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ASYAD

Driving Decarbonization in Oman's Transport Sector

Green Mobility through Hydrogen and EV Integration

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FOREWORD
TRANSPORT AND THE NET ZERO EQUATION

The transport sector is a critical frontier in Oman's transition to a sustainable economy. It brings together energy security, economic diversification, emissions reduction and the ambition to lead in global clean energy markets. This paper responds to a clear moment. Oman has the assets, the policy architecture and the institutional capacity to move.

Launched at Oman Sustainability Week 2026, this paper is built for policymakers, operators and investors working within tight decision cycles. It sets out what is currently in place, what works and where the gaps sit. Importantly, the paper points to what is next in the decarbonization frontier and how we can achieve it.

Transport is responsible for approximately 15.9 $MtCO_2e$ of Oman's annual greenhouse gas emissions, representing 18% of the national total. The sector is dominated by private vehicles, accounting for around 60% of transport emissions, alongside heavy freight movement across major logistics corridors. The national fleet exceeds 1.6 million registered vehicles, while electric vehicles remain a fraction of a percent. The gap to net-zero by 2050 remains material and unresolved.

Oman enters this transition with clear advantages. Solar and wind resources rank among the strongest in the region, supporting a hydrogen program that is already advancing at scale under Hydrom. This energy base connects directly into physical infrastructure. Ports at Sohar, Salalah and Duqm link production to global trade routes, while Oman Vision 2040 and the national net-zero target for 2050 provide policy direction. Asyad Group operates across this system. Its ports, shipping assets, logistics corridors and free zones carry the transition forward.

That position does not deliver outcomes on its own. It depends on how the system is used. Policy must reduce investment risk, while infrastructure must be deployed ahead of demand, and institutions must act in coordination. The analysis shows that combined policy measures deliver stronger results than isolated actions. Rail decarbonization, when linked to freight demand and port activity, delivers the largest emissions reduction.

Renewable electricity underpins both EV deployment and hydrogen production. Port infrastructure, including ammonia bunkering at Salalah and electrification initiatives at Sohar, provides the base for delivery.

The gap between current conditions and net-zero 2050 is clear. The technologies are available. The infrastructure is developing. What determines the outcome is the pace and consistency of execution across policy, investment and delivery.

EXECUTIVE SUMMARY

Transport accounts for approximately 15.9 $MtCO_2e$ of Oman's annual greenhouse gas emissions, representing 18% of the national total. The system is defined by dependency. More than 1.6 million vehicles are registered nationally. 97% of road users rely on private transport. Electric vehicles represent 0.1% of the fleet. On its current path, the sector does not reach net-zero by 2050.

Transport emissions, Oman - 2021

15.9 $MtCO_2e$

Transport emissions (2021)

18%

of national GHG

Making transport one of Oman's largest emitting sectors and a critical lever for net-zero by 2050

The outlined gaps reflect how the system is built. Road transport dominates and freight moves across long distances, while energy supply remains tied to fossil fuels. Shifting this system requires change across the entire value chain. That is how energy is produced, how goods move and how infrastructure is used.

These gaps are already being addressed - battery electric vehicles will scale across private transport and urban mobility, while green hydrogen and fuel cell systems will carry heavy freight, maritime activity and long-distance transport. Each has a defined role. The outcome depends on deploying them where they deliver the highest impact.

Oman is not constrained in this regard, instead it is very well positioned to provide the infrastructure for the transition. Renewable energy resources support electrification and hydrogen production at scale, while national policy frameworks set the direction. The system that connects these elements is already in place. Asyad Group operates the ports, shipping, logistics corridors and free zones that link energy production to trade and movement. Sohar, Salalah and Duqm anchor that system. Hafeet Rail extends it inland.

ROAD	RAIL	MARITIME	AVIATION	PORTS
EVs + FCEVs for 1.6M+ registered vehicles	Hafeet Rail 303km freight and passenger modal shift	Green ammonia bunkering + shore power at Sohar, Salalah, Duqm	SAF policy, airport solar PV, drone and AAM sandbox	Net-zero roadmaps at Salalah, Sohar, Duqm. LH_2 and NH_3 export

This matters because infrastructure determines adoption. Rail has the capacity to shift freight at scale. Ports enable new fuel systems, including ammonia bunkering and hydrogen export. Logistics networks determine how quickly low-carbon transport can be integrated into daily operations. All of this is underpinned by renewable electricity.

Early policy in this area must reduce investment risk and unlock capital. For this to take shape, infrastructure needs to be deployed ahead of demand, not in response to it, and rail has to become the freight system from the outset. Hydrogen infrastructure must develop around industrial and port demand. And as this system scales, regulations must be enforced to ensure scale.

4 THINGS EVERY POLICY MAKER SHOULD KNOW			
THE PROBLEM IS URGENT	TWO TECHNOLOGIES DEFINE THE PATH	OMAN'S INFRASTRUCTURE IS AN ENABLER	WHAT SHOULD HAPPEN NEXT
Transport is one of Oman's largest emitting sectors. Without intervention, the gap between current trajectory and net-zero 2050 will not close.	Battery electric vehicles (BEVs) for light-duty road transport. Green hydrogen and fuel cell electric vehicles (FCEVs) for heavy-duty, long-range, and maritime applications.	Oman to decarbonize its own logistics while becoming a global hub for green energy trade. Asyad Logistics sits at the core of this decarbonization effort.	2025-2030: Establish regulatory standards Extend fiscal incentives for EVs. Accelerate renewable energy Commercialize Hafeet Rail Enforce mass flow metering at bunkering ports.

The evidence is consistent across modelling and international experience. Single measures do not deliver change at system level. Combined policy does. EV adoption, rail modal shift and renewable energy integration produce the strongest emissions reduction when deployed together. Rail contributes the largest share as utilization increases.

Power sector decarbonization strengthens outcomes across all modes and EV adoption will follow as infrastructure and grid conditions improve. This required consistent coordination over time between policy, infrastructure and institutions. Delays in any one part of the system slow the rest.

The gap to net-zero 2050 is clear and Oman is well positioned to close these gaps.

TRANSPORT WILL DEFINE OMAN'S NET-ZERO STORY

Like many countries around the world, Oman is accelerating its decarbonization agenda. The transport sector remains the biggest blocker for making this agenda a reality. The sector emitted 15.9 $MtCO_2e$ in 2021, representing approximately 18% of total national greenhouse gas emissions, making it one of the country's largest emitting sectors and a critical focus for the transition to net zero by 2050. Hence, new policy consideration is an immediate strategic imperative.

THE NUMBERS AT A GLANCE

15.9 $MtCO_2e$
Transport emissions (2021)

18%
of national GHG

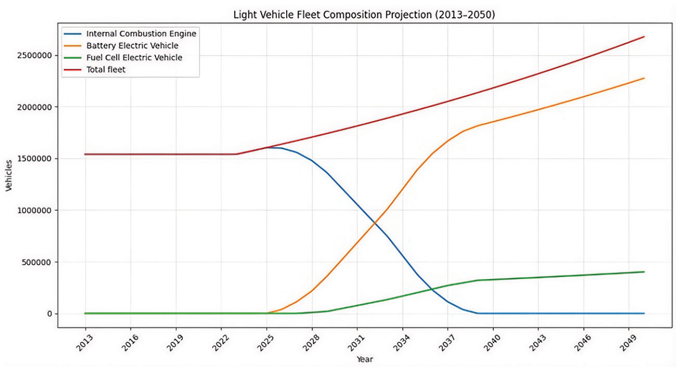
1.6M+
Registered vehicles

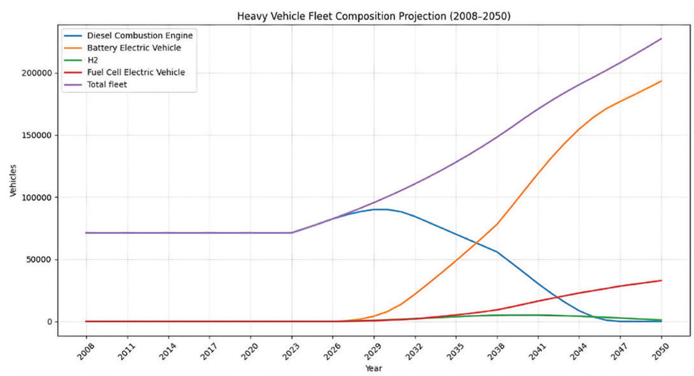
0.1%
EVs as share of total fleet

The national vehicle fleet is dominated by private cars, which account for approximately 60% of transport-related emissions.

97% of road users rely on private vehicles for their daily mobility needs.Transport emissions (2021)

Over 72,000 heavy-duty trucks and 86,000 commercial freight vehicles support industrial growth, logistics operations and port activities representing a significant opportunity for targeted decarbonization of high-intensity operations. Public transport capacity remains comparatively limited, with approximately 500 buses in operation nationwide, reinforcing continued dependence on private and road-based mobility. The Ministry of Transport's urban mobility study confirms that 97% of road users rely on private vehicles for their daily mobility needs.





Electrification of transport remains at an early stage. Electric vehicles currently represent only 0.1% of total registered vehicles, while hydrogen-powered transport is largely confined to pilot and demonstration initiatives. Major industrial and logistics hubs - Sohar, Duqm, and Salalah - operate significant fleets of cargo handling and heavy transport equipment, representing a substantial opportunity for targeted decarbonization.

To drive further vehicle electrification, Oman is making structural investments to diversify and modernize its transport infrastructure. The development of the Hafeet Rail network, the expansion of port infrastructure across the three main port complexes and a growing program of renewable energy deployment all set the stage for a comprehensive mobility transition. Complementary national initiatives are advancing green hydrogen production, sustainable aviation fuels, and low-carbon industrial development, positioning Oman to become a regional hub for sustainable energy and green logistics.

> "Closing the gap between Oman's current transport emissions trajectory and net-zero 2050 requires infrastructure, incentives, and institutions working in parallel. Oman has the assets to do it."

OMAN'S STRATEGIC POSITION

Oman enters the green mobility transition with structural advantages that few economies in the region can match. National policy ambition, abundant renewable resources, emerging hydrogen infrastructure and a strategic geographic position creates a uniquely favorable environment for leading the decarbonization of both domestic transport and regional energy trade.

POLICY ARCHITECTURE: VISION 2040 AND NET-ZERO 2050

Oman Vision 2040 provides the overarching framework for the sustainability transition. It commits the Sultanate to economic diversification, environmental stewardship and the development of world-class infrastructure across energy, transport, and logistics. The national net-zero target for 2050, underpinned by the work of the Oman Net Zero Center, translates this vision into sector-specific commitments. For transport, this means a structural shift away from fossil fuel dependence across all modes: road, rail, maritime, and aviation.

Renewable energy targets are concrete and time-bound. Oman aims to derive 30% of electricity from renewable sources by 2030, building from a base of approximately 11.5% achieved by 2025. This expansion is being led by large-scale solar projects. Ibri II, Manah I and Manah II plants together represent 1,500 MW of installed solar capacity, alongside the Dhofar Wind Farm. Oman's average solar irradiance reaches 6.7 kWh/m²/day in the Al Wusta region, and wind capacity factors reach up to 53% in selected zones, creating a resource base of exceptional quality for low-cost renewable power and hydrogen production.

The electricity system is undergoing a structural shift to match these ambitions. Gas-fired generation remains dominant, rising from 35.6 TWh in 2020 to 45.5 TWh in 2025 as demand grows, but solar PV output increased from a negligible base to 3.4 TWh over the same period, nearly doubling between 2024 and 2025 alone as major utility projects came online. This trajectory matters directly for transport. The emissions performance of every electric vehicle on Oman's roads and the commercial viability of every electrolyser connected to the grid depends on how quickly the power sector decarbonizes. And renewable energy is the foundation of this decarbonization; hence, the two cannot be planned in isolation.

To support this expansion, the Oman Electricity Transmission Company is advancing a multi-project grid reinforcement program through 2029. This will extend transmission capacity and improve rural supply, creating the connectivity conditions required for large-scale hydrogen production zones in the interior and coastal regions.

THE HYDROGEN STRATEGY

As a hydrogen producing nation, Oman aims to become a major global exporter of green hydrogen. Through the establishment of Hydrogen Oman (Hydrom) in 2022, the Sultanate has created a dedicated governance body to accelerate project approvals and manage the development of green hydrogen across more than 50,000 km² of allocated land.

> "Oman is on track to become the sixth-largest exporter of green hydrogen globally by 2030, accounting for 60% of the Middle East's total projected hydrogen exports."
>
> IEA, 2023/2024

Oman aims to produce more than 1 million tons of green hydrogen per year by 2030, rising to 3.25 million tons by 2040 and 8 million tons by 2050. Achieving these targets will require 8–10 GW of electrolysers by 2030, 35–40 GW by 2040, and 100 GW by 2050, a scale that, at the 2050 horizon, is equivalent to approximately 80% of current LNG exports in energy terms.

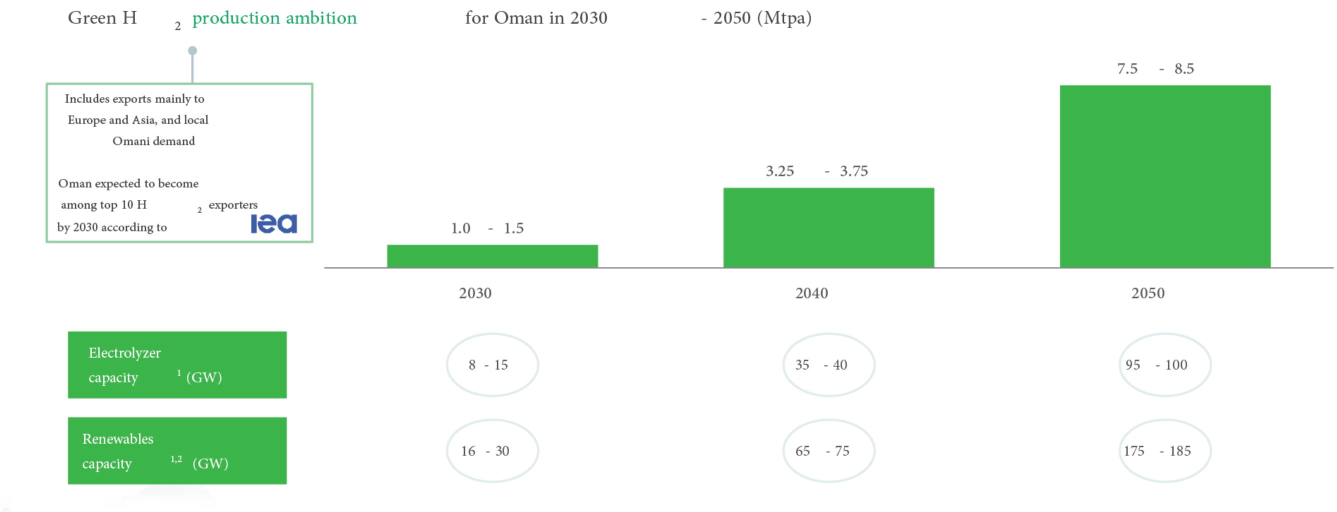
Hydrom has already launched more than seven large-scale green hydrogen projects across its first and second award rounds, including the ACME Duqm project, which is expected to produce 17,000 tons of hydrogen and 100,000 tons of ammonia by 2027. Critically, these projects are not standalone energy investments, they are demand anchors for the renewable electricity grid, and their domestic transport applications are real. The government has already deployed the country's first 15 light hydrogen vehicles and commissioned the first hydrogen production, supply and distribution station in Muscat.

These are pilot-scale interventions, but they signal the intent to connect the hydrogen production strategy to domestic mobility. The logic connecting energy production to transport decarbonization is direct: clean power is what makes EVs and FCEVs genuinely green, and low-cost renewable electricity is what makes green hydrogen commercially viable.

Hydrom's governance model is itself a strategic asset. By centralizing project approvals, setting binding technical standards and managing land allocation across more than 50,000 km², the body removes the coordination failures that have stalled comparable transitions in other emerging markets. Identified gaps remain. National hydrogen safety codes, environmental approval procedures for electrolysers and green certification schemes aligned to EU import requirements. However, the structural conditions for resolution are in place in a way they are not in most competitor jurisdictions.

The port specialization strategy is one of Oman's most distinctive competitive advantages. Rather than building generalist energy export capacity, the Sultanate has allocated specific roles to each major facility based on geography, existing infrastructure and target markets. Port of Duqm location outside the Strait of Hormuz, directly on the Arabian Sea, and its direct connectivity to European demand through the Port of Amsterdam Joint Development Agreement, makes it the natural hub for cryogenic liquid hydrogen export. Port of Salalah position on the Singapore-Rotterdam East-West shipping lane, its existing ammonia storage and pipeline infrastructure and its capacity to handle 1 million tons of renewable ammonia per year, positions it as the near-term bunkering priority, particularly as green ammonia offers faster vessel technology readiness than LH_2 and benefits from established handling experience.

The risk in the dual-port model lies in execution sequencing. The LH_2 pathway at Duqm carries additional technical and commercial uncertainty: liquefaction at -253 °C, boil-off management during transit, limited availability of certified carriers and the absence of long-term binding offtake agreements with European buyers. These risks are addressable, but they require phased implementation and early regulatory certification that cannot be deferred. Salalah's ammonia pathway is more mature and should be treated as the priority investment for the 2025–2030 window, with Duqm scaled commercially through the 2030s as hydrogen carrier technology and EU import infrastructure matures.



Oman's role as the physical infrastructure connecting energy production to logistics movement is where Asyad Group becomes central to the national strategy. The following section examines how Asyad's port, shipping, logistics, and free zone assets translate this strategic position into operational decarbonization.

ASYAD AT THE CENTRE OF OMAN'S DECARBONIZATION JOURNEY

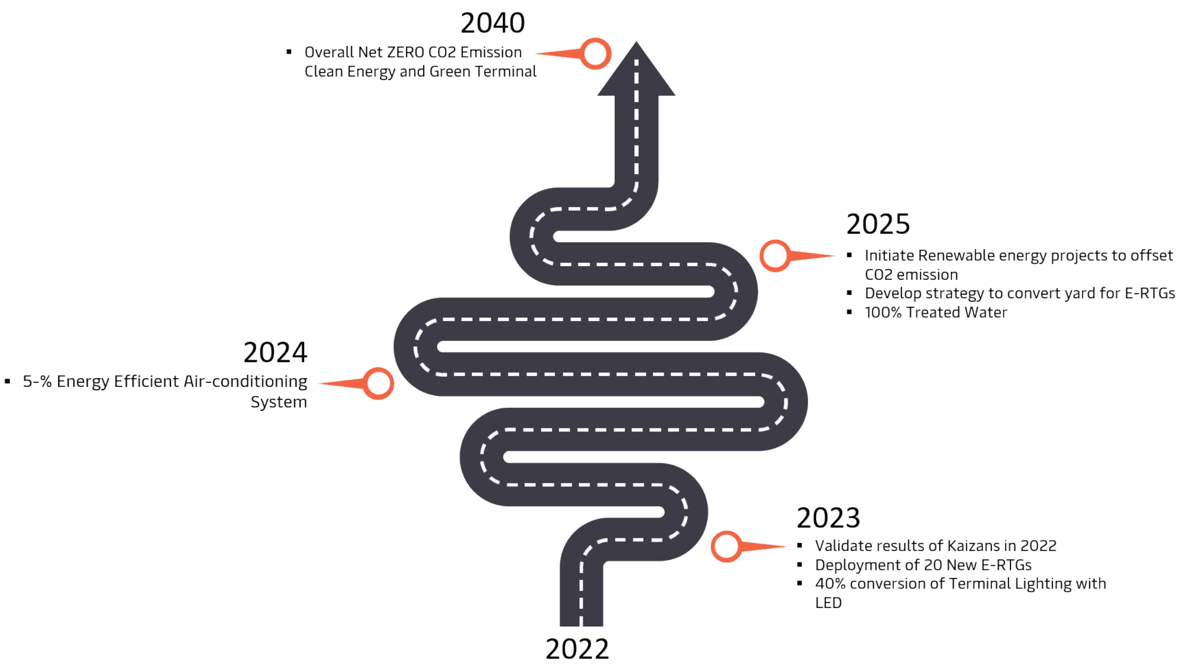
Asyad Group operates the ports, shipping assets, logistics corridors, and free zone infrastructure that will carry the physical weight of Oman's decarbonization transition. Each of these verticals plays a direct and specific role in how the national strategy moves from policy to operation.

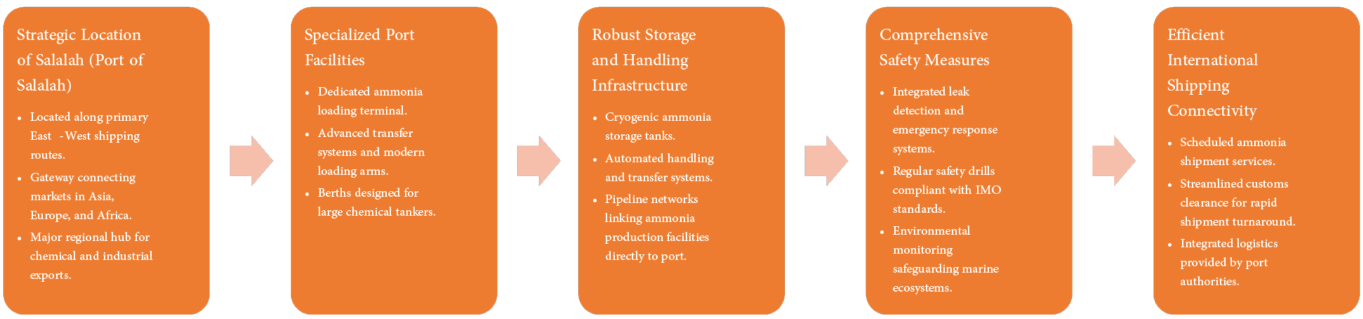
PORTS	MARITIME	LOGISTICS & LAND TRANSPORT	FREE ZONES
1M t/yr renewable ammonia capacity, Port Salalah	**6%** reduction in fleet carbon emissions, 2024	**3×** increase in freight forwarding shipments, 2024	**USD 6.26b** FDI attracted in 2024, up 133% year-on-year
Port Salalah: Net Zero by 2040. Sohar: 35 MW electrolyser with 350 MW scale-up potential. Duqm: anchor for world's first commercial LH_2 export corridor to Europe.	Fleet expansion to 90+ vessels across 200+ commercial ports. Green ammonia and LH_2 positioned as the primary clean marine fuels for deep-sea decarbonization aligned with IMO targets.	All new buses to be electric by 2030. EV last-mile delivery, electrified port equipment, and decarbonized cold chain operations to become standard across the logistics network.	Zones positioned as anchors for clean industry, green manufacturing, and low-carbon freight, hosting the electrolyser capacity and hydrogen derivative processing the national transition requires at scale.

Ports generate direct emissions from equipment, vehicles, marine services, and energy use, while also contributing to a broader emissions footprint associated with berthed vessels, trucking, cargo handling, warehousing and port-linked industrial activity. For Oman, the significance of this sector is heightened by the role of Sohar, Salalah and Duqm in trade, manufacturing, energy logistics, and future hydrogen-derived export opportunities. A decarbonization strategy that omits ports would overlook one of the country's most important interfaces between industry, trade, infrastructure and the energy transition.

PORTS

Port Salalah has committed to achieving Net Zero Emissions by 2040, with a target to reduce 70% of its emissions between 2020 and 2030. Its decarbonization roadmap covers the electrification of Rubber-Tired Gantry Cranes (RTGs), installation of high-capacity power substations and energy-efficient infrastructure, as well as the development of a clean energy terminal. The roadmap also includes infrastructure upgrades such as electricity grid reinforcement through high-voltage feeder lines, and the replacement of existing yard tractors and utility vehicles with lower-emission alternatives.





Critically, Port Salalah's location on the East-West shipping lane, between Rotterdam and Singapore, positions it as a first-mover green ammonia bunkering hub. The port already has ammonia storage and pipeline infrastructure in place, including nitrogen purification units, offtake logistics and ammonia pipelines, with a capacity to handle 1 million tons of renewable ammonia per year. Its location above the Strait of Hormuz provides additional commercial advantages: reduced freight costs, lower insurance premiums, and fewer disruptions compared with routes passing through the Strait itself. These characteristics make Salalah not merely a logistics facility but a strategic energy transition asset with near-term commercial viability.

> "Port Salalah's decarbonization roadmap positions it as a first-mover green ammonia bunkering hub on the East-West shipping lane."

Port Duqm is being developed as a hub for the processing, storage and export of liquid hydrogen, anchoring the world's first commercial liquid hydrogen corridor connecting Oman to the Netherlands and Germany under a Joint Development Agreement between Hydrom, OQ, Hynetwork and Hamburger Hafen und Logistik. The agreement binds the involved parties to the infrastructural development interlinking the corridor and ensures alignment with European standards and requirements for green hydrogen production.

The port's location outside the Strait of Hormuz, directly on the Arabian Sea, combined with its 1,500-hectare footprint, dedicated processing infrastructure, and direct connectivity to major roads, rail network and airports, makes it the optimal facility for cryogenic LH_2 export to European industries.

The Duqm facility will process and ship liquid hydrogen at -253°C using Ecolog vessels designed for zero-boil-off transport, addressing one of the key logistical challenges associated with hydrogen as a fuel source. Phase one of the ACME Duqm project targets production of 17,000 tons of green hydrogen and 100,000 tons of green ammonia by 2027, with subsequent phases focused on commercial scaling and overland export connections to the UAE.

TWO PORTS, TWO ROLES, ONE SYSTEM

ASPECT	PORT DUQM	PORT SALALAH
Main function	Green hydrogen exportation	Green ammonia bunkering
Shipping routes	Europe (Port of Amsterdam)	East-West Shipping Lane
Target markets	Netherlands and Germany	Singapore, Rotterdam, GCC, Africa
Existing infrastructure	Processing and exporting	Processing and bunkering equipment
Processing capacity	High (25 million t/yr by 2050)	High (1,000 t/day)

Sohar Port's decarbonization approach combines near-term operational measures with longer-term clean energy infrastructure ambitions. On the operational side, the port has long used market incentives for cleaner vessels through environmental certification and port-dues rebates. More recently, Sohar initiated B20 biofuel trials in its tug and barge operations in cooperation with Hormuz Marine, Svitzer and Woqod, a blend of 80% diesel and 20% used cooking methyl ester, sourced locally. The sustainability target for this initiative is a 17% reduction in emissions, in line with the Sultanate's net-zero goals by 2050.

On the infrastructure side, a 35 MW electrolyser project tied to solar power is under development, with a potential scale-up to 350 MW, and a broader 3.5 GW solar ambition to support green hydrogen, green ammonia and green steel production. The Marsa LNG project at Sohar is being positioned as a lower-carbon marine fuel hub, with electric-driven liquefaction and a 300 MWp solar farm intended to cover the plant's annual energy needs, a design that would make the plant's Scope 1 and 2 intensities approximately 90% lower than the global LNG plant average.

Sohar has also launched the Sohar Net Zero Alliance with more than 10 partners, committing to annual emissions reporting and sector-wide decarbonization targets. This is an important institutional step, since decarbonizing a logistics-industrial port requires action from tenants and shipping lines, not just the port authority itself.

The implementation of onshore power supply (OPS) systems, in partnership with Moonrock Research and Development and Denmark's PowerCon, will allow berthed vessels to shut down engines at berth, reducing local air pollution and greenhouse gas emissions at the container terminal. The LED light-on-demand initiative, using motion-sensor-controlled outdoor lighting across 4.5 kilometers of the port, is projected to cut energy consumption by 80% in that area and save more than 80 tons of CO_2 annually.

Across the three ports, however, the current landscape remains uneven. Emissions reporting methods, project maturity and the scope of disclosed data vary significantly. Sohar is currently calculating Scope 1 and 2 emissions in line with the GHG Protocol, though Scope 3 coverage is not yet complete. A unified national port decarbonization framework, covering standardized Scope 1, 2, and relevant Scope 3 emissions is needed to align ambition, implementation, and accountability across the port system.

MARITIME

Asyad Shipping's green fleet development reflects the Group's commitment to sustainable maritime operations. The Sohar Max vessel, launched by Asyad, is designed with advanced wind propulsion features to reduce fuel consumption by up to 6% and cut approximately 3,000 tons of CO_2 emissions per vessel per year. This initiative represents a concrete step toward the decarbonization of deep-sea shipping operations aligned with IMO decarbonization frameworks. In 2024, Asyad Shipping's Singapore office saw operated ships increase from 9 to 38, primarily within the product and dry bulk segments. The Group also successfully transported over 145,700 TEUs in 2024, an 11% increase over target, while achieving a 6% reduction in fleet carbon emissions, marking a measurable step in the transition toward clean, sustainable energy solutions across the shipping fleet.

11% increase over target, while achieving a 6% reduction in fleet carbon emissions, marking a measurable step in the transition toward clean, sustainable energy solutions across the shipping fleet.

LOGISTICS AND LAND TRANSPORT

Asyad Logistics recorded exceptional growth in 2024, achieving a sevenfold increase in freight forwarding shipments year-on-year following the acquisition of Skybridge Freight Solutions, the Group's first international acquisition and a strategic move that extended its operational presence to over 90 global markets.

The Group's warehouse network expanded from three domestic facilities to 11 regional hubs, substantially enhancing operational capacity and geographic reach. Freight forwarding volumes rose sharply, with sea freight increasing by 349%, land by 198%, and air by 160% compared to 2023, reflecting the agility of Asyad's integrated logistics network. As Oman's logistics network scales at this pace, the integration of low-carbon practices, including EV-powered last-mile delivery, electrified port equipment and decarbonized cold chain operations, will become increasingly central to the Group's operational model and to its ability to meet the sustainability standards that international trade partners and customers are progressively demanding.

Mwasalat, the Oman National Transport Company and an Asyad subsidiary, launched Oman's first electric bus in 2024, representing the first step in the electrification of the national public transport fleet. In 2024, Mwasalat buses transported over 4 million passengers, marking a 5% increase year-on-year, while ferries carried 245,000 passengers and transported 31,000 tons of cargo, a 30% year-on-year increase. The government has signaled an intention to require all new buses to be electric by 2030, a mandate that will require coordinated depot infrastructure investment, grid connection planning and a clear electrification roadmap across the national public transport network.

FREE ZONES

Asyad's three free zones - Salalah, Sohar and the newly inaugurated Muscat Airport Free Zone - attracted USD 6.26 billion in foreign direct investment in 2024, a 133% increase year-on-year. The construction of the Muscat Airport Free Zone officially started in 2024, marking Oman's first free zone directly linked to an international airport and a development that strengthens national logistics infrastructure and reinforces the Group's contribution to meeting growing demand for integrated trade and logistics solutions. Through the Supplier Development Program, Asyad enabled seven Omani enterprises to integrate into global supply chains in 2024, while the Asyad Accelerator platform was launched to catalyze tech-driven startups across Oman's logistics ecosystem. As the Sultanate develops its low-carbon economic ecosystem, these zones are positioned to become anchors for clean industry, green manufacturing, and sustainable logistics, industrial platforms that can house the electrolyser capacity, hydrogen derivative processing, and low-carbon freight operations that the national transition requires at scale.

THE FULL MOBILITY PICTURE: ROAD, RAIL, AVIATION, MARITIME

To ensure successful decarbonizing, Oman's transport system needs action across all modes simultaneously. Each one presents distinct challenges and opportunities, but they are only as clean as the energy that powers them. The following is a structured status-and-gap assessment across Oman's transport ecosystem, organized by the scale of decarbonization impact from the mode with the largest immediate lever to those where the foundation is being laid for structural change in the decade ahead.

MODE	EMISSION REDUCTION POTENTIAL
Road	5.4–7.9 $MtCO_2$ avoided 2025–2035 under enhanced policy scenarios. Scales with grid decarbonization.
Rail	25.87–45.66 $MtCO_2$ avoided per year by 2035. Dominant decar bonization lever in the portfolio. 2,231–4,912 trucks removed from road daily.
Aviation	786 tCO_2/yr from current airport solar. SAF lifecycle reductions of up to 80% vs conventional jet fuel at scale.
Maritime	Port Salalah targeting 70% emissions reduction by 2030. Sohar biofuel trials targeting 17% reduction. Green ammonia bunkering at Salalah positions Oman as a decarbonization hub for East-West shipping lane traffic.

ROAD: LEADING WITH ELECTRIFICATION

Road transport is the dominant source of transport emissions, driven by approximately 1.3 million private cars accounting for around 60% of the sector's total greenhouse gas output. Approximately 3,000 electric vehicles are registered in Oman as of 2025, supported by around 160 public and private charging stations. The Ministry of Transport has set a target of 350 charging points by 2027, and launched the national public EV charger app Shahin in 2025 to improve charger visibility and accessibility.

Current EV incentives include zero-rated VAT, exemptions from customs duty and registration fees, free charging tariffs at public stations, and home charging aligned to standard residential electricity rates. The national EV sales target of 14,000 units by 2050 is structured in three phases: 30% by 2030, 66% by 2040, and 100% by 2050. Policy modelling indicates that enhanced incentives, combining a 10% capital subsidy, reduced loan rates, and fleet mandates of 20–30%, would push EV adoption to between 105,000 and 131,000 units by 2030 and avoid between 5.4 and 6.6 million tons of CO_2 between 2025 and 2035. International evidence is unambiguous on technology choice. BEVs should be the primary decarbonization pathway for private cars, taxis and light commercial vehicles.

Mwasalat launched Oman's first electric bus in 2024, with all new buses required to be electric by 2030. The Muscat Metro, currently at feasibility stage, represents the most significant proposed intervention for higher-capacity urban transit.

RAIL: THE HIGHEST-IMPACT DECARBONIZATION LEVER

The Hafeet Rail project, a 303-kilometre cross-border railway connecting Sohar Port to Abu Dhabi via Al Ain, represents the most powerful single decarbonization intervention in Oman's transport system. The railway will support bulk trains carrying approximately 14,000 tons per trip, intermodal trains carrying 276 TEU per trip, and passenger trains with projected annual demand exceeding 500,000. Under the base scenario, avoided emissions reach 39.65 million tons of CO_2 per year and nearly 3,800 trucks are displaced daily by 2035. Under an accelerated scenario, the project avoids 45.66 million tons annually, contributing to a projected total reduction of 149.5 million tons per year by 2035. Rail is the dominant decarbonization lever in the portfolio, outperforming both EV deployment and power sector decarbonization from 2031 onwards.

AVIATION: BUILDING THE CLEAN FUEL FOUNDATION

The Central Aviation Authority has established SAF policies aligned with ICAO's global environmental framework, and a national SAF Taskforce was created in 2024. PDO has installed photovoltaic systems at Fahud, Marmul, and Qarn Alam airports, generating approximately 1,227 MWh per year and reducing CO_2 by up to 786 tons annually. The Sandbox AAM Oman 2025 Program marks Oman's entry into drone logistics and urban air mobility, with a national AAM master plan in development. SAF production cost remains the principal barrier; the role of Oman's green hydrogen surplus in enabling power-to-liquid SAF production is a credible medium-term pathway.

MARITIME: PORT INFRASTRUCTURE AS DECARBONIZATION PLATFORM

Oman's ports are among the most strategically positioned in the world for maritime decarbonization; hence, the direction of travel is clear. What the sector currently lacks are the institutional architecture to match its physical ambition.

The core gap is measurement. Emissions reporting methods, project maturity, and the scope of disclosed data vary significantly across the three main port complexes. Without a unified national framework, it is not possible to benchmark progress, prioritize investment or make credible decarbonization claims to the international shipping lines and green fuel buyers whose decisions will determine whether Oman's port strategy succeeds commercially.

Port specialization is the right strategic architecture. But specialization only delivers competitive advantage if it is matched by regulatory readiness. These are governance decisions that can be made now, and whose absence creates the primary bottleneck between physical infrastructure readiness and commercial activation.

The maritime mode will not decarbonize in isolation. Shore power reduces berthed vessel emissions only where grid capacity and tariff frameworks support it. Green ammonia bunkering is only credible where production timelines, offtake agreements, and certification schemes are in place. Each of these dependencies leads back to the same foundation: renewable electricity at scale, and the hydrogen production infrastructure that Sections 2 and 3 describe. Maritime is where Oman's energy transition becomes visible to the world. Getting the governance right is what turns that visibility into competitive advantage.

THE TRANSITION STALLS WITHOUT THESE FIVE THINGS.

Oman's green mobility transition is well established. The renewable resources exist, the policy architecture is in place, and the infrastructure is being built. What determines whether the transition happens at the speed the national strategy requires is not technology availability. It is the removal of a specific set of barriers and the deployment of the policy instruments that the evidence shows actually work.

BARRIERS

	BARRIER	LEVER
Infrastructure	160 chargers serving a fleet of 1.6 million vehicles.	160 chargers serving a fleet of 1.6 million vehicles.
Regulation	EV policies non-binding. No hydrogen safety code. No SAF mandate.	National Green Mobility Act. Ammonia codes by 2026. MFM mandate by 2028.
Market	EVs 24% above ICE price. No long-term hydrogen offtake in place.	Green loans at 2–4%. Fleet mandates. USD 5b investment facility by 2030.
Technology	LH_2 certified carriers not at scale. Ammonia handling infrastructure	Centralized liquefaction at Duqm. Port safety certification ahead of 2027 ACME production.
Behavior	97% of road users on private vehicles. Metro and rail not yet operational.	Electrify bus fleet by 2030. Carbon pricing on trucking to load Hafeet Rail from day one.

INFRASTRUCTURE GAPS

EV charging infrastructure remains sparse relative to the scale of the national vehicle fleet. With approximately 160 chargers installed and operating by 2025 against a total vehicle stock of 1.6 million, spatial density is uneven and intercity corridor coverage is incomplete. The Ministry of Transport has set a target of 350 charging points by 2027, but the more important metric is network performance - uptime, utilization and coverage on major highways - rather than station count. Hydrogen refueling infrastructure is at an even earlier stage, with a single operational station at Shell's Old Airport location in Muscat. For heavy transport, the absence of established ammonia refueling networks limits near-term deployment of alternative fuel vehicles at the scale the logistics sector requires.

REGULATORY FRAGMENTATION.

EV policies are currently non-binding and short-term, sitting outside transport legislation rather than embedded within it. There are no comprehensive regulations covering long-term tax policy, battery safety, import standards, or disposal.

Port-specific bunkering and LH_2 handling regulations, covering bunkering procedures, emergency response, vessel standardization, and safety zoning, remain underdeveloped. Hydrom has improved coordination in green hydrogen development, but gaps remain in national hydrogen safety codes, environmental approval procedures for electrolysers, and green hydrogen certification schemes aligned with EU import requirements. The absence of a unified National Green Mobility Act, coordinating EVs, hydrogen, ports, rail, and SAF under a single regulatory framework, is the single most significant institutional gap in the current landscape.

> "Combined policy packages outperform standalone measures. The modelling shows convergence of EV adoption, rail modal shift, and renewable energy integration produces the greatest emissions reduction."

MARKET IMMATURITY

High upfront EV purchase costs, approximately 24% higher than equivalent ICE vehicles, remain a significant barrier to mass-market adoption. Without extended or strengthened policy support, EV penetration risks falling well short of national targets. The current incentive package lowers some barriers but does not fully overcome financing constraints or create strong obligations for fleet turnover. In green hydrogen, the absence of guaranteed long-term offtake and price visibility in European markets, combined with growing competition from other large-scale exporters, creates financing risk for the development of the LH_2 export corridor at Duqm. Projects that cannot demonstrate demand certainty cannot reach final investment decision.

TECHNOLOGY READINESS

Liquid hydrogen logistics present specific technical challenges such as liquefaction at -253°C, boil-off management during transit, and limited availability of certified LH_2 carriers. These challenges are addressable. Oman is developing centralized liquefaction and shipping infrastructure at Duqm, and Ecolog vessels are being designed for zero-boil-off transport. However, they require phased implementation and early safety certification that cannot be deferred. The timeline for Phase 1 ACME production by 2027 is credible only if the regulatory and infrastructure preconditions are in place before the facility reaches operational readiness.

BEHAVIORAL INERTIA

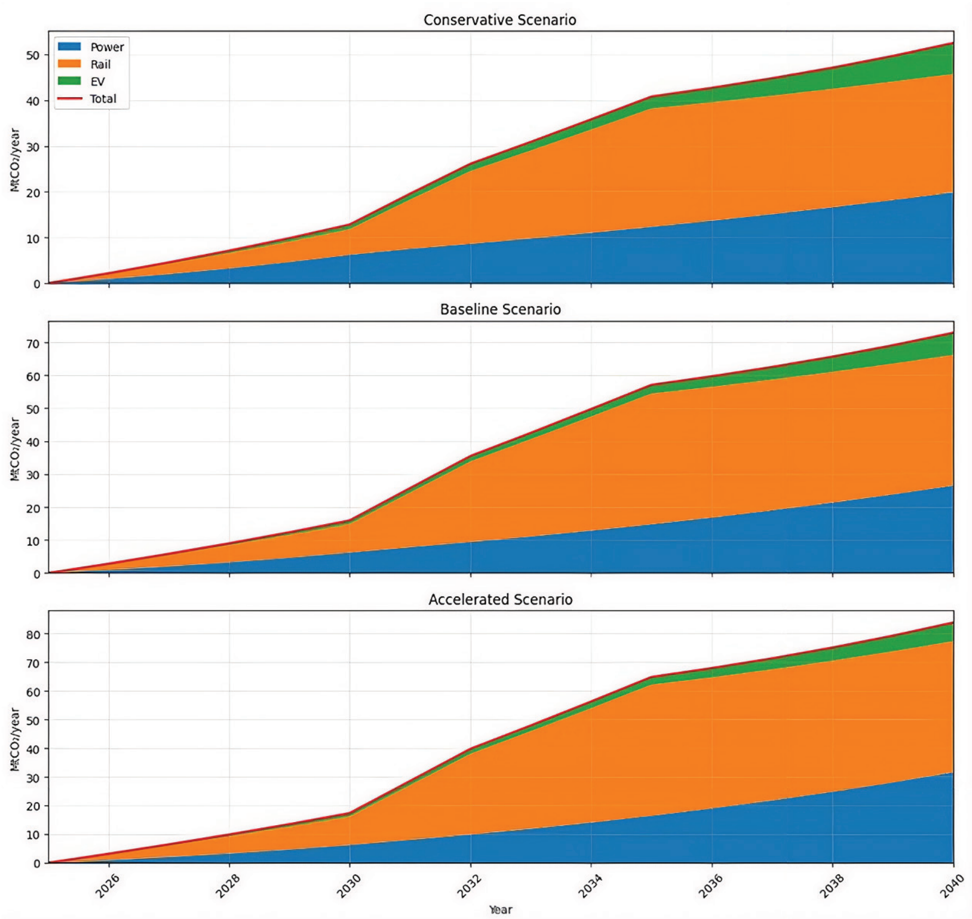
With 97% of road users dependent on private vehicles for daily mobility, shifting travel demand toward collective transport modes is a structural challenge that no single policy instrument resolves. Public transport capacity, while growing, remains modest relative to the scale of private vehicle dependence.

The Muscat Metro represents the most significant long-term structural intervention, but it remains at feasibility stage. Until higher-capacity transit alternatives are operational and competitive on time, comfort and cost, behavioral shift will be incremental.

WHAT WORKS: POLICY EVIDENCE

The scenario modelling conducted for this paper is unambiguous on one point. Combined, sequenced policy packages consistently outperform standalone measures. A regulatory mandate without commercial support creates compliance pressure but does not trigger bankable investment. Fiscal incentives without clear standards encourage opportunistic activity but not durable market formation. Market mechanisms without regulatory backing remain voluntary and too limited to support scale. The most effective pathway combines all three simultaneously, with each instrument addressing a distinct barrier while reinforcing the others.

The EV scenario analysis illustrates the compounding effect of policy ambition clearly. Under a conservative baseline, current policies, no new intervention, EV stock reaches approximately 39,000 vehicles by 2030 and 88,600 by 2035. Under a balanced market acceleration package, combining a 10% capital subsidy, a 4% loan rate and a 20% fleet mandate, new EV sales approach 50% of registrations by 2030 and avoided emissions over the decade reach 5.42 million tons of CO_2. Under an infrastructure-led scaling scenario, 15% subsidy, 3% loan rate, 30% fleet mandate, avoided emissions rise to 6.59 million tons. The high-ambition scenario delivers 7.92 million tons of avoided CO_2 and pushes EV fleet share to over 50% by 2035. The divergence between scenarios widens significantly after 2030, reflecting the compounding effect of early infrastructure deployment and market confidence on subsequent adoption rates.



The rail modelling reinforces the same conclusion from a different angle. Under all three Hafeet Rail scenarios (conservative, base and accelerated), the project delivers material decarbonization benefits. But the spread between the conservative case (25.87 Mt CO_2/yr avoided by 2035) and the accelerated case (45.66 Mt/yr) is determined by utilization and policy conditions that load the network from day one. Carbon pricing on long-haul trucking, intermodal terminal investment at Sohar Port, and early freight demand aggregation are the levers that shift outcomes from the conservative to the accelerated trajectory.

> " A projected reduction of **149.5M tons** of carbon emissions per year by 2035 "
>
> Hafeet Rail

Renewable energy scenario analysis shows that grid decarbonization is a multiplier to transport electrification. Raising the renewable electricity share from 10% to 30% increases EV-related emissions reductions by approximately 14%. Moving toward a 60% renewable share nearly doubles EV climate effectiveness compared with a low-renewable grid. The emissions performance of every electric vehicle, hydrogen electrolyser and shore power installation is a direct function of how fast the power sector decarbonizes.

The overarching conclusion from the modelling is that delayed action cannot be fully recovered later. Once deployment momentum, infrastructure readiness and market adoption diverge across scenarios, the resulting emissions outcomes remain persistently separated through 2040. The strategic choice is not between acting now and acting later with equivalent effect. It is between securing compounding reductions early and accepting durable underperformance. The interventions that matter most are the ones that happen before 2030.

RECOMMENDATIONS: FIVE DECISIONS THAT WOULD CHANGE THE TRAJECTORY

The barriers identified in the preceding section are not intractable. Each has a known policy response and the scenario evidence shows that the responses work when deployed together. The following five recommendations are prioritized by leverage, time-sequenced by urgency, and mapped against specific lead authorities. They address the most critical decision points in Oman's green mobility transition.

RECOMMENDATION 1: ESTABLISH A NATIONAL GREEN MOBILITY REGULATORY ACT	
Action	Consolidate fragmented regulations governing EVs, green hydrogen, ports, rail, and SAF into a unified National Green Mobility Act, providing long-term policy certainty across all transport modes.
Rationale	Regulatory fragmentation is the primary cause of delayed investment decisions. A unified code aligns incentives, eliminates overlapping approvals, and signals durable policy commitment to domestic and international investors.

RECOMMENDATION 2: EXTEND AND DEEPEN EV FISCAL INCENTIVES THROUGH 2030	
Action	Extend VAT exemption, customs duty waiver, and registration fee relief for EVs beyond 2025; introduce low-interest green mobility loans (target: 2–4%); mandate fleet electrification targets for government and large corporate operators.
Rationale	Market forces alone will not deliver the EV penetration required for transport decarbonization. Enhanced policy support shifts the market into a rapid adoption phase, increasing EV stock from a conservative 39,000 by 2030 to 105,000–131,000 under an infrastructure-led scenario.

RECOMMENDATION 4: ENFORCE PORT SPECIALIZATION AND MFM STANDARDS	
Action	Enforce port specialization policy - Duqm for LH_2 export, Salalah for green ammonia bunkering - and mandate certified mass flow metering (MFM) in all bunkering ports by 2028.
Rationale	Port specialization avoids duplication of infrastructure investment and strengthens Oman's positioning against regional competitors. MFM mandates create the measurement and governance conditions required for credible low-carbon bunkering and underpin the commercial viability of Salalah as a green ammonia hub.

RECOMMENDATION 5: CREATE A GREEN MOBILITY INVESTMENT FACILITY	
Action	Establish a dedicated Green Mobility Investment Facility combining blended finance, public guarantees, and concessional loans to mobilize at least USD 5 billion in private capital by 2030 for EVs, hydrogen, ports, rail, and SAF infrastructure.
Rationale	High capital requirements are the most universal barrier across all transport decarbonization pathways. Blended finance vehicles reduce investment risk, lower the cost of capital, and unlock private sector participation at the scale required to meet national targets.

FUTURE OUTLOOK

What does a successful transition look like? Based on the scenario modelling and policy analysis in this paper, the following horizon view sets out what Oman can expect to achieve at each major Vision 2040 checkpoint if the recommended policy pathway is pursued with consistency and coordination.

MILESTONE YEAR	STRATEGIC FOCUS	INDICATIVE NATIONAL INITIATIVES	EXPECTED OUTCOME
By 2030	Foundation and market creation	Establish regulations, safety standards, permitting reform, pilot projects, fiscal incentives, initial certification, early mandates, and first off-take agreements	Early project pipeline established; market viability demonstrated
By 2040	Commercial scale and integration	Expand production capacity, develop shared infrastructure, integrate green fuels into industry and transport, strengthen domestic supply chains, align with export market requirements	Green fuel ecosystem scaled across strategic sectors
By 2050	Net-zero delivery and market maturity	Achieve economy-wide low-carbon integration, mature domestic and export markets, reduce dependence on subsidies, complete deep decarbonization in hard-to-abate sectors	Net-zero-aligned energy and industrial system

THE COMBINED EMISSIONS REDUCTION TRAJECTORY

Under the base scenario, the combined impact of renewable energy expansion, Hafeet Rail deployment, and EV adoption produce a total avoided emissions trajectory of approximately 57 $MtCO_2$ per year by 2035, rising to 72.9 Mt per year by 2040. Rail is the dominant contributor in this model, accounting for the largest share of avoided emissions from 2031 onwards as the network reaches full commercial utilization. Power sector decarbonization is the second most significant lever, delivering steady, growing reductions as renewable penetration increases. EV deployment, while important, is a longer-term supporting strategy its full impact materializes as the grid decarbonizes and fleet turnover accelerates.

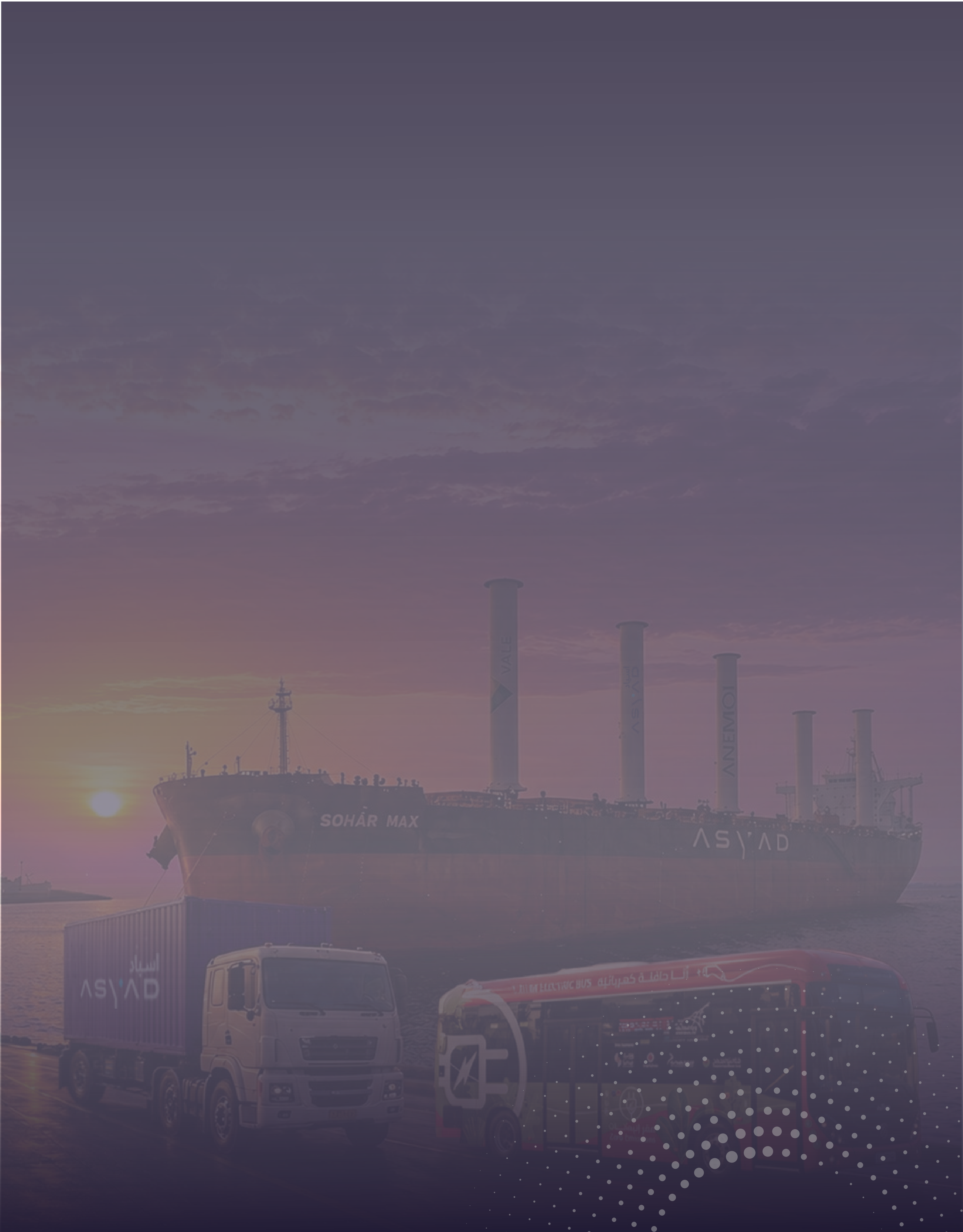
The accelerated scenario demonstrates the strategic upside: total avoided emissions of 64.8 Mt per year by 2035 and 83.7 Mt per year by 2040, achieved by moving faster on all three levers simultaneously. The widening spread between scenarios from 2031 onward reflects the compounding effect of early action, infrastructure deployed before 2030 sets the utilization trajectory for the following decade.

CLOSING STATEMENT

Oman moves forward with determination. The assets are in place, the policy architecture exists, and the institutions are positioned to act. What the transition requires now is not a new strategy, but the consistent, coordinated execution of the one that already exists.

The green mobility transition is Oman's opportunity to define itself, in the global clean energy era, as a model. The infrastructure Asyad Group operates, the hydrogen Oman will produce, the railway that will shift freight from road to rail, and the ports that will anchor the world's clean fuel corridors are not aspirations. They are the foundation of a sustainable logistics superpower.

> "The strongest conclusion is simple. Act before 2030 and the gains compound."



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