance companies' reduced willingness to offer coverage to ZET owners.

Public and private stakeholders in China have recognized how these challenges can hinder faster ZET adoption and have implemented several measures to address challenges related to ZET insurance. **Exhibit 4** below summarizes the solutions introduced in this paper and how they address issues faced by the ZET insurance ecosystem.

Exhibit 4 Overview of challenges and solutions in China's ZET insurance ecosystem

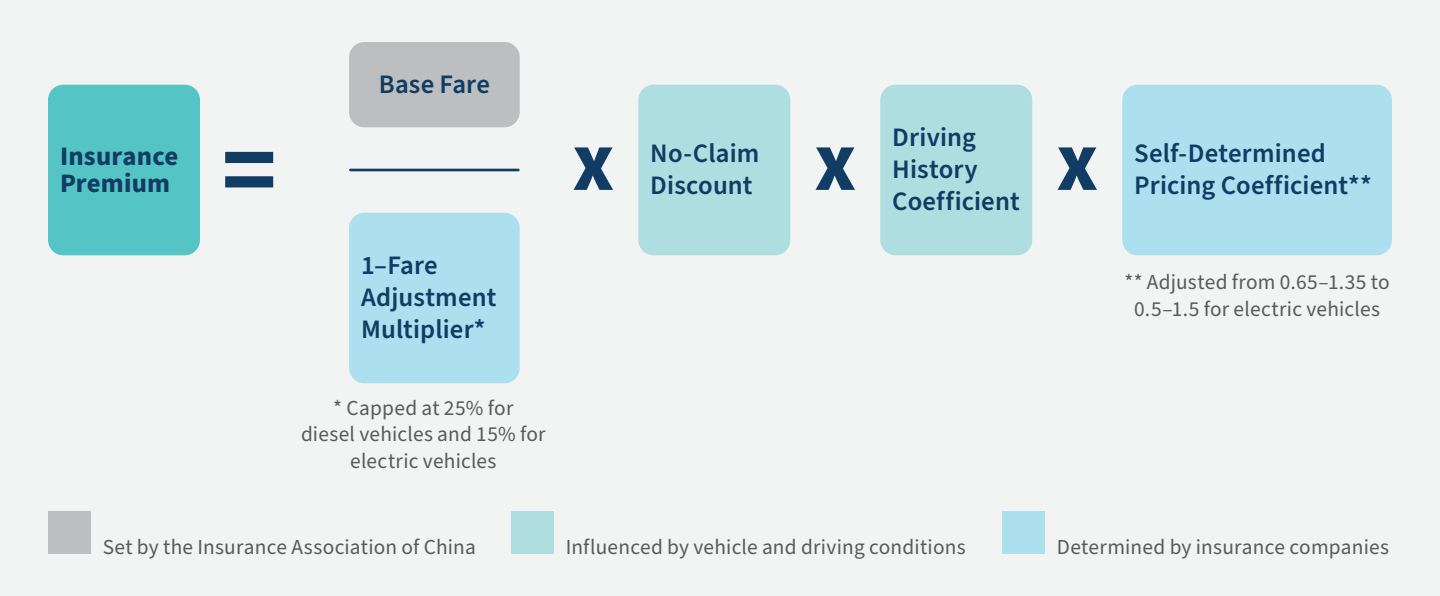


RMI graphic. **Source:** RMI analysis

On the regulatory side, the National Financial Regulatory Administration issued a rule in January 2024 that prohibits insurance companies from rejecting liability insurance applications from electric vehicle owners. Liability insurance is mandatory in China for any vehicle to operate on the road.

In addition, the National Financial Regulatory Administration has several policies in place to regulate the insurance premium pricing mechanism for electric vehicles, including ZETs. Commercial vehicle insurance in China is typically priced based on the formula shown in **Exhibit 5**.

Exhibit 5 Vehicle insurance premium pricing formula in China



RMI graphic. **Source:** RMI analysis

The pricing formula has several key components:

- The **base fare** is a fixed fee determined by the Insurance Association of China.
- The **fare adjustment multiplier** accounts for miscellaneous fees charged by the insurance companies, such as service fees, taxes, expected revenue, etc.
- The **no-claim discount** is based on previous claims filed by the insurance holder. The fewer previous claims there are, the lower the insurance premium will be.
- The **insurance company sets the self-determined pricing coefficient,** usually based on the company's business strategies.

The pricing formula indicates that insurance companies have the greatest flexibility in adjusting the fare multiplier and self-determined pricing coefficient. Therefore, China's policies regulate how insurance companies can set these two values for electric vehicles, including ZETs. According to a policy issued in 2021, the pricing formula caps the fare adjustment multiplier at 25% for diesel vehicles and 15% for electric vehicles. A lower fare adjustment multiplier for electric vehicles indicates lower insurance premiums.

A subsequent rule introduced in 2024 revised the self-determined pricing coefficient range from 0.65–1.35 to 0.5–1.5. This change gives insurance companies greater flexibility in setting precise premiums based on risk factors and financial conditions. Furthermore, China's insurance pricing policy also includes dedicated sections that promote the refinement of insurance pricing algorithms on an ongoing basis, leveraging real-world data to better reflect the actual risks associated with electric vehicle operations.

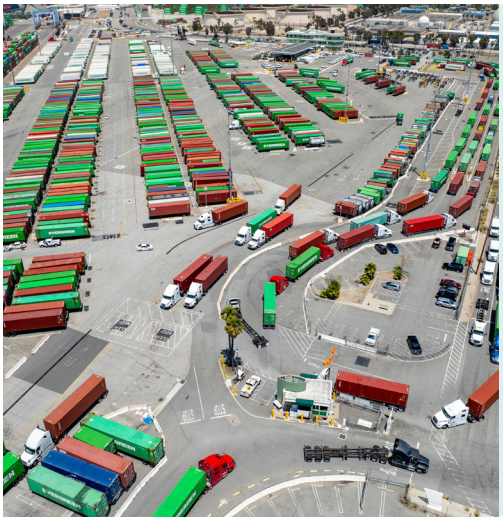
These regulations aim to improve the availability of ZET insurance products at reasonable prices while enabling insurance companies to make ZET insurance a viable business by providing them with more flexibility in designing informed pricing strategies. In the long term, as more ZETs enter the market, insurance companies will be able to develop competitive insurance products tailored specifically to these vehicles, drawing on risk assessments based on vehicle performance data.

In the private sector, fleets, OEMs, and insurance companies are also exploring innovative solutions. Compared to diesel trucks, ZETs usually have more telematics data. Fleets in China are collaborating with demand-side customers to build online databases that track ZET driver behavior to better inform insurance pricing strategy.[33] On the OEM side, manufacturers like *China FAW Group Corp* provide packages that include the purchase of the ZET itself, three years of insurance at a reduced price, included maintenance services, and a five-year battery warranty.[34]

The development of ZET insurance products and databases has made these insurance options more affordable and accessible. These measures provide ZET operators with protection against operational risks, unexpected repair costs, and asset downtime, ensuring greater reliability and efficiency.

In addition to China, other geographies are also exploring solutions to improve ZET insurance product availability and lower insurance premiums. The text box below shows one example from the United States.

Box 1 California's Assembly Bill on ZET insurance



California's Assembly Bill 844 is a rule for ZET insurance that requires the Department of Insurance, a California state agency, to develop an online public tool with available ZET insurance options.[35] It also mandates the Department of Insurance to develop a comprehensive strategy that covers landscape assessment of ZET-specific insurance and addresses any gaps. This includes consideration for establishing a risk pool and other tools to offer insurance to ZET owners who are unable to find insurance in the private market.[iv] The strategy will be used to improve the availability of ZET insurance in the state to achieve its zero-emission trucking targets.

iv. Risk pool refers to a group of insurance holders who share similar risk features, usually identified by insurance companies as high risks. Existing risk pools for auto insurance in California, such as the California Automobile Assigned Risk Plan, ensure that all insurance companies charge the same rates (higher than standard rates) for high-risk auto insurance holders. This rule explores the possibilities of establishing a similar risk pool for ZET insurance.

Applying Lessons Learned for the Indian Market

In India, there are two main types of auto insurance: third-party insurance and comprehensive insurance. The **Exhibit 6** summarizes the differences between these two insurance types.

Exhibit 6 Summary of key types of auto insurance in India

Type	Coverage	Premium Rates	Requirement	Discounts for EVs?
Third-party Insurance	Insurance that covers costs incurred from damages or liabilities caused by the insured vehicle to a third party[36]	Rates determined by the Insurance Regulatory and Development Authority of India (IRDAI) based on vehicle type	Mandatory for any vehicle to operate on the road	Yes, 15%
Comprehensive Insurance	Usually covers third-party damage as well as damage or injury related to the insured vehicle and driver	Determined by individual insurance companies based on the model, use case, vehicle age, number of past claims, driver information, etc.	Optional but purchased by most fleets	No

RMI graphic.

For all electric vehicles, including ZETs, IRDAI has set a 15% discount for the third-party liability insurance premium rates.[37] **Exhibit 7** summarizes the FY23–24 third-party annual insurance rates for electric and non-electric commercial vehicles.

Exhibit 7 Third-party insurance premium rates for ZETs and ICE trucks

Gross Vehicle Weight	ZET Annual Rates (INR)	ICE Truck Annual Rates (INR)
< 7,500 kg	13,642	16,049
7,500 kg–12,000 kg	23,108	27,186
12,000 kg–20,000 kg	30,016	35,313
20,000 kg–40,000 kg	37,357	43,950
> 40,000 kg	37,606	44,242

RMI graphic. **Source:** Insurance Regulatory and Development Authority of India (IRDAI)[38]

This policy greatly improves the affordability of third-party insurance for ZET owners. For comprehensive insurance, which is typically more costly and is closely related to the residual value, repair costs, and asset risks of ZETs, the global examples discussed above can potentially offer several learnings for India. Key action items recommended for different stakeholders are summarized **Exhibit 8**.

Exhibit 8 Recommended actions for stakeholders in India to create a sustainable ZET insurance market

Type	Coverage
ZET OEMs	Increase information transparency around e-truck technology and performance
	Issue extended battery warranty
	Pilot bundled offers that include both vehicle and insurance at the time of truck purchase
	Standardize ZET components to ease repair burdens
Fleets	Utilize the data benefits of e-trucks to better track truck real-world battery and fuel efficiency performance, operational schedule, driving behaviour, etc.
	Provide driver training programs to familiarize drivers with ZET operations
Insurance Companies	Improve insurance premium pricing strategy for ZET insurance based on real-world operational data to offer competitive products
	Develop workforce with specialized knowledge on ZET insurance products
	Develop insurance products specifically designed for ZET batteries
Insurance Regulatory and Development Authority of India (IRDAI)	Dedicate resources to understand the commercial insurance landscape for e-trucks, including costs, available products, key market gaps, etc. and create corresponding guidelines for the industry
	Offer to defray or provide incentives for commercial e-truck insurance
	Encourage the collection of ZET-specific performance data to help insurers better assess ZET-related risks

RMI graphic. **Source:** RMI analysis

Concerted efforts by OEMs, fleets, insurers, and the government can collectively foster a supportive environment for the ZET insurance industry to thrive in India. Over time, ZET insurance can evolve into a viable business for insurers and an affordable option for fleets.

Mobility-as-a-Service

ZET leasing is a business strategy that effectively allocates ZET-related risks to the parties that are better equipped to manage them. Compared to purchasing trucks outright, leasing enables fleets to operate vehicles within a specified contract period while making regular payments to the lessor. Fleets can purchase the truck at the end of the lease term or return it to the lessor.

Truck leasing is often bundled with additional services, such as access to charging infrastructure, electrification planning, and maintenance services, collectively referred to as mobility-as-a-service (MaaS). This business model addresses several critical challenges for fleets considering entry into the ZET market, including high up-front costs, uncertainties regarding charging infrastructure availability, and limited knowledge of ZET operations and maintenance. Therefore, MaaS is an effective business measure to kick-start the ZET industry, helping to overcome market entry barriers for fleets.

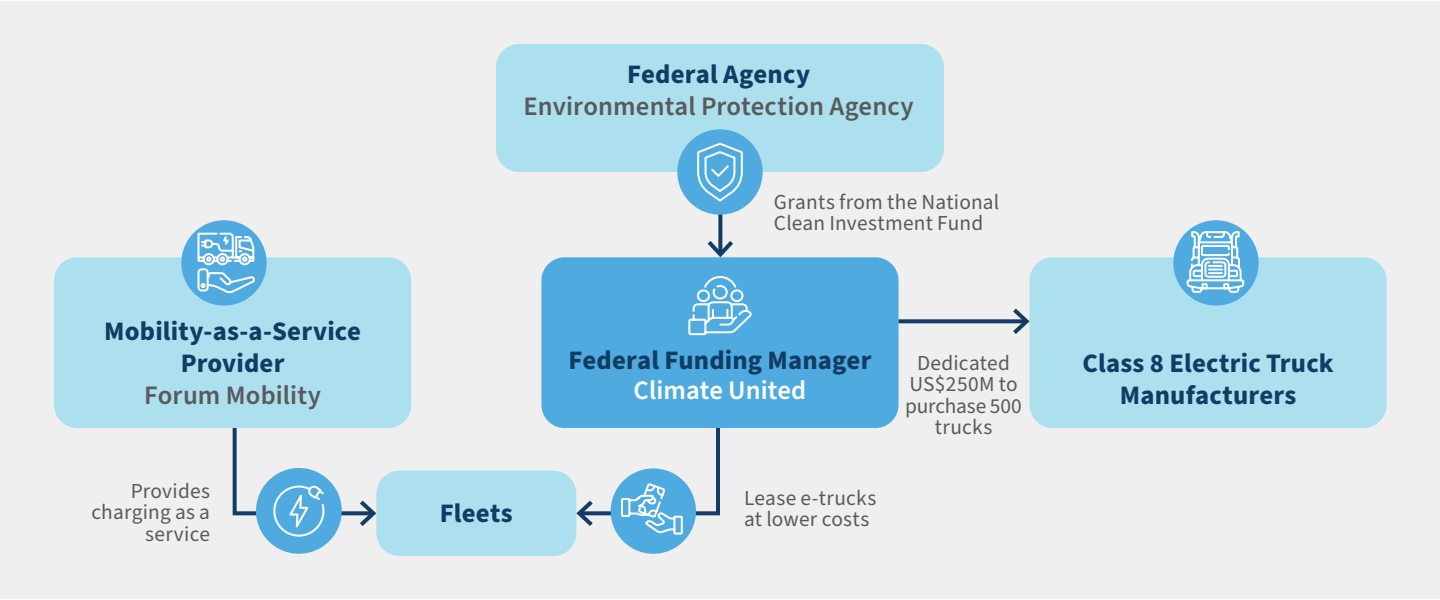
The following sections provide several examples of how MaaS, with various funding sources and operational models, has been implemented across the world. In the three regions analyzed, MaaS, provided by OEMs, specialized MaaS providers, and truck rental companies, has emerged as a widely adopted business model in the ZET industry, with the market showing steady growth.

CASE STUDY

United States Grants to Support an Affordable Drayage Truck Leasing Program

In recent years, several MaaS companies focused on ZETs have emerged in the United States. At the same time, truck manufacturers and conventional truck rental companies have begun offering MaaS solutions as well. In October 2024, a new collaborative MaaS partnership supported by the United States Environmental Protection Agency's National Clean Investment Fund was announced, as summarized in **Exhibit 9** on page 24. The federal funding is managed by Climate United, a nonprofit organization that has committed to spend US$250 million to procure 500 drayage ZETs for port applications.[39] In partnership with a MaaS company, Forum Mobility, Climate United will provide vehicle leasing and charging services to fleet operators at lower than market rates, with preferences for smaller fleets.

Exhibit 9 Summary of the United States Drayage Truck Leasing Program



RMI graphic. **Source:** Climate United[40]

This innovative model shifts the perceived ZET technology, charging planning, and residual value risks from small fleets to a dedicated third party that is better positioned to manage and mitigate risks with strong government funding support. This model focuses entirely on the port drayage truck segment, which is a major truck use case in the United States. One challenge in the commercial vehicle leasing sector is that different applications require different models, making it challenging to re-lease a vehicle to the next customer. However, this MaaS model enables used vehicles to be effectively repurposed for the next customer in the port drayage segment.

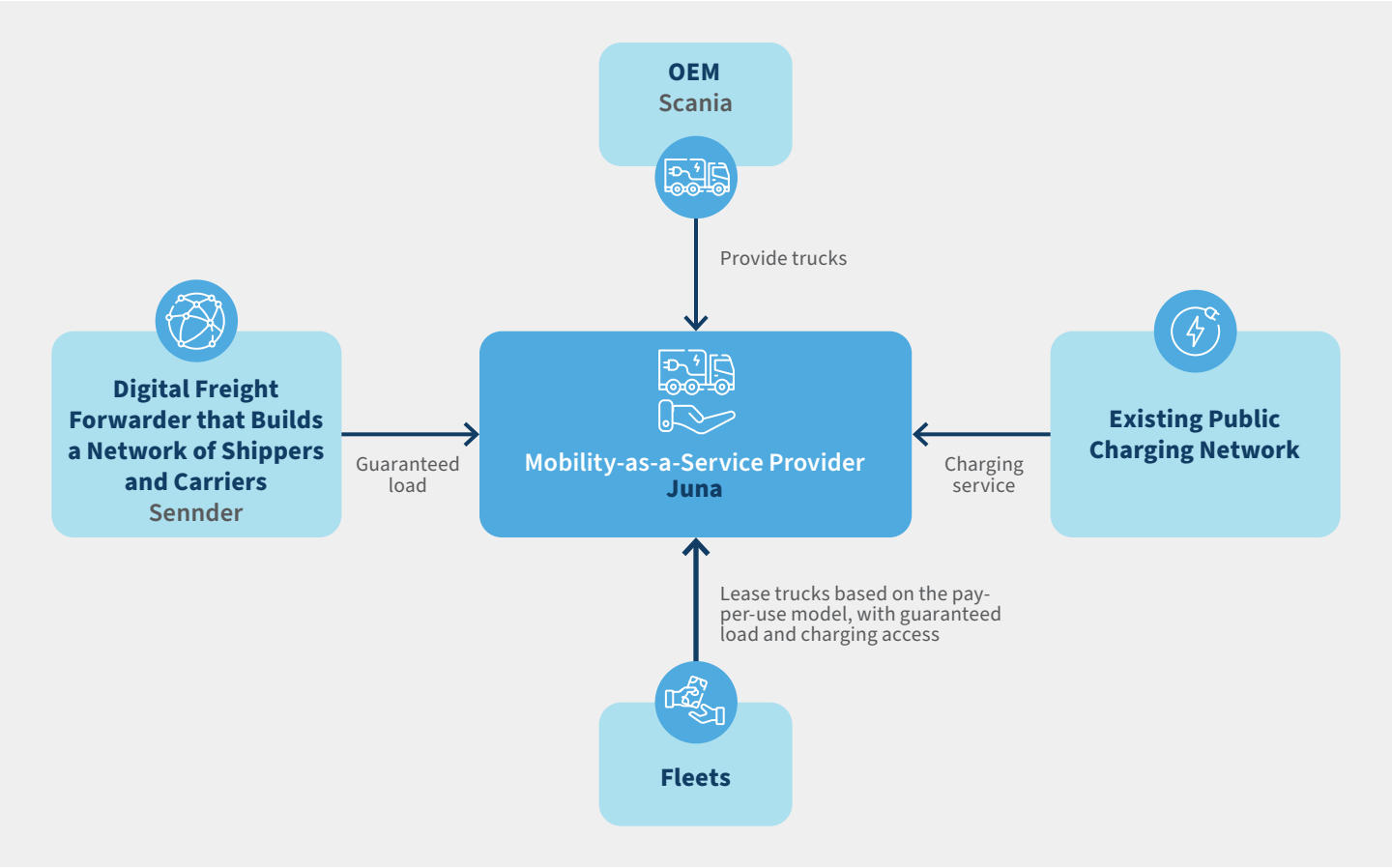
CASE STUDY

Flexible ZET Leasing: Europe's Pay-Per-Use Model in Action

Leasing has been a dominant business model in Europe's passenger vehicle segment. Half of the new cars in Europe are leased to customers, and the top seven leasing companies account for around a third of the new car sales.[41] Similarly, in the commercial vehicle segment, Europe has seen an increasing number of partnerships among fleets, OEMs, and leasing service providers to expand their businesses into the ZET mobility-as-a-service industry.

One innovative model in the EU's MaaS ecosystem is the pay-per-use model. *Juna,* a joint venture between truck manufacturer Scania and digital freight forwarder provider Sennder, offers a flexible ZET lease pricing strategy based on the actual kilometers driven. Juna's ZET services also include charging planning, insurance, maintenance, and guaranteed truck utilization through load contracts from Sennder's logistics platform.[42] This pay-per-use model, along with comprehensive ZET operation solutions, offers fleets unsure about ZETs an easy opportunity to try them without bearing the burden of truck purchase costs, fixed-term lease contracts, or infrastructure planning.

Exhibit 10 Summary of the EU pay-per-use MaaS model



RMI graphic. **Source:** Juna[43]

CASE STUDY

China Supports Loans from Development MaaS Finance Institutions

In China, MaaS is mainly offered by OEM-owned financial firms and dedicated leasing companies. One commercial vehicle leasing platform, *Lionbridge,* has raised funding to support its MaaS businesses through international development finance institutions. For example, in 2022, the *Asian Infrastructure Investment Bank* (AIIB) provided a US$60 million loan to *Lionbridge* to procure 3,000 to 3,200 electric logistics vehicles, which would be leased to its customers.[44] *Lionbridge* has also received US$10 million from *Proparco,* and US$20 million from the *International Finance Corporation*.[45, 46] *Lionbridge* adopts a financial leasing model, which offers fleets the option to purchase trucks at the end of the loan term. The low-cost financing from international development finance institutions unlocks opportunities for MaaS providers to kick-start their ZET leasing businesses, which enables consumers to operate ZETs without bearing the high up-front cost.

Applying Lessons Learned for the Indian Market

The global examples of MaaS business models introduced in this section demonstrate that MaaS can take various forms in India.

- MaaS services can be provided by truck rental companies, third-party logistics companies, OEMs, affiliated finance companies, or specialized MaaS firms focused on electric vehicles.
- MaaS services may include truck leasing, electrification planning, access to charging and parking , and connections with customers to ensure guaranteed truck utilization.
- MaaS can also involve partnerships with charging service providers or logistics companies to offer comprehensive ZET solutions.
- Government grants or concessional loans from multilateral or domestic development banks can be used to kick-start the MaaS industry, building upon examples from the United States and China.
- The leasing platform can be designed to cater to specific applications, especially early adopting applications, such as the US Climate United drayage truck MaaS program, or to a broader range of customers. The first option ensures that a used truck can be effectively re-leased to the next customer, given the similarity in their operational requirements, while the second option expands the customer base, offering more flexibility.

Conclusion

This report examines three financial solutions — risk-sharing facilities, ZET insurance products, and mobility-as-a-service — implemented in global markets to mobilize capital and support ZET market growth. Case studies from China, the United States, and Europe demonstrate how these tools attract capital, distribute risk, and enhance ZET operability. The examples highlight loan guarantee programs that improve the accessibility and affordability of ZET financing, public-private initiatives that lower the cost of ZET insurance, and how MaaS reduces market entry barriers for fleets.

By leveraging global examples, public and private actors in India can strategically design financial solutions that play a transformative role in creating a more favorable lending environment and unlocking greater capital flows to ZETs.

In particular, this report offers the following recommendations for key stakeholders in India to adopt global best practices in financing the transition to ZETs:

Exhibit 11 Recommended actions for Indian stakeholders to adopt global best practices in ZET finance

	Risk-Sharing Facilities	Insurance	Mobility-as-a-Service
Government Ministries	Allocate funding to develop the first government-backed loan guarantee program for ZETs in India	The IRDAI should develop comprehensive guidelines on ZET-specific insurance products as well as incentives that lower comprehensive insurance rates for ZETs	Provide fiscal incentives such as subsidies or tax breaks to MaaS providers
Multilateral Development Banks	Develop risk-sharing facilities for ZETs in India	Less applicable	Less applicable
Fleets	Less applicable	Provide driver training programs to decrease ZET operational risks; collect ZET performance data to inform insurance pricing strategy better	Less applicable
OEMs	Provide battery warranty	Less applicable	Partner with MaaS providers to offer leasing service; provide battery warranty for ZETs
Charging Infrastructure Providers	Less applicable	Less applicable	Partner with MaaS providers to provide charging services
Insurers	Ensure ZET insurance products with reasonable pricing are available	Dedicate resources to understanding ZET operations and developing a better data-informed ZET insurance premium pricing strategy	Provide ZET-specific insurance products to MaaS companies

RMI graphic. **Source:** RMI analysis.

As India's ZET market expands, adopting lessons from these regions can strengthen the financial viability of ZETs, enhance access to affordable financing, and reduce entry barriers for fleet operators. With the right financial tools, India can accelerate the adoption of ZETs, demonstrating its potential to deliver both significant environmental benefits and sustained economic returns, paving the way for a cleaner and more resilient transportation future.

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