



شركة وادي الرياض  
Riyadh Valley Co

# EV charging stations: Immense growth prospects



August, 2023



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## Introduction

In today's world, global economies consider electric vehicle (EV) adoption as a key to the countries' progress towards achieving their sustainability goals. Demand for electric vehicles is surpassing the supply in the market. Rise in demand for greener transport solutions with high-performance and slight decline in electric vehicle battery prices contributed to the rapid expansion of the electric vehicle market during 2019-2022. Additionally, in response to growing environmental concerns, governments and environmental organizations worldwide have implemented strict standards to lower car emissions.

Consumers and fleets considering electric vehicles need access to charging stations. This necessitates the availability of charging stations at home, workplaces or public locations. An electric vehicle charging network is an infrastructure system of charging stations to charge electric vehicles. Residential EV charging refers to charging at home. Commercial electric car charging applies to EV cabs, multi-family units, and workplace charging stations. Commercial electric vehicle charging stations can be used by employees and customers. Many commercial EV charging stations are available to the public as well. Government, car manufacturers and charging infrastructure providers create such networks.

Global electric vehicle charging station market size was valued at USD 46.5 billion in 2022 and is anticipated to grow at a CAGR of 31.5% from 2023 to 2032.<sup>1</sup> The growth in market size of the charging infrastructure could be directly linked to the surge in the sales of electric vehicles. According to International Energy Agency (IEA), more than 10 million electric cars were sold worldwide in 2022 and sales are expected to grow by another 35% this year to reach 14 million. Global electric vehicle market is forecasted to grow at a CAGR of 17.30% from 2022-2030.<sup>2</sup>

China, Europe, and the United States account for a major portion of the electric car sales. China accounted for 60% of global electric car sales in 2022. Europe and the United States witnessed strong growth, with sales increasing 15% and 55% respectively in 2022.

Electric vehicles market is gaining traction in the GCC region, particularly in UAE and KSA as the countries intend to meet their carbon neutrality targets by 2050 and 2060 respectively. In the UAE, the Roads and Transport Authority's creation of free parking spaces, exemptions from RTA (Road and Transport Authority) EV registration and renewal fees encourage the adoption of electric vehicles.

Saudi Arabia has developed EV targets such as setting out that at least 30% of all vehicles in Riyadh will be electric by 2030. EV charging infrastructure market is forecasted to grow during 2023-2027 aided by a rise in EV sales and targeted government initiatives. In November 2020, the Ministry of Municipal Rural Affairs and Housing announced its plan to allocate 5% of parking spaces for EVs and install EV charging stations in all Car parks. Private investment for EV charging station is increasing in Saudi Arabia. In February 2023, Tawal and Electromim signed a strategic partnership to enhance the country's electric vehicle supply equipment (EVSE).

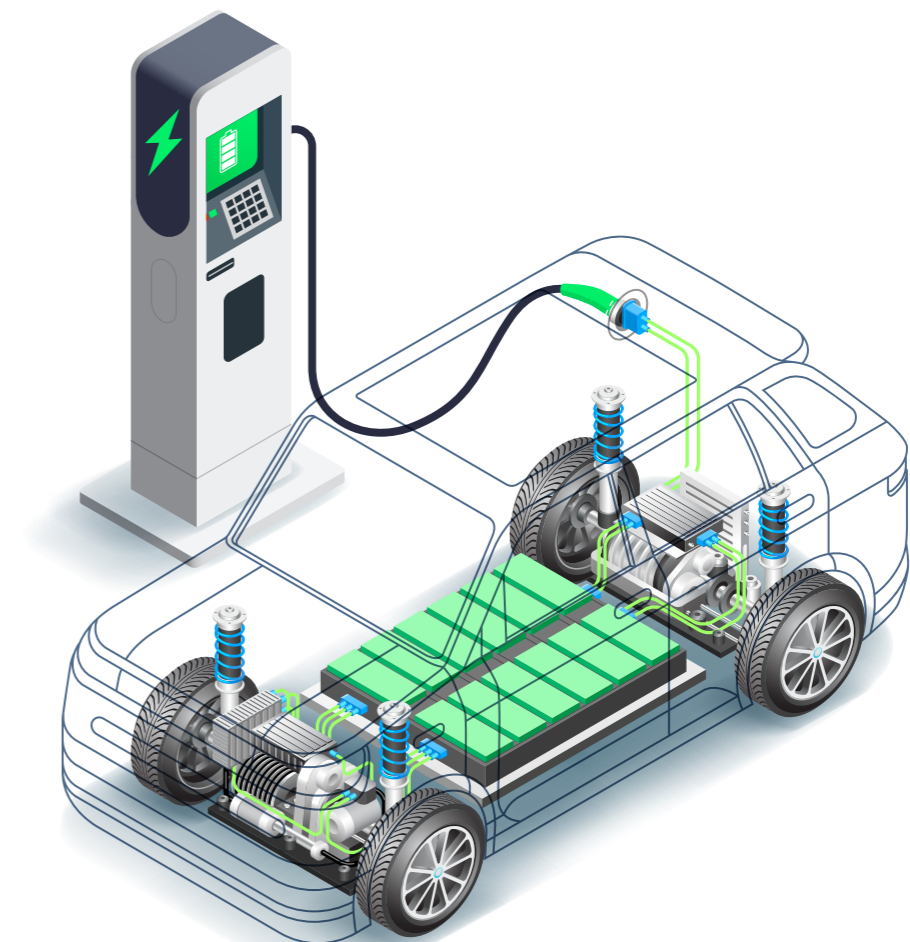
<sup>1</sup>Precedence Research  
<sup>2</sup>Vantage Market Research

## Overview of EV Charging infrastructure

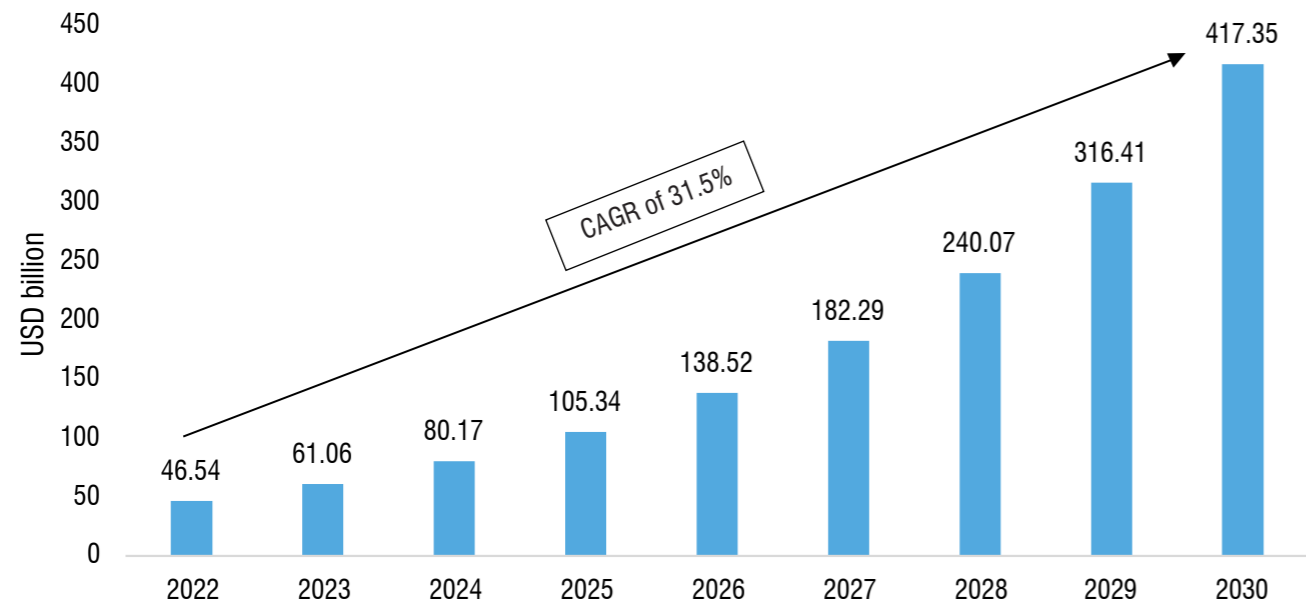
An electric vehicle charging station is an equipment that connects an electric vehicle to a source of electricity to recharge electric cars and plug-in hybrids. Charging stations, known as electric vehicle supply equipment, are available at public locations such as shopping centres and are provided by private or electric utility companies. An EV charger pulls electric current from the grid and delivers it to the electric vehicle through a connector. An electric vehicle stores that electricity in a large battery pack to power its electric motor. To recharge an EV, an EV charger's connector is plugged into the electric car inlet via a charging cable.

Electric vehicle charging stations provide different types of charging levels such as level 1, level 2, and level 3. Electric vehicle charging stations have various configurations such as wall-mounted or free-standing, single charging head or multi-head, commercial or residential grade, and indoor or outdoor instalment. EVSE charge fees either on monthly or yearly flat rates or per-kWh to hourly rates.

Government initiatives to encourage the adoption of electric vehicles, surge in the demand for electric vehicles and increased deployment of electric vehicles by shared mobility operators underpin the growth in the market size of EV charging infrastructure. Additionally, the incorporation of vehicle-to-grid (V2G) electric vehicle charging stations that aid in balancing the demand and supply of power grid is expected to further offer growth opportunities to the charging industry during the forecast period.



## Market size of EV Charging industry (2022-2030)



Source: Precedence Research

As electric vehicles continue to gain momentum, the battery technology behind them is also evolving. The charging process is becoming more accessible and convenient with more mainstream options automakers provide. The key developments in the charging solutions are expected to offer better flexibility for electric vehicle users and enable electric vehicles to gain prominence in the transportation ecosystem along with internal combustion engine (ICE) vehicles.

### Top Trends in EV Charging infrastructure

#### Smart EV Charge

- Smart EV charging stations are equipped with advanced technology such as Wi-Fi that enables monitoring of the charging session, including the status of the vehicle and its battery to improve customer experience.
- User-Managed Charging enables user to control their charging station by opening and closing the gate and adjusting the voltage output and temperature. Additionally, they can monitor their vehicle's battery state, and remotely start or stop charging functions if they have an app installed on their phone.
- The Supplier-Managed Charging enables charging providers to adjust the charging parameters based on different situations, such as preventing local power networks from overloading.

#### Vehicle-to-Grid technology

- Vehicle-to-Grid (V2G) technology is a system that allows electric vehicles to interact with the power grid and provide services to the grid by sending excess energy stored in the EV's battery back to the grid.
- This technology enables EVs to act as mobile energy storage units that can be used to balance the grid's supply and demand.

#### Plug and charge

- Plug and Charge provides a secure connection between the EV and the charging station, allowing for automatic identification and authorization of the EV.
- This technology allows EV owners to plug their vehicle into a charging station and start charging without the need for a separate authentication process.

#### EV Roaming

- EV Roaming allows EV users to charge their vehicle on the road at any regional charging station on any eMobility service provider's EV charging network using an EV charging self-service mobile app.
- The charging transaction gets reflected in their monthly invoice by the eMobility Service Provider.

#### Emergence of Charging as a service

- In the early stages of EV adoption, companies focused primarily on building EV charging infrastructure and establishing charging stations.
- The recent years witnessed a shift towards companies offering services around EV charging. Companies with substantial infrastructure are investing heavily in EV charging as it highly impacts their primary business.

#### Move to Open Charge Point Protocol 2.0.1 (OCPP)

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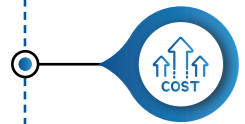
### Charging availability

- EV drivers find it difficult to locate a free charging station as the number of electric cars are increasing and drivers leave their cars parked at charging stations after they have finished charging.
- Some parking stations are implementing parking sensors that detect if a parked vehicle is blocking the station, which notifies the driver through an app and marks the station as occupied.
- EV drivers will receive push notifications through the app when their charging is complete and will be notified of when they must remove their vehicle or be charged additional fees by the Charge Point Operator (CPO).

Source: E-Infochips

Although pent up demand and drive towards sustainability support migration to electric vehicles, factors such as affordability, absence of robust power infrastructure and supply constraints are likely to weigh the market growth.

### Challenges to EV Market Growth



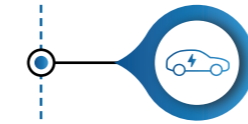
#### High costs

- The cost of charging systems with level 2 and above is higher in comparison with level 1 charging systems due to the equipment costs.
- The equipment used is expensive as they are publicly mounted and have additional features such as payment processing system, LCD screen, and tracking system, adding up to the cost of these charging stations.



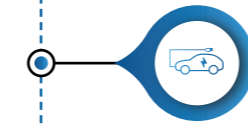
#### Lack of Standardization

- Governments need to standardize charging infrastructure to support the increase in the sales of electric vehicles.
- Several countries use different standards for fast charging. Japan uses CHAdeMO, Europe, U.S, and South Korea use CCS, and China uses GB/T.
- The lack of standardization across countries might likely impact the installation of charging stations and hamper the growth of the EV charging station market.



### Lack of vehicle-grid interportability

- There is a need for consensus agreements, logistics, and communication channels between the grid, utilities, and charging manufacturers.
- The government or utility companies withhold essential information that are otherwise not provided to the charging network providers. This slows down the development time and reduces the project's profitability.
- Cooperation among all partners is essential for the implementation of the vehicle-to-grid infrastructure.



### Limited availability of EV models

- There is still a narrow range of EVs available for selection compared to gasoline-powered cars, and the variety of models offered is limited.



### Charging price structures

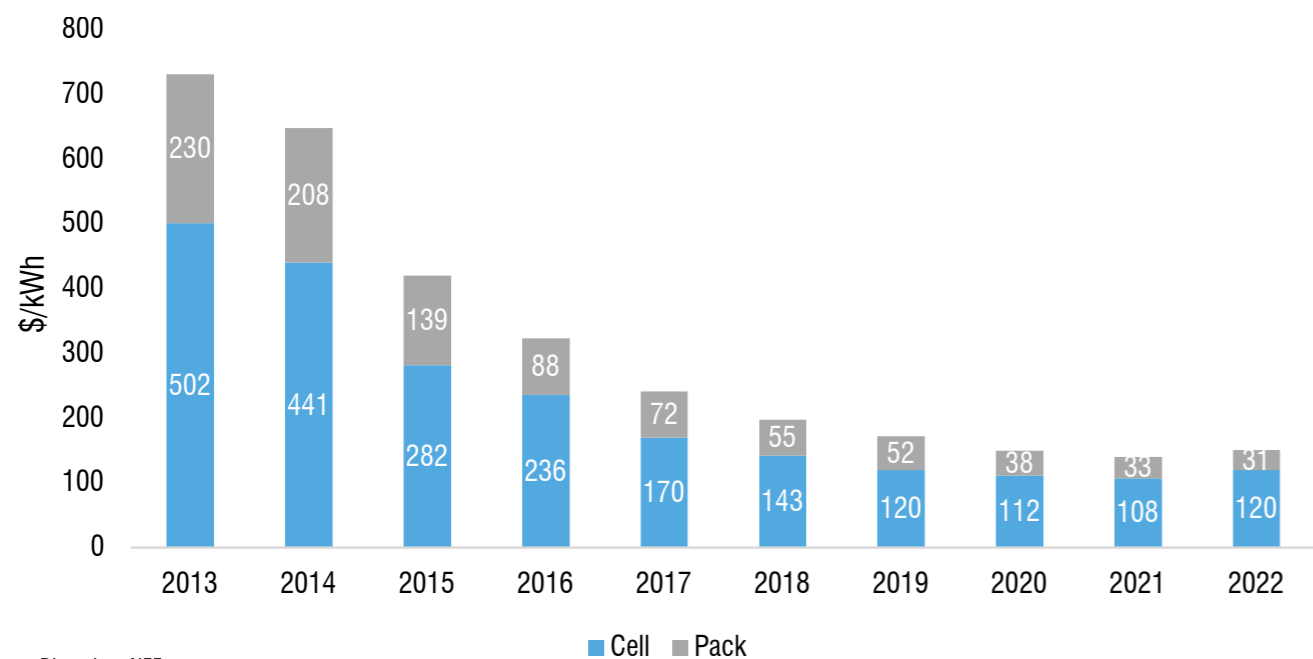
- Unlike gasoline, EV charging includes different pricing structures. Utility regulators fix consistent rates per kWh for home charging. Public charging stations may include per-session fees, per-minute fees, or pricing based on charging speed.
- This difference can result in inconsistent pricing and inflated charging costs, creating barriers to EV usage due to consumer frustration and negative experiences.

Source: Allied Market research, EV Charging summit

The electric car sales worldwide climbed to over 3 million during the pandemic, marking a record-breaking year for electric mobility.<sup>3</sup> The decline in battery costs coupled with government incentives to promote usage of EVs were the key drivers for the expansion of EV market during the period.

<sup>3</sup>IEA

### Volume-weighted average lithium-ion battery costs (2013-2022)



Source: BloombergNEF

In 2020, EV market recorded a growth of over 40% in global sales from the 2.1 million electric cars sold in 2019. EV battery pack costs fell from USD 924 in 2011 to USD 132 in 2021, recording a 30% dip during the period.

### COVID-19 – A record year for EV market

#### Regulatory policies

Several countries had solid regulatory measures, such as EV mandates, intending to drive original equipment manufacturers (OEMs) to diversify their sales from conventional vehicles towards electric powertrains. Government policy support was robust, particularly in Europe, as 2020 was a critical target year for emissions standards. There was a surge in purchase incentives in Germany. Several countries reasserted their targeted support to low and zero-emission vehicles to aid the automotive industry's recovery from the impact of the Covid-19 crisis.

#### Technology and reduced battery cost

Battery costs declined during the pandemic. As the demand for electric cars, grid storage installations and other battery-based systems increased during the period, batteries were manufactured in higher volumes. Higher volumes drove prices lower. Fleet operators initiated their technology transition. OEM offers were upgraded in both model choice and performance.

#### Rise in demand

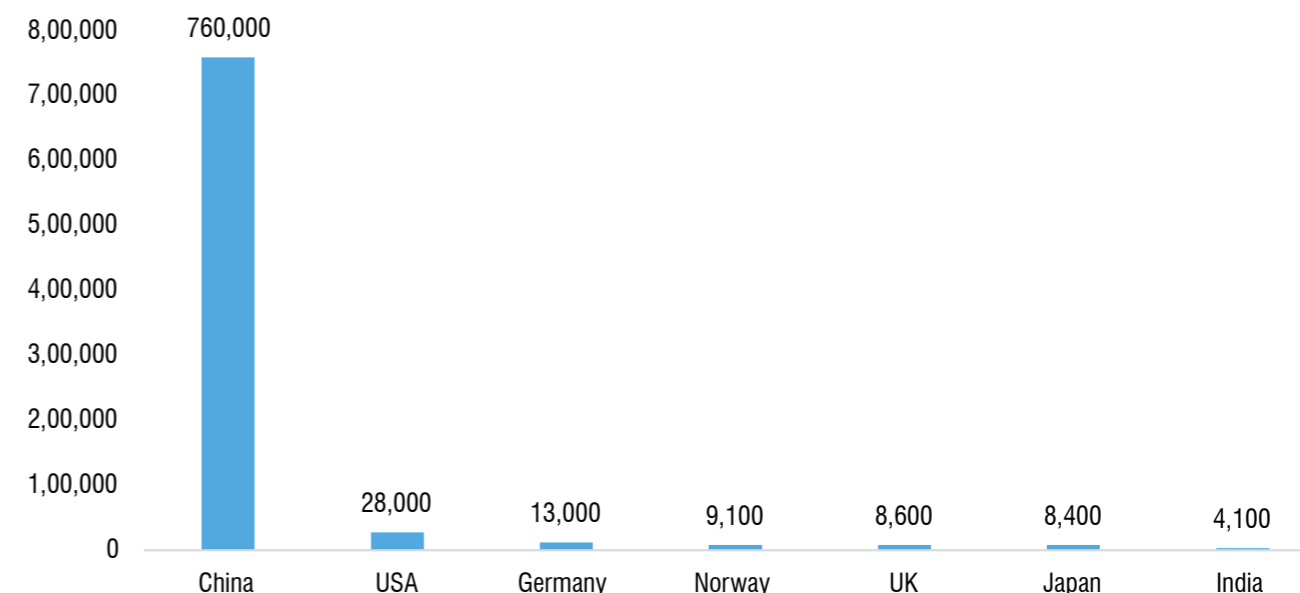
Affluent households that were less affected by the economic downturn started purchasing more EVs during the pandemic.

Source: IEA, BloombergNEF

### Global Market for EV Chargers

China has the highest number of publicly available charging stations on a global scale. As of 2022, the country had 1,760,000 charging points, roughly 65% of all public charging stations available worldwide. In addition, 43% of stations in China have the fast-charging capability.

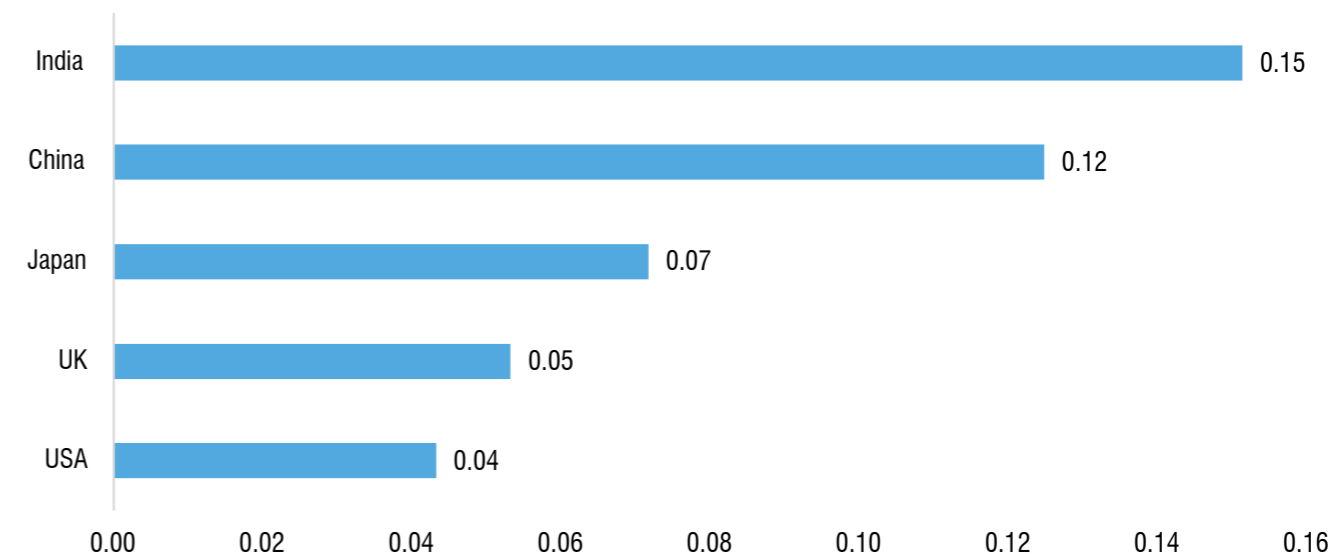
### Publicly available fast-charging points across countries (2022)



Source: IEA

Alternative Fuel Infrastructure Directive (AFID), the key policy regulating the deployment of EVSE in the European Union, recommended that countries aim for 1 public charger per 10 EVs, a ratio of 0.1 in 2020.

### Ratio of public chargers (EVSE) per EV stock, 2022



Source: IEA, Marmore Research

As of 2022 among key global economies, India and China had higher charging stations. Despite continuous surge in the number of EVs in U.S, the development of charging infrastructure is slower and inconsistent.

### Top 5 EV Charging companies worldwide (2022)

#### EVBox (Netherlands)



- The charging station facilitates across Europe and North America and services all types of electric cars.
- EVBox offers a wide range of commercial and residential fast-charging stations at affordable prices.
- The company has shipped over 400,000 charging ports to customers and partners over 70 countries worldwide.

#### Star Charge (China)



- Also known as Wanbang Digital Energy, the company researches and develops charging technology.
- It produces equipment for New Energy Vehicles.
- Star Charge has formed strategic partnerships with almost 60 Auto OEMs worldwide, including Mercedes, BMW, Jaguar, Land Rover and Volkswagen.
- The charging station has gained significance in China owing to its smart equipment, users and data operations services.

#### ChargePoint Inc., USA



- ChargePoint provides services to businesses, utilities, governments, malls, and parking service providers around the world.
- It has 200,000 charging points with additional 355,000 to public places to charge through roaming integrations with other major networks.
- Its mobile app helps to track available stations in a particular area to charge electric vehicles.

#### ABB (Switzerland)



- ABB sold more than 680,000 electric vehicle chargers across more than 85 markets.
- It sold over 30,000 DC fast chargers and 650,000 AC fast chargers.
- Its portfolio ranges from the AC wallbox for home, work or retail installations to the Terra 360 which is ideal for refuelling stations, urban charging stations and retail parking.

#### Teld New Energy (China)



- The firm is one of the largest EV charging station companies in the world. It is engaged in New Energy EV Charging Network construction and operation and Internet appreciation services.
- As of September 2022, Teld had the largest EV fast charging network in China.
- TELD is aiming at building the largest automobile charging system eco-cooperation in China.
- TELD has over 316,000 EV charging units and around 20,000 stations.

The EVSE infrastructure continues to evolve rapidly. Some countries are devising strategic plans to install large-scale interconnected EV charging stations along main transport routes. Key considerations in the planning include digitalisation, interoperability, and roadmaps for developing charging networks. Stimulus packages are strengthening the funding for EV infrastructure.

### Policies promoting EV deployment



#### European Union

- The Alternative Fuel Infrastructure Directive (AFID) guides the publicly accessible EV charging stations. EU members are required to maintain ratio of 1 charger per 10 electric cars.
- European Energy Performance of Buildings Directive has set requirements for residential and non-residential buildings to improve access to charging points.
- The Recovery and Resilience Facility, a EUR 672.5 billion fund, includes support for charging stations.



#### United States

- In 2021, an infrastructure plan was established to install 500,000 chargers, adding 100,000 charging points.
- California and New York offer subsidies and tax incentives, and collaborate with electric utilities to promote EV deployment.



#### China

- China has announced a USD 1.4 trillion digital infrastructure public spending programme that includes funding for EV charging stations.
- Several cities in China have set targets to install about 1.2 million chargers by 2025.



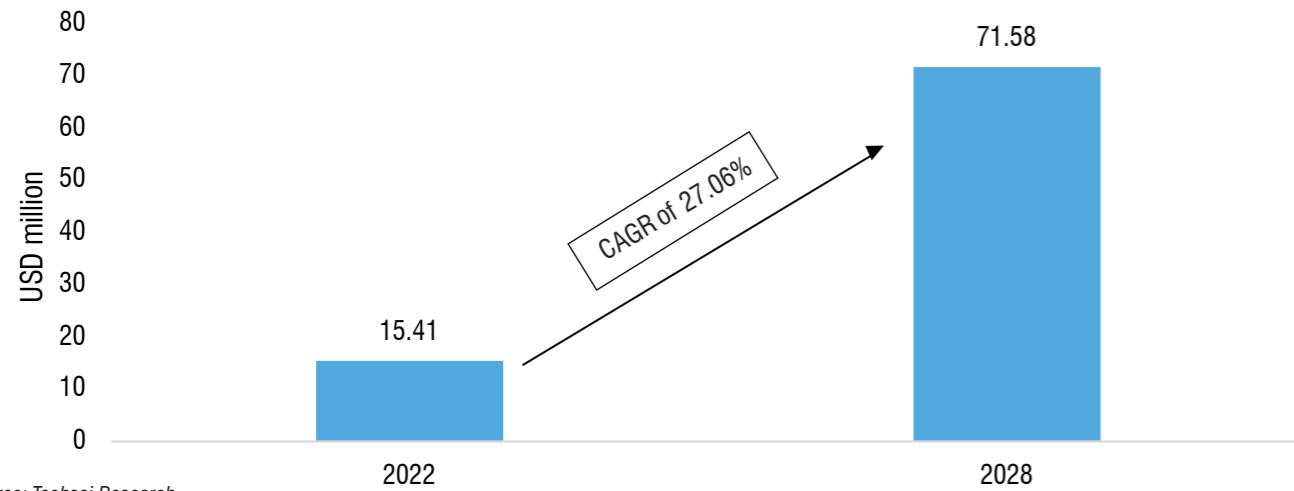
#### India

- Under India's FAME II programme, USD 133 million is allocated for charging infrastructure.
- In October 2020, the Ministry of Heavy Industries announced that investors could benefit from the scheme and install a minimum of 1 charging station every 25 km along key highways.

## Global Market for EV Chargers

The EV Charging market in the GCC region presents numerous growth opportunities during 2023-2028 owing to the rise in demand for electric vehicles, high rate of car ownership in the region and government initiatives to promote the use of renewable energy and reduce greenhouse emissions.

### Market size of EV Charging Infrastructure (2022-2028)



Source: Techsci Research

The adoption of EVs is a key element of the GCC countries' progress towards clean energy transition, which is driving the need for charging infrastructure. The development of fast-changing technologies and battery technologies is making EVs convenient for long-distance travel within the region, further strengthening the demand for charging infrastructure.

### Demand drivers for EV adoption

#### Economic diversification

The GCC region depends largely on oil and gas exports for its income. The use of EVs and related technological and infrastructural developments is aiding the GCC region become less reliant on oil and diversify its economy.

#### Technological advancements

The GCC region is embracing new technological developments in line with its global peers. These technological breakthroughs have resulted in the development of infrastructure for charging EVs such as wireless charging and quicker charging periods.

#### Focus on sustainability

The GCC electric vehicle market is expanding as traditional vehicles are replaced with zero-emission vehicles. Rising pollution levels and greater inclination of people towards sustainability and green energy is driving EV demand.

#### Emerging new players in the market

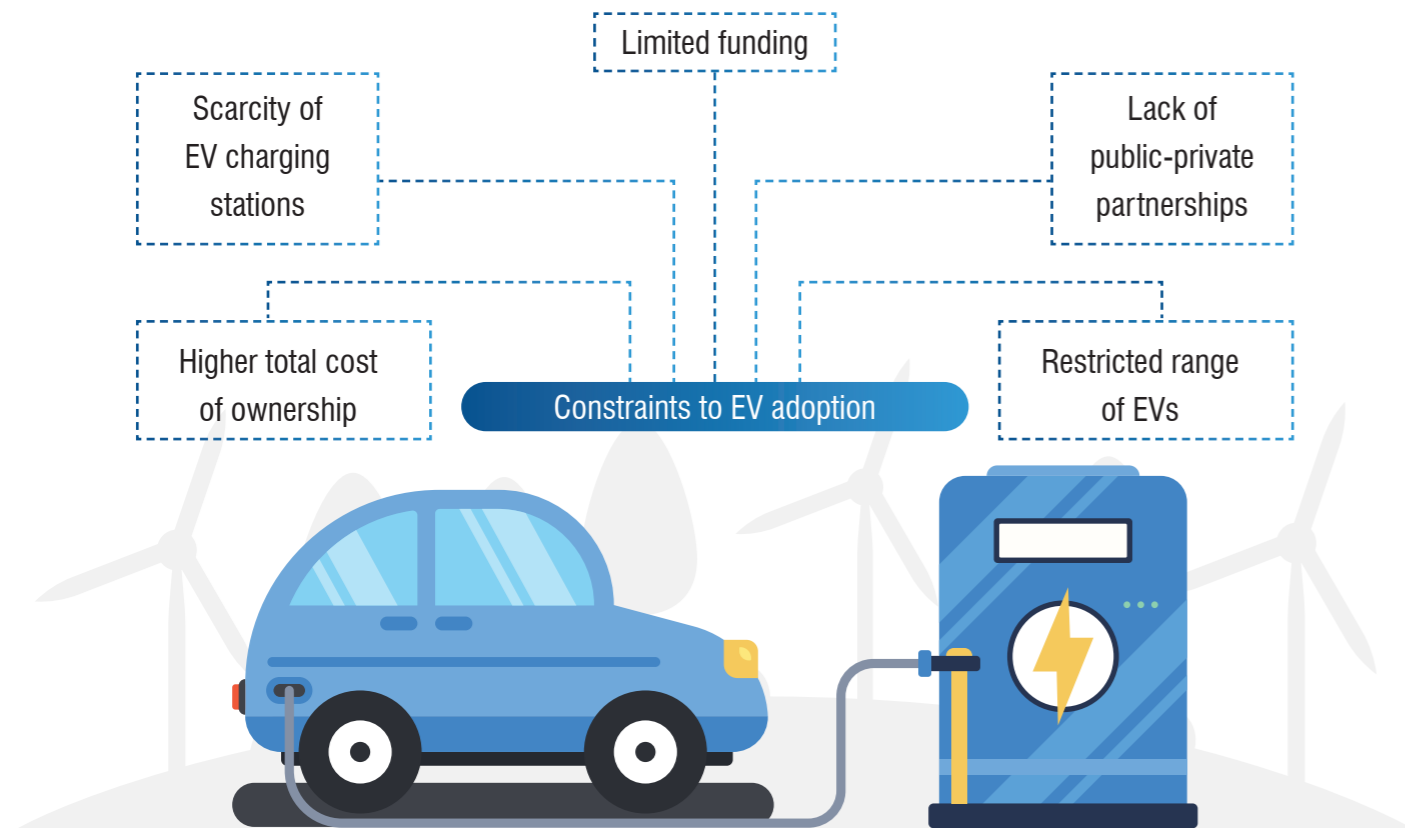
Several manufacturing businesses in the region have made investments in vehicle manufacturing and charging infrastructure industry's research and development over a period of a few years. New players including startups and established automakers have collaborated with local battery manufacturers and service providers to establish their business and launch new EV models. For example, in 2021, a luxury electric vehicle named Lucid Air was introduced by Lucid Motors.

Source: Techsci research, Businesswire

However, the growth of electric vehicles sector moderated after the COVID-19 pandemic as automotive manufacturers delayed the assembly of vehicle parts due to shortages. Reduction in the vehicle miles travelled coupled with consumer's lower purchasing power impacted the industrial growth after the pandemic.



### Challenges to EV adoption



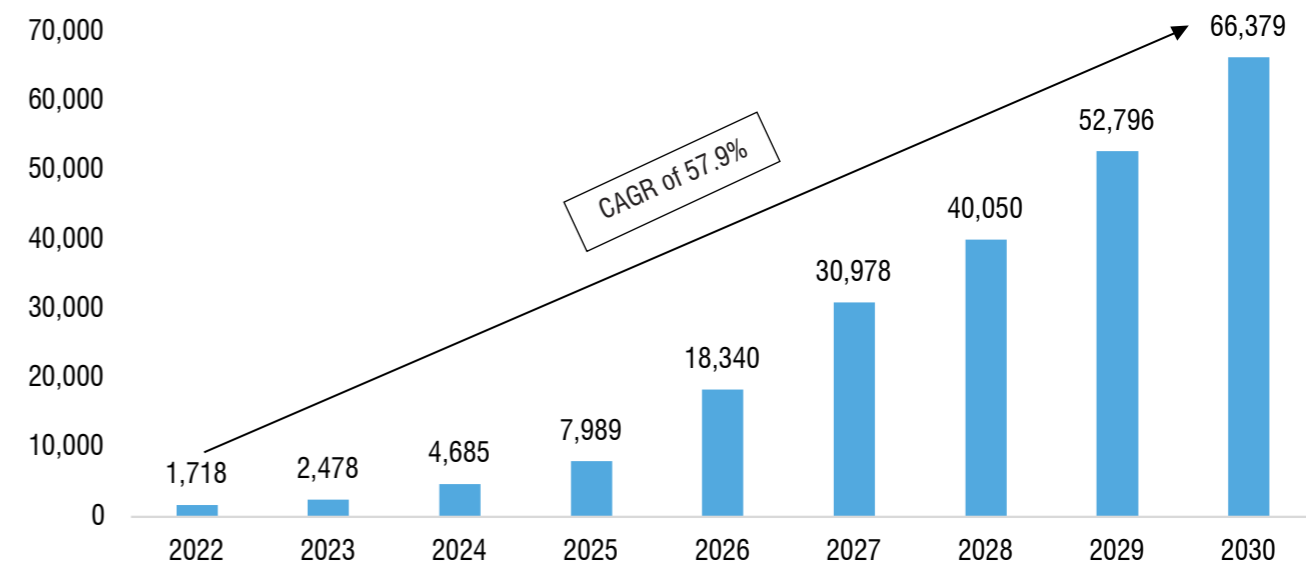
Source: Businesswire

Saudi Arabia has been a frontrunner in accelerating its deployment of electric vehicles in the recent years. Saudi Arabia has invested over USD 50 billion in the assembling of electric vehicles over the next 10 years. In 2022, Saudi Arabia announced a USD 6 billion investment in a steel plate mill complex and an EV battery factory. Saudi Arabia also inked a contract with Lucid Group Inc. to buy 50,000-100,000 electric vehicles over a 10-year period.

### Global Market for EV Chargers

Saudi Arabia electric vehicle revenues witnessed stable growth during 2018-19 owing to the lift of ban on the import of electric vehicles. However, EV sales declined in 2020 due to the supply chain disruptions following the outbreak of the pandemic. Government policies favouring the adoption of EVs coupled with greater demand for sustainable transportation solutions due to increased urbanization augurs well for the electric vehicles market.

#### Saudi Arabia EV sales forecast (2022-2030)



Source: EV Reporter

In 2020, there were more than 15 million registered vehicles in Saudi Arabia. Roughly, four-fifths of the registered vehicles were cars or light vehicles. Though the electric vehicle market in Saudi Arabia is in its developing phase, the market is expected to witness steady growth in the near term. The relatively young and tech-savvy population and high per-capita income of the country underpin the growth in the industry.

#### Major EV players in Saudi Arabia

##### Ceer

- Ceer is the first Saudi Arabian EV brand, a joint venture between Saudi's Public Investment Fund (PIF) and Foxconn, with BMW serving as the component provider.
- The company plans to design and manufacture a range of sedans and Sport Utility vehicles with license component technology from BMW.

##### Lucid Motors

- Lucid Motors is an American-based EV manufacturer, with major stake held by Saudi government through PIF.
- In 2022, the Saudi government committed to purchasing 100,000 vehicles over ten-year period from Lucid.
- The quantity ranges from 1,000-2,000 vehicles annually and is expected to increase between 4,000-7,000 vehicles annually starting from 2025 to be assembled at Saudi's factories.

### Hyundai

- In December 2022, Hyundai Motors signed an agreement with the Saudi government to build assembly plants with CKD (completely knocked down) system for electric cars and internal combustion engine cars.

### Canoo

- In 2023, Saudi company GCC Olayan partnered with Canoo for sale, maintenance, distribution and repair of electric vehicles.
- The companies also intend to introduce a digital vehicle ecosystem for the local assembly and repair of EVs.

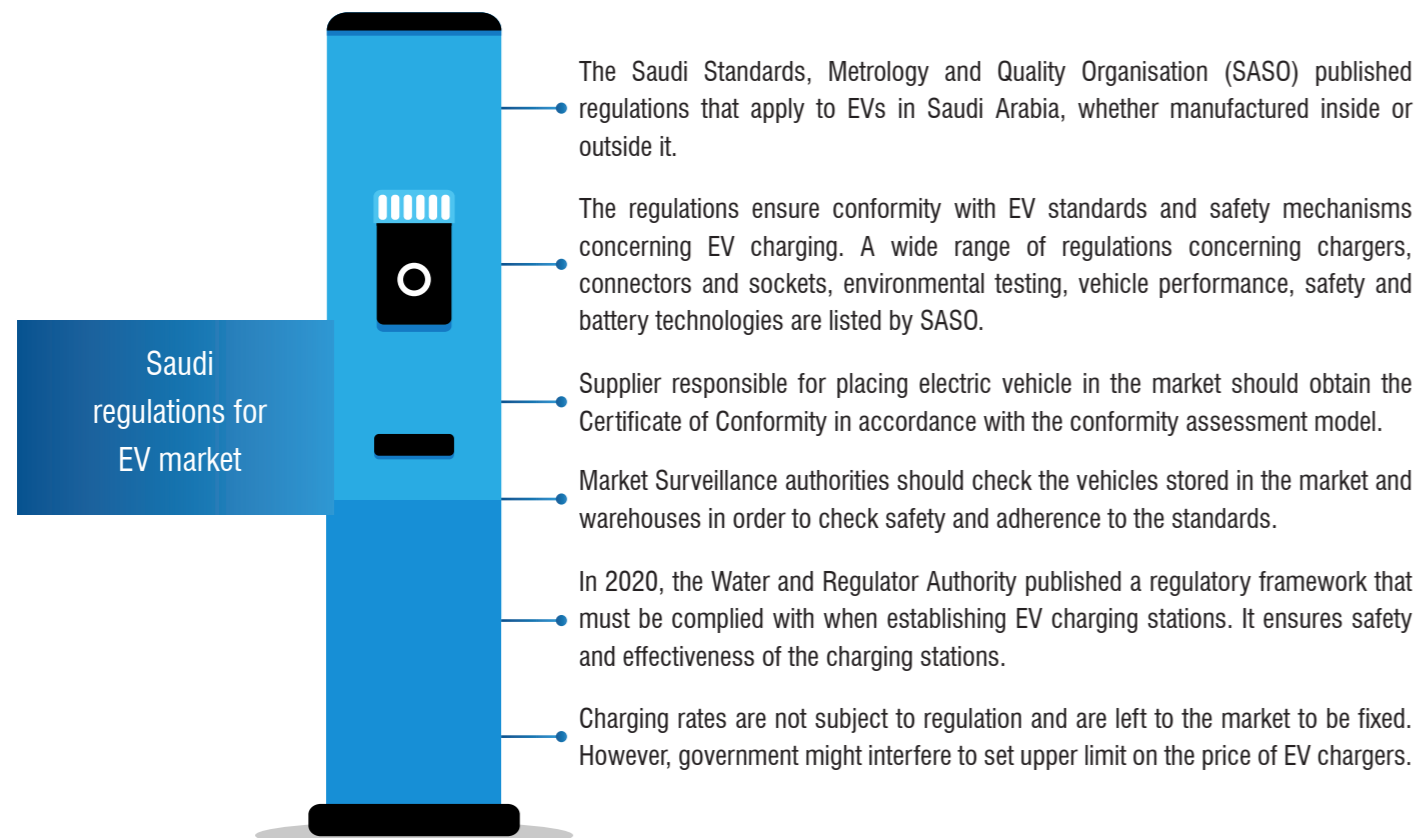
### Avaas Group

- Avaas Group entered into a partnership with Saudi government to manufacture lithium batteries and electric buses within Saudi Arabia.

Source: EV Reporter

Saudi Arabia is expected to position itself as a key manufacturer of EVs in the Gulf region through collaboration with global EV players, investments through PIF and participation in EV production projects. The country is advancing research on battery materials to address gaps in electric vehicle supply chain.

### Regulatory framework for EV market

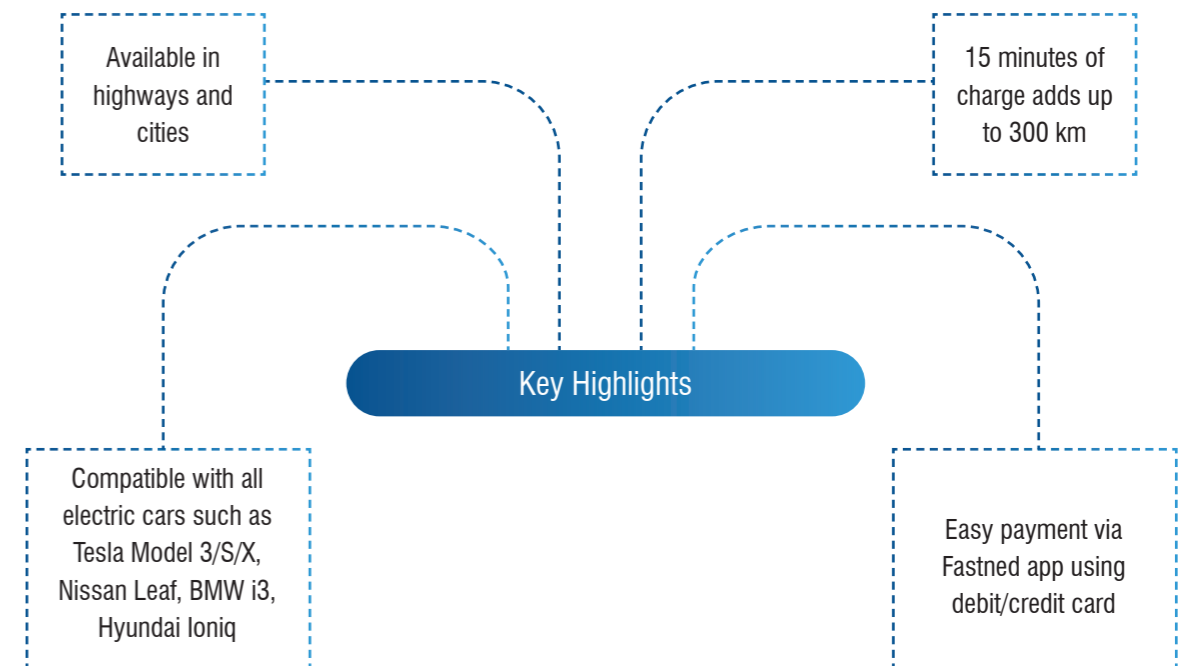


Source: EV Reporter

## Spotlight: Fastned

The Dutch Company Fastned is one of the Riyadh Valley Company portfolio companies and successfully exited it in the Euronext stock market. Where it's a fast-charging network vehicle that generates electricity from renewable sources such as solar and wind. Founded in February 2012, it is headquartered in European Union. The company's mission is to give freedom to electric vehicle drivers and accelerate the transition to sustainable progress. They aim to establish a European network of 1,000 fast charging stations in prime locations where all-electric vehicles can charge with renewable energy.

### Key Highlights



Source: Fastned Website

Fastned prices its services on a different scale for standard users and Gold member.

## Pricing

Standard Tariffs (Pay as you go)	Gold Member
The Netherlands € 0.69 per kWh	The Netherlands 30% off standard tariff plus € 11.99 per month
Germany € 0.69 per kWh	Germany 30% off standard tariff plus € 11.99 per month
France € 0.59 per kWh	France 25% off standard tariff plus € 11.99 per month
Belgium € 0.69 per kWh	Belgium 30% off standard tariff plus € 11.99 per month
Switzerland CHF 0.59 per kWh	Switzerland 30% off standard tariff plus CHF 11.99 per month
United Kingdom £ 0.69 per kWh	United Kingdom 30% off standard tariff plus € 9.99 per month

Source: Fastned website

## Conclusion

The adoption of electric vehicles is expected to witness strong upsurge in the medium term. Developing batteries with alternative compositions and improving battery production capacity have game-changing implications for EV adoption. Major public and private investments in the United States and international markets are already being witnessed, indicating the confidence in EV technology and its potential for helping reach net-zero emissions. According to IEA, the shift towards electric cars is the first wave, which is expected to be followed by electric vans and buses. By 2030, 47% of passenger cars sold is expected to be battery electric vehicles (BEV).<sup>4</sup>

Given that cost of charging an electric vehicle is cheaper than using conventional fuel and EVs will likely require less maintenance than a conventional car, they will be a good alternative to conventional cars over the next decade. BloombergNEF estimates that battery-pack prices will average at USD 100 per kWh by 2024. The price level is ideal for BEVs to be price-competitive with conventional cars without subsidies. These prices would give electric cars a substantial price advantage over conventional vehicles.

The rise in EV usage is observed to give a tremendous boost to the electric vehicle charging station market, which is expected to be valued at USD 280.5 billion by 2032.<sup>5</sup> A wide range of EV charging providers are expanding their network across various regions through partnerships. Stringent government regulations pertaining emissions and technological advancements further aid in the industry growth.

The ideal charger-to-vehicle ratio is one public charger for every 10 to 15 cars. Roughly, up to 20 million public chargers is expected to be installed by 2030 to keep up with the electric vehicle demand. When private chargers are included, BloombergNEF estimates up to 490 million will be needed by 2040.

The GCC region, especially Saudi Arabia is poised for growth of electric vehicle market and EV charging stations. Saudi is anticipated to lead the Middle East in its electric vehicle adoption. According to the United Nations, the urban population in Saudi Arabia is expected to reach 44 million by 2050, up from 23 million in 2020. The relatively younger, digital-savvy population with greater emphasis on sustainability and increased affinity for cars among Saudis are anticipated to boost EV sales in the country.

In terms of total cost of ownership, the electric vehicles are expected to be economical as battery technology continues to improve and the pricing is expected to decline. This enables electric cars to travel further on a single charge, which is a critical need for a large country like Saudi Arabia. The average range of electric cars has increased from around 150 km per charge in 2011 to over 400 km per charge in 2021.<sup>6</sup>

<sup>4</sup>S&P Global Mobility<sup>5</sup>GMI Global market insights<sup>6</sup>IEA

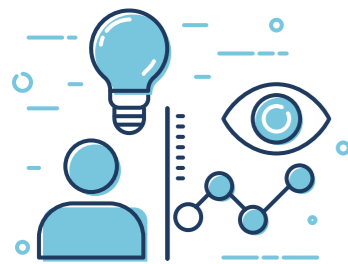




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Riyadh Valley Company established in 2010 by Royal Decree No.116 dated 13/4/1431 AH to be the investment arm of King Saud University in the fields of Knowledge Economy and the university strategic projects.



#### Vision

To be the regional leader in knowledge-based investment and technology.



#### Mission

Riyadh Valley Company is a strategic investor, focused on leveraging the local capabilities, investing locally and globally in growth - stage businesses to create financial and strategic returns that will support the future of economic development in the Kingdom.

### Investment Sectors:

#### Venture Capital Investments



Healthcare Investment



FinTech



Renewable energy & Sustainable Resources



Education



Information & Communication Technology



Logistics and Transportation

#### Strategic Investments



Innovation and R&D Projects



Commercial Projects



Educational Projects



Residential Projects



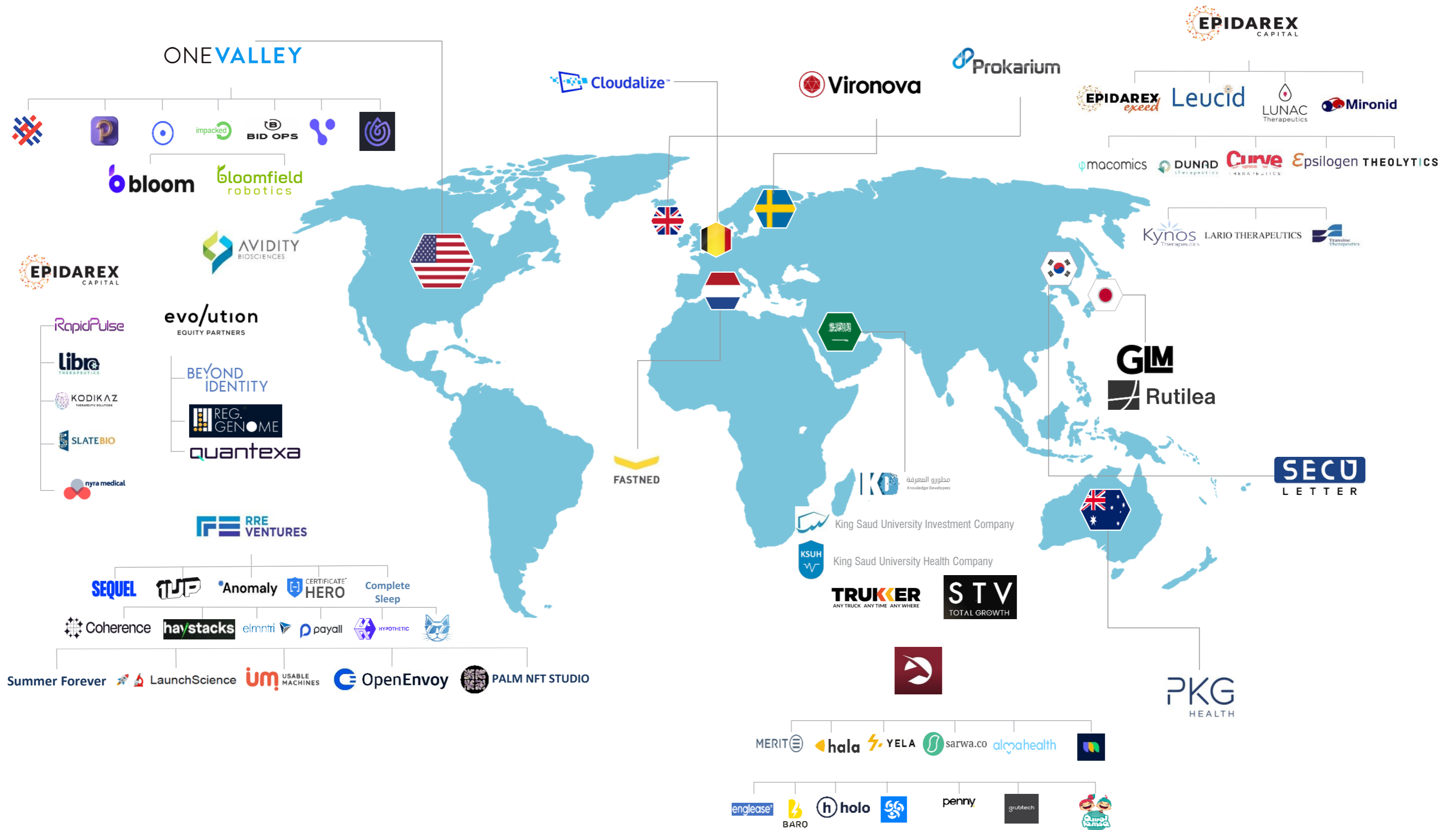
Healthcare Projects



Mixed-use Projects



Knowledge Investment Portfolio



Strategic Investment Portfolio



**Sudair Pharma Company Project**

Research center and offices



**ELM Information Security Company Project**

Research & Innovation center



**Four Directions Company Project**

Office project



**Majd Real Estate Company Project**

Offices project



**Derma Clinic Company Project**

Residential project



**City Lights Real Estate Company Project**

Mixed-use project



**Qasr Alaaredh Company Project**

Building



**Sahat Al-Ardh Company Project**

Mixed-use project



**NMR Real Estate Company Project**

Mixed-use project



**Takween Altanmia Company Project**

Offices project



**Al-sorooH Al-Mubarakah Company Project**

Offices project



**Obeikan Company Project**

Commercial project



**Derma Clinic Company Project**

Healthcare project



**Dur Alkuttab Company Project**

Educational project



**Four Directions Company Project**

Commercial project



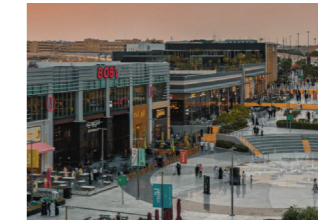
**Omnia Real Estate Development Company Project**

Commercial project



**The Esplanade Project**

Commercial project



**U WALK Project**

Commercial project



**Arrowad Education Company Project**

Educational project