



(Vector 2). A growing presence in the global e-mobility supply chain as a strategic element of economic diversification

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A potential outcome, circa 2040: Decision makers have made strategic investments to develop and expand the industrial capabilities and capacity necessary for multiple Arab countries to be meaningful participants in the global e-mobility manufacturing supply chain. A growing number of homegrown companies have emerged as designers and manufacturers of electric vehicles of all types (cars, buses, two- and three-wheelers, trains, drones). Several major global automakers have built plants in the region and are manufacturing and assembling their vehicles with local partners and substantial local labour. Tier 1 and Tier 2 automotive component suppliers (defined in the text below) are operational in almost every Arab country, manufacturing a wide variety of thousands of parts and components that make up electric cars and other e-vehicles. A growing number of these companies make some of the most technologically sophisticated digital connectivity components of today's IoT- and smart-grid-connected EVs. Battery manufacturing and charging infrastructure manufacturing are active and expanding in the region. The technical and digital skill base of the mobility industry workforce in many of the countries of the region has broadened and deepened, spanning computer programming and coding, computer-aided design and manufacturing (CAD/CAM), data analytics, AI and machine learning, robotics, sensor integration and more. All these skills are critical to the automotive industry of 2040 and other digitalized industry sectors. The strategic investments and the policy and other actions taken since the early 2020s to develop industrial capacity in the e-mobility value chain has helped many of the countries in the region meaningfully diversify their economies in a range of green and digital economy areas.

A. E-mobility can play an important role in the diversification of Arab region economies

The Arab region is in strong need of economic development and diversification. Oil, gas and minerals have historically dominated and continue to dominate the exports and the government revenues of most countries of the region. Despite economic diversification efforts channelling oil and mineral revenues into other activities over the past decade and longer, the region remains highly dependent on these resources. While many countries produce goods and trade in services, they are primarily for domestic markets, with the principal industries being textiles, construction, cement, metals, chemicals, food processing, fertilizers, tourism and business services including banking and financial services.

1. The need for technology – and manufacturing-based Arab region economic diversification

The urgency of effective Arab region economic diversification is increasing. In the face of climate change, pollution and other driving forces, the global shift toward sustainability is having an accelerating downward effect on the prospects for oil and gas economies. Commitments and initiatives under the European Union's Green Deal “foresee a reduction in oil imports by up to 25 per cent by 2030, and by 79 per cent in 2050 compared to 2015, [with] 90 per cent of energy needs being met by renewables by 2050”.⁸⁹ While optimistic in the near-term, even the Organization of the Petroleum Exporting Countries (OPEC) projects global oil demand plateauing around 2035.⁹⁰ Bloomberg projects oil demand specifically from road transport peaking globally in 2027 in a conservative scenario, with electric and fuel cell vehicles displacing 21 million barrels/day of oil demand by 2050. A faster transition to electric mobility would see the decline in oil demand accelerate, with nearly 50 million barrels/day displaced by 2050.⁹¹

One key to diversifying economies is for countries in the region to promote the development of sectors that produce a larger variety of goods with more complex forms of production, more private sector innovation and growth, exports with higher value-added and better integration with global value chains. Many in the region emphasize this in their near- and longer-term planning. Bahrain describes “rethinking its place in the global value chain and identifying new sources of future economic strength, driven by a thriving private sector”, and “attaining increasing levels of sophistication and innovation, particularly by expanding to knowledge-based sectors”.⁹² A key theme in

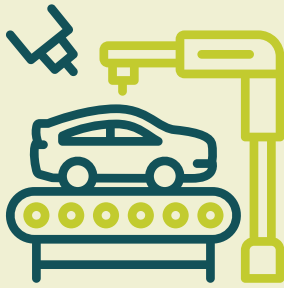
mid-range planning by Kuwait is “growth through a combination of private sector development efforts, and diversification by developing a strong presence in a variety of industries”.⁹³

The transformation in Saudi Arabia is already underway including major efforts to enhance local content in the production of goods and services. The Public Investment Fund (PIF) aims by the end of 2025 to create 1.8 million new jobs through a focus on thirteen vital and strategic sectors.⁹⁴ Oman 2040 Vision describes “economic diversification with focus on technology, knowledge and innovation, reinforcing upstream and downstream integration among economic sectors to expand the production and export base, and deepening investment in high value-added sectors”.⁹⁵

While facing different challenges in terms of their current conditions and their capacity to diversify, the middle-income countries, least-developed countries and countries experiencing conflict of the Arab region also recognize the need to move their economies into more technologically advanced industries and trading relationships. The Egyptian Vision 2030 includes a Knowledge, Innovation and Scientific Research pillar aimed at “ensuring the developmental value of knowledge and innovation and using their outputs to meet national objectives”.⁹⁶ Targets include a six-fold increase in high-tech exports as a percentage of national exports by 2030. The Jordanian Vision 2025 describes “developing priority industry clusters and increasing their competitiveness to become successful exporters”, including information and communications technology (ICT), life sciences including biotechnology and renewable energy technology.⁹⁷ The Iraqi 2030 Vision describes an intended “transformation in the economic base and the connection with the global economy” and “stimulating sectors with high added value, especially in industry and agriculture”.⁹⁸

2. Diversifying economies by developing e-mobility industrial supply chain capabilities

The automotive industry, as it transforms into a global mobility industry, can be strategic in the development of advanced industrial manufacturing and production capabilities in the Arab region. As described throughout this report, the future of the automotive industry is electric and highly digitalized, connected vehicles. Increased roles in the supply chain of these vehicles would not be a “silver bullet” for any Arab country's diversification into a high-



Morocco is the clear **leader** in the **Arab region's** automotive manufacturing, assembly and supply chain capacity, with a current **production** over **700,000 vehicles** per year. The **automotive industry** is the country's leading **exporter**, representing **25 per cent** of Morocco's total export, and it is projected to grow at an average annual rate of **17.5 per cent** between **2020** and **2025**

technology and advanced production economy. But it could be one valuable element in countries' diversification models, if deliberately developed. It would be not distinct from, but rather part of, the larger strategies of the region's countries to create new "green economies" rooted in the transition to renewable energy.

Taking this path would help accelerate and scale the region's own adoption of EVs as well as serve economic diversification aims. While growth projections are encouraging, currently the EV take-up in the Arab region lags well behind much of the rest of the world. One market analysis⁹⁹ calculated the Middle East and African market valued at \$35 million in 2020 and projected it to reach \$84 million by 2026, representing a strong compound annual growth rate of over 15 per cent but from a low base. The International Energy Agency (IEA) estimated 10 million EVs in use globally in 2020, 3 million of which were sold that year, a rise of 40 per cent from 2019.¹⁰⁰ In the Arab region today, the number of EVs is measured in thousands. Jordan leads with approximately 20,000 on its roads and streets.¹⁰¹

Global manufacturers of EVs are beginning to focus on the Arab market – for example, GM plans to introduce 13 EV models in the region by 2025. Stellantis has several EV models in the Middle East and North Africa market and plans to introduce others in the near future across its brand portfolio.¹⁰² Arab countries can potentially stimulate and serve local demand in part by developing industrial supply chain capacity and in doing so further stimulate the global manufacturers' attention to the region.

3. A foundation exists for a robust Arab region role in the e-mobility value chain

The region's role in the automotive and mobility industry is not only an aspirational future. There is already a significant foundation.

Morocco is the clear leader in the Arab region's automotive manufacturing, assembly and supply chain capacity, with a current production over 700,000 vehicles per year. The automotive industry is the country's leading exporter, representing 25 per cent of Morocco's total export, and it is projected to grow at an average annual rate of 17.5 per cent between 2020 and 2025. The move into e-mobility vehicle and component production is underway. French-Italian company STMicroelectronics is producing electronic chips for Renault EVs in Morocco, and the chip production augurs full EV manufacturing in Moroccan plants. In 2021, a collaboration between five technical institutions in Benguerir introduced a 100 per cent Moroccan production line for manufacturing charging stations for EVs, with an anticipated production capacity of 5,000 terminals per year.¹⁰³

The automotive industry is important in Egypt, with annual output of over 70,000 vehicles. More than 80 manufacturers run more than 15 car assembly factories and 75 other facilities in the country, including GM, BMW, Hyundai, Toyota and Nissan. Egyptian industry has the capacity to produce 300,000 passenger cars, light commercial vehicles, trucks and buses per year. In an ongoing effort to localize automobile production, in December 2021 Egyptian officials initiated discussions with the Emirati company M Glory Holding for the manufacture of Egyptian-made cars with an Egyptian labour force.¹⁰⁴

Egypt is also entering into the e-mobility industrial supply chain ecosystem. State-owned El Nasr Automotive Manufacturing is in talks with new prospective partners to continue a project originally intended to proceed with Chinese developers Dongfeng to begin producing EVs locally beginning in 2023, with annual output expected to be 20,000 e-vehicles by 2026. More than 50 per cent of these vehicles' components will be manufactured locally, and an MoU with the Arab Organization for Industrialization outlines future joint-venture plans for EV production in Egypt. In February 2021,



Saudi Arabia is aiming for half the production of currently imported vehicles to be domestic by 2030 – more than **500,000 vehicles** per year and expected to grow annually. Developing the **automotive sector** is an initiative under the **Saudi National Industrial Development and Logistics Program (NIDLP)**

the Egyptian company Brightskies began a collaboration with the Engineering Automotive Manufacturing Company (EAMCO) to develop an electric bus prototype, together producing the bus, battery pack and powertrain electronic control unit. Foton Motor of China has also started manufacturing electric buses in Egypt, with a potential capacity of 500 buses per year with nearly 50 per cent locally produced components

and charging infrastructure. In May 2022, the multinational automotive group Stellantis gained approval from the Egyptian Government to build a plant for the local manufacture of EVs, a \$35 million project scheduled to be implemented by 2025. Plans indicate these EVs manufactured in Egypt will be exported to Algeria, Morocco, South Africa and several other African countries.¹⁰⁵

B. Automotive industry development is emerging in more countries of the Arab region

In other countries in the region, there is growing interest and effort to begin developing automotive manufacturing and supply chain industrial capacity. Egypt and Morocco are seeing others moving to enter into or grow in the automotive industry. It is anticipated that these efforts will grow as e-mobility advances in the Arab region and globally.

1. Saudi Arabia and the United Arab Emirates are making investments to compete in the global e-mobility sector

The United Arab Emirates is one example of a country looking to the automotive industry as an economic diversification priority, calling it an ideal long-term option for the Emirates' industrialization strategy. Abu Dhabi is planning to develop an "Auto City" in the Mussafah district to encourage the development of new plants for manufacturing cars, accessories and spare parts.¹⁰⁶

In the United Arab Emirates, M Glory Holding Group opened its first EV manufacturing plant in March 2022 in Dubai Industrial City, expected to be one of the largest in the region with 1,000 new jobs and making 55,000 EVs a year. The vehicles will be exported to other GCC countries as well as Egypt

and four other countries in Africa. Omar Al Suwaidi, United Arab Emirates Undersecretary of Industry and Advanced Technology, has described the EV venture as part of efforts in three economic diversification programmes that all have the aim of making it a new "vital sector in the United Arab Emirates to develop new competitive advantages and consolidate the position of the United Arab Emirates as a hub for global companies, investments and talents".¹⁰⁷

Currently, two Dubai-based automakers, W Motors and Jannarely Automotive, make only ICE "hyper performance" cars but Jannarely is reported to be considering an electric version of its Design-1 vehicle. Dubai's Jebel Ali Port in the Jebel Ali Free Trade Zone is an established major automotive logistics base. More than 530 vehicle and transport sector companies are operating in the zone including Mitsubishi, Volkswagen and GM. Some of these companies are looking at the possibility of establishing vehicle assembly operations in the Zone, and the CEO of port operator DP World has said "we're nurturing the automotive trade and are geared for growth".¹⁰⁸

As part of its strategy for localizing manufacturing content across a range of industries, Saudi Arabia is aiming for half the production of currently imported vehicles to be domestic by 2030 – more than 500,000 vehicles per year and expected

to grow annually. Developing the automotive sector is an initiative under the Saudi National Industrial Development and Logistics Program (NIDLP). Saudi Arabia Basic Industries Corporation (SABIC) has worked with automobile manufacturers including Hyundai, Volkswagen and Mitsubishi, and the country has several spare parts factories because of demand for replacement parts. Securing a deal with a major automaker for a car plant was a target to be achieved by the end of 2020, but discussions with Toyota, Tata and Nissan were unsuccessful. The Saudi National Automobile Manufacturing Company (SNAM) and South Korean company SsangYong did establish a partnership in 2019 to produce up to 30,000 SsangYong cars per year in a SNAM assembly plant beginning in 2021.¹⁰⁹

More recently there has been a significant success in Saudi Arabia. The United States-based EV manufacturer Lucid Group announced in February 2022 a long-term plan (15 years with \$3 billion in financing and incentives) to build its first international manufacturing plant in Saudi Arabia. It is projected to produce more than 150,000 vehicles per year and will foster advanced engineering, R&D and manufacturing expertise in a local workforce (more than 4,500 jobs in King Abdullah Economic City). At the signing, the Minister of Investment described the effort as Saudi Arabia “taking a major step towards our goal of diversifying our economy by creating a new manufacturing hub to spearhead the future of mobility for the Middle East region”.¹¹⁰

2. E-mobility start-ups are also emerging in the Arab region

In 2021, a new Lebanese EV producer, EV Electra, introduced a car developed “from start to finish” in the country. Production will begin in 2022 with targeted capacity of 10,000 EVs each year. The workforce of 300 includes Palestinian as well as Lebanese engineers, and the company plans to install 100 potentially solar and/or wind-powered charging stations across Lebanon. An Omani start-up, Mays Motors, has also announced a locally designed and manufactured EV with initial production of 600 cars per year starting in 2023. It is being developed with the support of investment accelerator Oman Technology Fund and the Ministry of Commerce, Industry and Investment Promotion. Mays co-founder Haider bin Adnan al Zaabi described it as “an innovative Omani product built with Omani hands and backed by Omani technical knowhow” and “the beginning of a new and promising sector in the sultanate”. Kuwait Ports Authority (KPA) in August 2021 signed an agreement to build the region’s first dedicated city to provide all port and logistics services and other infrastructure

to the major manufacturers importing EVs to the region. The General Manager of KPA described the project as “in line with Kuwait’s Vision 2035 to diversify the country’s economy”.¹¹¹

Developing e-mobility industrial supply chain capacity also already involves the region’s start-up and entrepreneurial sector in other ways, in the micro-mobility and MaaS elements of the e-mobility spectrum. The local technology development is not – yet – extensive in the manufacturing of EVs but rather in the information and communication technology that powers electric micro-mobility and mobility-as-a-service (MaaS).

Fenix, an e-scooter provider that has incorporated q-commerce deliveries into its business model, is operating to date in Bahrain, Qatar, Saudi Arabia, Türkiye and the United Arab Emirates. Like other micro-mobility and MaaS companies, the app developed by Fenix uses proprietary software and interfaces to manage bookings, maintenance, payments, e-commerce and more. They also co-develop the scooters along with their intelligence and software, and use swappable batteries, a feature they opted for in recognition of distinctive characteristics of the Arab region market. Careem launched in 2012 in Abu Dhabi and Dubai as a “value-added aggregator of private cars (limos) and taxis in the Middle East”. It has expanded to offer a variety of services in more than 90 cities, primarily in the Arab region, including ride hailing, bike sharing, food and grocery orders, delivery services, bill payments and more. They have developed a highly regarded mobile “super app” that enables all these services and also now encompasses cutting edge peer-to-peer (P2P) fintech. They have also developed and leverage smart systems for tracking vehicles and predicting high-ridership/user areas.¹¹²

Swvl is a transit-as-a-service or TaaS solutions company powered by cutting-edge technology of its own design and development for dynamic routing, network planning, demand estimation, fleet optimization and other transit services. They currently operate in Egypt, Jordan, Saudi Arabia and the United Arab Emirates in the Arab region, and recently announced a new strategic partnership to begin operations in Kuwait. With backing from global strategic and financial investors including Agility and Luxor Capital Group, their recent listing on Nasdaq made Swvl the first TaaS/MaaS company to list on any stock exchange, with expectations of a valuation of more than \$1 billion. In March 2022 Swvl partnered with mobility fintech company Moove to further scale operations as well as expand their vehicle options to include electric buses.¹¹³

Manufacture of electric two- or three-wheelers is beginning to emerge in the Arab region but is currently very early. One example is Bako Motors, a German-Tunisian start-up that will begin producing a range of electric bicycles and tricycles

of its own design in late 2022 for sales targeted throughout Africa. The company plans to launch a subsidiary in Riyadh in 2023. Micro-mobility could potentially open up the vehicle design and manufacture element of the e-mobility value chain to middle-income countries, least developed countries and countries in conflict. As one analysis notes, “because of their relatively simple construction, and market growth, smaller countries are likely to initially develop assembly and retrofit of two- and three-wheeler as an interim step to development and manufacture”. An example is Opibus, a company in Kenya

that converts used ICE vehicles to electric. The company has developed and is selling a new electric motorcycle with design specifications mindful of local road conditions and local users’ long-distance driving needs. McKinsey analysis similarly notes that “EV companies could consider investing in homegrown-product innovation to design or tailor EVs for local needs and conditions”, and “local vehicle assemblers may also invest in national and regional supply chains by manufacturing some parts locally”.¹¹⁴

C. The automotive supply chain is transforming, creating opportunity for the Arab region

The global supply chains of the mobility industry ecosystem are being transformed by the exponential growth of highly digitalized and connected EVs, and by several other dynamics independent of but relevant to the growth of EVs. This is creating new kinds of opportunities for existing and aspiring suppliers. Different countries in the Arab region can diversify and grow their economies in different ways by increasing their roles in these global supply chains.

1. New OEMs emerge to challenge the legacy automakers as they adapt to electric

One of these dynamics is the emergence of new electric vehicle OEMs. Tesla today is the most well known and most successful, but numerous others have joined them in the market including Rivian, Nio, Lucid, Li, XPeng, Fisker and many more – with an estimated 200 EV start-ups in China alone. It is anticipated that only a fraction of these companies will succeed and sustain, for a variety of reasons. These include difficulty raising capital, supply chain vulnerabilities, uncertainty of ongoing policy support from Governments and most importantly a near-term or longer-term mismatch between demand and supply.¹¹⁵ But those that do survive are anticipated to operate differently than traditional automotive OEMs, including with respect to where they situate their manufacturing and assembly plants.¹¹⁶ They will also likely be less bound to the well-established suppliers at all tiers of the automotive supply chain, by choice for flexibility and in part because such suppliers may be contractually obligated to larger OEMs, or focused on meeting demand from their current customers. Timely emergence in the Arab region of component suppliers and other mobility value chain partners can align with expected interest from new EV OEMs.

The risks of supply shortages and bottlenecks in the automotive supply chain model, recently highlighted by the COVID-19 pandemic, are anticipated to spur OEMs to desire supplier networks more local to the markets they serve. As the market demand for EVs grows in the Arab region, this dynamic could create opportunity for local Tier 1, Tier 2 and Tier 3¹¹⁷ suppliers. Tier 1 suppliers are companies that supply parts or systems directly to OEMs. Tier 2 suppliers make parts that are included in assembled automobiles, selling them not directly to OEMs but to Tier 1 suppliers. Tier 3 suppliers produce raw or close-to-raw materials like metal or plastic and provide them to companies at all levels above them in the supply chain including OEMs. Today’s model of highly globally distributed sourcing, with components and inputs to components engineered and then shipped across multiple international borders, is being questioned as never before by both new and established OEMs.¹¹⁸ Sourcing from suppliers in the Arab region market would mitigate some of the vulnerabilities that EV manufacturers face, if suppliers emerge to meet the demand.

The carbon emissions of transporting automotive components around the world is also a consideration in light of increasing pressure from regulators, public interest advocates, investors and others to make the entire automotive value chain more sustainable. OEMs and their suppliers are compelled to consider this, from responsible mining of metals to sustainable waste disposal. They must also consider environmentally conscious distribution of parts and finished products, recyclable packaging of components being shipped, sustainable warehousing and inventory management and more.¹¹⁹ This could promote interest on the part of global OEMs to partner with Arab region suppliers in serving local Arab markets, as well as factor into their decisions on siting manufacturing and assembly plants in the region. A recent McKinsey report cites analysis suggesting “transportation costs related to CO₂ would have to rise by a factor of ten to erase the benefit of having a plant in a lower-cost geography”. But if labour costs in the Arab region were comparable, the

proximity to market and to a local supplier network could be attractive from a sustainable footprint standpoint.¹²⁰

2. Priority opportunities for the Arab region in the e-mobility value chain

Manufacturing and assembly of complete EVs, whether by homegrown start-ups or in partnership with established global OEMs, would be only one part of an Arab region e-mobility industrial ecosystem future. The potential for expansion of capacity and capability in the Tier 1, Tier 2 and Tier 3 supply chain niches is important as well. The Middle East automotive spare parts market is projected to grow at a steady rate out to 2026 and beyond, including exhaust systems, braking systems, batteries, electrical systems and others. Manufacturers of these parts are working to set up localized manufacturing companies to reduce import costs, with the investment poised to boost and diversify local economies. Automotive aftermarket sales are projected to increase by more than 35 per cent to nearly \$40 billion in the region between now and 2024.¹²¹

Looking at EVs specifically, McKinsey notes that EV components are the only sub-sector of automotive components anticipated to grow between now and 2030, rising from 9 per cent to 42 per cent as a share of the global value chain. These components include electric motors, battery management systems, low- and high-voltage battery cells and fuel cells. The International Energy Agency notes a number of EV components as being in critical need of supplier expansion, including battery metal processing and refining,

cathode and anode manufacturing, separator manufacturing, cell production and battery assembly. The analysis goes on to note that “each of these industries, some of which are nascent, need to expand rapidly to avoid bottlenecks that would slow down the transition to full electric mobility”.¹²² Building capacity in these areas could represent opportunity for the Arab region to serve not only its own but also the larger global market for EVs, and thereby also serve economic diversification.

Battery-related technologies and services (manufacture, mineral refinement and provision, other sub-component development, recycling, swapping, etc.) and charging infrastructure (manufacture, installation, maintenance) could be particularly beneficial priorities in an e-mobility component of broader economic diversification strategies. By most analyses, batteries and charging will be the greatest financial opportunities in the EV value chain, each representing hundreds of billions of dollars of investment to come in the next two decades and beyond. Arab countries can be part of these opportunities.

3. Batteries and battery-related technology and services

Passenger EVs will be the majority (55 per cent) of a projected more than 8 TWh global battery demand in 2030, up from approximately 1 TWh today. Over that period, the demand for EV batteries will rise nearly fifteen-fold. Calculating from announced production targets of current suppliers, only about 60 per cent of the expected 2030 demand will be met, pointing



to the need and opportunity for new suppliers to emerge.¹²³ In the Arab region market alone, estimates for the EV battery market range indicate a 16 to 22 per cent compound annual growth rate between now and the end of the decade, to more than \$125 billion.¹²⁴

Trends in the battery production industry indicate the potential benefit for Arab countries of prioritizing development of technical and industrial capacity in this area. With China dominating approximately 80 per cent of global battery cell production capacity, the United States, countries throughout Europe and Asia and others in the rest of the world are racing to increase their capacity.¹²⁵ In response to the soaring demand, current battery producers globally are crafting and implementing expansion strategies, in some cases representing billions of dollars in investment, to open new “giga-factories” to supply cells to automakers. Joint ventures between OEMs and battery manufacturers are proliferating – examples include agreements between Volkswagen and Bosch, Stellantis with both LG Energy Solutions and Samsung, GM with SolidEnergy Systems and others.¹²⁶

Efforts by Governments and private sector interests in the Arab region to develop technical capabilities in battery production can be anticipated to be met with interest by EV manufacturers in all geographies. Co-production ventures with existing battery manufacturers as part of their expansion could be one potential outcome. Partnerships with OEMs could also be part of the future. Stellantis managing director for the Middle East Markus Leithe recently said a battery production plant in the region “is possible ... we have had some very initial exchanges of opinions around that ... there is definitely an interest coming from governments around that”.¹²⁷

OEMs are also establishing partnerships upstream in the battery supply chain, seen for example in two recent BHP agreements to supply nickel sulphate to Tesla and the Toyota-Panasonic joint venture Prime Planet Energy and Solutions. Some countries in the Arab region have potential to benefit from this trend given proven supplies of minerals essential to EV batteries. One agreement already in place is between BMW and Managem Group of Morocco for €100 million to provide 20 per cent of the cobalt that BMW will require for battery cathodes between now and 2024.

Other types of international agreements related to battery raw materials are also emerging. In November 2021, Khalifa Industrial Zone Abu Dhabi and Australian mineral exploration and development company Lepidico announced an agreement to build the first lithium production facility in the Arab region. The company’s managing director indicated their interest in “bringing the lithium chemical industry to [not only] the United

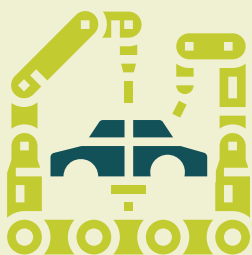
Arab Emirates [but also] the wider Middle East region”. Saudi Arabia signed agreements in 2021 with another Australian company, EV Metals Group, for a \$3 billion investment in lithium and nickel processing plants, as well as license applications to explore for these and other battery minerals in the country. In an October 2021 interview with Bloomberg, Abdulaziz Al Harbi, CEO of Saudi Arabian Mining Company (Maaden) said “in the next 10 to 20 years we are going to spend huge amount of money looking for those metals in Saudi Arabia”.¹²⁸

Another opportunity in the Arab region is the circular economy prospect of building and operating EV battery recycling plants and building new plants to recycle phased out ICE vehicles. There are several battery recycling plants in Dubai, such as Dubatt, a fully integrated lead acid battery (LAB) recycling plant at Dubai Industrial City. Currently there are no single plants in the Arab region specialized in EV battery recycling, but existing battery recycling plants could look to expand to the recycling of EV batteries.

4. Charging infrastructure and related technology and services

As with batteries, the requirements for EV charging stations will be huge as the number of EVs of all types rises sharply, representing significant opportunity if the industrial capacity to serve the market is developed in the Arab region. Bloomberg projections in a conservative scenario are that nearly 300 million charging points will be needed globally by 2040, requiring nearly \$600 billion in investment. Their scenario achieving net-zero tailpipe emissions for the global road transport sector would require some 500 million charging stations and represent a market investment of more than \$900 billion.¹²⁹ Demand in the Arab region is projected to grow from \$130 million in 2020 to \$93 billion by the end of the decade, a 45 per cent compound annual growth rate.¹³⁰ McKinsey emphasizes that “now is the time for EV charging companies to invest in production capacity and a skilled workforce ... [and] build out factories and supply chains in relevant regions to match demand [as] the foundation for successful rollouts of chargers in the coming years.”¹³¹

There is already nascent charging infrastructure manufacturing capacity in the Arab region to further build for a greater regional role in this segment of the EV value chain. In Morocco, a 100 per cent indigenous production line for “iSmart” EV charging stations began operation in 2021 in the city of Benguerir, projected to produce 5,000 terminals per year intended for the local and broader Africa markets. It was developed by Green Energy Park, a consortium of three research



The International Data Corporation finds that **76 per cent** of **manufacturers** across all **industries** in the **Middle East, Turkey and Africa** have or will soon launch some form of **company digital transformation initiative**. They project **\$229 billion** in ICT spending in countries in the region in 2022 (**\$137 billion** in telecommunications and **\$92 billion** in IT, including **\$40 billion** in enterprise IT spending).

institutions supported by the Ministry of Industry, Trade and Green and Digital Economy and the Ministry of Energy, Mines and the Environment. Green Energy Park is also developing a fast-charging terminal.¹³² Revolta, one of three Egyptian companies in the EV charging infrastructure sector, opened its production facility in 2019, in partnership with Ukrainian company EcoFactor. As part of the project by state-owned El

Nasr Automotive Manufacturing company to build EVs with a Chinese partner, the Egyptian company Infinity plans to build and install 3,000 charging stations throughout the country. And in a recent report, the intergovernmental organization Regional Center for Renewable Energy and Energy Efficiency (RCREEE) recommended charge point manufacturing as a promising source of economic income in Egypt.

D. Developing workforce skills is key to Arab region growth in the e-mobility industrial supply chain

Looking to the e-mobility industry supply chain as an element of Arab region economic diversification is an opportunity to increase jobs in the region that leverage technical skills. With the increasing digitalization of electric cars and other e-vehicles (to operate, and for their connections to grids, IoT and each other), expanding automotive and mobility-related industrial capability in the region can also be an investment in developing digital skills (especially among young people).

1. Automotive and mobility sector skills increasingly are digital skills

Skills relevant for a growing number of jobs in the e-mobility sector will be transferable to and from other sectors that will also be part of countries' economic diversification strategies and objectives. In addition to traditional industries becoming more digitalized, the broader "green economy" objectives of all countries of the region, outlined in national plans and visions, will require many of the same skills as a focus on the e-mobility industry supply and value chain.

With the vehicle fleet in the Arab region and globally shifting to electric (all modes, from cars to buses to two- and three-wheelers) and becoming increasingly digitalized, the automotive

industry's jobs of the future won't look like the jobs of the past. As the International Labour Organization notes, "digitalization is heralding a new era in the industry, employing technologies including advanced analytics, artificial intelligence, sensors, the internet of things, cloud computing, blockchain, cyber-physical systems, machine learning, robotics, and 3D printing". Additionally, "EVs will also create job gains in the electricity generation sector, production and deployment of EV charging station infrastructure, and manufacturing of batteries, electrical parts, and related machinery".¹³³

To establish a growing role in the e-mobility industry, meeting the demand for the necessary tech-skilled labour will be a challenge for the Arab region. At the same time, there are foundations of digital adoption, technology-based innovation in some industries and commitments to high-tech skill development to build on. While most businesses and Governments remain slow to digitize, McKinsey notes strong consumer digital adoption (primarily in GCC countries but climbing in other Arab countries). They also note that the large tech-centric demographic under age 24 can be expected to accelerate the trend and pressure business and government to catch up.¹³⁴ In an assessment of 150 firms in the Arab region (focusing on the largest companies in the GCC countries), BCG found between 53-64 per cent in three sectors (tech, financial and consumer) to be digitally mature based on 36 criteria.¹³⁵



Progress on digitalization extends beyond the GCC countries. Jordan has emerged as a digital hub for the region, with hundreds of ICT companies and a national broadband network expected to soon support 5G and provide high-speed connectivity to thousands of public sites as well as businesses and homes. Morocco has a growing aerospace sector of more than 100 companies with a workforce of more than 15,000 and increasing digitalization. Egypt recently launched a “Digital Egypt” initiative designed in part to “encourage entrepreneurship and promote research and development and innovation in the field of ICT to drive sector growth and position Egypt as a regional innovation hub”. It is also intended to develop digital skills in the workforce and population. The International Data Corporation finds that 76 per cent of manufacturers across all industries in the Middle East, Turkey and Africa have or will soon launch some form of company digital transformation initiative. They project \$229 billion in ICT spending in countries in the region in 2022 (\$137 billion in telecommunications and \$92 billion in IT, including \$40 billion in enterprise IT spending).¹³⁶

A recent analysis of investments into Arab region-based tech start-ups from 2019 through 2021 shows more than 1,300 deals across multiple sectors with a total value of \$2.9 billion in 2021. The number of deals increased 60 per cent from 2020 to 2021. The value of these deals region-wide more than tripled, including a 350 per cent growth for North Africa-based start-ups. Investment in companies in Levant countries are growing more slowly. Iraq, Morocco and Qatar saw the largest increase in the number of deals. The number of global investors investing in Arab region-based tech start-ups more than doubled from 2020 to 2021 and the number of deals they participated in grew by more than 50 per cent. Investments spanned start-ups

in fintech, enterprise SaaS, e-commerce, health-tech, logistics, ed-tech and 12 other sectors. Notably, there were 39 investment deals in start-ups in the automotive sector and 43 in the transportation sector.¹³⁷ All of this activity indicates an emergent digital skill base in the region that can be further accelerated by and for development of e-mobility-related industrial capability.

2. Skills for the e-mobility value chain can boost broader economic diversification aims

If countries can begin in the near term to overcome education and skill deficits, the scale and pace of growth across the e-mobility industry value chain presents substantial opportunities to boost economic development and diversify economies. The long-range plans and vision documents that outline many countries’ economic diversification aims also outline accompanying objectives for the accelerated development of the kinds of skills needed for the future mobility industry and other industries that are becoming more digitalized. Movement from intent to implementation is underway in a number of countries. In the United Arab Emirates, a National Program for Coders is attracting and training 100,000 coders and establishing 1,000 digital companies over five years, in collaboration with Google, Microsoft, Amazon, Cisco, IBM, Hewlett Packard Enterprise and others. Efforts under Digital Egypt include the Egypt University of Informatics, the Digital Egypt Builders Initiative and several programmes for digital skills development for young people. In Saudi Arabia, a collaboration between General Assembly and the MiSK Foundation is training thousands of young people in new tech and digital skills.

Private sector skill training providers and social sector organizations are also playing a growing role in building the skills in Arab countries that will be essential for developing e-mobility industry and supply chain capacity.¹³⁸ It is expected that the automotive industry in the region will itself also invest in the development of necessary skills for its workers relevant to e-mobility technologies. In 2019, BMW Group Middle East opened a new training centre with capacity to train thousands of technical and other staff in current and emerging developments in automotive technology including hybrid and all-electric vehicles. Hyundai has operated training centres in the region since 2013 and in 2019 the exclusive distributor of Hyundai in the United Arab Emirates launched the Hyundai United Arab Emirates Training Academy. In Morocco, the Automotive Industry Training (IFMIA) operates as a public-private partnership with four training centres for technicians and other industry staff roles, one of which is run by Renault at its plant in Melloussa.¹³⁹

developing the **workforce skill base**

for growing e-mobility supply chain capability in the Arab region will be a challenge



nearly **40 per cent** of
employers in the region that
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to business growth”**

E. Key challenges in pursuing this e-mobility pathway

Progression on this pathway to an Arab region e-mobility future faces some key challenges that are foreshadowed in the preceding narrative.

1. Current skills deficits and barriers to overcoming them

Even with the encouraging indications described above, developing the workforce skill base for growing e-mobility supply chain capability in the Arab region will be a challenge. In an assessment of 130 countries, the World Economic Forum found the region effectively leveraging only 62 per cent of its human capital potential – approximately the global average, but 10-15 percentage points below the top performing countries. They cite the nearly 40 per cent of employers in the region that see skills gaps as “a major impediment to business growth”. Survey analysis by Arabnet shows in particular “an acute digital skills gap – digital talent only accounted for 1.7 per cent of the workforce in 2017, [with] skills around hardware and IT, development/coding, product design, and data and analytics some of the least available”. Further reflecting those findings is another survey, by PwC in 2019 of CEOs in the Middle East, in which 70 per cent indicated the lack of availability of key skills (primarily digital and analytic) as a concern and threat to business success. In January 2021, that percentage had risen to 81 per cent.¹⁴⁰

2. Attracting investment in the region and its industries

The challenge of increasing investment into the Arab region is pinned to global capital flows and structural trends in the global economy. World exports as a percentage of GDP declined from 29 per cent in 2010 to 26 per cent 2020 and global foreign direct investment (FDI) declined by 36 per cent over the same period. This has been driven by multiple factors including the rise of populism, higher trade barriers and the shift of consumer spend from manufacturing to service sectors, which are more difficult to export. The pandemic accelerated this reversal, revealing the fragility of global trade and supply chain activities. The Middle East has been especially vulnerable to some of these disruptions, and recent gains from some of the rising costs of energy

among its oil and gas exporters have been uneven and tend to exacerbate differences in access to capital (particularly in the rising cost of borrowing). Investment in the oil and gas sectors globally has been ceding market share to investments in renewable energy, batteries and the technology sector in general, and the Arab region is not (yet) a strong pull for this investment. Traditional greenfield FDI into the region remains highly concentrated in the Gulf, with only a few other bright spots in venture capital investment and new technology start-up ecosystems. The start-up ecosystem will increasingly emerge as a driving force of the region's economic and social development, and e-mobility industrial supply chain capacity development can be part of that over time, but the region is not yet there. Additionally, laws and policies designed to protect the interests of State-owned enterprises historically have been impediments to attracting investors to the region, in the form of high minimum capital requirements, ownership restrictions limiting stakes in companies, local production rules and licensing processes. These are diminishing but their legacy has not been entirely overcome.

3. Intraregional trade relationships and mechanisms

Intraregional merchandise exports in the Arab region during the period 2015-2019 represented between 10.4 to 12.8 percent of total merchandise exports, while intraregional

merchandise imports represented between 13 to 13.8 percent of total merchandise imports during the same period,¹⁴¹ compared for example to the European Union where 63 per cent of total trade from the region is intraregional. One of the reasons for this low intraregional trade among Arab countries is the limited size of the private sector, with fewer firms and few large firms of scale. Additionally, the extent of government ownership in transportation and telecom sectors in the region is significantly higher than other sectors. This is visible for example in Qatar (approximately 80 per cent government ownership in the telecom sector), Algeria (nearly 100 per cent government ownership in the transportation sector) and Tunisia (approximately 80 per cent government ownership in the transportation sector). These sectors together with storage currently contribute close to 8 per cent of Arab countries' GDP.¹⁴² Regulatory barriers to market entry remain significant in the region, with restrictions limiting the flow of capital, how companies expand and how new businesses are started in different markets across the region. Obstacles in regulatory regimes include new construction permits, access to credit, protecting minority investors, cross-border trading, contract enforcement and resolving insolvency. Finally, cross-border transport infrastructure in the Arab region is underdeveloped and its development over the last 20 years has been a mixed picture. Where such infrastructure is lacking, trade and economic integration are naturally restricted.

Recommendations for growing the Arab region's presence in the global e-mobility supply chain as a strategic element of economic diversification (Vector 2)

Based on our research and analysis, the following recommendations individually and collectively have potential to advance and accelerate the movement of the Arab region on this pathway for an e-mobility future. In some cases, they are adapted and customized for the Arab region from recommendations drawn from other analyses that focus on the evolving automotive industry and supply chain in the region (and globally) and economic diversification objectives of Arab countries.



Establish a coherent and consistent policy framework with clear strategic goals, incorporating economic, fiscal and other types of policy levers, to stimulate Arab markets for e-mobility and reduce investment risk for current and aspiring manufacturers and suppliers in the region

Greater demand in the Arab region for EVs could motivate local companies to start or grow businesses across the automotive and broader mobility value chains. In

addition to the stimulus to current and emerging Arab manufacturers, major global automakers will respond to the growth of Arab country markets with increased supply. This could create opportunity for local companies to pursue partnerships with those manufacturers as component suppliers. As noted above, supply chain trends favouring supplier relationships closer to the markets being served could make regional companies more attractive as Tier 1 and Tier 2 suppliers, potentially promoting the growth or start-up of such companies. Continued attention to revising laws and policies

historically designed to protect the interests of State-owned enterprises will be important to encourage private investors and start-ups. In parallel, Governments in the region can stimulate demand for EVs to stimulate such supply chain partnerships through a variety of policies, advancing the trend of e-mobility overall as well as the more specific aim of growing local e-mobility industries. One such policy could be the removal or reform of transportation fuel subsidies, as has been done in some countries. For example, Qatar increased gasoline prices by 25 per cent and an additional 30 per cent in 2016; Saudi Arabia did so by 55 per cent in 2016; and in 2015, the United Arab Emirates liberalized retail fuel prices based on average global prices for diesel and gasoline, with prices updated on a weekly basis. Other policies could include for example: stringent fuel economy and greenhouse gas emissions standards; subsidies for consumer purchases of EVs; target dates for phaseout of ICE vehicles; reducing or eliminating vehicle import duties for EVs (ensuring this does not conflict with efforts to promote the production of EVs locally); mandating purchase of clean fuel vehicles by public sector entities; priority use of carpool lanes for EVs; banning ICE vehicles from city centres; regulating the used vehicle market to minimize ICE vehicle imports from the Global North; creating incentives for the recycling and use of ICE vehicle parts in the manufacturing of new EV vehicles and other products; and others. Some such policies are already in place or planned in some countries. It is important that the policy framework developed to stimulate EV demand overall be well-thought and balanced to ensure that incentives to suppliers expand partnerships with local manufacturers instead of only increasing importation of final products manufactured outside the region.



Create and implement systems of policy, institutional, fiscal and financial support and incentives to Arab companies in e-mobility industrial supply chain ecosystems

A variety of measures can be established by Governments throughout the region to promote the start-up and growth of native businesses in the e-mobility value chain and to attract automotive OEMs and Tier 1, 2 and 3 suppliers to the region. In doing so, it is important to ensure that the products produced locally are fully compatible and of the same quality standards as those produced by OEMs in their own countries or elsewhere. Morocco already has a system of such measures, under its Industrial Acceleration Plan, which includes: “free zone” (offshore) status which grants exemptions on corporate taxes and

VAT to companies in six “automotive ecosystems” that export 85 per cent or more of their production; direct financial assistance to companies in these ecosystems; and access to offshore banks for customized financing packages and assistance in complex foreign trade operations. Several ASEAN Governments have extensive automotive sector support policies and programmes that offer models potentially adaptable in the Arab region. Examples include Indonesia which has a variety of such policies in place including some specifically to promote local EV manufacturing. One is an up-to-100 per cent deduction of corporate income tax for companies that produce cars with integrated battery and electric motors as well as electric two- and three-wheelers and electric motors and parts. Malaysia has an extensive “National Automotive Policy 2020” designed to make the country “a regional leader in manufacturing, engineering, technology and sustainable development in the automotive sector” including EVs and much more. It includes a variety of government investment funds to support local companies’ R&D, engineering and manufacturing capabilities; initiatives to attract FDI in the country’s automotive companies; and export promotion programmes, trade investment missions and Free Trade agreements to promote local industry.



Emphasize mobility sector-relevant skills development in national and other education and training initiatives supporting economic diversification

All Arab countries have plans and visions in varying forms for diversifying their economies over the next 5 to 30 years that include initiatives to improve education systems and provide skill training for citizens. The Vision 2030 of Bahrain describes a strategy to “provide quality training to our people in the applied and advanced skills required for global competitiveness and attracting new industries to Bahrain”. The Vision 2040 of Oman describes “establishment of a stimulating education system and vocational training” to “enable better adaptation of the Omani labour market to the new global future of jobs”. The Vision 2030 of Iraq includes targets in the medium term to “improve technical and vocational education” and in the longer term “to establish more vocational schools and institutes to meet the labour market needs”. Similar objectives exist across the region. In such programmes, skills relevant to the electric and digitalized future of mobility should be emphasized. Training in ICT hardware and software development and application will be valuable for countries to develop industry capacity across the

entire mobility systems supply chain. Some initiatives should focus specifically on EV and EV component-related technical skills such as electric drivetrain maintenance, EV charge point installation, vehicle retrofit, battery management, battery swap system logistics, etc. Private sector provision of e-mobility relevant skills and training across the region, and public-private partnerships such as the Moroccan Automotive Industry Training Institutes, should be promoted as well, for example potentially through tax incentives.



Use vehicle import duties and other automotive trade regulations to incentivize mobility system manufacturers to incorporate Arab suppliers in their supply chain

Governments in the Arab region could leverage their taxation and other regulatory powers to promote indigenous businesses that are seeking entry or growth as suppliers in the e-mobility industrial ecosystem. While the complete-vehicle manufacturing capacity of local producers is beginning to grow, vehicles including EVs in the region will be predominantly imported for the foreseeable future. Rather than establish local content requirements that risk long-term negative effects on their economies and competitiveness, countries could reduce or waive vehicle import duties on EVs of all types that have some selected percentage of local suppliers in their supply chain. Other taxes on imported EVs such as VAT, sales tax, luxury tax, port tax or tariffs on raw materials used in EV manufacturing could be considered in a similar manner.



Prioritize the battery and charging station elements of the e-mobility supply chain as areas of focus for industry capability and capacity development in the region

This study and other research overwhelmingly point to two areas as the lynchpins for scaling e-mobility globally: increased battery production and battery technology advancement and increases in charging infrastructure production and deployment. Between 2020 and 2030, global demand for EV batteries is projected to grow by a factor of 15, from a market of tens of billions to hundreds of billions of dollars. The charging infrastructure requirements will be of a comparable scale, with hundreds of millions of devices needed and hundreds of billions of dollars to be made through manufacturing, installing and servicing them. The very fast and much more powerful chargers (500kW or more) necessary

for heavier commercial cargo trucks will be part of the need in the region and globally and should also be part of the charging technology manufacturing capability that Arab countries work to develop. Investments by Arab region companies to develop the capability and capacity to serve these immense markets have the potential to create the greatest number of jobs of any investments in the e-mobility industrial ecosystem. Actions by Arab Governments to support the creation and scaling of these companies with financial and other interventions should be a priority for that reason. Supply chain resiliency concerns can be expected to make global EV manufacturers eager for redundant battery and charging station supplier options, boosting the prospects for Arab region companies. In the battery area, in addition to manufacturing there will be recycling, swapping and other related sub-industries to grow. In the charging area, installation, maintenance, data management and other sub-industries will grow alongside the potential for manufacturing.



Prioritize the creation of partner relationships with new and emerging EV manufacturers outside the Arab region

The investment and other commitments of established automotive OEMs to EVs and e-mobility are substantial, demonstrating an ability borne of their financial power to pivot from traditional business models. At the same time, their size, and responsibilities to shareholders, present operational constraints that are not shared by many EV start-ups. The relative freedom of these start-ups include where and how they build their manufacturing, assembly and other production-related facilities and where they build their supplier relationships. Existing and aspiring e-mobility component suppliers should pursue the new EV OEMs as a priority. Two-thirds of automotive suppliers surveyed by McKinsey in April 2022 did not anticipate significant revenue in 2030 from business partnerships to supply new OEMs like Nio, Lucid, Rivian or other even newer start-ups, including those working in the electric medium- and heavy-duty cargo truck space. If established Tier 1 and Tier 2 component suppliers focus on their traditional OEM customers, focus by Arab region companies on new OEMs could present opportunities with less competition over the next decade and beyond to grow the region's e-mobility industrial capacity. As newer OEMs compete for Arab region EV market share, local supplier partnerships will also be attractive for efficiency and cost reasons and to help meet pressures to lower the carbon footprint of their operations. Arab region Governments can play an important role in promoting these partnerships and providing the right investment

climate to encourage external producers to partner with domestic ones, making use of the comparative edge as well as benefiting the region.



Focus on developing EVs and related technologies that are tailored to distinctive needs and conditions of the Arab region as high-potential niche markets

Competition in the electric vehicle markets for all types of EVs focuses largely on cost and range, but also on other features. In addition to technology and performance features that will be attractive to consumers irrespective of market, there are opportunities in developing vehicles and parts that are customized to the environmental, social, economic, consumer preference and other conditions of individual markets. Start-ups in the Arab region could focus on local markets with EVs and components for EVs that are designed specifically for those markets. One area could be vehicles ruggedized for the heat and other environmental conditions of the Arab region. Extreme temperatures have a range of detrimental effects on EVs, primarily related to battery degradation

and fast charger degradation. Dust and sandstorms can be damaging to the power electronics of EVs and their batteries and chargers. Current and aspiring technology companies in the Arab region could choose to focus on innovations to contend with such conditions. They would have a substantial local market to serve, for cars and also buses if transit authorities continue to scale up procurement, as well as opportunities in other high-heat geographies. Low-cost electric passenger vans to help make the informal public transit sector in the Arab region more sustainable could be promising. Two- and three-wheel EVs customized to extreme heat environments could be another focus area that could grow Arab region mobility industrial capacity while also accelerating the economic opportunities that electric micro-mobility and electric-powered MaaS could enable. Opibus in Kenya is an example of a start-up pursuing this path with e-motorcycles tailored to that country's distinctive needs. Policies by Arab region Governments to financially and otherwise support development of an e-mobility industrial supply chain could target the provision of additional support to local companies which develop region-specific customized vehicles and vehicle components as well as to companies that convert ICE vehicles to electric.