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ASEAN MOBILITY: POISED FOR EV ACCELERATION

ASEAN Mobility: Poised for EV Acceleration



Indonesia best placed; Thai/Vietnam doing well

After clean tech, the biggest global theme is carmakers transitioning to green energy. In this report, we compare ASEAN's progress in this area, especially development of electric vehicles, vs the global trend. Our key findings are: 1) ASEAN lags developed markets in mobility transition due to lower affordability and smaller scale of investments; 2) rapid and large-scale EV adoption is critical for ASEAN to achieve its net zero carbon target because its transportation sector emissions are high; and 3) there is significant opportunity to develop batteries and other EV parts in ASEAN currently from a low base and emerge as a leading exporter. Among ASEAN countries, Indonesia and Thailand are the best placed for development of EV ecosystems due to natural resources and their large auto industry base. Vietnam and Malaysia could benefit if policy is catalyzed to scale up EV transition. Our Top Picks in the sector are INCO, MDKA, CD, GRAB and GREATEC, as they should benefit from transition to EVs over the long term.

EV sales rising rapidly; @ 14.4% of global sales now

Global EV sales are now over 10m vehicles pa from almost nothing in 2017. They have risen substantially due to: a) sharp increase in volume from Tesla, BYD and other leading EV makers; b) subsidies and incentives driving EV sales in the EU and China over internal combustion engine (ICE) vehicles; and c) improving EV adoption in the US. Going forward, the US could be a major driver of EV adoption due to its USD369b Inflation Reduction Act package and the unleashing of significant investment in the battery ecosystem, which will lower both the cost of new purchases and cost of manufacturing. EV adoption in Asia however is still lagging due to high upfront costs. Overall, it appears that the global auto sector is on target to reach 30%-plus electric vehicle sales as a share of total new vehicles sold by 2030. EVs make up 14.4% of global vehicle sales now.

ASEAN lagging but Indonesia could tilt favourably

ASEAN lags the developed economies and China when we compare its EV adoption, investment in charging infrastructure, policy and incentive support and development of local manufacturing systems. However, in recent times, global majors have chosen to develop a battery ecosystem in Indonesia, backed by government policy support. This could catapult Indonesia to become a major adopter of EVs as well as a battery manufacturing and export hub. The Philippines also has nickel mines and could be a battery mineral supplier. Vietnam promises to develop a local EV brand with local conglomerate Vin Group making a big investment. Thailand and Malaysia are established auto manufacturing hubs and are expected to shift their ICE manufacturing towards EV parts ecosystem.

Top Picks: CD, GRAB, GREATEC, INCO and MDKA

The mobility transition investment theme in ASEAN could be played through: a) battery minerals in INDO - INCO and MDKA; b) auto parts suppliers to EVs in MY - GREATEC; c) shared mobility providers in SG - CD and GRAB, AC in PH and d) auto ancillaries in TH - AH, SAT and STANLY. Our TP offer upside of 11-64%. We also profile a few interesting unrated stocks, which closely reflect this theme such as VinFast in VN, GENE, YNS and PMAH in MY, NANO in SG and NFCX and VKTR in INDO.

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Top Picks

Company	Bbg code	Curr	CP	Rating	TP
Merdeka Cop.	MDKA IJ	IDR	3,360	BUY	5,300
Vale Indonesia	INCO IJ	IDR	6,600	BUY	8,800
Greatch Tech	GREATEC MK	MYR	4.45	BUY	6.05
Ayala Corp	AC PM	PHP	639	BUY	1,050
Grab Holdings	GRAB US	USD	3.60	BUY	4.00
ComfortDelGro	CD SP	SGD	1.25	BUY	1.45
AAPICO Hitech	AH TB	THB	32.5	BUY	44.0
Somboon Ad. Tech	SAT TB	THB	18.9	BUY	24.0
Thai Stan. Elect.	STANLY TB	THB	199.0	BUY	240.0

Source: Maybank IBG Research
Price as on 24 Jul'23

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Executive summary

1. ASEAN's transition to EVs lags developed markets, but an emerging battery system in Indonesia could bring powerful changes

The purpose of this report is to analyse the prospects and challenges of the world's transition to EVs. We carried out detailed research on the sustainability disclosures of automakers in the ASEAN region to understand their strategy to transition to EVs. We also reviewed the policy measures and steps taken globally, as well as met experts to understand certain nuances. Our key takeaways from ASEAN and the world's transition to EVs are as below:

- **ASEAN - 6 countries' transportation sector emissions are in the range of 13-29% of the total energy emissions vs. the global average of 23%.** Indonesia is highest at 29%, whereas Vietnam is the least at 13%. The reduction of transportation sector emissions is critical for ASEAN not only because of its high share of total emissions but also because most cities in ASEAN have PM 2.5 levels (which refers to tiny particles or droplets in the air that are two and one half microns or less in width) in excess of the WHO's prescribed limit. High PM 2.5 levels in the air causes deaths globally as air quality is bad and people develop respiratory problems.
 - Among the ASEAN countries' per capita transportation emissions, Malaysia has the highest at 2 tCO₂e (tonnes of carbon dioxide equivalent) pa vs the global average of 1.1 tCO₂e. Incidentally, Malaysia also has the highest car ownership ratio of 82% in ASEAN and it offers subsidised fuel. Among other ASEAN-6 countries, the per capita transportation sector emissions of Singapore at 1.2 tCO₂e and Thailand at 1.1 tCO₂e are on the higher side versus the global average. However, those of Indonesia, Vietnam and Philippines are low and range from 0.4-0.6 tCO₂e.
- **ASEAN's EV penetration is low even within comparable emerging markets.** As at end-2022, ASEAN's EV car sales as a share of total vehicle sales was 2.1% vs 29% in China, 21% in Europe and 14% global average. Such a low EV penetration is due to high upfront cost of ownership and lack of local production ecosystem. EV penetration in ASEAN is even lower than that of India's 2.3%. If we include CNG-based vehicles, low carbon emission cars would total 12% of total cars sold in India.
 - Despite having 3rd largest 2-wheeler (2-wh) sales in the world at 12.9m units pa, electric 2-wh sales in ASEAN are merely 4% of total 2-wh sales and most are in Vietnam. In contrast, India has already sold close to 1m electric 2-wh in 2023 and penetration of electric 2-wh in India stands at 6% of total 2-wh sales. The penetration of electric 3-wh in India reached 40% of new sales in 1H2023.
- **Subsidies in ASEAN are not enough to bring down upfront high cost of purchasing EV over ICE vehicles.** Singapore, Thailand and Indonesia provide rebates/subsidies for EV purchases. Incentives across ASEAN - 6 countries is in the form of tariff cuts and lower registration fees. The premium in price for an EV car ranges from 13-51% in ASEAN despite subsidies. Only in Singapore is the price of EV and ICE cars similar. The price point at which an EV is available in ASEAN ranges from USD30,000-50,000 which makes it difficult to switch. In contrast, India offers an upfront subsidy in the hands of consumers for purchasing an electric 2-wh vehicle or car (c.8-10% of the vehicle price) as well as various other concessions on loans, registration fees and tax rebates. Yet, the price of an electric 2-wh in India is higher by 40-50% and car by 50-60% vs an ICE vehicle.

- **Only three ASEAN countries have set explicit targets for EV sales as below**
 - Malaysia targets EV market share of 15% by 2030 and 38% by 2040 in annual vehicle sales.
 - Thailand targets 30% of all car sales to be EVs by 2030.
 - Indonesia targets 25% of all car sales to be EVs by 2030.

These targets by ASEAN countries, to be achieved by 2030, are quite modest compared to the global market outlook by BloombergNEF and IEA, which suggest 30-60% of total sales to be EVs by the same time period to be on target for net zero. Clearly more action on the targets and their enabling policies is required within ASEAN to continue to be on the path to net zero emissions from their transportation sectors. Singapore, Thailand and Vietnam are the only ASEAN countries to have announced a phasing out of the sale of ICE vehicles by 2030/2035/2040, respectively.

- **Japanese dominance in ASEAN auto sector is under threat from Chinese automakers who could eventually pave the way for a shift to electric mobility.** One key reason for ASEAN's relatively slow mobility transition is due to domination of Japanese companies in its automotive sector. The Japanese brands such as Toyota, Honda, Suzuki, Isuzu, Nissan and Yamaha dominate both 2 and 4-wheeler production and sales in the ASEAN-6 countries with a limited presence of Korean, European and American automakers. It is well known that the Japanese automakers are behind in the transition to battery operated electric powertrain and are still not taking a comprehensive view to shift. They are still evaluating the possibility to commercialize hydrogen and push for hybrid vehicles where upfront cost is a barrier. The Japanese are also trying to develop and commercialize a solid-state battery by 2027, which if successful will charge in 10 minutes and offer a 1,200km/charge range. The Chinese automakers such as BYD, Geely, GWM, Xpeng, Nio and others are penetrating export markets aggressively and have 10-20% cheaper EV models compared to the Japanese, Korean and European competitors. China's exports of EV vehicles rose 51% YoY for 2022 and maintained strong growth in 1H 2023. Chinese EV makers had a 79% share of all 4-wheeler (4-wh) EVs sold in ASEAN in 1Q23. We believe if the ASEAN auto industry shifts decisively towards electric powertrains like in China, Europe and the US it would come at the cost of the Japanese automakers and their investment in the ICE powertrain.
- **ASEAN needs to develop a battery ecosystem and position itself well in the complex geopolitical dynamics.** On the whole, the current status of ASEAN's mobility transition is no different from its energy transition. It is lagging the developed markets mainly due to lack of large-scale investments, lack of significant incentives to switch to electric mobility and the EV ecosystem/supply chain is largely cornered by China (processes 2/3rd of lithium and nickel - the two most critical battery minerals). China, Japan and Korea together own nearly 90% of all battery parts manufacturing in the world as well. To break this stronghold of China, the EU and US are now offering major incentives for automakers to set up units locally and are establishing tailor-made material sourcing contracts with select countries. ASEAN will need to maintain policies such that it is able to attract investment from both US and China and keep its minerals in the region for higher value addition.

The silver lining is that the global auto and battery makers are keen to develop and invest in different global supply chains to have reliable supply of battery minerals and EV components. Local manufacturing of EVs in ASEAN offer significant upside on a small base. The risk would be to traditional ICE-based automakers and component makers in the region as they would lose a significant part of their sales each decade unless they make a rapid shift to electric vehicles/parts.

Fig A: EV value chain in ASEAN

Value chain	Selected country	Selected companies
Nickel mining	Indonesia	Merdeka Battery Materials (Indonesia), PT Hengjaya Indonesia, PT Antam (Indonesia), Harita TBP (Indonesia), Eramet (France), Nickel Mines (Australia), Solway Investment (Switzerland), Tsingshan Holding (China), Vale (Brazil), Zhejiang Huayou Cobalt (China)
	Philippines	Intex Resources (Philippines), Sumitomo Metal Mining (Japan) and Mitsui (Japan)
Nickel smelting	Indonesia	Eramet (France), Jiangsu Delong Nickel Industry (China), Nickel Mines (Australia), Solway Investment (Switzerland), Tsingshan Holding (China), Vale (Brazil), Zhejiang Huayou Cobalt (China)
EV battery, parts and components production	Indonesia	LG Energy Solution (Republic of Korea) and Hyundai Group (Republic of Korea)
	Malaysia	Honda (Japan), SK Group (Republic of Korea), Greatch Technology, Genetec Technology
	Thailand	BMW (Germany), Evlomo (United States), Mercedes-Benz (Germany), SAIC (China), Toyota (Japan)
EV production	Indonesia	Hyundai (Republic of Korea), Toyota (Japan), NFC Indonesia, VKTR Teknologi Mobilitas
	Malaysia	Toyota (Japan)
	Philippines	EnPlus (Republic of Korea), Ayala Corp
	Singapore	Hyundai Motor Innovation Centre (Republic of Korea)
	Thailand	BMW (Germany), Foxconn (Taiwan), Mercedes-Benz (Germany), Mitsubishi (Japan), Nissan (Japan)
	Vietnam	VinFast (a subsidiary of Vingroup) - a very young EV player set up in 2017)

Source: ASEAN Investment Report 2022 research, Maybank IBG Research

Indonesia, Thailand could attract investment to establish alternate supply chains for battery operated vehicles. Indonesia and Thailand are the two largest automotive markets within ASEAN (c.10% of their GDP is from the auto sector). We believe both these countries will emerge as regional and global hubs for battery development in the coming 5-10 years. Indonesia is at an advantage because of its world-leading nickel reserves and nickel's use in electric vehicle batteries (Indonesia supplied half of nickel for batteries in 2022). Reportedly, Indonesia attracted total investments of around USD20b for developing nickel mines and other downstream products but this is mainly from Chinese metal producers. The Indonesian government recently decided to not export nickel ore but to add value, make batteries and develop a battery system to support the local manufacture of electric vehicles. Large auto and battery makers such as Tesla (TSLA US, Not Rated), BYD (1211 HK, Not Rated), LG Chem (051910 KS, Not Rated), CATL (300750 CH, Not Rated) and Panasonic (6752 JP, Not Rated) are evaluating Indonesia's policies with an eye to making large investments in the country. Moreover, a policy clarity by US is needed in terms of how much import content it will allow in EVs manufactured in the US (Chinese ownership in Indonesia is a hindrance).

After achieving policy clarity, Indonesia could attract much more investment and this can not only catapult Indonesia's vehicle transition to cleaner products but also help ASEAN as a region adopt electric vehicles faster and more cheaply. No other country in ASEAN is witnessing more developments on the electric vehicle front than Indonesia. The Philippines also has nickel reserves from which the country can benefit if developed along with a push for local battery manufacturing by the government. Thailand is the 2nd biggest country in terms of automotive production within the ASEAN region with several global auto company manufacturing operations based there for global exports. China's CATL is likely to set up a battery unit in Thailand, which augurs well for ASEAN. The benefit of battery ecosystem in Indonesia and Thailand should be visible in the cost structure and shift away from ICE products to EV in another 4-5 years.

Malaysia is also looking to play a bigger role in the emerging EV ecosystem in ASEAN. Malaysia reportedly approved investments worth USD5.8b in the EV powertrain during 2018-2023. Recently, Tesla launched sales of its Model 3 and Model Y in Malaysia including setting up its super charging stations and an experience centre. This should help the trend of EV adoption in Malaysia. In addition, China's Geely is likely to make a large commitment in Malaysia due to its shareholding in local carmaker Proton. China's BYD, Great Wall Motors and Chery have already launched EV cars in Malaysia this year. The transition to the EV ecosystem from ICE is critical for Malaysia because the auto sector contributes 4% to its GDP (2021) and it is the 3rd largest automotive market in ASEAN after Indonesia and Thailand.

ASEAN could learn from other countries on mobility transition. Some of the key lessons for ASEAN to increase electric mobility adoption and accelerate mobility transition are 1) consistent consumer subsidy for EVs including second hand EVs to develop a strong resale market, 2) incentives for public charging infrastructure, 3) removal of subsidies on fossil fuel especially petrol, diesel and compressed natural gas, 4) creation of at least 1 charger for every 10 cars and set a charging time of 20-30 minutes, 5) import substitution and local manufacturing of battery and its parts, 6) include zero emission vehicles as a part of corporate net zero program, 7) subsidize green hydrogen ecosystem to electrify long haul trucks and 8) electrify public buses to reduce air pollution in urban areas.

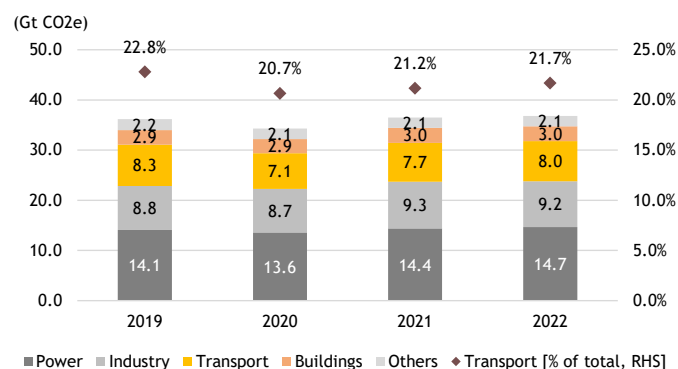
2. Vehicles contributed 22% of global energy-related CO2 emissions in 2022

Out of the world's 36.8 GtCO₂ of energy-related emissions in 2022, the IEA estimates the transportation sector accounted for 22% of the emissions. Almost 200 countries have committed to reducing their emissions under the Paris Agreement, and more than 137 countries committed to net zero carbon emission at COP26 (26th Conference of the Parties), which supports transition to low- and zero-emission vehicles. In other words, we have at the most two decades to phase out less energy efficient and polluting ICE vehicles and their ecosystems.

Transportation sector emissions have increased at the fastest pace amongst all the industries in 2021-2022 (+9.0%/+3.2%) after a steep decline in 2020 of 14.2%. During the same period, global energy related CO₂ emissions increased by 6.9%/0.9% after declining by 5.2% in 2020. Passenger vehicles accounted for 45% of the transportation sector's CO₂ emissions, followed by freight vehicles at 30%.

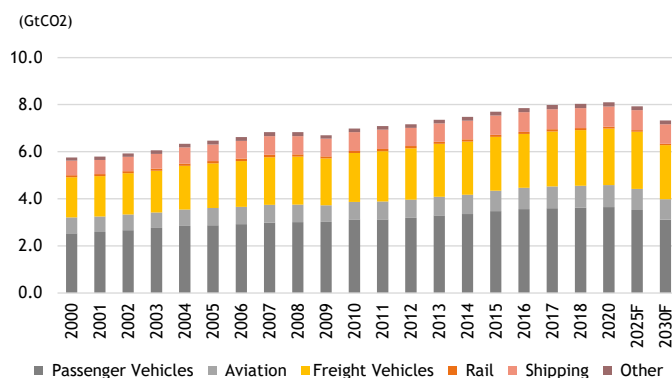
In terms of countries, about 48% of the transportation emissions come from the US (22%), Europe (15%) and China (11%), according to Our World in data. ASEAN's top-6 countries and India accounted for 4.5% and 3.7% of global transportation sector emissions, respectively. The per-capita transportation emission is the highest in the US at 5.3 tCO₂e/capita, with Europe at 1.7, China at 0.6 and India at 0.2 vs the global average of 1.1 tCO₂e/capita. Within the ASEAN countries, Malaysia is highest at 2 tCO₂e/capita followed by Singapore at 1.2 tCO₂e/capita.

Fig 1: CO2 emissions by sector: Transportation sector contributes 22-24% of global emissions



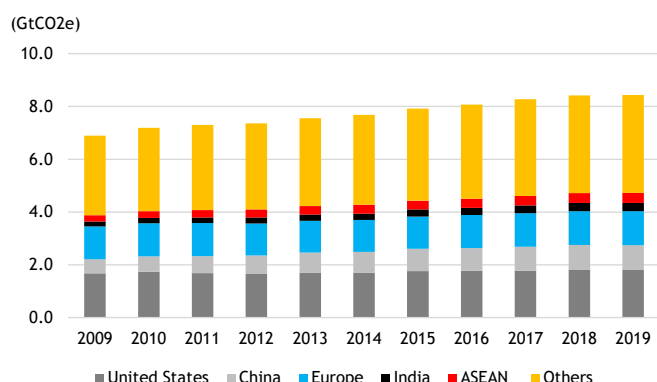
Source: IEA

Fig 2: Transport emissions: passenger vehicles contribute 42-44%, followed by freight vehicles at 30%



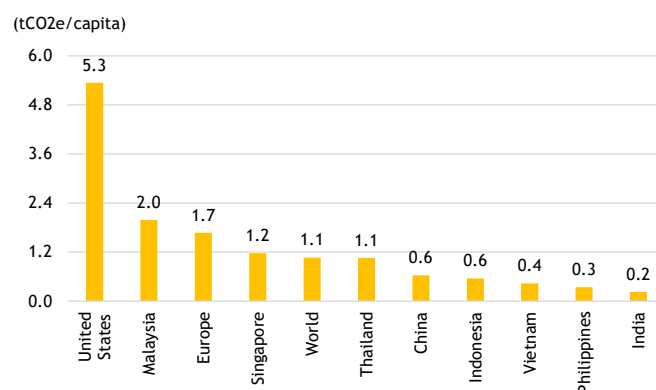
Source: IEA

Fig 3: Transport emissions: country-wise



Source: Our World in data

Fig 4: Transport emissions: country-wise per-capita



Source: Our World in data

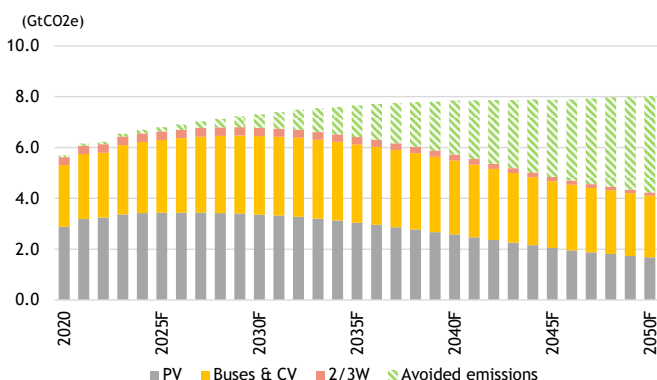
Transport sector emissions, at 6.1 GtCO₂e in 2022, have not surpassed the pre-Covid level of 6.3 GtCO₂e. BloombergNEF has drawn up two scenarios:

1. The economic transition scenario (ETS) - where it assumes no new policies or regulations are enacted that impact the market; the long-term climate targets are not met and targets to phase out ICE vehicles set by countries are not fulfilled;
2. Net-zero carbon scenario - where it investigates the potential routes to net-zero emissions.

Expectations in the two scenarios:

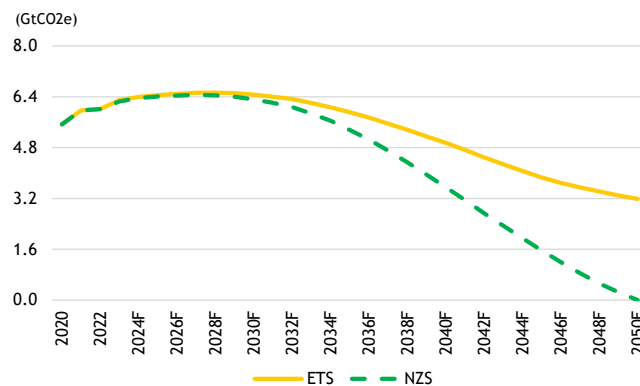
1. In its ETS, BloombergNEF expects the 2019 emissions number is surpassed in 2023. It further expects transport sector emissions to peak in 2029.
2. Under its net-zero scenario, BloombergNEF expects zero-emission passenger vehicle fleets to be 20% of the total fleet by 2030. The big shift will happen from 2038, where avoided emissions will be more than 1 GtCO₂e (and 3 GtCO₂e in 2050) vs the ETS scenario.

Fig 5: Transport sector emissions: 30% decline in emissions over 2022-2050F under the economic transition scenario due to transition to electric and fuel-cell vehicles



Source: BloombergNEF

Fig 6: Transport sector emissions in economic transition & net-zero scenarios: projected gap to be 3.19 GtCO2e by 2050, driven by bigger transition from 2038F



Source: BloombergNEF

John Doerr, a renowned venture capitalist and the author of '*Speed and Scale*', suggests the following points to reduce transportation sector emissions from 8 GT to 2 GT by 2050:

- 1) EVs achieve price-performance parity with new combustion-engine vehicles in the US by 2024 (USD35k) and in India and China (USD11k). Green premium (EVs priced at a premium to ICE vehicles) is a major obstacle to adoption of EVs. In India, the initial purchase price of an electric 2-wh is still 78% higher than for an ICE 2-wh; for an electric car it's 92% more costly, electric truck 41% higher and electric bus 200-250% more expensive.
- 2) One out of every two new personal vehicles purchased worldwide is an EV by 2030, and 95% by 2040.
- 3) All new buses are electric by 2025, and 30% of medium and heavy trucks purchased are zero-emission vehicles by 2030, and 95% of trucks by 2045.
- 4) 50% of the miles driven on the world's roads are by EVs by 2040, and 95% by 2050 - this could reduce emissions by 5 GT.

The above are hard to achieve because, according to an estimate by BloombergNEF in 2020, of the total miles driven by personal and commercial vehicles on a global basis, just 1% was electric; in the case of 2-3 wheelers, it was 19% and for buses, it was 31%. Annually, we drive more than 13t miles and to 100% electrify those will be a staggering task. This would be possible if autonomous EVs are offered under a shared mobility model and they form a large portion of the overall market.

Truck decarbonization would need Green H2, which is 5-7 years away from commercialization. Even though global EV car sales are now 14% of the total new sales in 2022 and those of electric 2-wh are at 43% and electric bus at 3.8%, there is risk of not meeting the transition to EVs in time. This is because of hard-to-decarbonize long-haul trucks. Long-haul trucks typically travel distances of 800km-plus in one journey with a payload of 25 tonnes and above. If these trucks are fitted with big batteries their weight would go up and safety would be compromised. Also, the charging infrastructure on highways is still not well developed in most countries. To overcome this challenge, some of the countries, including the US, the EU, China and India, are working on using Green Hydrogen (H2) to power these trucks. The Indian government launched a production-linked incentive (PLI) in June 2023 in eight cities where trucks using Green H2 would serve as a pilot case. They would remain within a cluster of 25km, known as 'Hydrogen Valley'. Similar experiments are ongoing in the UK and the EU. India has set a target to reduce the cost of Green H2 to USD1-2/kg by 2030 vs USD8-10/kg currently. Once the cost of Green H2 is on parity with fossil fuel, it would be a game-changer to deploy this technology across long distance truck fleets resulting in minimal emissions and reduced cost. Petroleum companies in India and ASEAN already make grey H2 and are familiar with making green H2 but would need electrolyzers for the same. When the electrolyzers are available at a reasonable price, the overall cost of H2 should come down, allowing everyone to embrace this solution.

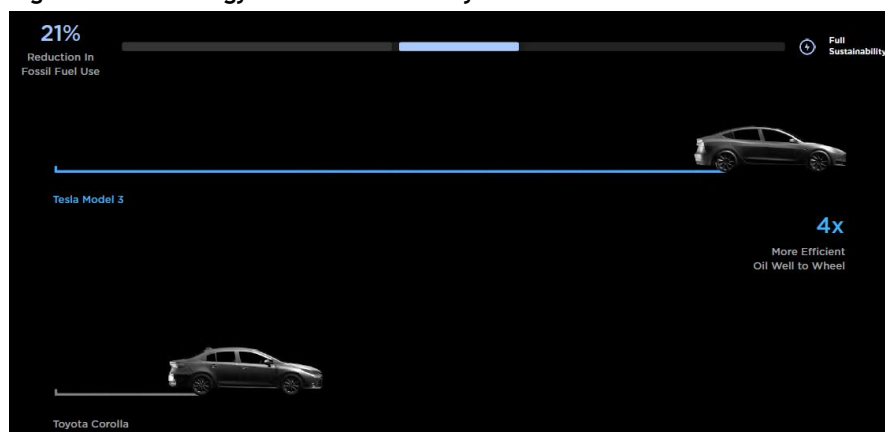
3. Transport sector transition to EVs is irreversible. Why and how?

The dominance of ICE technology over the past century has been so long and far-reaching that the transition to EV is still viewed with skepticism and disbelief by many. Some of the critical factors that need to be overcome to achieve this transition include:

- 1) energy efficiency;
- 2) lower emissions;
- 3) availability of critical minerals to make EV batteries; and
- 4) reduced cost of transportation.

We use case studies and information provided by Tesla in its Master Plan presentation in March 2023 and Ather Energy in its May 2023 document to substantiate these factors in favour of EVs.

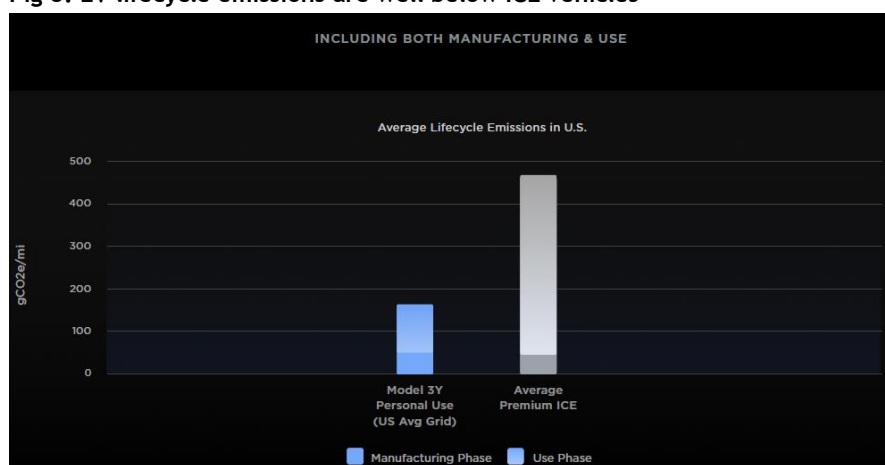
Fig 7: EVs use energy far more efficiently



Source: Tesla Master Plan 3 presentation

According to Tesla's (TSLA US, Not Rated) Master Plan, by switching to EVs fully at a global level, we can reduce fossil fuel use by 21%, amounting to 28 PWh/year (Petawatt hours). EVs can convert 60% of the electrical energy from the grid to power the wheels but petrol or diesel can convert only 17-21% of the energy stored in the fuel tank to the wheels.

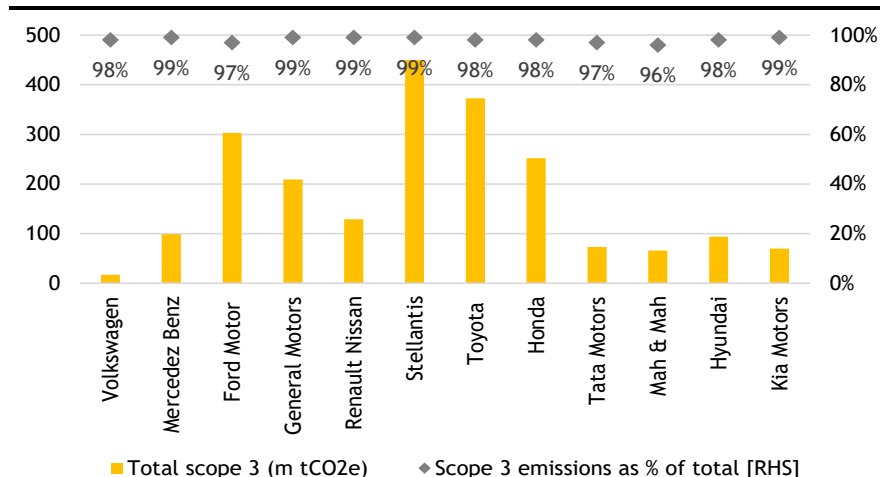
Fig 8: EV lifecycle emissions are well below ICE vehicles



Source: Tesla Master Plan 3 presentation

The key reason for this savings in lifecycle emissions in the case of EVs is that their tailpipe emissions are negligible compared to ICE. On average, an ICE Car emits 35 tonnes of GHG emissions over its lifespan, which is lower by 29% for an EV using the current grid charging mix and by 80% if the entire charging source is renewable energy. For any ICE vehicle, 98-99% of life-cycle emissions are Scope 3 i.e. customer/supplier emissions with the bulk being in its use phase. These are reduced in the case of EVs but not completely eliminated until the entire grid uses renewable power. However, the direction is clear i.e. it will keep going down over the long term.

Fig 8a: Scope 3 emissions at 97-99% for all automotive companies who disclose emissions data

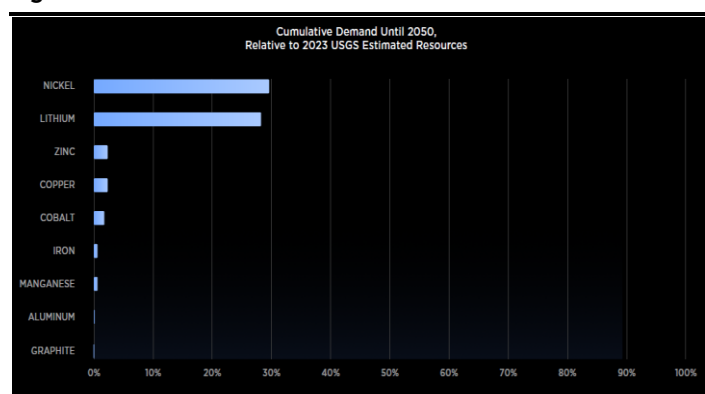


Source: Company reports, Maybank IBG Research

Slow-moving traffic is a big issue across cities globally and this problem will only worsen because urbanization is expected to increase substantially in the coming years. Slow-moving traffic is responsible for 23% of PM2.5 levels and this in turn is a leading cause of pollution and respiratory disease in cities.

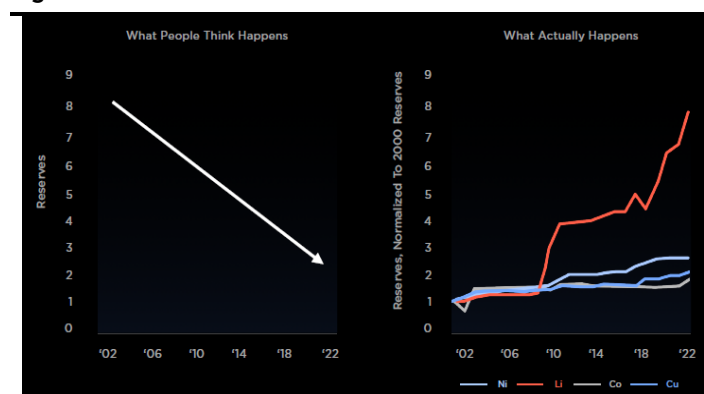
One of the most serious concerns relating to transition to EVs is the availability of critical raw materials, including rare earth minerals to make batteries. Over the past few years, we have witnessed a sharp increase in EV production and battery capacities, and with the recent green economy packages announced in the US and the EU, the investment in battery and related infrastructure would rise exponentially. This would unleash massive demand for nickel, cobalt and lithium, among other metals. Tesla's Master Plan clarifies that resource availability is easing with time and is likely to only improve i.e. we would not be consuming a major portion of the reserves of these critical minerals even by 2050, the year of transition.

Fig 9: Resources are available for EV transition



Source: Tesla Master Plan 3 presentation

Fig 10: We can find more

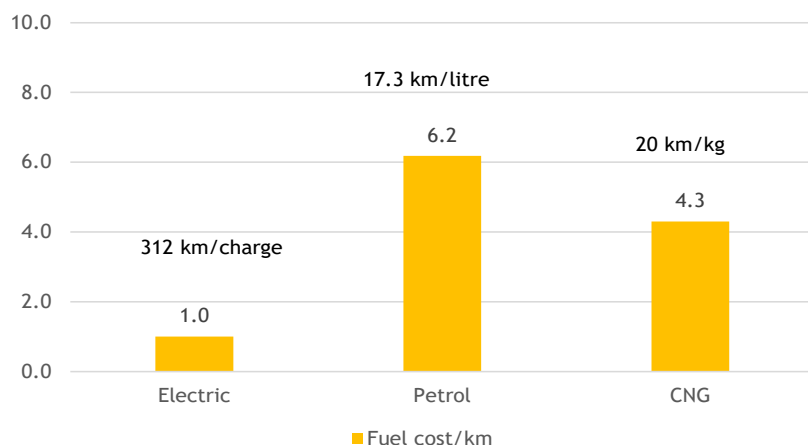


Source: Tesla Master Plan 3 presentation

Cost comparison: EVs vs diesel cars vs petrol cars vs CNG cars

India has a unique combination where all the different fuel sources are being used currently in the automobile sector, especially in cars. The chart below shows the range and cost per km, which makes it clear which one is the best fuel to use and why EV adoption would increase as the battery cost comes down and consumer affordability improves.

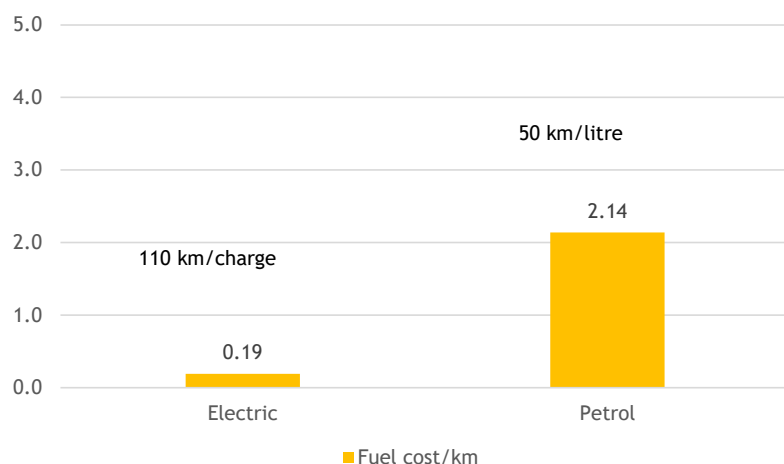
Fig 11: Cost/km and mileage comparison using the Tata Nexon model; EVs cheapest on running cost (fuel cost per km is in INR)



Source: Maybank IBG Research

We also provide this analysis in the case of 2-wh as documented by one of India's leading electric 2-wh start-up, Ather Energy. The electric 2-wh is the genesis of micro-mobility.

Fig 12: Cost/km and mileage comparison using the TVS iQube model; EVs cheapest on running cost (fuel cost/km is in INR)



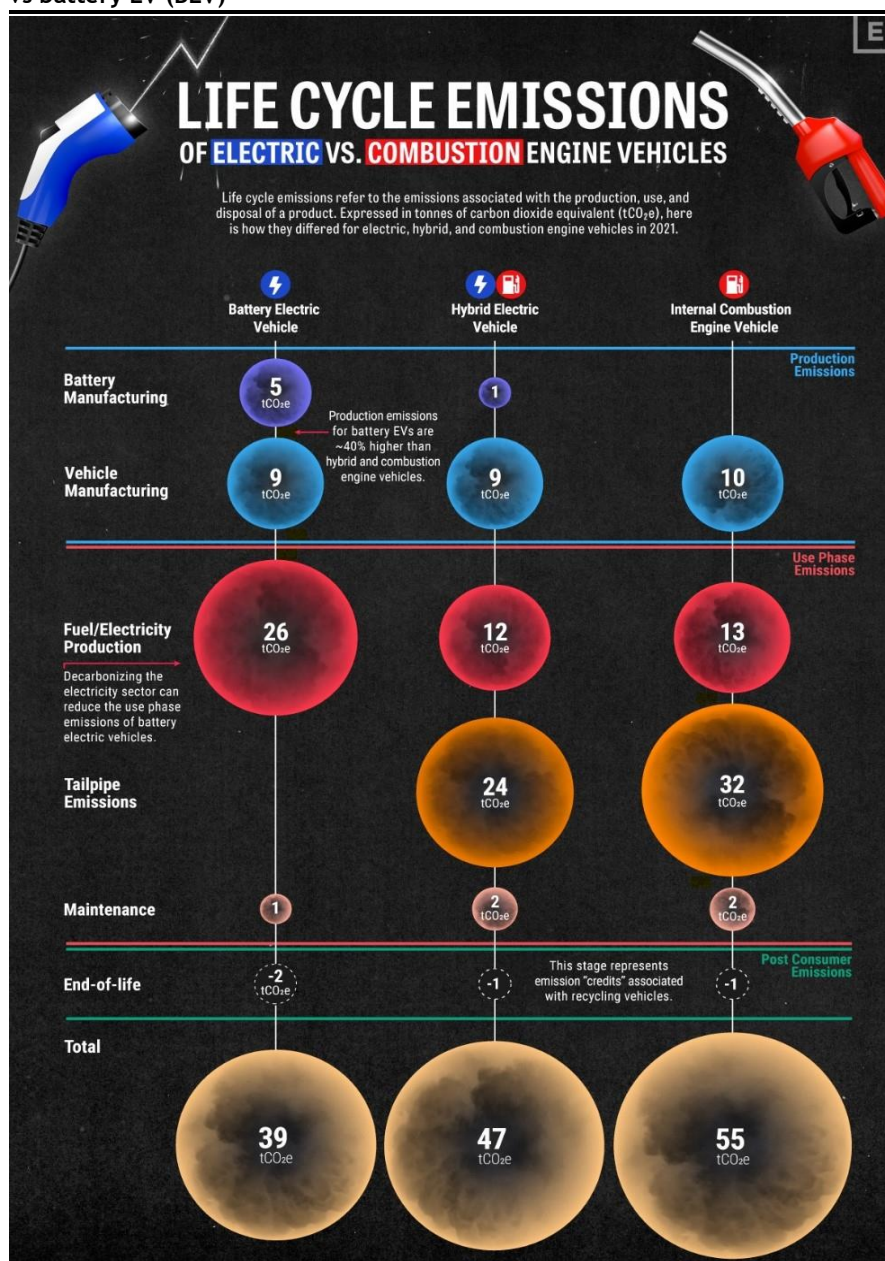
Source: Maybank IBG Research

4. Lifecycle emissions: EVs win vs hybrid EVs and vs ICE

Globally, ICE vehicles were 95% of the passenger vehicle fleet in 2022, based on data collated by BloombergNEF. Use-phase emissions form more than 80% of the lifecycle emissions from an ICE vehicle. Tail-pipe emissions form more than 70% of the use-phase emissions. The best way to reduce use-phase emission is to move to renewable energy powered EVs. This will help achieve global goals of limiting global warming to below 2C or 1.5C, in-line with the Paris Agreement's targets.

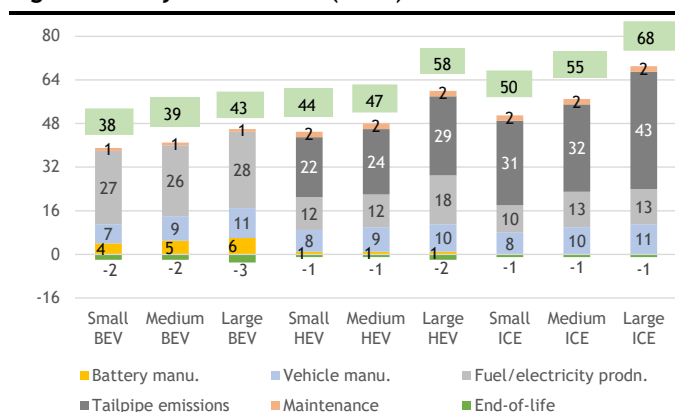
Lifecycle emissions for 2021 for a medium-sized ICE vehicle works out to 55 tCO₂e. This compares to a similar hybrid EV which works out to 47 tCO₂e and a battery-operated EV, which works out to an even lower 39 tCO₂e, as per a study done by Polestar, Rivian and Kearney (Polestar and Rivian pathway report 2023). This assumes a 16-year period and 240,000 km.

Fig 13: Lifecycle emissions for a medium-sized vehicle: ICE vs hybrid EV (HEV) vs battery EV (BEV)



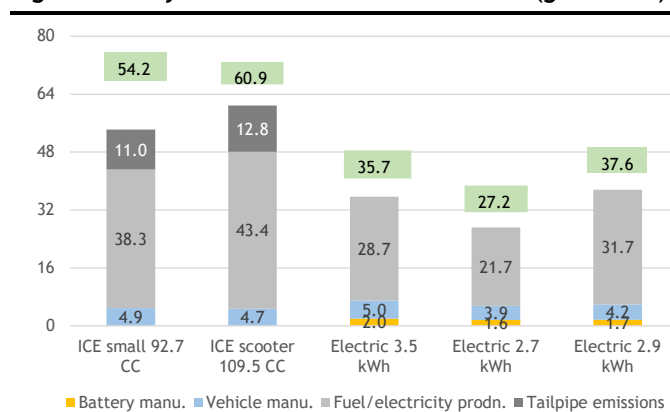
Source: Polestar and Rivian Pathway Report 2023, Visual Capitalist

Fig 14a: Lifecycle emissions (2021): ICE vs HEV vs BEV



Source: Polestar and Rivian Pathway Report 2023

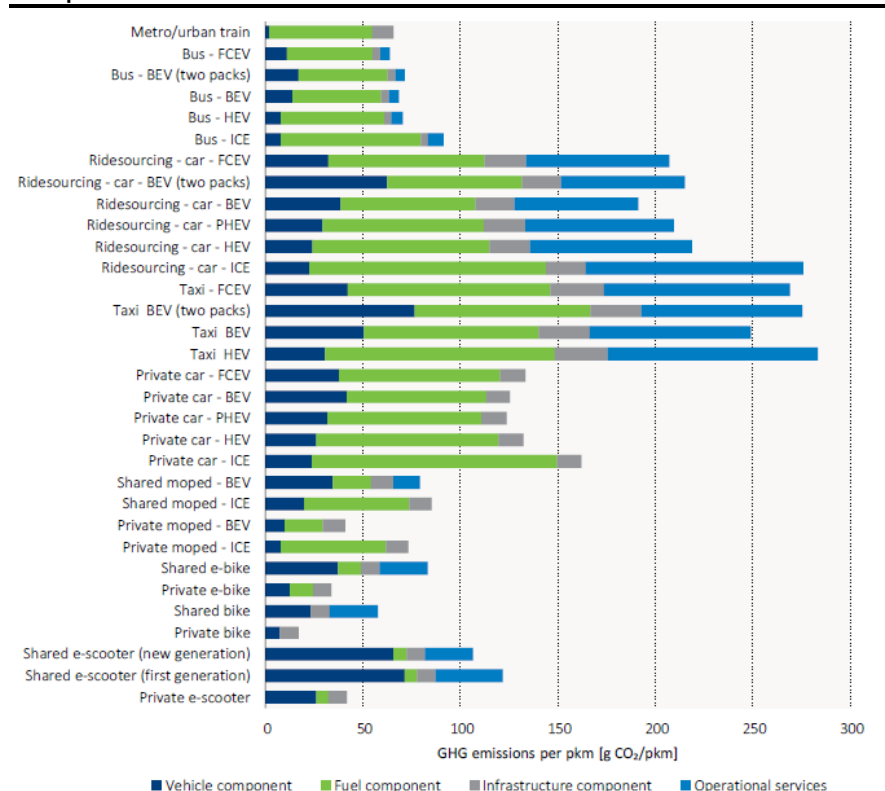
Fig 14b: Lifecycle emissions 2-wh: ICE vs BEV (gCO2e/km)



Source: Ather Energy presentation

This life-cycle GHG savings compared to ICE for a 2-wh is a game changer for adoption of more electric 2-wh. This is because of the rapid increase in electric 2-wh-based shared mobility and fleet services. It is the easiest, cheapest and fastest way to bring down direct and indirect emissions (supplier/customer). Many companies have started offering EV purchase plans as perquisites to their employees because employee commute accounts for a significant % of total scope 3 emissions. Especially in populous countries such as India and Indonesia, this could have a profound role in decarbonizing transportation, reducing pollution and improving urban/city life.

Fig 14c: Estimates for life-cycle GHG emissions for different modes of urban transport



Source: International Transport Forum - "Assessing the environmental performance of new mobility"

While the above is an example from Europe, it could be broadly applicable anywhere. It simply suggests that battery-operated private mopeds followed by private bikes and then public transport are the most energy/emission efficient mediums of transport. Apart from the major movement of transitioning from ICE to electric which requires massive upfront investment, several countries are working on improving public transport. This includes expanding metro railway in cities, converting diesel and CNG buses into electric buses and creating platforms that enable renting electric bikes or mopeds. Singapore plans to replace 400 diesel buses with electric by 2025, half of the buses to electric by 2030 and 100% electric/hybrid by 2040. It plans to expand its rail network by about 360km by 2030. Malaysia has established a revolving fund of MYR450m for e-bus competitive leasing and annual MYR100m fund. Thailand has targeted addition of 34,000 electric buses. BloombergNEF forecasts ASEAN electric bus sales to reach 44,500 pa by 2040.

5. Social impact of EV adoption: positives will outshine negatives

Positive social impacts of electric mobility

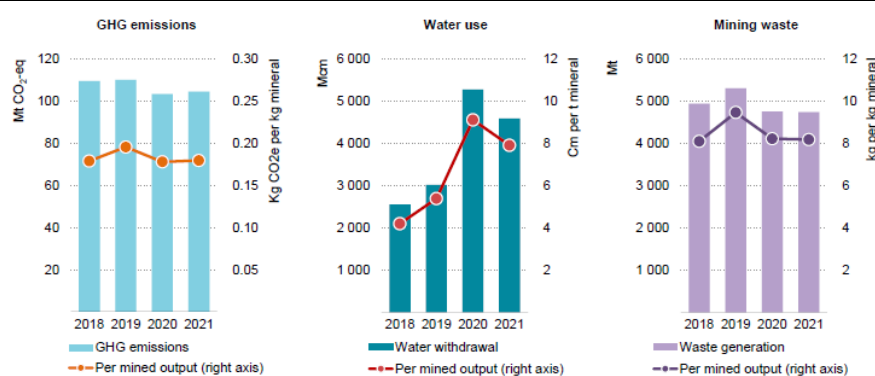
1. **Increase in income generation and job creation:** More than 1/3rd of the electric 2-wh sold in India are used for commercial purpose. In rural areas, most of these are purchased by 1st time vehicle buyers and those who are not connected to traditional banking channels. This enables them to get connected with the mainstream economy, carry out their commerce/trade or delivery jobs etc. The operating cost of an electric 2-wh is 1/10th of its ICE counterpart, which enables the buyer to save and use the money to improve his cash flow or repay his/her vehicle loan. The same is more or less applicable to electric 3 wheelers used mainly at airports, bus and railway stations and tourist locations. For many lenders, loans for EVs is categorized as a social-inclusion loan.
2. **Reduces emission and air pollution:** As compared to ICE vehicles, CO₂ emissions of EVs are 26-36% less depending upon the size of vehicle. It will further decrease as the power source upgrades to renewable energy. In addition, zero-emission EVs eliminate PM_{2.5} from the environment, resulting in reduced air pollution and respiratory disease. According to the book '*Speed and Scale*' by John Doerr, particles from tailpipes and power plants cause 350,000 premature deaths in the US alone and one in five deaths worldwide. America's Environmental Protection Agency says that this pollution is linked to heart disease and lung cancer.

Negative social impact of electric mobility

1. **Mining of battery minerals and unfair labour practices:** Large amounts of key battery minerals, including lithium, nickel and cobalt, are sourced from mines in Africa. There are several instances of forced labour, child labour, lack of health and safety and other human rights violation of workers. This has created a major constraint in terms of sustainability of mining operations and the entire supply chain.
2. **Water use and contamination:** The mining of battery minerals leads to excessive use of water and causes contamination, which could be harmful for the surrounding community and biodiversity.

Overall, more responsible mining of battery minerals is the most critical if it is to be scaled up.

Fig 14d: GHG emissions, water use and mining waste remain high for mining companies



Source: Critical Mineral Market Review 2023

6. Global EV market expanded due to rapid growth in demand in China, the EU and the US

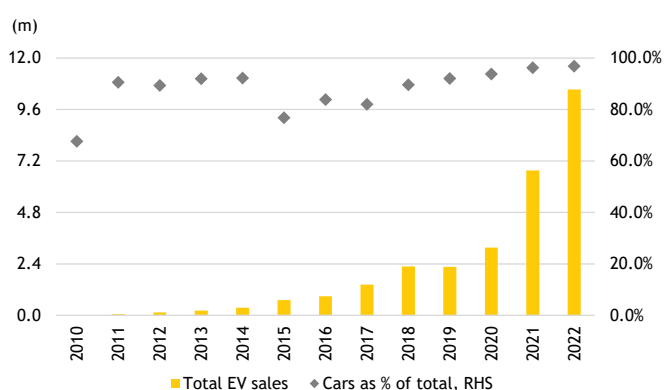
4-wh EV market

Four wheeler (4-wh) EV sales surpassed the 10m mark in 2022 at 10.27m vehicles, higher by 57% YoY. Cars formed 99.4% of the sales with buses accounting for a large part of the balance. EV car sales as a % of total car sales increased to 14% in 2022 vs 9% in 2021 and have reached more than 10 times their sales in 2017.

Of the 2022 EV car sales of 10.27m, BEV dominated with 72% share, followed by plug-in hybrid electric vehicles (PHEV) at 28%. Over 2019-22, BEV's share has ranged between 67-72% as more and more brands have launched BEVs.

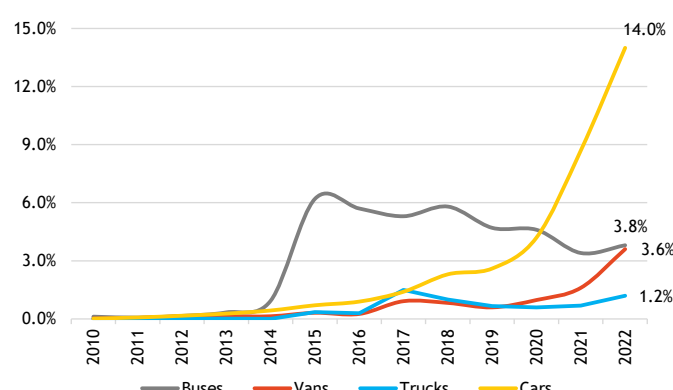
China has dominated global EV sales with a 58% share of EV car sales in 2022; China sold 5.9m EVs last year, 82% higher YoY. China's share of global EV sales has been trending higher, except for a slip in 2020 when its share decreased to 38% against 51% in 2019, largely due to a surge in EV adoption in Europe. Europe's share declined to 25% in 2022, after peaking at 46% in 2020.

Fig 15: Of global 4-wh EV (PHEV+BEV) sales, cars formed more than 90% of sales



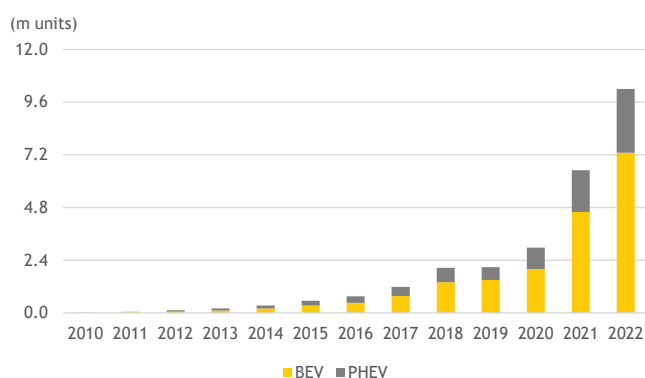
Source: IEA

Fig 16: EVs share of total: cars at 14%, driven by pickup in the China market



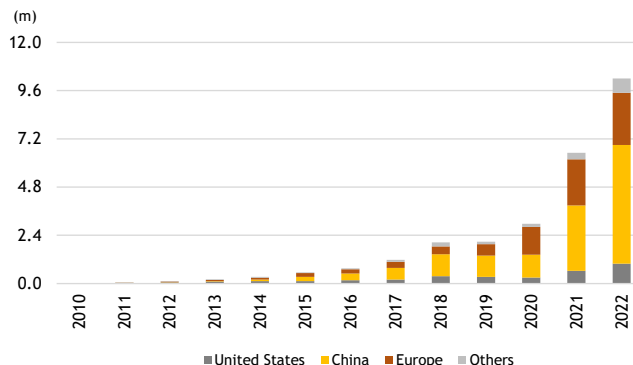
Source: IEA

Fig 17: EV car sales: battery EVs dominate at 72% of total global EV car sales



Source: IEA

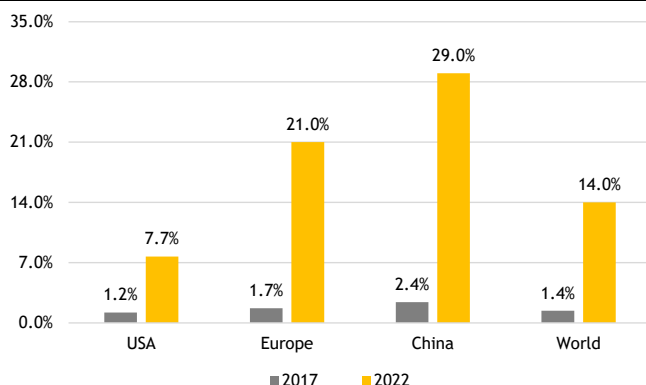
Fig 18: EV car sales: China dominates with a 58% market share, followed by Europe at 25%



Source: IEA

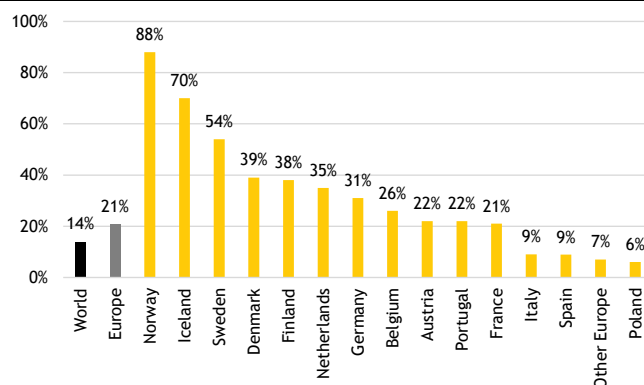
In terms of adoption of EVs in the car industry, the global share of new sales has risen to 14% in 2022 from 1.4% in 2017. Amongst the major economies, China dominates with EVs at 29% of total car sales, followed by Europe at 21% whereas the US is at 7.7%. Many European countries have seen a much higher adoption of EVs, such as Norway's EV sales forms 88% of its new car sales, Iceland at 70% and Sweden at 54%. Amongst the high-population countries, Germany is at 31% and France at 21%, whereas Italy and Spain are at 9%.

Fig 19: EV car sales: market share in total car sales surges in major geographies



Source: IEA

Fig 20: Numerous European countries seeing much higher EV share vs global average



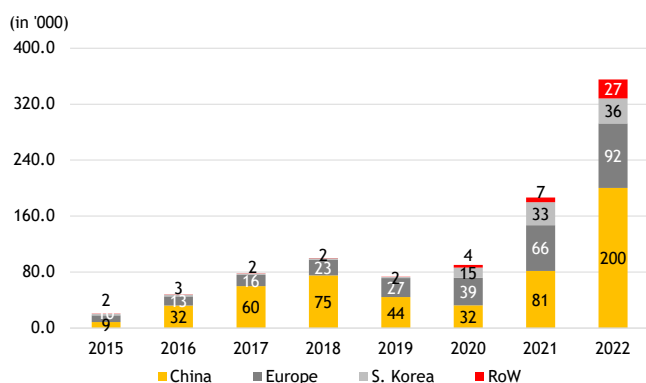
Source: IEA

Commercial and 3-wheeler market

Global commercial EV sales i.e electric trucks increased 90% YoY in 2022, reaching 355,185 units. China dominated with 56% share of the total electric truck les. Its market share increased from 36% in 2020. Electric truck sales as a percentage of total sales was at 2.7% in 2022, as per BloombergNEF.

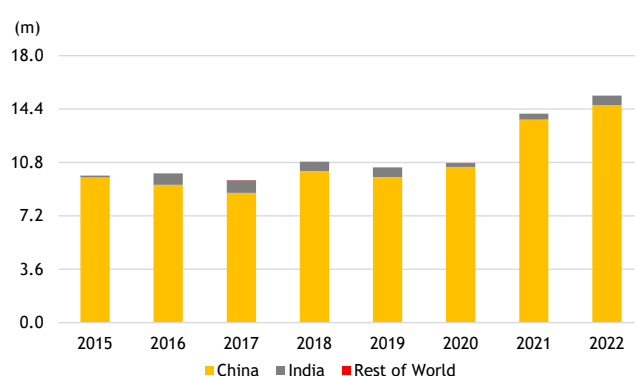
Global 3-wheeler (3-wh) EV sales increased 9% YoY to 15.3m in 2022. 3-wh EV sales had reported a strong pick-up in 2021 with a YoY increase of 31%. China dominates with a lion's share of 96%. EV sales constitutes 82% of global 3-wh sales, according to BloombergNEF.

Fig 21: Global commercial EV sales: increased 90% YoY in 2022, China dominates with 56% market share



Source: BloombergNEF

Fig 22: Global 3-wheeler EV sales: China had the lion's share at 96% of global EV sales in 2022

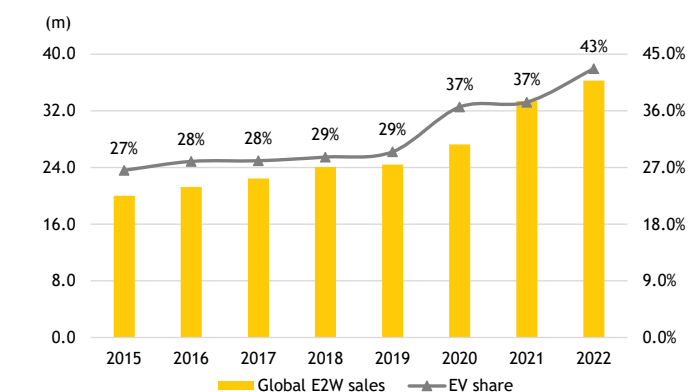


Source: BloombergNEF

2-wh market

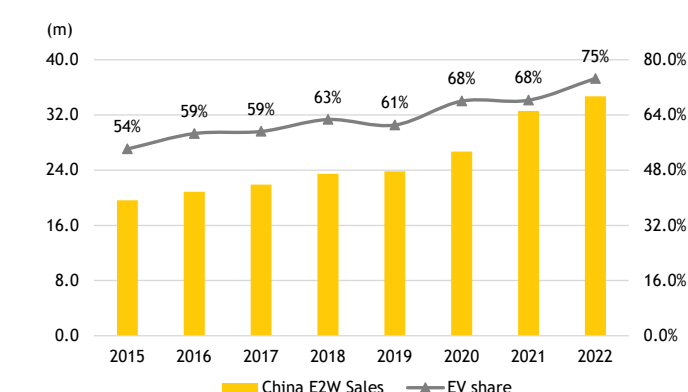
Global 2-wh EV sales increased 9% YoY to 36.3m units in 2022. Again, China remains the largest market for EV 2-wh with a 96% share of the global EV 2-wh sales. Globally, EV 2-wh sales make up 43% of overall 2-wh sales and for China it was 75% in 2022.

Fig 23: Global 2-wh EV market: EVs made up 43% of global sales in 2022



Source: BloombergNEF

Fig 24: China's 2-wh EV market: EVs accounted for 75% of China's sales in 2022



Source: BloombergNEF

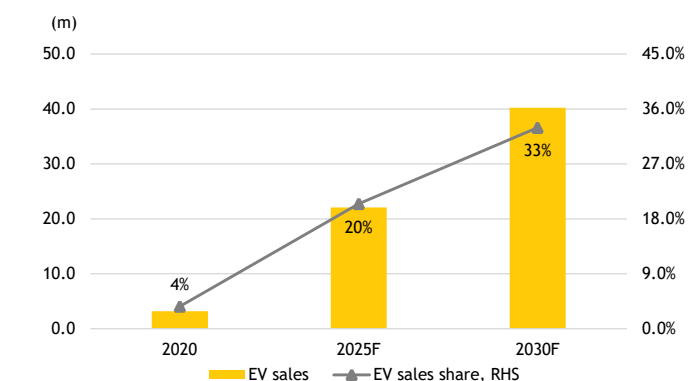
Global EV sales outlook suggests 4-10x current size for 2-3 and 4 wheelers by the turn of 2030

The IEA forecasts 4-wh EV sales to increase to about 22m in 2025F and 40m in 2030F under its stated policies scenario (STEPS). STEPS reflects existing policies and measures, as well as firm policy ambitions and objectives that have been legislated by governments around the world. Under STEPS, 4-wh EV sales will be 20-33% of global 4-wh sales in 2025-30.

Under its Announced Pledges Scenario (APS), which assumes that all announced ambitions and targets made by governments around the world are met in full and on time, IEA forecasts 4-wh EV sales to be 22.4m in 2025F and 45m in 2030F. This is slightly higher than the STEPS forecasts.

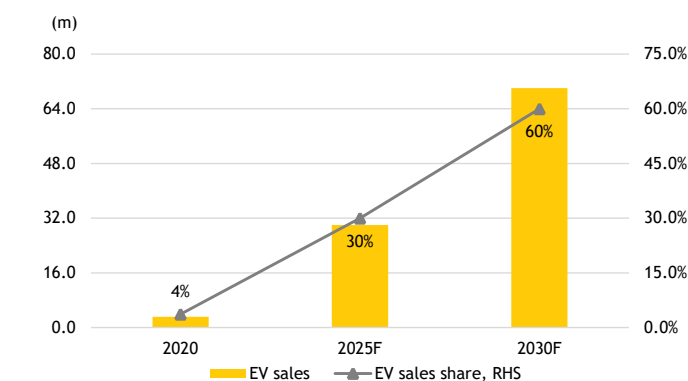
Under its Net Zero by 2050 scenario (NZE), IEA forecasts 4-wh EV sales to be 30-70m in 2025-30 with share of global EV 4-wh sales at 30-60%.

Fig 25: 4-wh EV sales share: to increase to 33% by 2030E under IEA's Stated Policies Scenario (STEPS)



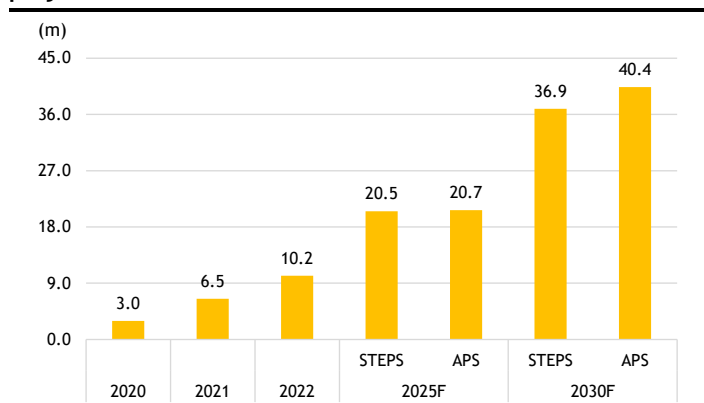
Source: IEA

Fig 26: 4-wh EV sales share: to increase to 60% by 2030 under IEA's Net Zero by 2050 scenario (NZE)



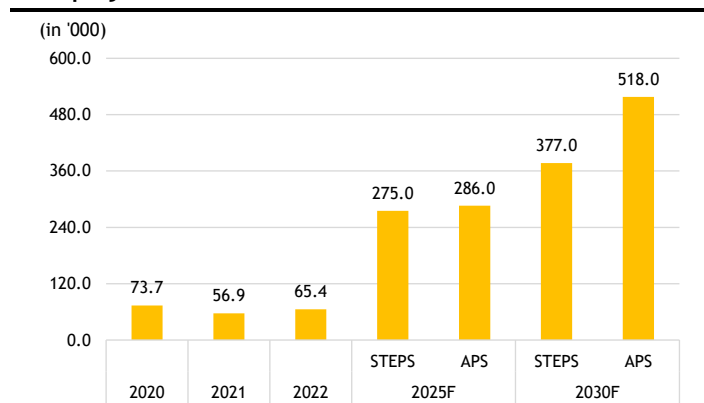
Source: IEA

Fig 27: IEA's STEPS and APS scenarios: global electric car sales projection



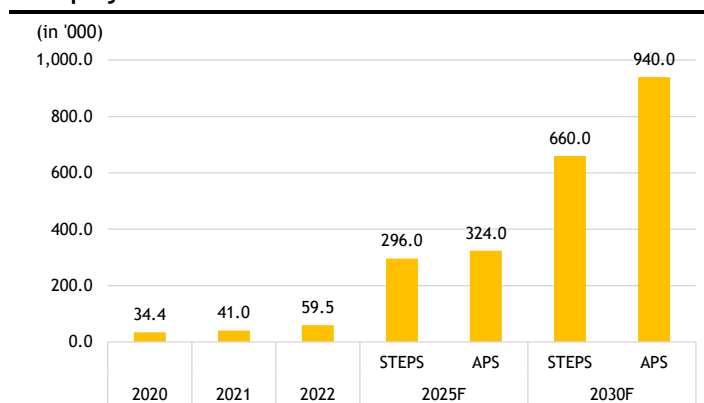
Source: IEA

Fig 28: IEA's STEPS and APS scenarios: global electric buses sales projection



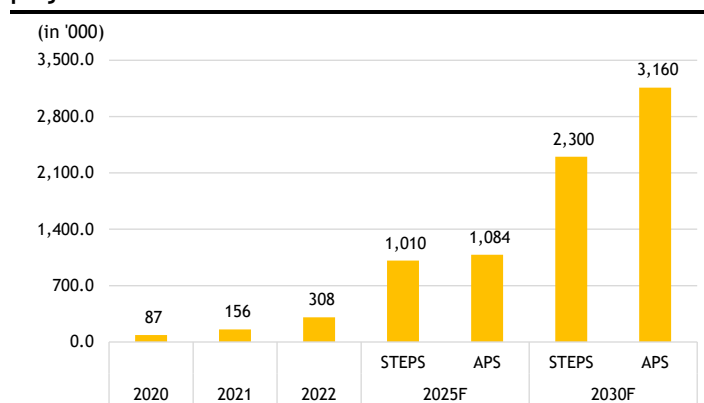
Source: IEA

Fig 29: IEA's STEPS and APS scenarios: global electric trucks sales projection



Source: IEA

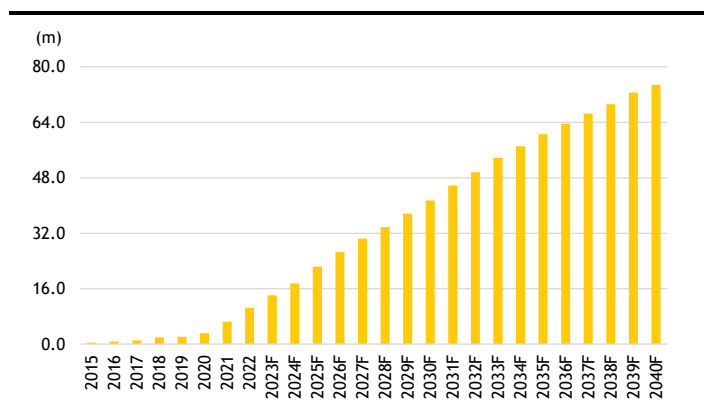
Fig 30: IEA's STEPS and APS scenarios: global electric vans sales projection



Source: IEA

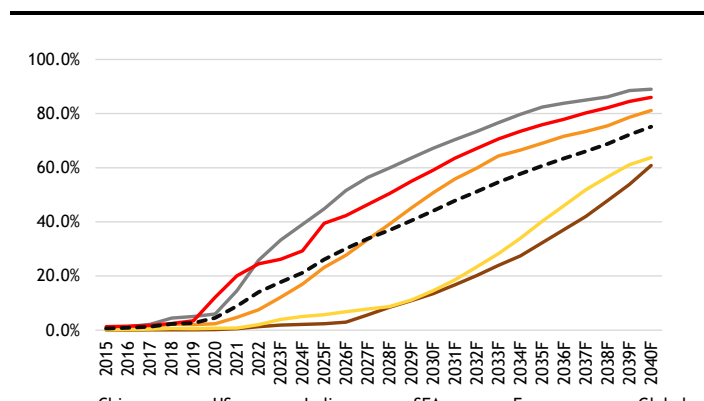
BloombergNEF forecasts the global annual sales of electric passenger vehicles (EV cars) to reach 41m in 2030F and 75m in 2040F under its economic transition scenario (ETS). The share of EV cars to total cars sold is forecasted to increase to 44% in 2030F and 75% in 2040F. China, Europe, the US and the UK will be ahead of the global average at 51-67%, whereas Japan, India and Southeast Asia will be around 13-29% in 2030. Within the EV mix, the share of plug-in hybrid vehicles is expected to become zero in 2040.

Fig 31: BloombergNEF forecast: Global annual electric car sales to be 41-75m for 2030-2040F



Source: BloombergNEF

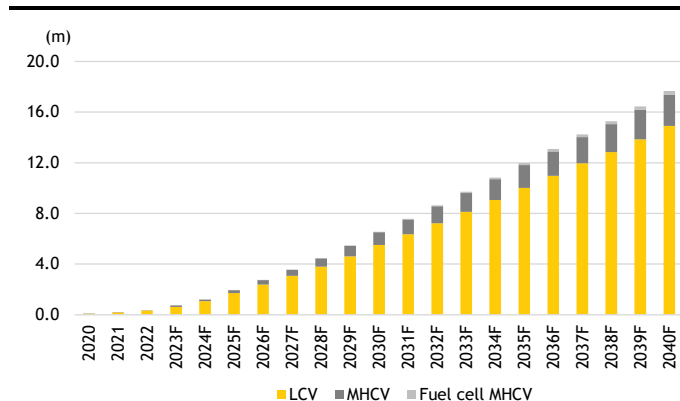
Fig 32: BloombergNEF forecast: Global electric car sales share to 44-75% for 2030-2040F



Source: BloombergNEF

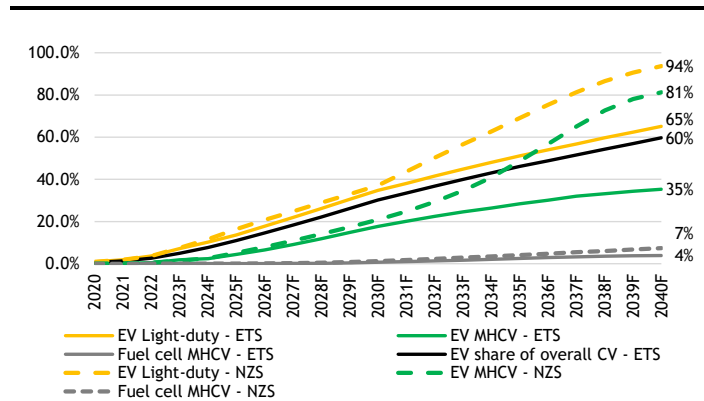
The global annual EV commercial vehicle (CV) sales is expected to hit 6m in 2030F and to further rise to 16m in 2040F with its share of total at 53% and 89% respectively. Additionally, fuel cell MHCVs (medium and heavy commercial vehicles) will form 4% of the CV sales by 2040. Under the Net zero by 2050 scenario, the share of light duty EV touches 81% vs 35% in the ETS scenario and for EV MHCVs, it is 94% vs 65% in the ETS scenario. Clearly, EV is the largest driver for net zero.

Fig 33: BloombergNEF forecast: global annual electric CV sales to be 7-17m for 2030-2040F



Source: BloombergNEF

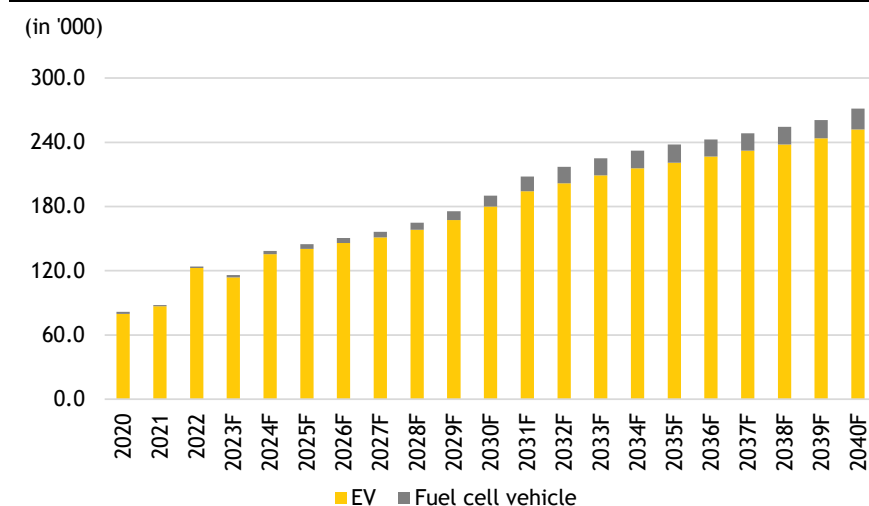
Fig 34: BloombergNEF forecast: global electric CV sales share to 30-60% for 2030-2040F



Source: BloombergNEF

Global annual EV bus sales is expected to reach 180,000 in 2030F and to further rise to 250,000 in 2040F with its share of total at 59% and 77% respectively. Additionally, fuel cell buses will form 6% of the bus sales by 2040. EV buses are an important means to decarbonise public transport.

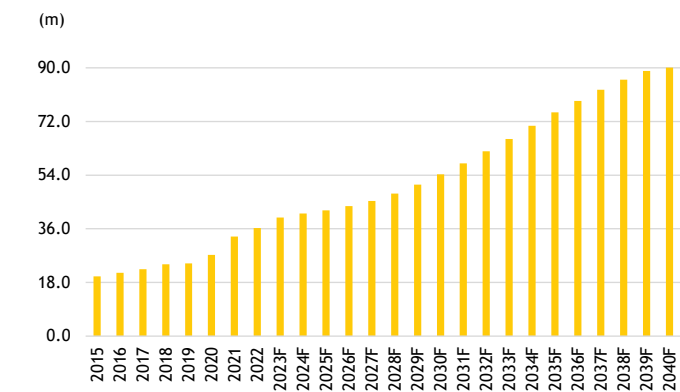
Fig 35: BloombergNEF forecast: global annual electric bus sales to reach 180-250,000 for 2030-2040F, 59-77% share of global sales



Source: BloombergNEF

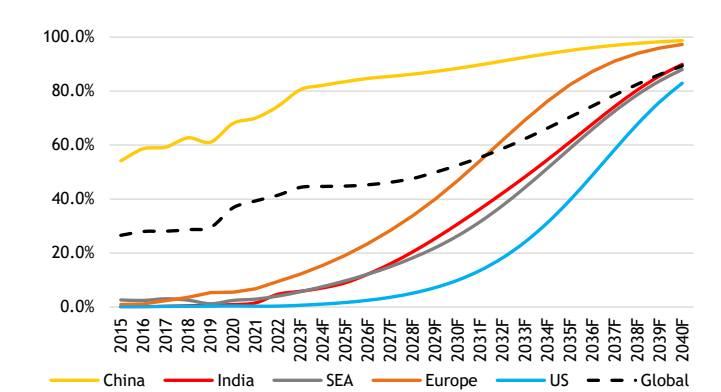
Similarly, global annual EV 2-wh sales is expected to hit 54m pa in 2030F and to further rise to 91m in 2040F with its share of total at 53% and 89%, respectively. For 3-wh sales, global EV sales is expected to rise to 19-21m pa in 2025-2040 with share of global sales at 91-96%.

Fig 36: BloombergNEF forecast: global annual electric 2-wh sales to reach 54-91m for 2030-2040F



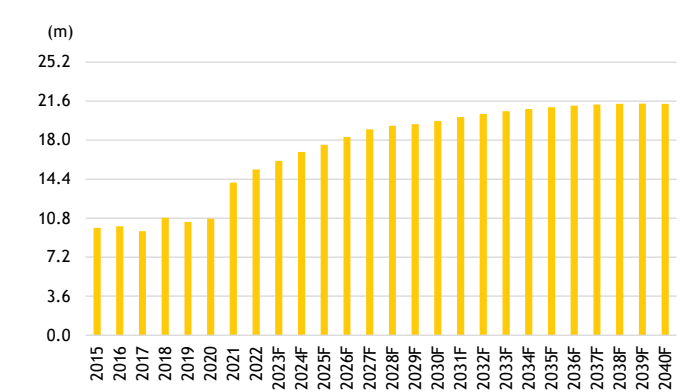
Source: BloombergNEF

Fig 37: BloombergNEF forecast: global electric 2-wh sales share to 53-89% for 2030-2040F



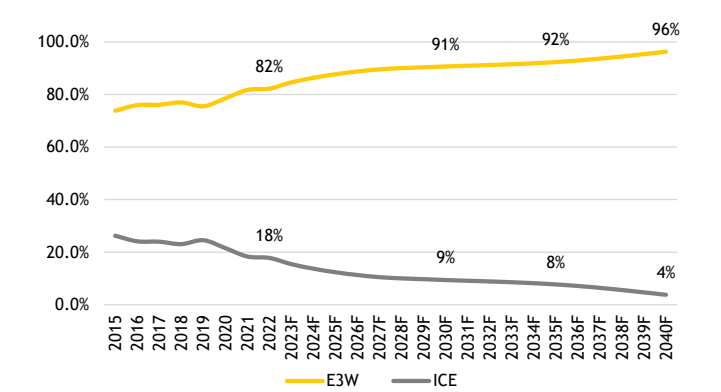
Source: BloombergNEF

Fig 38: BloombergNEF forecast: global annual electric 3-wh sales to reach 19-21m for 2030-2040F



Source: BloombergNEF

Fig 39: BloombergNEF forecast: global electric 3-wh sales share to 91-96% for 2030-2040F



Source: BloombergNEF

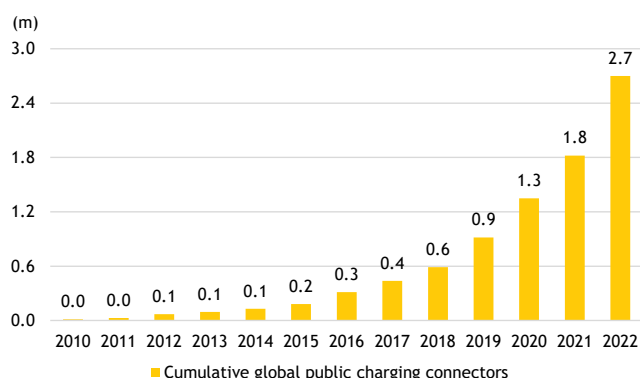
7. Global charging infrastructure outlook suggests exponential growth

Currently, most of the EV charging demand is met by home charging. However, as EVs proliferate, the need for publicly accessible chargers will increase. In dense urban areas, where access to home charging is more limited, public charging infrastructure is a key enabler for EV adoption in order to provide the same level of convenience and accessibility as for refuelling conventional vehicles.

According to the IEA, there were 2.7m public charging points globally as of end-2022. This is an increase of more than 900,000 or 55% YoY. The share of fast chargers (power >22kW) has increased to 33.3% of total public chargers in 2022 vs 30.2% in 2020. Also, 70% (760,000) of the fast chargers and 55% of the slow chargers (1m) are located in China.

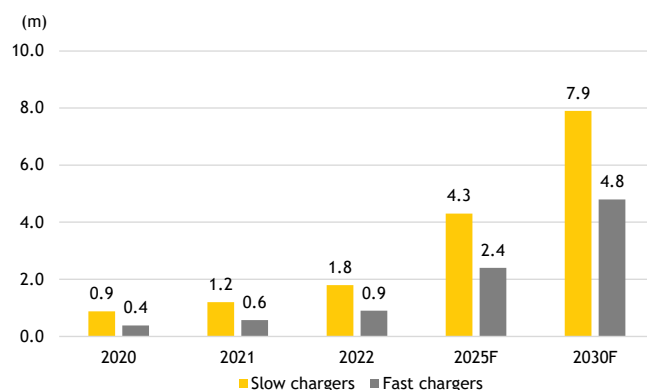
The IEA forecasts the number of public chargers to rise to 12.7m by 2030F, 5 times that of 2022. Fast chargers will be 38% of the total public chargers vs 33% in 2022.

Fig 40: Cumulative global public charging connectors increasing at brisk pace



Source: IEA

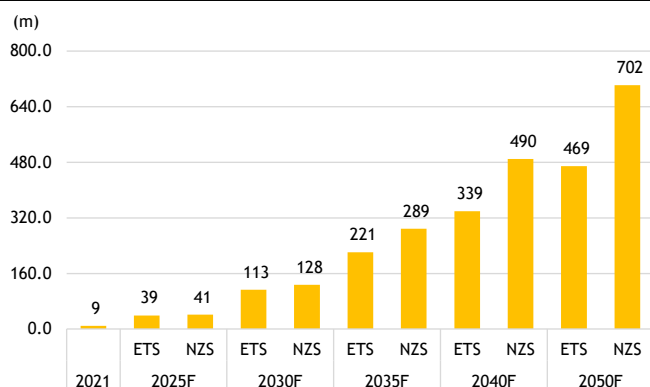
Fig 41: Global public chargers under STEPS scenario to reach 12.7m by 2030, 5x from 2022



Source: IEA (Note: Fast charger are defined as having power greater than 22kW)

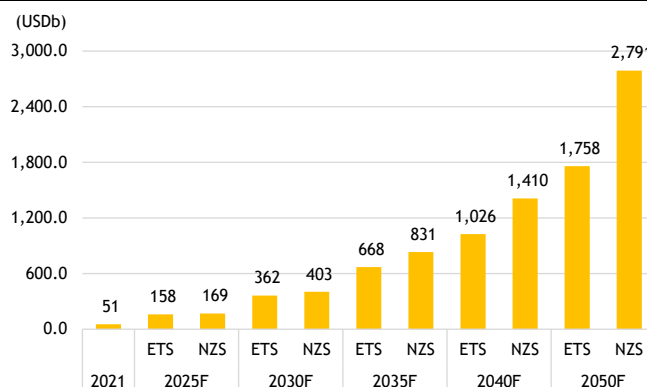
BloombergNEF forecasts the global charging infrastructure demand (public and private) will surge to 39-113m by 2025-2030 under its ETS scenario and further to 339-469m by 2040-2050. Under its net zero scenario, the global charging infrastructure demand will be 702m by 2050F. The cumulative investments from now to 2050 is estimated at USD1.8t and USD2.8t under the ETS and net zero scenarios, respectively.

Fig 42: Global charging infrastructure demand: 469-702m connectors by 2050F under ETS and NZE scenarios



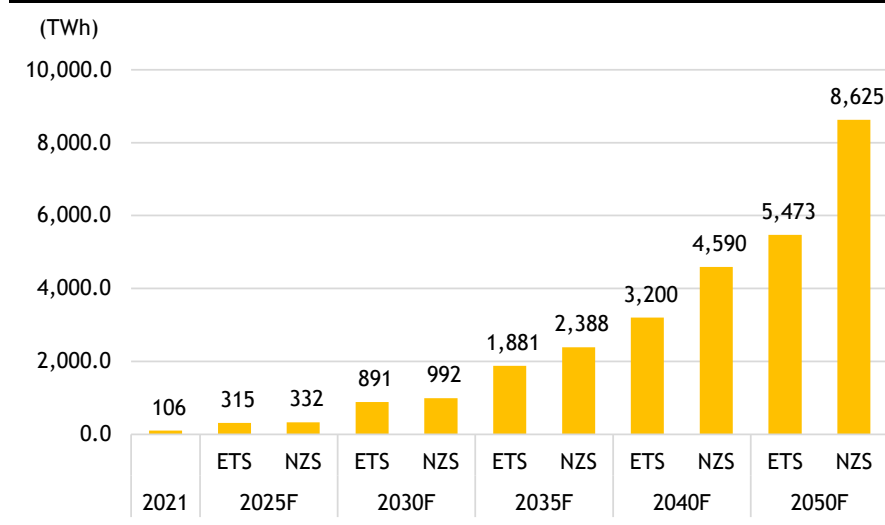
Source: BloombergNEF

Fig 43: Cumulative investments in charging infrastructure: projected at USD1.8-2.8t by 2050



Source: BloombergNEF

Fig 44: Electricity demand from charging infrastructure: projected at 5.5-8.6 PWh by 2050, 15-21% of total global electricity consumption

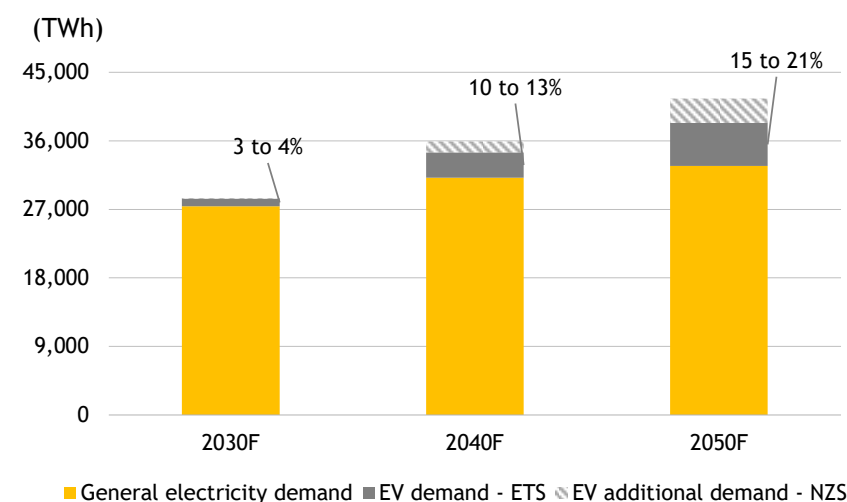


Source: BloombergNEF

Will EV adoption lead to a steep rise in electricity demand?

According to BloombergNEF, under the economic transition scenario, the additional electricity demand will be 2.5-3.5% by 2030F, going up to about 10% by 2040F and 15% by 2050F. Under the net zero scenario, the increase in demand will be 4-21% over 2030-50F.

Fig 45: EV adoption: additional electricity demand from EV adoption is expected to range from 15-21% of total electricity demand by 2050

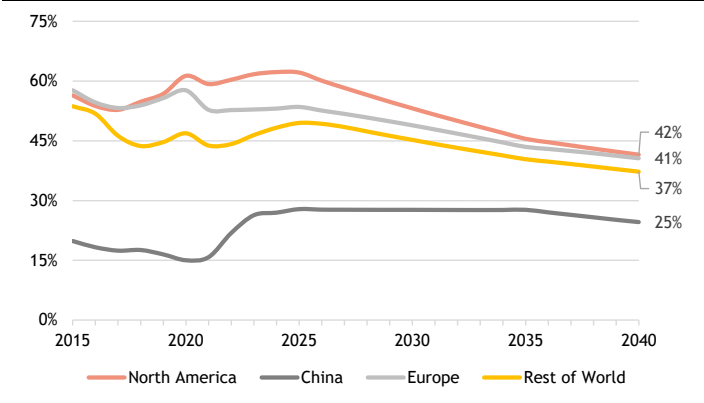


Source: BloombergNEF

Currently, home chargers are fulfilling 55-60% of the charging requirements in the US, Europe and the rest of the world (ex-China). This will decline as EV proliferation and availability of public chargers increases. BloombergNEF expects the share of home chargers to decline to about 40% by 2040. For China, the home charger share in 2022 was 22%, and it should increase to 25% by 2040.

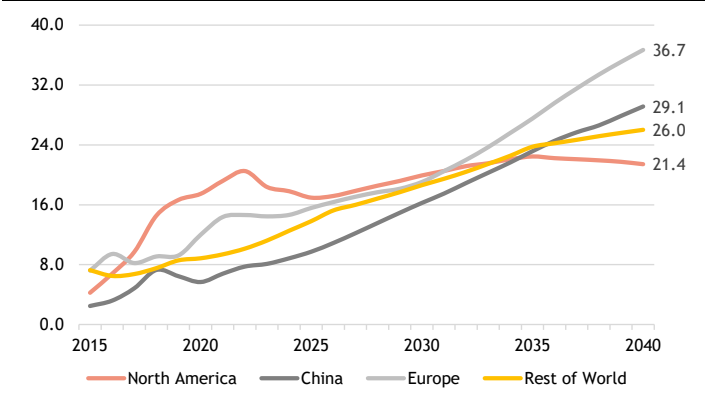
The rising number of EVs per public charger will increase the utilisation and profitability of public chargers. In 2022, the US, Europe, China and the rest of the world had an EV/public charger ratio of 20.5%, 14.6%, 7.7% and 10.1%. This will increase to 21.4%, 36.7%, 29.1% and 26% by 2040F.

Fig 46: Share of home charging to decline from around 55-60% in 2022 to 40% by 2040F



Source: BloombergNEF

Fig 47: EVs per public charger to increase for most regions from 7.7-20.5 in 2022 to 21.4-36.7 by 2040F



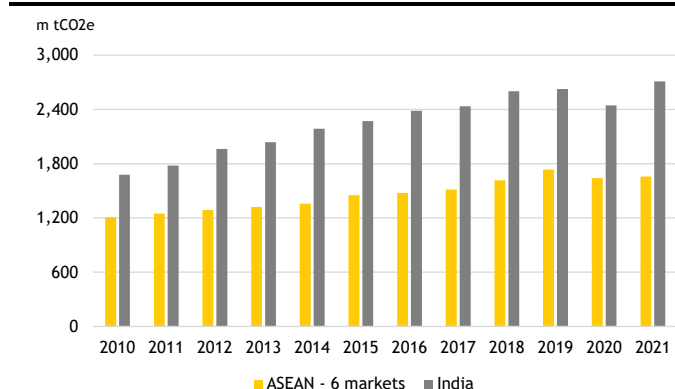
Source: BloombergNEF

8. ASEAN and India EV market size and outlook suggest rapid expansion from a small base

ASEAN - 6 markets had aggregate energy emissions of 1.6b tonnes of tCO₂e in 2021, which accounts for 4.7% of total global emissions. Within the ASEAN - 6 markets, Indonesia is the largest emitter with 38% share, due to high share of coal mining, followed by Vietnam at 20%, Thailand at 17% and Malaysia at 16%. The Philippines is 8% whereas Singapore is 2% of the total. India's energy emissions were 2.7b tonnes in 2021, which is 7% of global emissions.

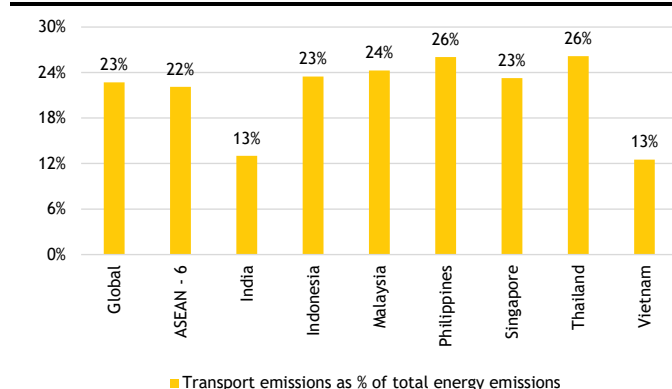
Transportation sector emissions account for 22% of the energy emissions on an average in the ASEAN - 6 markets vs the global average of 23% and India at 13%. Vietnam is the lowest at 13%, whereas the Philippines and Thailand are at 26%.

Fig 48: Energy emissions (tCO₂e): ASEAN - 6 markets at 1.6b and India at 2.7b tonnes in 2021



Source: Our World in data

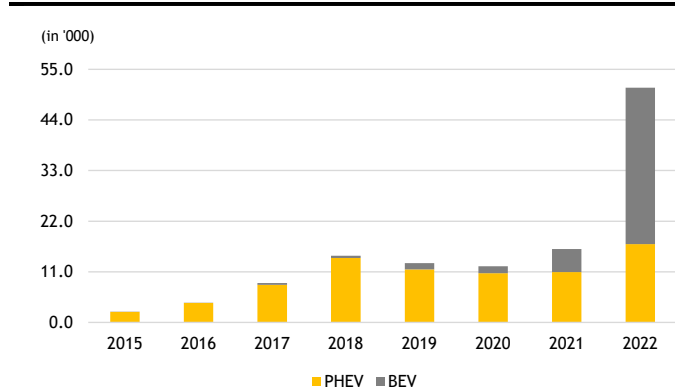
Fig 49: Transportation sector emissions as % of total: ASEAN - 6 markets' average closer to the global average



Source: Our World in data

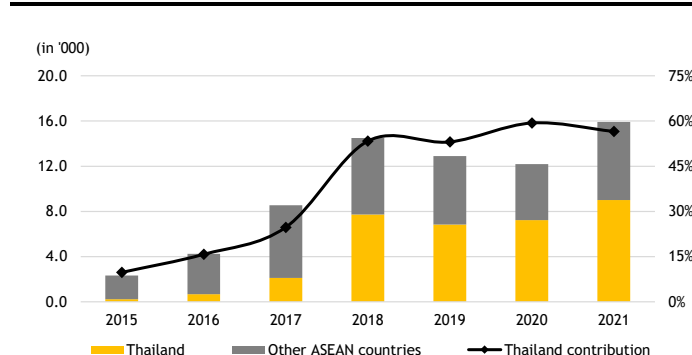
EV car sales in ASEAN surged to about 50,851 in 2022 from 15,926 in 2021, driven by launch of new models. Despite the sharp increase, EV sales were just 2.1% of the region's passenger vehicle sales. BEVs accounted for 67% of the EV sales vs 33% in 2021. BEVs were a meagre 1-4% in 2015-18. Thailand leads within the ASEAN countries, contributing more than 50% of the region's EV sales, followed by Indonesia and Vietnam.

Fig 50: ASEAN passenger EV sales: sales surged in 2022, however still at meagre 2.1% of overall sales



Source: BloombergNEF, Maybank IBG Research

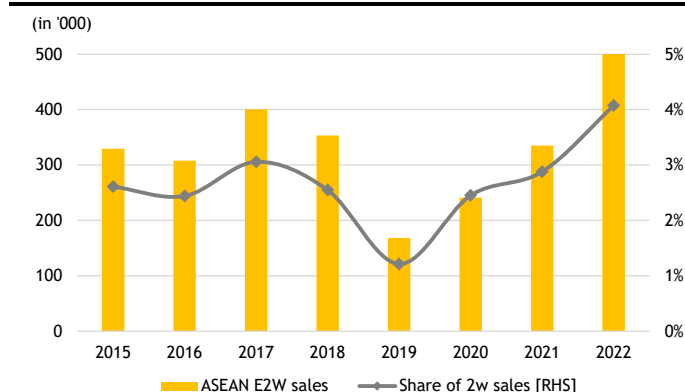
Fig 51: ASEAN passenger EV sales: Thailand contributed to 56.5% of total sales



Source: BloombergNEF

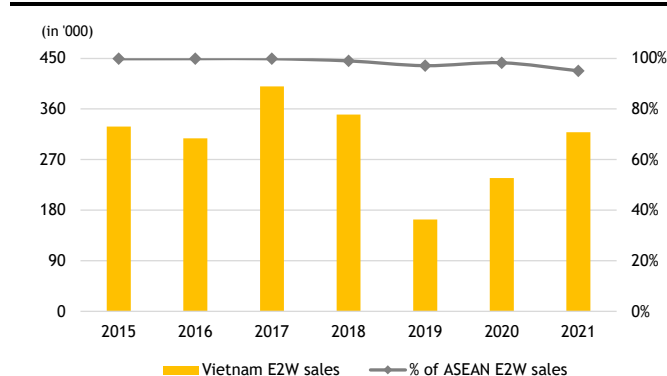
The ASEAN 2-wh market is the 3rd largest globally with 12.9m units sold in 2022. EV sales have increased in the past couple of years after a slump in 2019. EV sales formed 4% of total sales in 2022. Vietnam remains the largest market, capturing more than 95% of the EV sales.

Fig 52: 2022 ASEAN electric 2-wh market: a meagre 4% of ASEAN 2-wh sales



Source: BloombergNEF

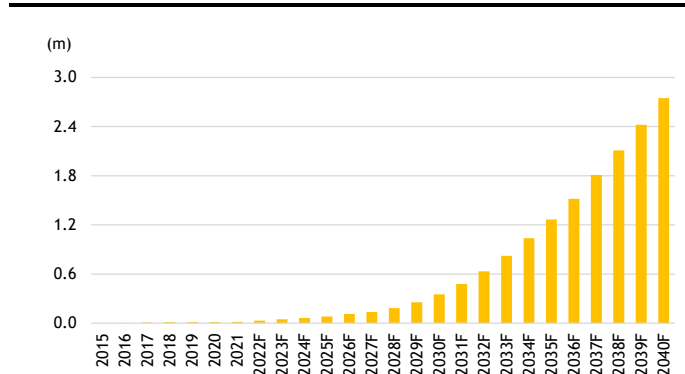
Fig 53:Vietnam holds the lion share at 95% of the ASEAN electric 2-wh market



Source: BloombergNEF

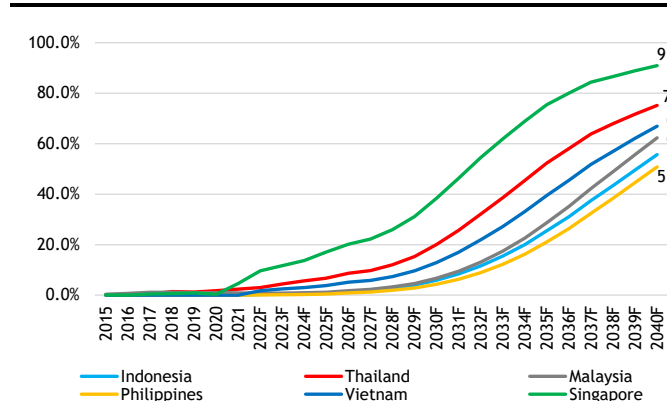
BloombergNEF forecasts ASEAN's annual electric passenger vehicle sales to reach 2.7-2.9m by 2040, making up 62-64% of total annual passenger vehicle sales in ASEAN. In the near term, favourable government regulations in the form of concessional taxes for imports and setting up of facilities should double EV sales.

Fig 54: BloombergNEF forecast: ASEAN annual electric car sales to surge 89x to 2.7m by 2040



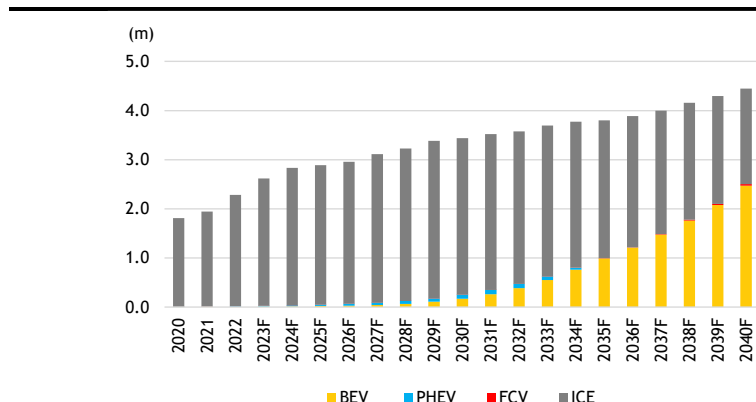
Source: BloombergNEF

Fig 55: ASEAN electric car market by 2040: share of overall market to be 51-91% across ASEAN countries



Source: BloombergNEF

Fig 56: Battery electric vehicles to make up 62% of ASEAN car market by 2040

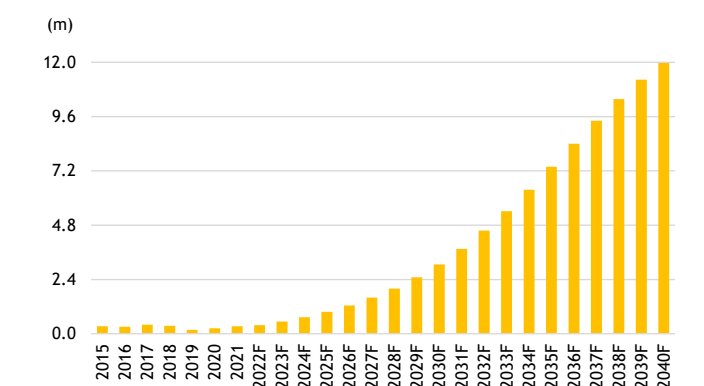


Source: BloombergNEF

EV 2-wh sales growth will remain robust, driven by entry of start-ups and driven by faster adoption of scooters. The ease of charging through home charging or battery swapping will also drive faster adoption. BloombergNEF

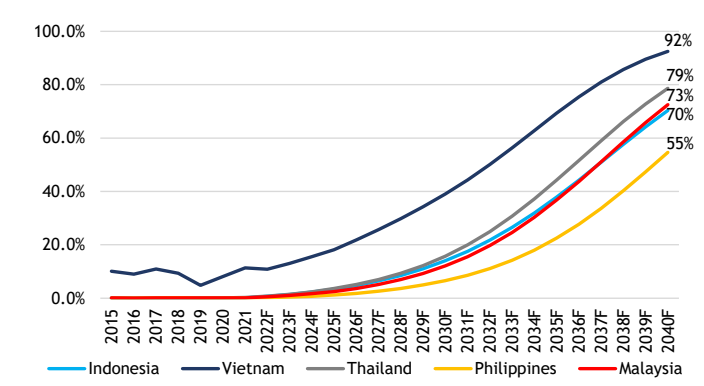
forecasts ASEAN 2-wh sales to reach 12m units by 2040 with larger ASEAN markets such as Vietnam, Thailand and Indonesia taking the lead.

Fig 57: ASEAN electric 2-wh sales projection: expected to surge by 31x over 2022-40 to 12m units



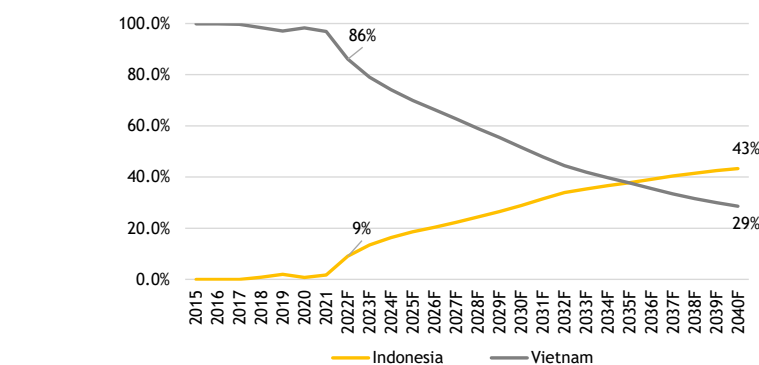
Source: BloombergNEF

Fig 58: ASEAN electric bike sales share projection: to account for 55-92% of overall bike sales by 2040



Source: BloombergNEF

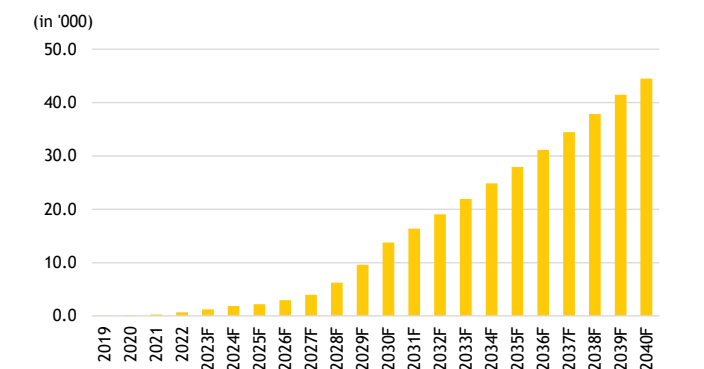
Fig 59: Indonesia projected to contribute to 43% of electric 2-wh sales in ASEAN by 2040, up from 9% in 2022



Source: BloombergNEF

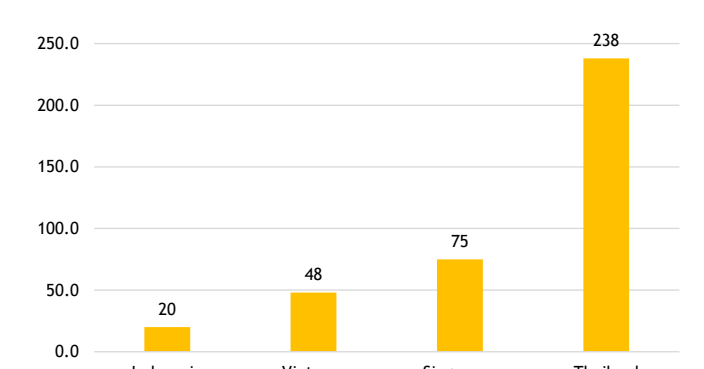
Decarbonising public transport is the low hanging fruit for all governments around the world. This has driven the demand for electric buses. ASEAN will be no different. Most governments across ASEAN have formulated plans to replace fossil-fuel-powered buses with electric buses through to 2030. BloombergNEF forecasts ASEAN electric bus sales to reach 44,500 units by 2040.

Fig 60: ASEAN electric bus sales: projected to surge by 64-fold as compared to 2022 levels



Source: BloombergNEF

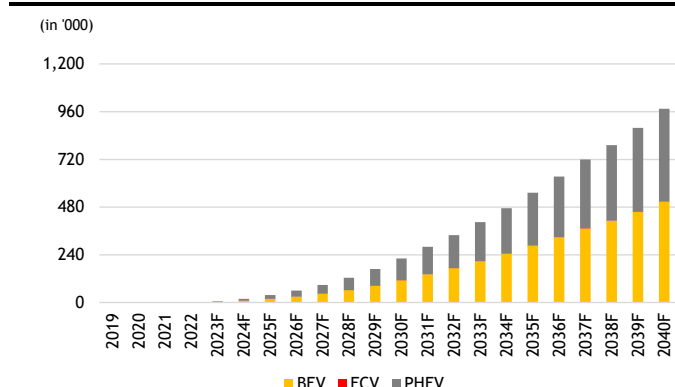
Fig 61: ASEAN electric bus fleet in 2021: Thailand leading with the largest fleet of 238



Source: BloombergNEF

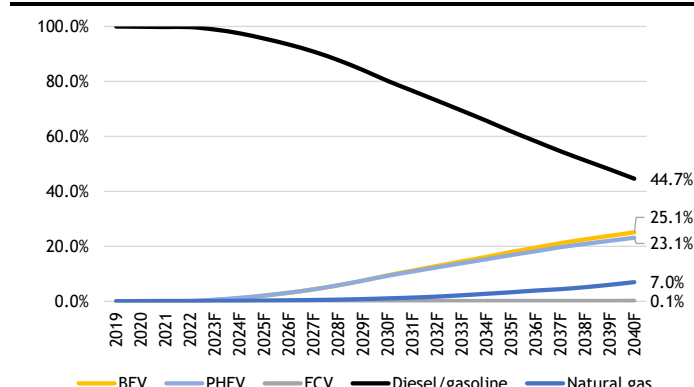
The decarbonisation of trucks will be slower compared to cars, buses and 2-wh. The expectation is that electric and plug-in hybrids will take a lead. However, we believe fuel-cell-powered trucks for long distance will have a meaningful contribution as hydrogen technology starts to show results in heavy-duty long-distance trucks. BloombergNEF forecasts BEV and PHEV to account for 25.1% and 23.1% of the annual sales whereas the share of diesel/gasoline trucks to decline to about 45% by 2040 from 99.8% in 2022.

Fig 62a: ASEAN electric truck sales: projected to surge to more 500,000 units by 2040 vs just 130 units in 2022



Source: BloombergNEF

Fig 62b: ... share of electric trucks to be 25.1% and plug-in hybrids to be 23.1%

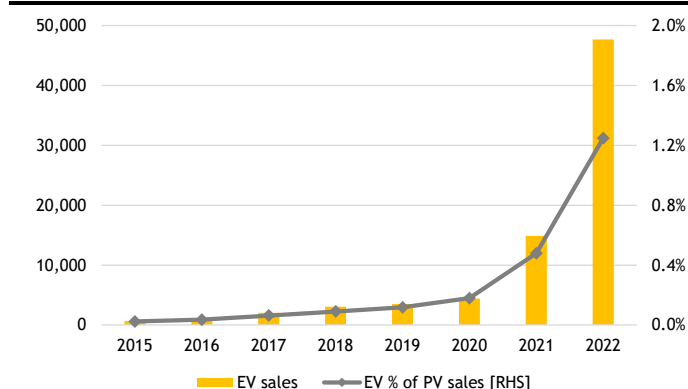


Source: BloombergNEF

India: electric vehicle outlook

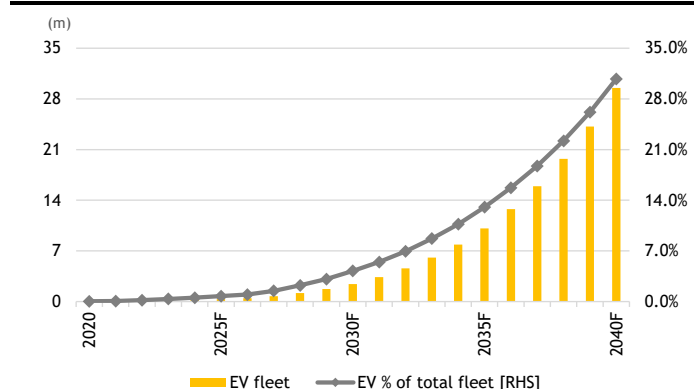
India's annual car sales were 3.8m in 2022 vs an average of 3m in the previous 5 years. EV sales increased gradually over 2015-2021. There was a big surge in 2022 of more than 3x to 47,677 vehicles. However, this is still only 1.2% of the total passenger vehicles sold in 2022. India also has a large compressed natural gas (CNG) market for cars where only-CNG and hybrid (petrol and CNG) vehicles are sold. There were 421,466 only-CNG vehicles sold in 2022, taking the environment friendly vehicles share of total passenger vehicles sold to 12%.

Fig 63: India's EV car sales: only 1.2% of annual car sales in 2022; including only-CNG it increases to 12%

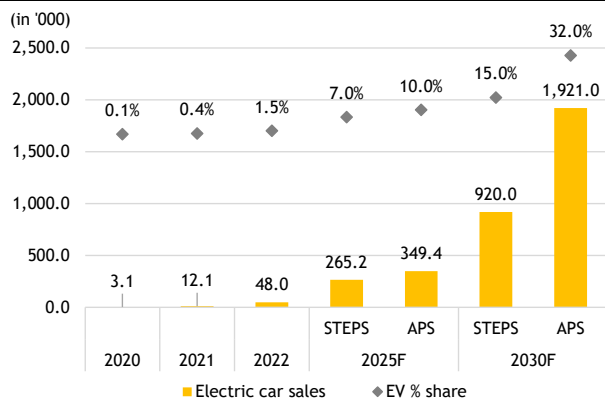


Source: BloombergNEF

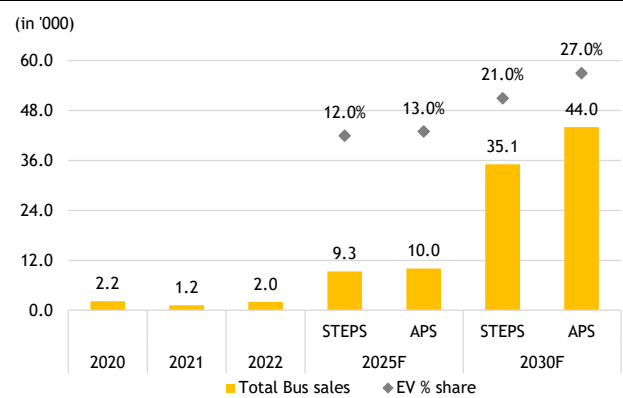
Fig 64: In India, EV cars to account for 31% of the car fleet by 2040F from just 0.2% in 2022



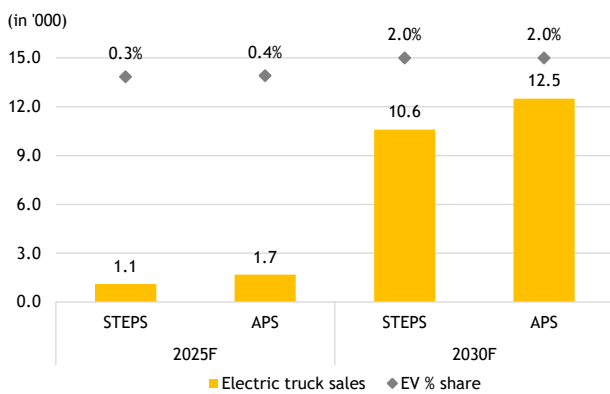
Source: BloombergNEF

Fig 65: IEA's STEPS and APS scenarios: India electric car sales projection

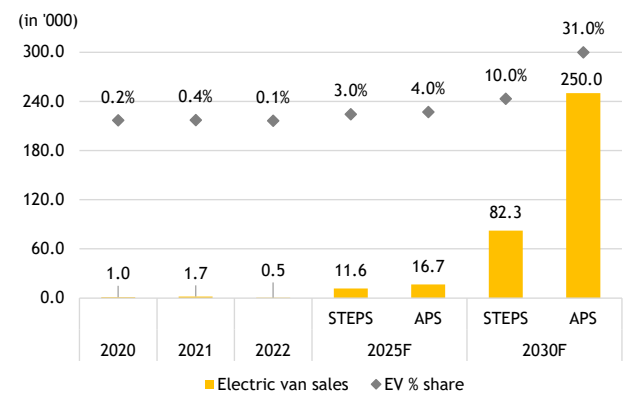
Source: IEA

Fig 66: IEA's STEPS and APS scenarios: India electric bus sales projection

Source: IEA

Fig 67: IEA's STEPS and APS scenarios: India electric truck sales projection

Source: IEA

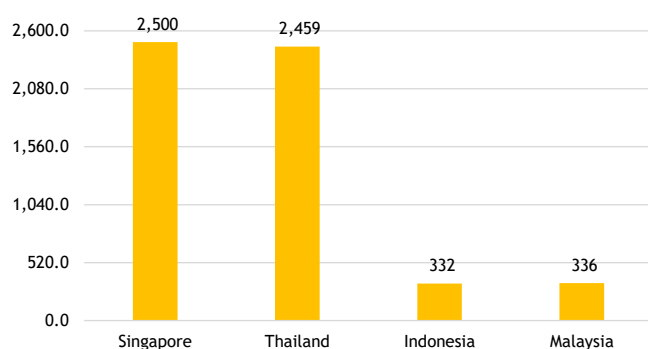
Fig 68: IEA's STEPS and APS scenarios: India electric vans sales projection

Source: IEA

9. ASEAN and India charging infrastructure size is very small but the outlook is for exponential growth

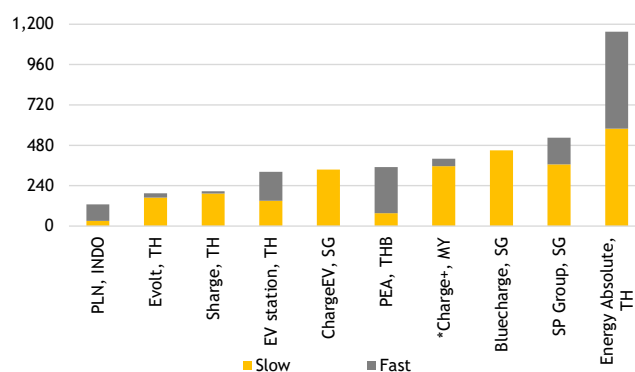
ASEAN's public charging infrastructure is currently very small, in line with the EV adoption. Singapore and Thailand lead, driven by start-ups making investments. Reports suggest that VinFast has also deployed about 40,000 public charging points across Vietnam for both its bikes and cars with a target to increase this number to 150,000. A large portion of the chargers currently are slow chargers.

Fig 69: ASEAN public EV charging points: region-wise 1H22
slow chargers make up majority of the deployed chargers



Source: BloombergNEF

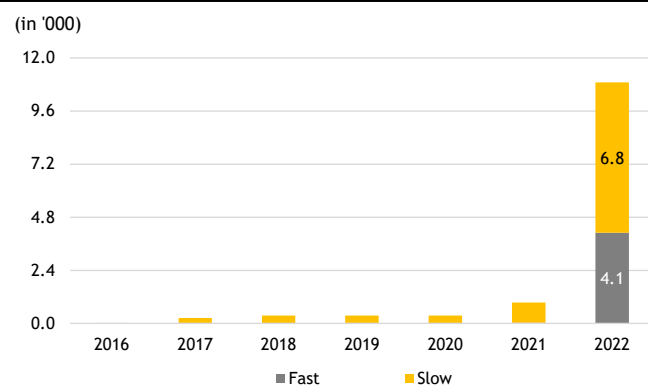
Fig 70: Public EV charging points: company-wise 1H22
Energy Absolute deployed highest no. of chargers in Thailand



Source: BloombergNEF

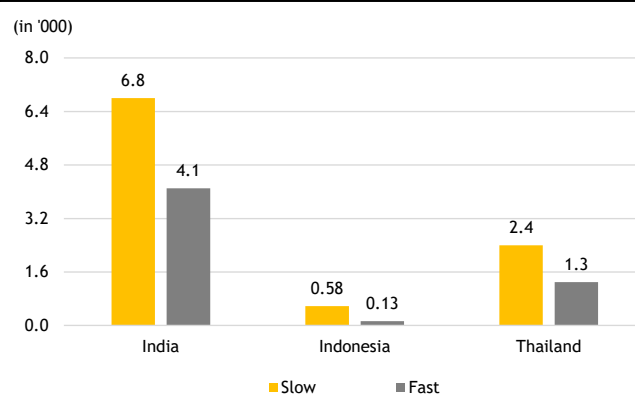
India has seen a large jump in charging infrastructure as EV sales surge, driven by a push by local OEMs such as Tata Motors (TTMT IN, NR) and Mahindra & Mahindra (MM IN, NR) and government pushing for switching to electric buses from diesel public transport buses. Multiple private power companies are taking a lead in setting up charging infrastructure.

Fig 71: India EV charging points increased exponentially in 2022



Source: IEA

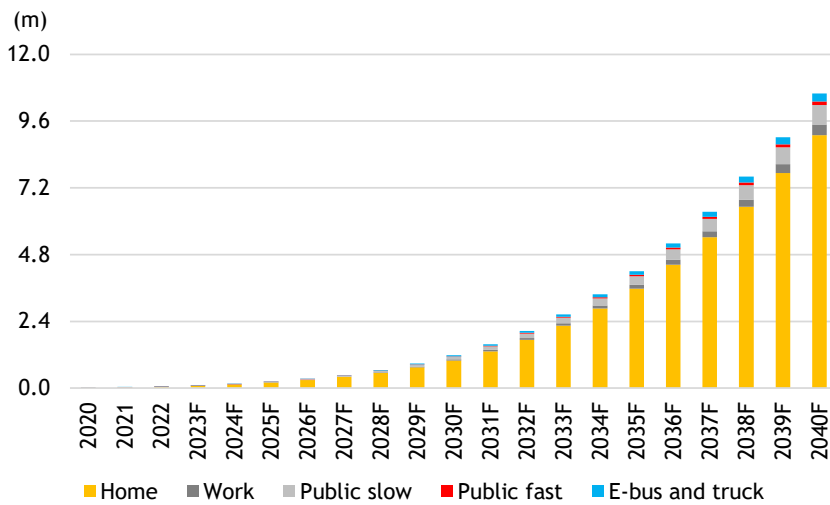
Fig 72: Charging infrastructure (public & private) landscape in 2022: India leads, followed by Thailand and Indonesia



Source: IEA

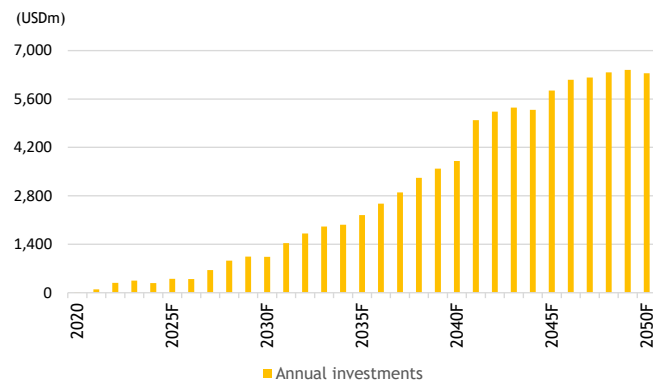
Investments in charging infrastructure is expected to surge, driven by: a) increasing EV adoption; and b) forward integration for power companies and annuity type business model attracting fixed-income investors. BloombergNEF forecasts annual investments to increase to USD400m by 2025F, USD1b by 2030F and USD3.8b by 2040F for India, and for ASEAN it is USD452m by 2025F, USD1.2b by 2030F and USD3.4b by 2040F.

Fig 73: ASEAN EV charging infrastructure outlook: to increase to 10.6m stations by 2040F, home chargers to drive installations



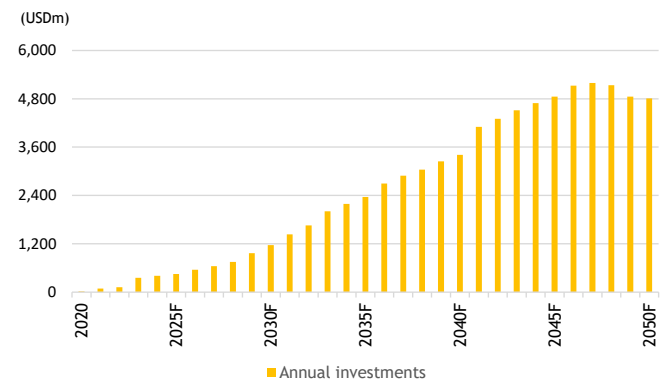
Source: BloombergNEF

Fig 74: India EV charging infrastructure will need cumulative investments of USD88.8b over 2023-50F



Source: BloombergNEF

Fig 75: ASEAN EV charging infrastructure will need cumulative investments of USD77.8b over 2023-50F



Source: BloombergNEF

Fig 76: India - type of charging stations and charger compatibility

Charging station	Voltage (V)	Power (kW)	Type of vehicle	Type of compatible charger
Level 1 (AC)	240	<=3.5 kW	4w ,3w,2w	Type 1, Bharat AC-001
Level 1 (DC)	>=48	<=15 kW	4w,3w,2w	Bharat DC-001
Level 2 (AC)	380-400	<=22 kW	4w,3w,2w	Type 1, Type 2, GB/T ,Bharat AC-001
Level 3 (AC)	200-1000	22 to 4.3 kW	4w	Type 2
Level 3 (DC)	200-1000	Up to 400 kW	4w	Type 2, CHAdeMO, CCS1, CCS2

Source: Power Ministry India

10. Example of charging infrastructure financial model in India

Fig 77: India - capex and opex for a charging station

Type of charger	Number of chargers	Power Output	Approx cost (INR)	Number of EVs that can be charged simultaneously	Maximum power sold to EVs/day
Capex					
CCS	1	50 kW	1,250,000	1	1,000
ChAdeMO	1	50 kW	1,250,000	1	1,000
Type 2 AC	1	22 kW	120,000	1	440
Bharat DC-001	1	15 kW	240,000	1	300
Bharat AC-001	1	3 x 3.3 kW	60,000	3	200
Swap station		15 kW			300
New electricity connection (250 KVA), transformer, cabling, panels, breakers, energy meter			750,000		
Civil works			250,000		
EVSE management software - integration cost			40,000		
Total capex			3,960,000		3,240
OPEX					
Employee cost			400,000		
Lease rent for land			600,000		
Other costs			100,000		
Total opex (excluding EVSE software fee)			1,100,000		
EVSE management software fee (5% of net electricity margin)					

Source: Power Ministry India, Maybank IBG Research

Fig 78: India - sensitivity of returns for charging station

Description\CUF	100%	Year 1 15%	Year 2 25%	Year 3 40%	Year 4 60%	Year 5 80%	Total
Electricity sold/year	1,166,400	174,960	291,600	466,560	699,840	933,120	2,566,080
Margin on electricity sold (INR)	7	1,224,720	2,041,200	3,265,920	4,898,880	6,531,840	17,962,560
Lease rental (INR)		600,000	600,000	600,000	636,000	636,000	3,072,000
EVSE software fee (5%) (INR)		61,236	102,060	163,296	244,944	326,592	898,128
Other opex (INR)		500,000	540,000	583,200	629,856	680,244	2,933,300
Total opex (INR)		1,161,236	1,242,060	1,346,496	1,510,800	1,642,836	6,903,428
Net profit/loss (INR)		63,484	799,140	1,919,424	3,388,080	4,889,004	11,059,132
NPV calculation							
Margin on electricity sold							
INR3	-3,960,000	-601,364	-308,940	146,496	728,688	1,343,148	1,308,028
NPV (10% discount)	-3,960,000	-546,695	-255,322	110,065	497,704	833,989	-3,320,260
INR4	-3,960,000	-435,152	-31,920	589,728	1,393,536	2,229,612	-214,196
NPV (10% discount)	-3,960,000	-395,593	-26,380	443,071	951,804	1,384,413	-1,602,684
INR5	-3,960,000	-268,940	245,100	1,032,960	2,058,384	3,116,076	6,183,580
NPV (10% discount)	-3,960,000	-244,491	202,562	776,078	1,405,904	1,934,838	114,891
INR6	-3,960,000	-102,728	522,120	1,476,192	2,723,232	4,002,540	8,621,356
NPV (10% discount)	-3,960,000	-93,389	431,504	1,109,085	1,860,004	2,485,262	1,832,466
INR7	-3,960,000	63,484	799,140	1,919,424	3,388,080	4,889,004	11,059,132
NPV (10% discount)	-3,960,000	57,713	660,446	1,442,092	2,314,104	3,035,687	3,550,041

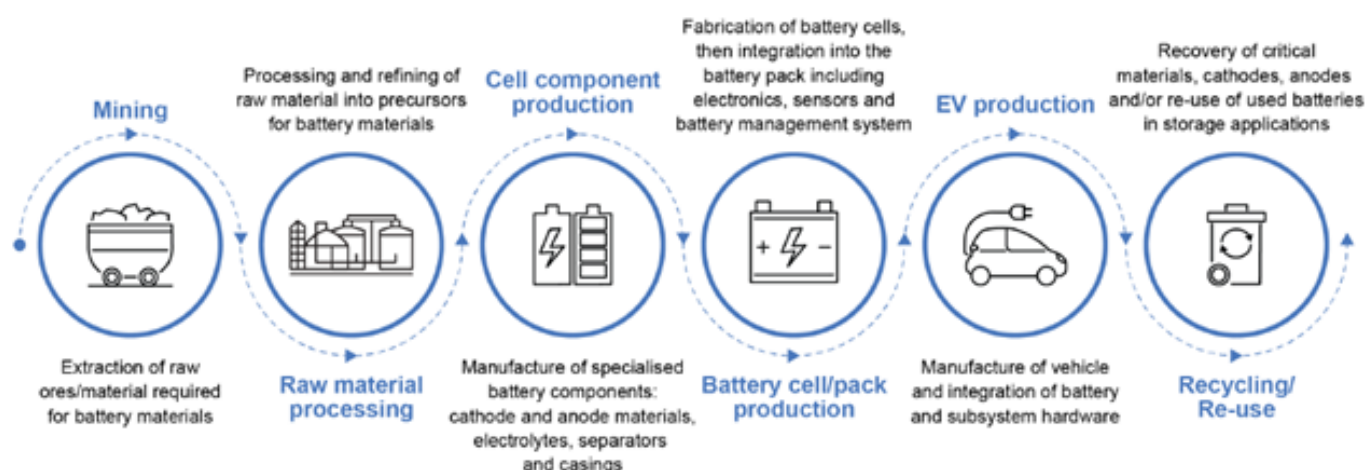
Source: Power Ministry India, Maybank IBG Research

11. Understanding the global EV battery market and outlook

Lithium-ion battery is the most important component of an EV as it is the source of energy for the vehicle. Battery forms 45-50% of the cost of an EV, which consists of multiple cells put together to form the source of energy. The other important components are: 1) electric motor (10% of cost), which converts electrical energy from battery to mechanical energy to be supplied to the wheels; 2) the motor controller (5% of cost) regulates the electrical energy from the battery to the motor and other components; and 3) the inverter (5% of cost) converts the electric current into AC/DC.

Below is a flow chart that depicts the battery value chain, starting from mining of the minerals (mainly lithium, cobalt and nickel etc). This is followed by refining these minerals to remove impurities, putting them together to produce cells, which are packed together and integrated into a battery pack that is fitted in the BEV.

Fig 79: The EV battery value chain

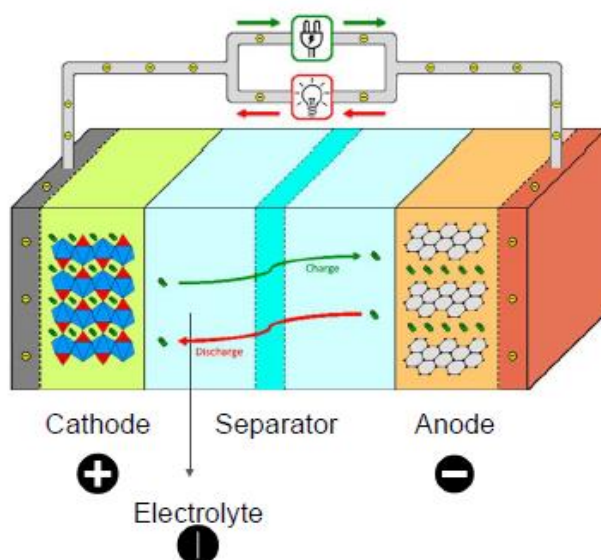


Source: IEA: Global Supply Chains of EV Batteries Report

A typical EV battery consists of the following:

- **Anode:** The negative terminal in a Li-ion cell generally consists of graphite and when the cell is charged, Li-ions get stored in graphite layers.
- **Cathode:** The positive terminal consists of Lithium along with other metals. Lithium ions migrate from the anode to the cathode during discharge to create an electric current and the process reverses during charging.
- **Electrolyte:** Enables the flow of ions between the cell terminals. The most commonly used electrolyte is Lithium Hexafluorophosphate, although it can be a non-metallic liquid conductor.
- **Separator:** Made out of semi-permeable material that isolates cathode and anode to prevent the flow of electrons through it but allows the passage of Li-ions.
- **Current collectors:** Each terminal of a cell has a current collector, at the negative and positive end. They facilitate the flow of electricity from the positive end to the vehicle motor during use and flow to the negative end during charging.

Fig 80: Functioning of EV battery



Source: Blume EV Primer 2022

There are multiple lithium ion chemistries/types, which are currently used:

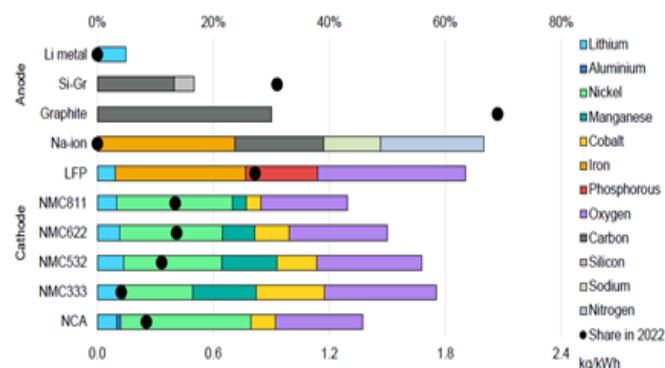
- Lithium Iron Phosphate (LFP)
- Lithium Nickel Cobalt Aluminium Oxide (NCA)
- Lithium nickel manganese cobalt oxide (NMC)
- Lithium Titanate (LTO)
- Lithium Manganese Oxide (LMO)
- Lithium Cobalt Oxide (LCO)

Fig 81: Common battery chemistries and form factor available

	2010s	2020s	2030s
1 Cathode	LCO ¹	LMO ² LFP ³ NMC ⁴ /NCA ⁵	LFP ³ NMC ⁴ /NCA ⁵ LMFP ⁶ /LMNO ⁷ Sulphur
2 Separator/electrolyte	Polymer/liquid	Polymer/liquid	Polymer/liquid Advanced liquid Semi-solid Solid
3 Anode	Graphite	Graphite	Graphite Graphite and silicon Lithium metal Silicon anode
4 Casing	Cylindrical	Cylindrical Pouch	Prismatic Cylindrical Pouch Prismatic

Source: McKinsey Battery Insights, 2022

Fig 82: Material content in different anode and cathodes



Source: IEA Global EV Outlook 2023

Different li-ion battery chemistries have varied characteristics in terms of cycle life (higher is better), energy density (higher is better), thermal runaway (lower is safer) and voltage (higher is better).

Fig 83: Characteristics of Li-ion batteries

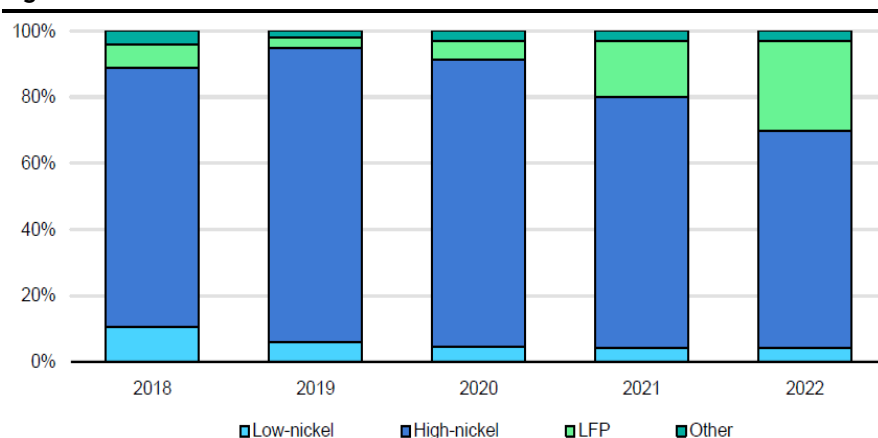
Battery type	Cycle life	Energy density (Wh/kg)	Thermal runaway (°C)	Voltage (V)
LCO	500-1,000	240	150	3.6
LMO	300- 700	100-150	250	3.7-3.8
NMC	1,000-2,000	150-220	210	3.6-3.7
LFP	>2000	90-120	270	3.2-3.3
NCA	500	200-260	150	3.6
LTO	3,000-7,000	50-80	Very safe	2.4

Source: Battery University

In 2022, lithium nickel manganese cobalt oxide (NMC) remained the most preferred battery chemistry with a market share of 60%. Lithium iron phosphate (LFP) was at #2 with a share of about 30% and Nickel cobalt aluminium oxide (NCA) was at about 8%. The rise in LFP cathode chemistries is due to higher preferences of Chinese OEMs. Close to 95% of the LFP batteries were used by the Chinese. BYD was about 50% of the demand. Tesla accounted for 15% and its usage of LFP batteries increased to 30% in 2022 vs 20% in 2021. In total, only around 3% of electric cars with LFP batteries were manufactured in the US in 2022.

LFP = Lithium iron phosphate. Low-nickel includes: NMC333. High-nickel includes: NMC532, NMC622, NMC721, NMC811, NCA and NMCA. Cathode sales share is based on battery capacity.

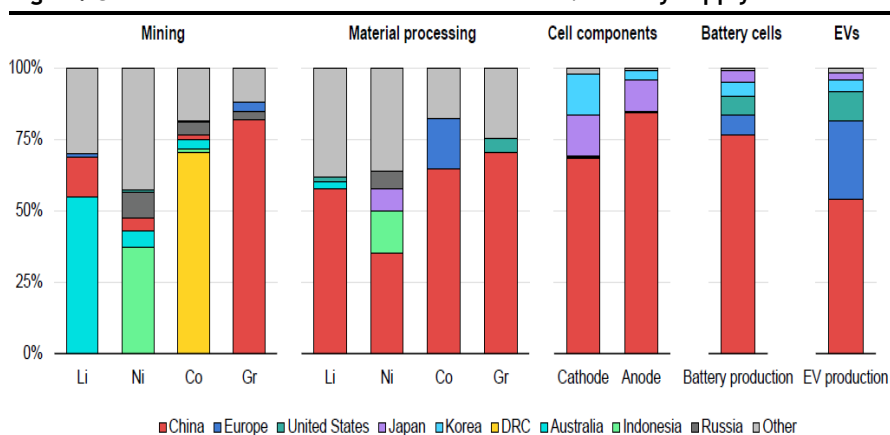
Fig 84: Share of LFP batteries increased between 2019 to 2022



Source: IEA Global EV Outlook 2023

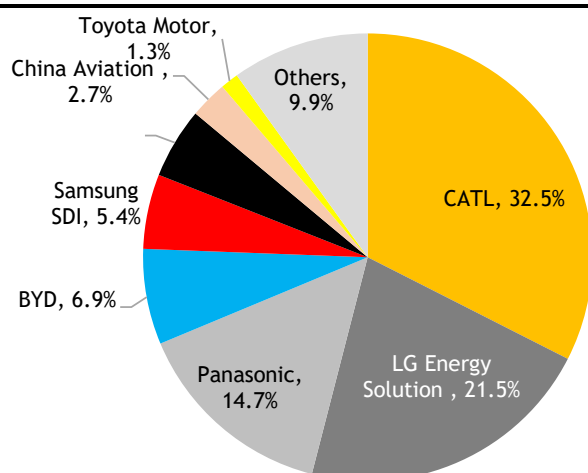
China dominates the entire downstream EV battery value chain post mining. Three-quarters of battery cell production capacity is in China, with the same for the specialised cathode and anode material production, for which China accounts for 70% of cathode and 85% of anode material global production capacity. Over half of global raw material processing for lithium, cobalt and graphite also occurs in China. With 80% of global graphite mining, China dominates the entire graphite anode supply chain from end-to-end.

Fig 85: China dominates the entire downstream EV battery supply chain



Source: IEA Global EV Outlook 2022

The EV battery manufacturing market is concentrated with top 2 companies commanding more than 50% share of the market and the top 5 contributing to 80% of the market.

Fig 86: Global market shares of EV battery manufacturers; CATL leads

Source: ASEAN Investment Report 2022 Research

Anode and cathode material mining is also concentrated within the top 6-7 countries, namely Australia, Chile, Russia, Canada, Congo and two ASEAN countries - Indonesia and the Philippines. Below are details about the source, location of extraction and top suppliers of all the major raw materials.

Fig 87: Details about lithium extraction

Particulars	Lithium extraction from	
Source	brine (concentrated salt water)	hard rock (spodumene)
Location	typically located in the high-elevation areas of Bolivia, Argentina and Chile (largest producer)	mined in Australia
Top suppliers	Sociedad Química y Minera de Chile SA (Chile); Allkem (Australia) in Argentina; Livent Corporation (United States) in Argentina; Ganfeng Lithium Co. (China)	Pilbara Minerals (Australia); Allkem (Australia); Ganfeng Lithium Co. (China)

Source: Maybank IBG Research

Fig 88: Details about nickel extraction

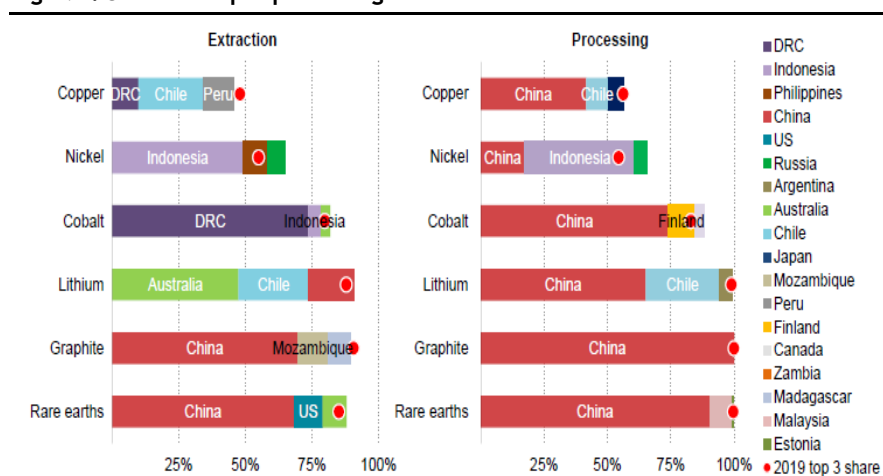
Particulars	Nickel extraction	
Source	sulphide (high grade nickel)	Laterite (low grade nickel)
Location	Russia, Canada and Australia	Indonesia, Philippines and New Caledonia
additional process needed to become battery-grade	No	Yes
Top suppliers	Jinchuan Group (China); BHP Group (Australia); Vale SA (Brazil); Nickel Asia Corporation (Philippines); Glencore (Switzerland)	Jinchuan Group (China); BHP Group (Australia); Vale SA (Brazil); Tsingshan (China); Nickel Asia Corporation (Philippines)

Source: Maybank IBG Research

Fig 89: Details of cobalt, graphite and manganese mining

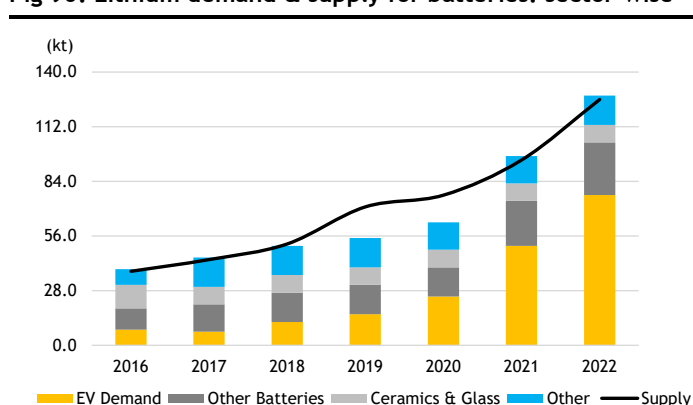
Particulars	Cobalt extraction
Source	By-product of copper/nickel
Location	Democratic Republic of Congo (DRC); Indonesia
Top suppliers	Glencore (Switzerland); Jinchuan Group (China); CN Molybdenum (China); Chemaf (DRC)
Particulars	Graphite mining
Source	found naturally or produced synthetically
Location	China (80%), new greenfield projects in Tanzania, Mozambique, Canada and Madagascar
Particulars	Manganese mining
Source	more widely distributed around the world
Location	South Africa, Australia, Gabon and China

Source: Maybank IBG Research

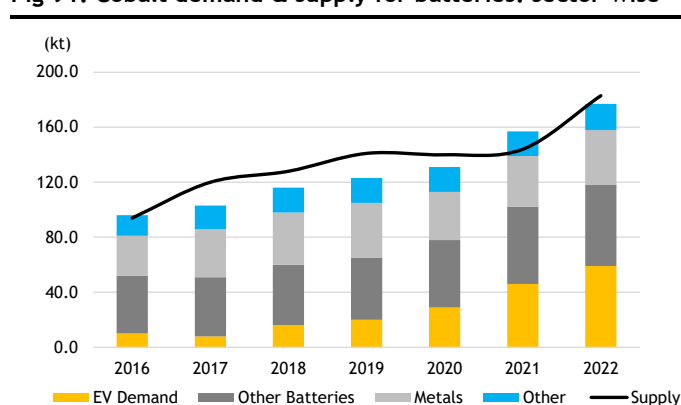
Fig 89a: Share of top 3 producing countries for selected minerals


Source: Critical Minerals Review 2023

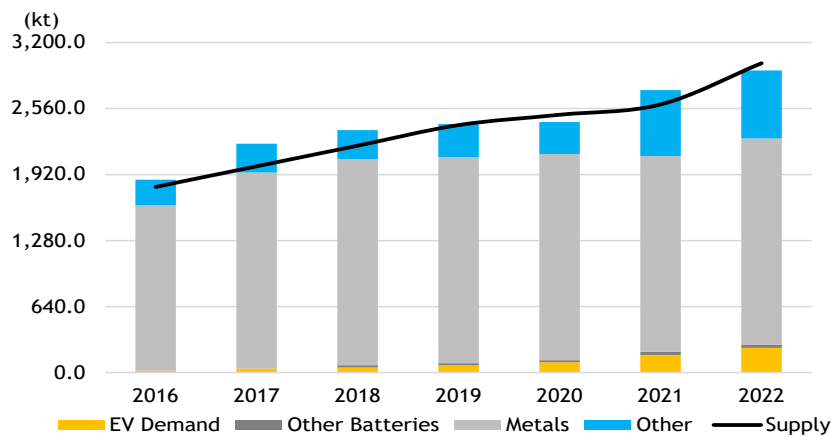
The advent of EV has driven the shift in demand for most minerals, such as lithium, cobalt and nickel. The share of EVs in relation to the demand for lithium has risen to 60% in 2022 vs 15% in 2017. Similarly, for cobalt, the EV share has increased to 33% in 2022 from 8% in 2017. Metals are currently driving the demand for nickel with the share of EVs at 8% in 2022 vs 2% in 2017.

Fig 90: Lithium demand & supply for batteries: sector-wise


Source: IEA

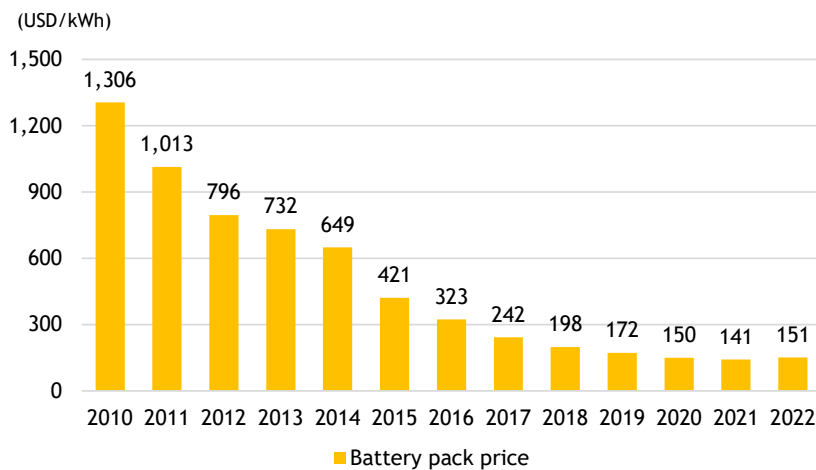
Fig 91: Cobalt demand & supply for batteries: sector-wise


Source: IEA

Fig 92: Nickel demand & supply for batteries: sector-wise

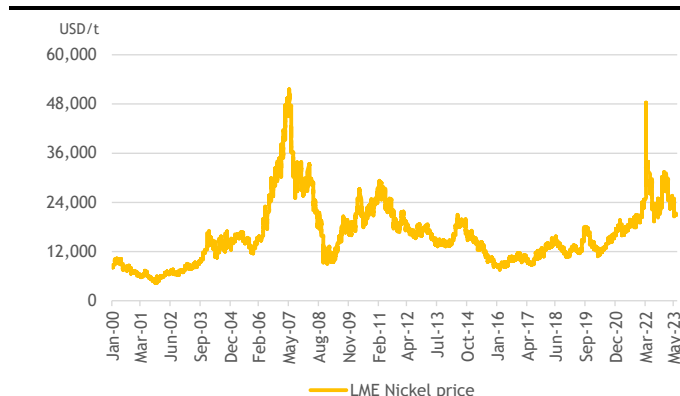
Source: McKinsey Battery Insights, 2022

Battery pack prices have continued to decline over the decade, driven by advances in technology, improved manufacturing processes and efficiency gains. However, battery pack prices increased in 2022 by 7% YoY to USD151/kWh mainly due to increase in prices of various raw materials. On an average, nickel prices increased by 39% YoY in 2022 and cobalt prices rose 24% YoY. Prices have cooled off since then and are lower vs. 2022 levels currently.

Fig 93: Battery pack price plummeted by 88%, from USD1,306 in 2010 to USD151 in 2022, however rose in 2022 by 7% driven by increase in material costs (USD/kWh)

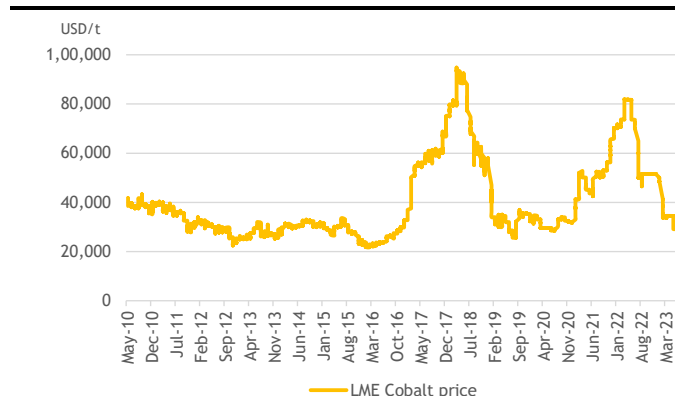
Source: BloombergNEF

Fig 94: LME nickel prices remain volatile, currently at about USD21,000/t vs average of USD25,600 in 2022



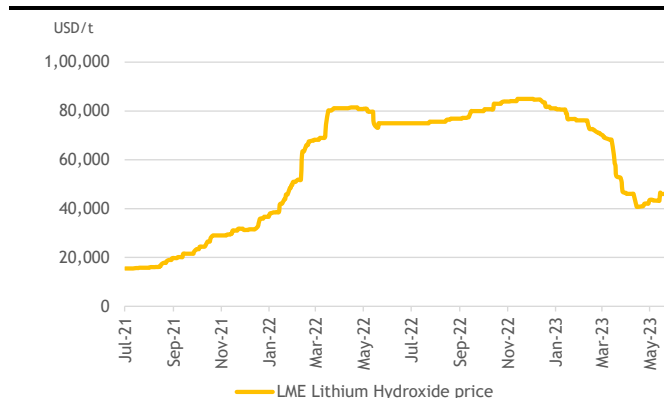
Source: Bloomberg

Fig 95: LME cobalt prices declining, currently at about USD29,000/t vs average of USD63,500 in 2022



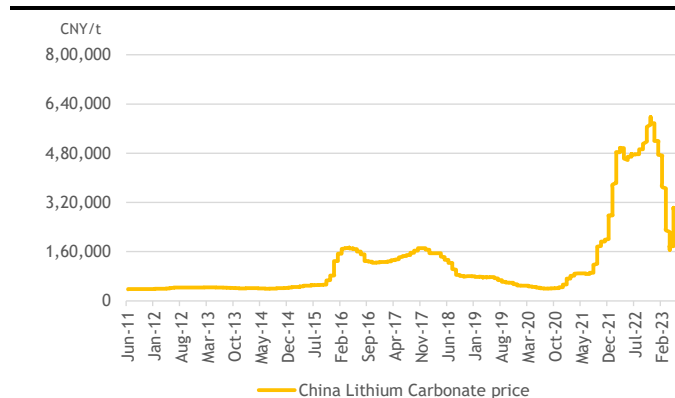
Source: Bloomberg

Fig 96: Lithium hydroxide prices declined after sharp rise, currently at about USD46,000/t



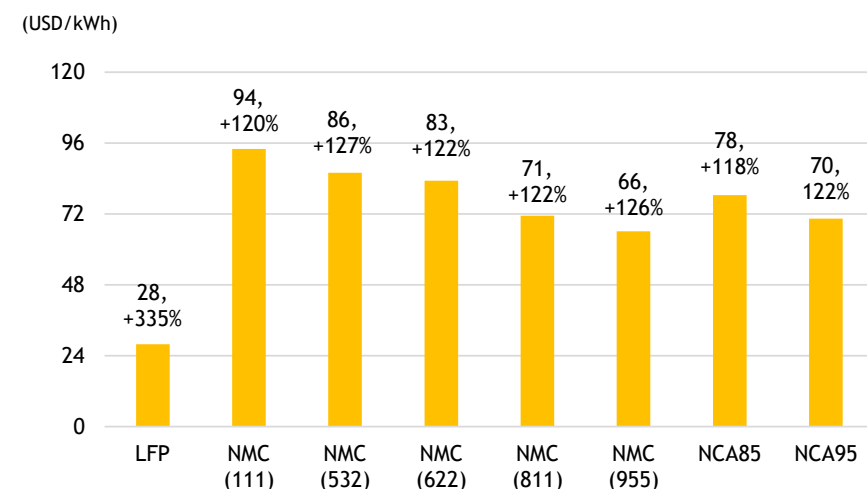
Source: Bloomberg

Fig 97: China lithium carbonate prices recovered after crashing, currently at about CNY297,500/t



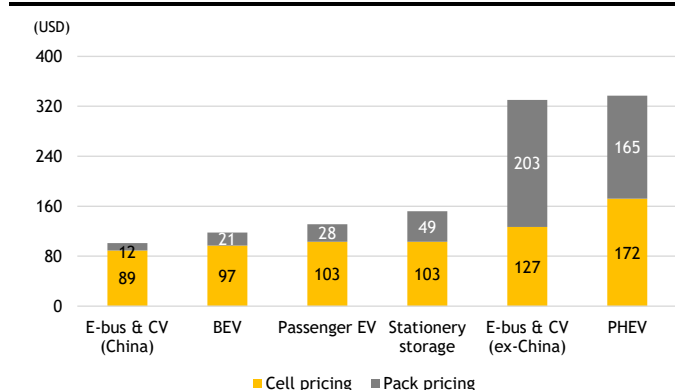
Source: Bloomberg

Fig 98: Raw material cost in mid-2022 for various cathode materials; cost surged by 120-335% YoY, driving up battery pack prices in 2022



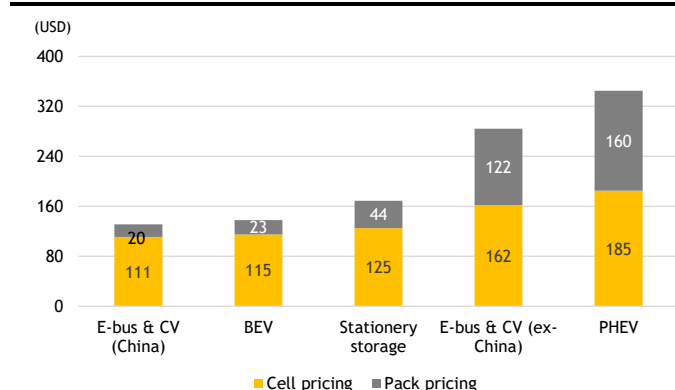
Source: BNEF

Fig 99: Volume weighted average lithium-ion battery price in 2021 for various EVs



Source: BNEF

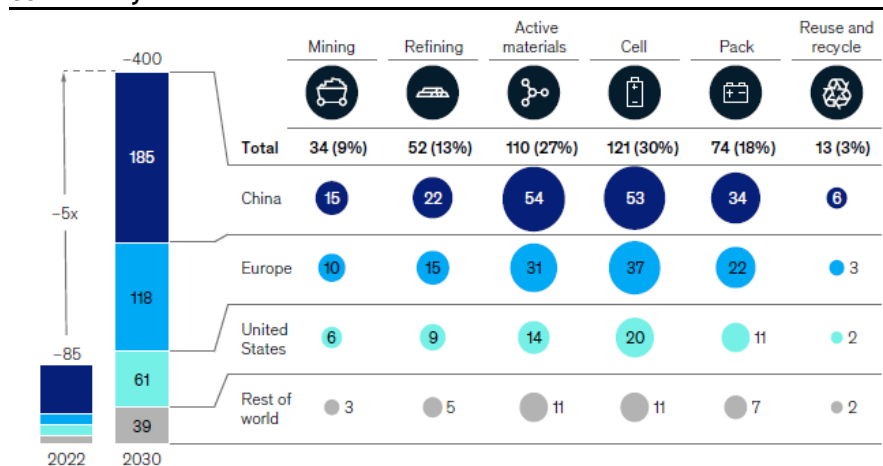
Fig 100: ...higher by 2-30% YoY in 2022 except e-bus (ex-China) mainly due to increase in cell prices



Source: BNEF

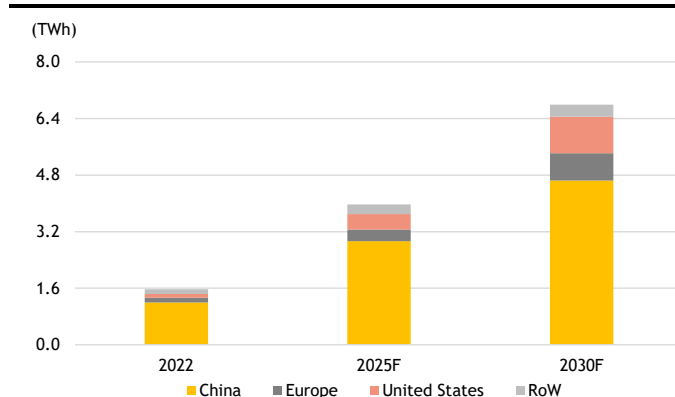
With the usage of EVs forecast to surge, the lithium-ion battery value chain has huge opportunities coming its way. From revenue of USD85b in 2022, McKinsey Battery Institute estimates the revenue opportunity to expand to USD400b by 2030. The largest will be for cell manufacturing at USD121b, followed by active materials at USD110b, with the rest encompassing battery packs, refining, mining and recycling and reuse.

Fig 101: Li-ion battery value chain will provide revenue opportunities of over USD400b by 2030



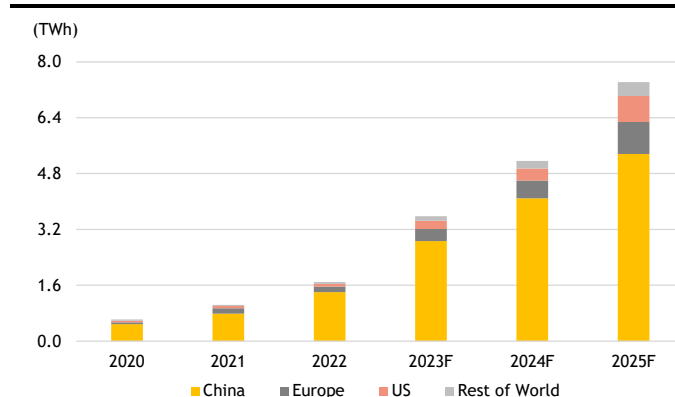
Source: McKinsey Battery Insights, 2022

Fig 102: IEA forecasts lithium-ion battery manufacturing capacity at 6.8TWh (2022-2030)



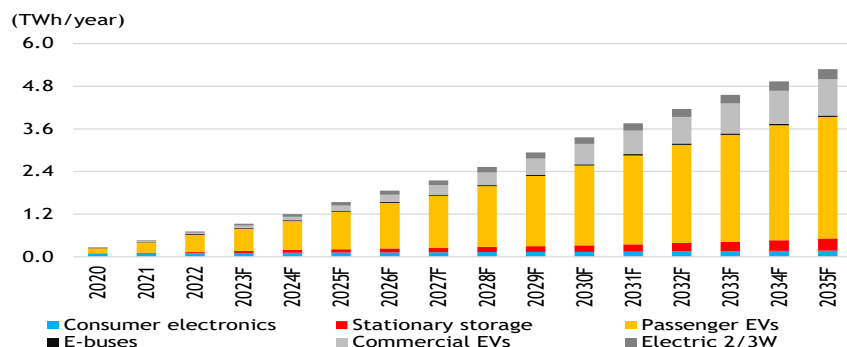
Source: IEA

Fig 103: ...BNEF forecasts lithium-ion battery manufacturing capacity at 7.8 TWh by 2025F



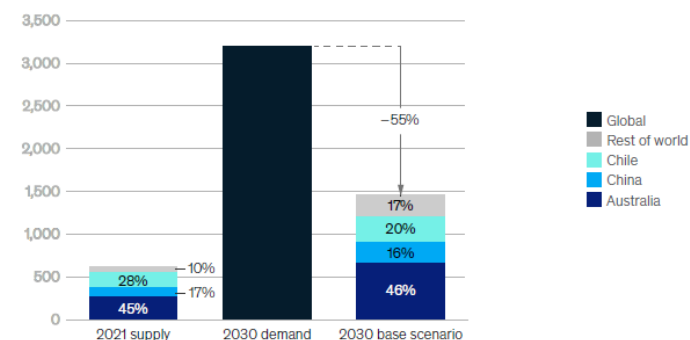
Source: BNEF

Fig 104: Lithium-ion battery demand to surge to 5.3 TWh by 2035F



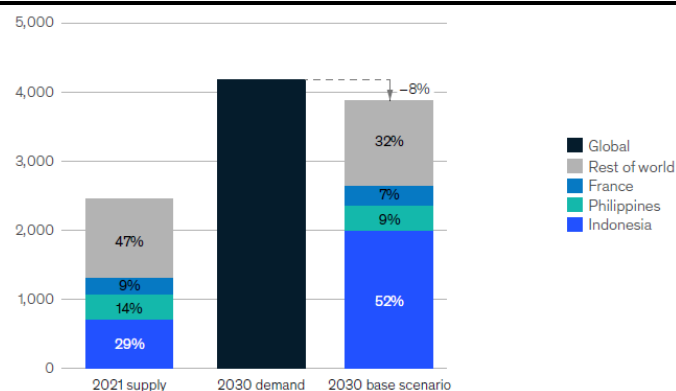
Source: BloombergNEF

Fig 105: Lithium carbonate global equivalent demand 2030 (kt), there will be a shortage if no further projects are developed



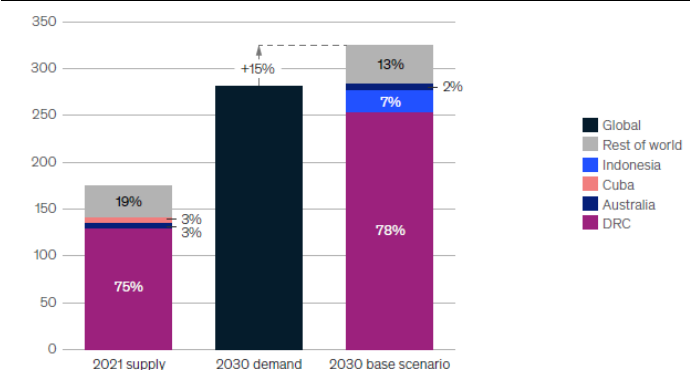
Source: McKinsey MineSpans, 2022

Fig 106: Nickel global demand 2030, supply 2021 and 2030 by country (kt), suggests slight undersupply



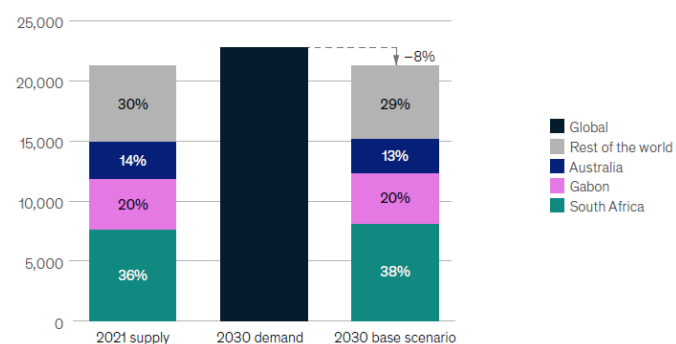
Source: McKinsey MineSpans, 2022

Fig 107: Cobalt global demand 2030, supply 2021 and 2030 by country (kt), supply will be more than sufficient



Source: McKinsey MineSpans, 2022

Fig 108: Manganese global demand 2030, supply 2021 and 2030 by country (kt), demand could slightly exceed supply



Source: McKinsey MineSpans, 2022

12. Our channel checks in India on batteries, charging infrastructure and financing

We visited electric 2-wh and car showrooms and met charging infrastructure service providers, financiers and actual users to understand their first-hand experience with EVs.

Large number of electric 2-wh companies

The electric 2-wh market in India consists of more than 50 companies selling at least one model of high-speed electric 2-wh. However, of these there are two start-ups that are getting a lot of attention, ie, Ather Energy and Ola Electric. The other major brands are part of old, well-established ICE 2-wh makers, such as Hero Motocorp, Bajaj Auto and TVS Motors.

Factors driving EV adoption

Apart from pricing, some of the key factors required to increase EV adoption in India would be convenient and cheap charging, battery performance and availability of financing. For both electric 2-wh and cars, there is significant interest in 'home charging'. This would typically be on slow AC chargers, which could take between 3-8 hours for a full charge depending on the size of the battery. The cost for home charging in India works out to be around INR6/unit, or approximately USD0.08, which means a cost of INR20-25 (USD0.3) for a 2-wh and INR180 (USD2.25) for a car for a full charge. At the current size and scale of EVs, it is unlikely to be a burden on the grid, based on our understanding from power utilities. Also, a good amount of this load is meant for 'night charging', which does not disturb the peak demand. According to experts, in the medium to long term, vehicle charging demand could rise to 7-8% of total grid capacity. Tesla estimates EV charging to add 15-20% to overall power demand by 2050 when it expects most of the world's vehicle sales to be EVs.

Congested cities to drive battery swapping

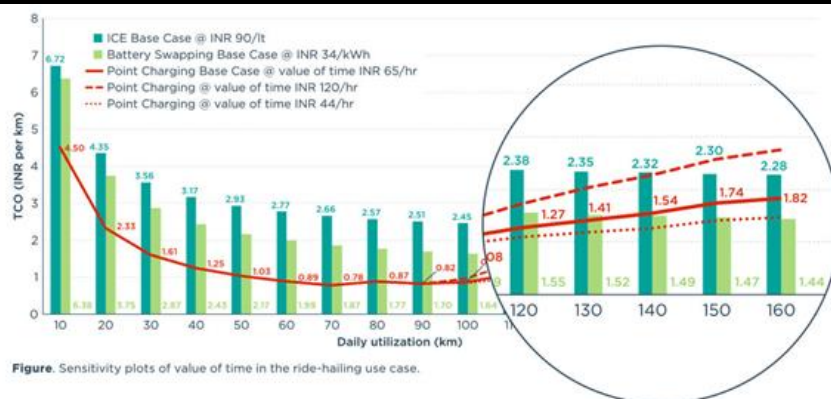
The issue with home charging is that in many congested cities with little parking space for cars or 2-wh, there is not enough space to charge. Further, the wait time at public charging stations is too long and public chargers are not conveniently located. Till the time a full-fledged charging infrastructure evolves just like fuel stations of today, an interim solution is battery swapping. Battery swapping has been made quite popular by Taiwanese company Gogoro in China, Singapore and Indonesia. Gogoro is already working to set up a manufacturing facility in India with an investment of USD1.5b. Gogoro's battery swapping stations could change bike batteries in 6 seconds and cost INR150 per charge. Others such as Sun Mobility in India are also working to provide a similar solution. This could be particularly useful for those operating a fleet of electric 2-3 wheelers as it enables high utilization.

To get the battery swapping business going, India may need to make a few policy changes, such as: 1) allow sale of EVs excluding batteries; and 2) make batteries interoperable etc.

In the absence of a large, cost-effective charging infrastructure, battery-swapping services could prove to be a better alternative in India. Already companies such as Gogoro are working towards setting up a big network to service the B2B needs for electric mobility. This would be extremely positive for the e-commerce companies in particular, such as logistics delivery firms and food delivery services etc for whom utilization of their vehicles is critical. According to Gogoro, the batteries could be swapped within a few seconds instead of 20-30 minutes of charging. This could be quite a boon for B2B users of electric 2-3 wheelers. The electric 2-wh

owners using battery swap services currently pay USD1.5-2/day. Some of the start-ups that specialize in this include Sun mobility (Cargo), Bounce and Zypp (electric 2-wh), and Battery Smart (e-Rickshaws). Some of the issues with this service is location of the battery swapping facilities, safety and maintenance of batteries and prevention of fire, and insurance etc.

Fig 108a: Sensitivity analysis for total cost of ownership (TCO) between ICE vs battery swapping vs point charging



Source: ICCT, TCO= Total Cost of Ownership

Utilisation of public charging stations currently only 5%

For standalone public charging stations in India, our channel checks suggest that the current utilization rate is just 5%. This is due to low number of EVs on the road and because of the cost of charging at public stations is 40-50% higher than at home (INR10-11/unit). Further, charging standard is not yet defined in India for light electric vehicles and requires harmonization.

Globally, one public charging facility for every 10 EVs is considered a good standard. Currently, India has only 1 public charging facility for every 50 EVs. This constraint, however, should ease as EV sales expand and the charging system becomes standardized. Typically, a public charger needs to be a DC charger with a capacity ranging from 25-50KW allowing full charge to an EV in 35-80 minutes. Globally, the public chargers now have a capacity of 150-300KW. India expects to achieve similar charging points by 2027, which would complete a full charge in 20-30 minutes, similar to a Tesla super charger in the US.

Battery capacity needs to increase in line with global standards

Car batteries in India are currently 20-40KW, which is half the size of the global markets. This needs to increase to reduce range anxiety and to overcome the gap in charging infrastructure at present. The LFP-type battery is more suitable in India (similarly for ASEAN countries) due to high temperature. NMC-type battery needs more thermal barriers. In India, it is recommended that batteries must be tested in 45-49-51 C degrees. Some even recommend an extreme 60C.

Thermal runaway needs standardisation and stricter focus

A major area of concern is batteries catching fire in electric 2wh and cars in India. The thermal runaway time is not standardized but is considered to be 5 minutes. The industry is working on achieving a thermal runaway time of 20-30 minutes. This actually depends upon the battery architecture and how flame retardant the material used in the car is, what is the thermal runaway between cells and modules, among other factors.

EV financing

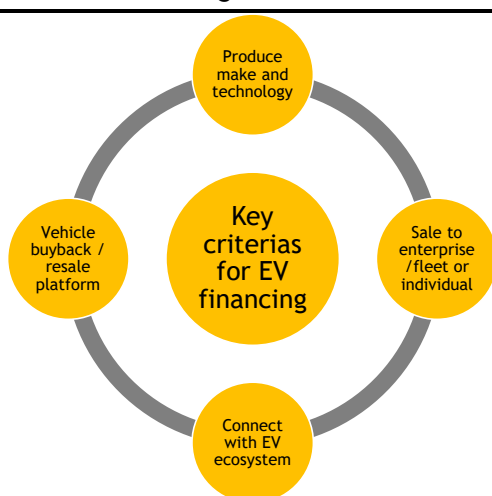
When it comes to financing, some of the key issues for a EVs are: 1) a large number of 1st-time vehicle buyers; 2) a large number of applicants from rural and semi-urban areas requiring vehicles for commercial/business purposes; 3) high cost of insurance; 4) high rate of interest and lower loan-

to-value ratio; and 5) lack of a secondary market to sell ICE vehicles that owners trade in for an EV.

As EVs are gaining more acceptance, most of the top banks in India are providing financing for buyers of leading EV brands, such as Tata Motors, Ather, Bajaj, TVS, Hyundai and MG etc. However, buyers of the weaker brands usually secure financing from the new fin tech start-ups or specialized financiers. Approval of these loans are highly digitised and automated, and borrowers usually do not need the traditional credit score to secure financing. Their main purpose is to create a positive social impact by bringing the unbanked into formal banking channels. If the vehicle purchase is helping the customer in gaining a job, it is a credit positive because it improves the possibility of repayment. They also install telematics in electric 2-wh to track the driving behaviour and location of vehicle owners and these finance companies can repossess the vehicles if the performance parameters suggest poor use of the vehicle.

However, such 1st-time EV buyers are charged between 15-20% rate of interest vs 8-9% for those financing via traditional bank channels. Some banks and financiers also fund batteries separately and that allows them to improve the loan-to-value ratio. Some automakers guarantee buying back their vehicles and provide a 7-year or specific km warranty on their battery to ensure that there are no concerns with the purchase of a vehicle in the secondary market. Although the data is not comprehensive, based on our understanding, the resale value of EVs is similar to ICE vehicles. In terms of the gross NPL ratio, for 2-wh and car loans for ICE vehicles, the range is 2-3%; however, EV loans are less than 1%, suggesting relatively lower issues of credit quality.

Fig 108b: Key criteria to EV financing



Source: Maybank IBG Research

Fig 108c: EV financing - banks vs non-banking financiers (NBFC)

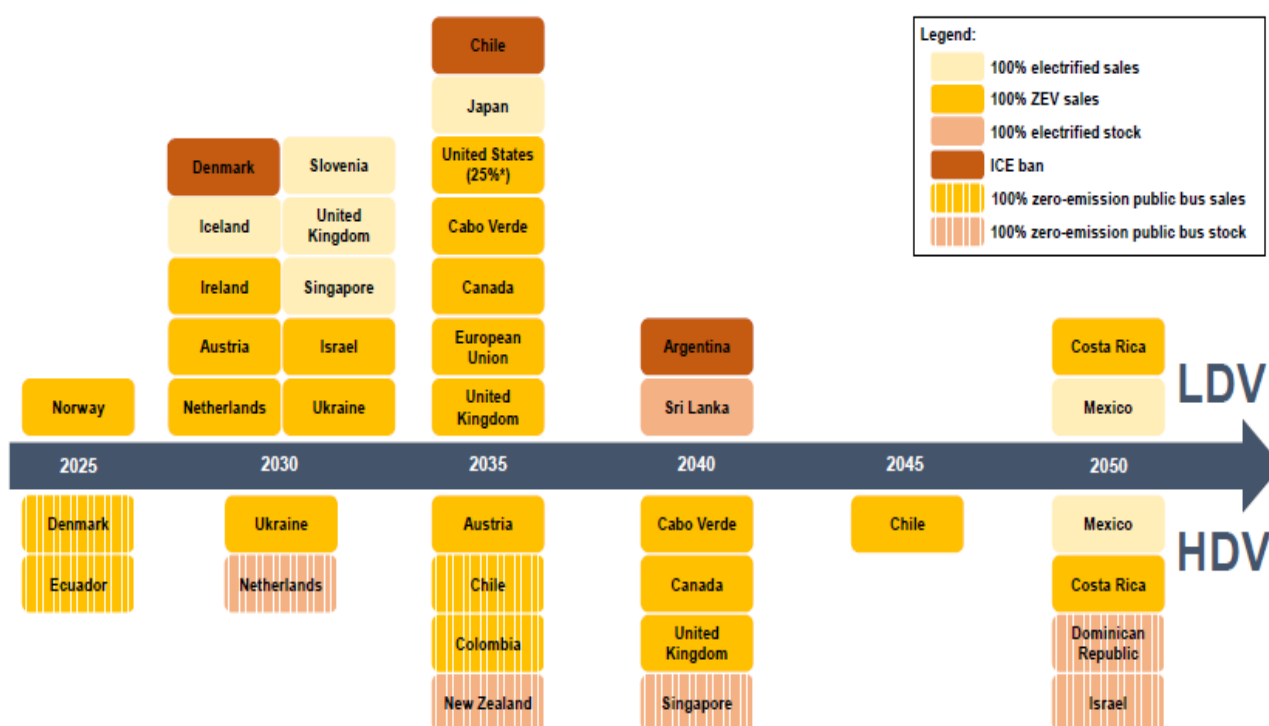
Banks	vs	NBFC/specialized lenders/fintech
Lending based on credit score, income		Lending mostly to unbanked customers
Tie-up with large established OEMs		Lending to customers with no credit scores
Financing of EV ecosystems, including dealers		Lending drives socio-economic impact
Target market is urban and EVs		Target market is rural, electric bikes in semi-urban areas
Rate of interest 8.6-9.3% for 4wh, 17.75-19.5% for 2wh		Rate of interest 17-23%
Loan-to-value ratio of 85-90%, including upfront government subsidy		loan-to-value ratio of 85-90%
Tenure: 7 years for cars and 3 years for bikes		Tenure: 3-7 years

Source: Maybank IBG Research

13. Regulations/policies/incentives and subsidies in global and ASEAN markets for electric mobility

Governments need to make specific time-bound targets if countries are to meet their net-zero targets. Transportation, at 24% of energy emissions, also needs to have similar time-bound targets. Amongst ASEAN-member countries, Singapore has set a target to stop sales of ICE vehicles after 2030 and phase out all ICE vehicles by 2040. Thailand targets to stop ICE sales from 2035. Vietnam plans to stop ICE vehicle sales from 2040 and phase out ICE vehicles by 2050.

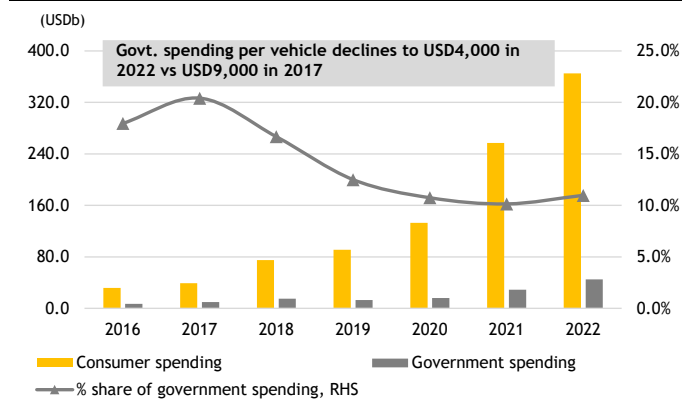
Fig 109: EV/ICE targets by various countries



Source: IEA

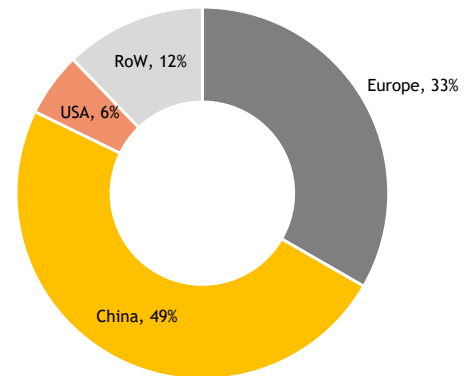
Along with setting targets, governments need to encourage citizens to switch out of fossil fuel-powered vehicles to EVs. This is possible by incentivising citizens and businesses to switch to EVs, a strategy used by the EU/UK and China in the past 5-7 years and which is now being aggressively applied by the US. The USD50b US government spending in 2022 included subsidies and tax deductions, such as VAT exemption, and bonuses related to weight, CO2 emissions or range. On a per-vehicle basis, government spending decreased from around USD9,000 per electric car in 2017 to USD4,000 in 2022, as sales increased more quickly than government spending. This was largely the case in Europe and China. However, incentives in markets where adoption has been lower to date, such as India, Indonesia and Thailand, could push overall government spending up. It is highly critical for emerging countries to sustain customer level and producer level incentives/subsidies for EV adoption as it is the biggest driver for their shift. This would be required for at least the next 5-8 years.

Fig 110: Global spending on EV surged by 50% in 2022, 53% CAGR over 2017-22



Source: IEA

Fig 111: China contributes to 49% of the government spending on EV followed by Europe at 33%



Source: IEA

Fig 112: Targets for EV volumes, share and charging infrastructure

Countries/states	EV volume	Target year	EV sales share	Target year	Charging infrastructure	Target year
Global						
China	NA	NA	50% (Cars)	2035	NA	NA
Germany	15m (Cars)	2030	NA	NA	1m	2030
Norway	NA	NA	100%	2025	NA	NA
Iceland	30,000 (Cars)	2026	NA	NA	NA	NA
California	1.5m EVs (Achieved Already)	2025	68% (PHEV+ZEV)	2030	NA	NA
New York	8,50,000	2025	100% (cars)	2035	NA	NA
ASEAN + India						
Malaysia	1.5m (EVs)	2040	38% (Annual new sales)	2040	10,000 (public)	2025
Indonesia	15.2m (Cars+2W)	2030	20% (Domestic)	2025	NA	NA
Singapore	NA	NA	100%	2040	40,000 Public 20,000 Private	2030
Thailand	306,000	2025	30% (production)	2030	20,000	2025
Vietnam	250,000 (Annual production)	2025	100%	2040	NA	NA
Philippines	1m	2030	NA	NA	NA	NA
India	102m	2030	30%	2030	2.93m (Public + Private)	2030

Source: Maybank IBG Research

Fig 113: Regulations/policies of various countries/states

Countries/states	Regulations/policies
China	NEV Mandate 2018 Development Plan for Energy-saving and New Energy Automotive Industry (2012-2020)
Europe	EU Sustainable and Smart Mobility Strategy and Action Plan 2020 CO2 emissions performance standards for cars and vans 2020
Norway	Carbon Tax since 1991 ZEV Mandate to facilitate adoption of greener transport by 2025
Germany	Act on the Digitalization of the Energy transition 2016 Act on E-Mobility 2015 Decree on Charging Stations 2016
Iceland	New Climate Action Plan, 2018-2030 Carbon Tax
United States	The ACT (Advanced Clean Truck) Regulation 2020 LCFS (Low Carbon Fuel Standard) 2019 IRA (Inflation Reduction Act) 2022: Clean Vehicle Credit NEVI (National EV Infrastructure) Formula Program 2022
California	Advanced Clean Cars II regulations
New York	Electric Vehicle Emissions Inspection Exemption

Source: Maybank IBG Research

Fig 114: Details of regulations/policies in ASEAN and India

Country	Regulations/policies
Malaysia	National Automotive Policy (NAP) 2020 Low Carbon Mobility Footprint (2021-2030)
Indonesia	National Master Plan for industry (2015-2035) Luxury Tax for Automotive products 2019 National Energy Policy
Singapore	EV Early Adoption Incentive (EEAI) Enhanced Vehicular Emissions Scheme (VES) Commercial Vehicles Emissions Scheme (CVES) Early Turnover Scheme (ETS)
Thailand	EV Tax Incentive Package (2022-2025)
Vietnam	Action Programme on Green Energy Transition National Transportation Vehicle Development Strategy (2022-2023) National Automobile Development Strategy (2021-2050) National Green Growth Strategy (NGGS) (2021-2030)
Philippines	Electric Vehicle Industry Development Act (EVIDA) (2022) Tax Reform for Acceleration & Inclusion (TRAIN) Act (2017)
India	FAME I (2015-2019) FAME II (2019-2024)

Source: Maybank IBG Research

Fig 115: ICE vehicle sale phase out targets

Global	ICE sale phase out date
Norway	2025
Iceland	2030
Netherlands	2030
Ireland	2030
California, US	2035
United Kingdom	2035
Denmark	2035
Canada	2040
France	2040
Spain	2040
Costa Rica	2050
ASEAN	ICE sale phase out date
Singapore	2030
Thailand	2035
Vietnam	2040

Source: Maybank IBG Research

Fig 116: EV incentives/subsidies by various countries/states

China	<ul style="list-style-type: none"> • Purchase tax exemption extended for NEVs through to the end of 2023. • NEV subsidy scheme extended to the end of 2022 (from previous 2020 expiry date), although it started reducing base-subsidy amounts by 10%, 20% and 30% each year (between 2020 and 2022).
Germany	<ul style="list-style-type: none"> • VAT reduction from 19% to 16% from 1 July 2020 until 31 December 2020. • Bonuses were available for eligible vehicles registered from 4 June 2020. Bonuses ranged from EUR5,625 to EUR9,000 for BEVs and PHEVs depending on the net price of the car. • Reduction of the taxable amount for BEVs and PHEVs (from 1% to 0.5% of the gross catalogue price per month). Additional reduction for BEVs with a gross list price of up to EUR60,000 (from 1% to 0.25% of the gross catalogue price per month)
France	<ul style="list-style-type: none"> • Bonuses ranging from EUR2,500 to EUR7,000 for households and legal persons depending on vehicle price and type. • Exemption from CO2-based tax component ('TVS') for vehicles emitting less than 20g CO2/km.
Netherlands	<ul style="list-style-type: none"> • Subsidies: for private individuals to buy or lease a new or used BEV. Environmental investment deduction for BEV and fuel cell EV (FCEV) light commercial vehicles and BEV taxis. Arbitrary depreciation of environmental investments scheme (Vamil) for FCEV cars or taxis and BEV cars equipped with solar panels. • Minimum rate (8%) for zero-emission cars with catalogue price of up to EUR45,000 (no price limit for FCEV cars).
Norway	<ul style="list-style-type: none"> • Purchase/import tax on EVs (1990-2022). From 2023 some purchase tax based on the cars' weight on all new EVs. • 25% VAT exemption on purchase (2001-2022). From 2023, Norway will implement a 25% VAT on the purchase price from NOK500,000 and above. • Annual road tax exemption (1996-2021). Reduced tax from 2021. Full tax from 2022. • No charges on toll roads (1997- 2017) and ferries (2009- 2017).
Iceland	<ul style="list-style-type: none"> • Local incentives for EVs support national subsidies and the charging infrastructure rollout. • Tax incentives for clean cars and fuels • Rebate system for older polluting cars. A system of rebates for decommissioning high-polluting cars may speed up their phase-out.
United States	<ul style="list-style-type: none"> • Federal Tax Credit for EVs: Individuals who bought EV in 2022 or before may be eligible for a clean vehicle tax credit of up to USD7,500. The credit equals USD2,917 for a vehicle with a battery capacity of at least 5 kWh plus USD417 for each kWh of capacity over 5kWh. • The Build Back Better Act was drafted in 2021 and proposes a restructuring of EV purchase subsidies to include an additional USD4,500 for EVs equipped with batteries manufactured with union labour, on top of a USD7,500 base incentive.
California	<ul style="list-style-type: none"> • CVRP (California Vehicle Rebate Project) provides up to USD7,000 for income qualified drivers to buy or lease a ZEV. • Clean Vehicle Assistance Program provide low income car buyers with special financing and up to USD5,000 in down payment assistance. • Clean Cars 4 All provides up to USD9,500 to low income drivers who scrap their older vehicles and want to purchase something that runs cleaner.
New York	<ul style="list-style-type: none"> • EV Rebate Programme provides rebates of up to USD2,000 for the purchase or lease of a new eligible EV. • EV Charging Station Rebates available for USD4,000 per port. Disadvantaged communities may receive an additional rebate of USD500 per Level 2 EV charging station. • Alternative Fuelling Infrastructure Tax Credit is available for 50% of the cost of alternative fuelling infrastructure, up to USD5,000.

Source: Maybank IBG Research

Fig 117: ASEAN+India EV incentives/subsidies

Malaysia	<ul style="list-style-type: none"> Imports: Fully-imported completely built-up (CBU) EVs, which had full import and excise duty. Exemptions extended to December 31, 2025. Local assembly: The excise duty and sales tax exemption for locally-assembled completely knocked down (CKD) EVs was extended until December 31, 2027. EV charging equipment providers: A 100% income tax exemption for manufacturers of EV charging equipment from YA 2023 to 2032 and a 100% investment tax allowance.
Indonesia	<ul style="list-style-type: none"> Tax holiday incentives: for up to 10 years if EV manufacturers make at least an IDR5t (USD346.2m) investment in the country. Subsidy: IDR80,000,000 (USD 5,000) will be given for purchasing a new battery-electric vehicle and half that amount for purchasing a conventional hybrid. New electric motorbikes will receive a purchase subsidy of IDR8,000,000 (USD 520), and the government will pay IDR5,000,000 (USD 320) for converting an ICE 2-wh to an electric 2-wh Value-Added Tax (VAT) incentives: Up to 10% VAT incentive would be provided for electric cars and buses with a domestic component level (TKDN) of above 40%. The electric cars and buses, which have a minimum domestic component level of above 20% to 40%, will be given a 5% VAT incentive.
Singapore	<ul style="list-style-type: none"> Rebates: EVs being carbon-free fall in the A1 band and are eligible to get a rebate of SGD20,000 EEAI: Newly registered electric cars and taxis will receive a 45% rebate off the Additional Registration Fee (ARF), capped at USD20,000. From 1 Jan 2022 to 31 Dec 2023, the ARF floor is lowered from USD5,000 to USD0. VES: the rebates for vehicles in both Bands A1 (USD25,000 rebate) and A2 (USD15,000 rebate) will be increased by USD5,000 for cars, and USD7,500 for taxis. The EEA1 and VES incentives are effective from 1 January 2021 to 31 December 2023. CVES: CVs are categorised into three bands resulting in a USD10,000 surcharge for the most pollutive vehicles to USD30,000 incentive for the least pollutive vehicles. The scheme was effective from 1 April 2021 to 31 March 2023. ETS: From 1 April 2021, existing Euro 4 Cat C diesel vehicles will also be eligible for the ETS.
Thailand	<ul style="list-style-type: none"> Import tariff reduction: on EV cars ranging from zero to 40%, depending on the type, model, engine size, until 2023. Excise tax and import duties reduction: on CKD and CBU units. The Thai cabinet is also giving exemption of import duties on significant electrical parts by 2022-2025. Excise tax cut: on imported EVs to 2% from 8%. Car manufacturers will also receive subsidies of between THB70,000 and THB150,000 for each EV and THB18,000 for electric motorcycles.
Vietnam	<ul style="list-style-type: none"> Registration fee reduction: EVs are exempted from the registration fee for 3 years, starting from March 1, 2022. The fee shall be paid equal to 50% of the fee for petrol and diesel cars with the same number of seats over the next 2 years. Special consumption tax: for EVs wherein rates have only increased from 5 to 15% since 2018 - which is significantly lighter when compared to the tax rate imposed for conventional car purchases with rates rising from 35 to 150%.
Philippines	<ul style="list-style-type: none"> Excise taxes, duties, and VAT waived for purchasing EV parts: exempts tariffs for imported EV components and gives a six-year income tax holiday for EV project investors. Reduction in excise taxes: Under the EVIDA law, imported hybrids get 50% off on excise taxes. Battery EVs get full tax exemptions.
India	<ul style="list-style-type: none"> Income tax benefits: Individuals can claim a deduction of up to INR150,000 (USD1,800) on the interest paid on loans taken to purchase EVs. GST (Goods and Service Tax) reduction: The GST on EVs was reduced from 12% to 5%. In addition, the GST on EV chargers was reduced from 18% to 5%. Custom duty exemption: to import capital goods and machinery required for manufacturing lithium-ion batteries used in EVs. PLI Scheme to provide incentive up to 18% to encourage the industry to boost domestic manufacturing of advanced automotive technology products. Fame Subsidy: INR10,000/kwh (vs INR15,000/kwh earlier for 2w) of battery effective 1 June 2023 up to 31 Mar 2024 for high speed electric 2-wh, 3-wh and 4-wh.

Source: Maybank IBG Research

14. ASEAN - positioning in the global supply chain and impacts due to shift from ICE to EV

If one looks through the EV value chain, ASEAN can play a dual role: a miner of critical raw materials, such as nickel and cobalt; and 2) becoming a manufacturing/export hub for global OEMs in the region.

Indonesia and the Philippines, at 27% of global nickel reserves, are two of the top six countries that account for 79% of global nickel reserves. This resource endowment has led to an increase in extractive FDI activities in Indonesia and growing attention paid by investors to the Philippines. Indonesia has seen commitment worth USD15b from LG Chem and CATL to develop the battery value chain in the country.

Nine of the top 10 battery manufacturers, all headquartered in Asia, have a presence in ASEAN, with significant integrated operations producing EV batteries.

All the top 10 EV manufacturers are present in ASEAN (eg, Tesla (US), BMW (Germany), Hyundai (Republic of Korea) and Toyota (Japan)). Many operate in the region with multiple business functions, from manufacturing of parts and components to assembly of EVs, sales and distribution, R&D and establishment of centres of excellence.

Fig 118: EV value chain in ASEAN

Value chain	Selected country	Selected companies
Nickel mining	Indonesia	Merdeka Battery Materials (Indonesia), PT H8engjaya Indonesia, PT Antam (Indonesia), Harita TBP (Indonesia), Eramet (France), Nickel Mines (Australia), Solway Investment (Switzerland), Tsingshan Holding (China), Vale (Brazil), Zhejiang Huayou Cobalt (China)
	Philippines	Intex Resources (Philippines), Sumitomo Metal Mining (Japan) and Mitsui (Japan)
Nickel smelting	Indonesia	Eramet (France), Jiangsu Delong Nickel Industry (China), Nickel Mines (Australia), Solway Investment (Switzerland), Tsingshan Holding (China), Vale (Brazil), Zhejiang Huayou Cobalt (China)
EV battery, parts and components production	Indonesia	LG Energy Solution (Republic of Korea) and Hyundai Group (Republic of Korea)
	Malaysia	Honda (Japan), SK Group (Republic of Korea), Greatch Technology, Genetec Technology
	Thailand	BMW (Germany), Evlomo (United States), Mercedes-Benz (Germany), SAIC (China), Toyota (Japan)
EV production	Indonesia	Hyundai (Republic of Korea), Toyota (Japan), NFC Indonesia, VKTR Teknologi Mobilitas
	Malaysia	Toyota (Japan)
	Philippines	EnPlus (Republic of Korea), Ayala Corp
	Singapore	Hyundai Motor Innovation Centre (Republic of Korea)
	Thailand	BMW (Germany), Foxconn (Taiwan Province of China), Mercedes-Benz (Germany), Mitsubishi (Japan), Nissan (Japan)
	Vietnam	VinFast a subsidiary of Vingroup) - a very young EV player set up in 2017)

Source: ASEAN Investment Report 2022 research, Maybank IBG Research

Indonesia and Thailand are the manufacturing/assembling hubs for the automotive industry of the region. Below (Fig 118a) we have presented a list of motor vehicle assemblers in Thailand for the various global auto OEMs. This is also visible from the production and sales data for the ASEAN countries. Indonesia and Thailand are exporters of passenger vehicles whereas Thailand is a large exporter of commercial vehicles. Conversely, Malaysia, the Philippines, Singapore and Vietnam are importers of 4-wh vehicles. Thailand is also a net exporter of motorcycles and scooters. Data for Indonesia and Vietnam is not available but channel checks suggests they are also net exporters of 2-wh vehicles.

Fig 118a: Motor vehicle assemblers in Thailand

Company	Passenger Car		Pickup	Bus & Truck		Van
	ICE	BEV		ICE	BEV	
Auto Alliance (Thailand) (Mazda)	●	○	●			
BMW Manufacturing (Thailand)	●					
Ford Motor Company (Thailand)			●			
FOMM (Asia)		●				
Great Wall Motor Manufacturing (Thailand)	●	○				
Honda Automobile (Thailand)	●	○				
Isuzu Motor Thailand			●	●		
Mercedes Benz Manufacturing (Thailand)	●	●				
Mine Mobility		●	●			
Mitsubishi Motors (Thailand)	●		●			
Nissan Motor (Thailand)	●	○	●			
SAIC Motor CP	●	○	●			
Suzuki Motor (Thailand)	●					
Suplaor	◇					
Takano Auto Thailand		●				
Tan Chong Subaru Automotive (Thailand)	●					
Toyota Motor Thailand	●	○	●			
Cho Tawee				●	●	
Foton CP Motor				●		
Hino Motors Manufacturing (Thailand)				●		
Absolute Assembly				●	●	●
Panus Assembly					●	
Scania Manufacturing (Thailand)				●		
Sakun C Innovation				●	●	
Thai Swedish Assembly				●		
Toyota Auto Works						●

Source: Thailand Automotive Institute, 2022

Note: ● In operation; ○ Board of Investment approved BEV project; ◇ not started production yet

Fig 118b: 2021 production and sales data for 4-wh

Country	Passenger vehicles (cars)			Commercial vehicles			2021		
	Production	Sales	Export / Import	Production	Sales	Export / Import	Production	Sales	Export / Import
Indonesia	889,756	659,806	229,950	232,211	227,396	4,815	1,121,967	887,202	234,765
Malaysia	446,431	452,663	-6,232	35,220	56,248	-21,028	481,651	508,911	-27,260
Philippines	44,250	85,260	-41,010	39,596	183,228	-143,632	83,846	268,488	-184,642
Singapore	0	48,011	-48,011	0	10,942	-10,942	0	58,953	-58,953
Thailand	594,690	317,874	276,816	1,091,015	436,380	654,635	1,685,705	754,254	931,451
Vietnam	118,954	214,384	-95,430	44,317	89,765	-45,448	163,271	304,149	-140,878
Total	2,094,081	1,777,998	316,083	1,442,359	1,003,959	438,400	3,536,440	2,781,957	754,483

Source: Asean Automotive Federation

Fig 118c: 2022 production and sales data for vehicles

Country	Passenger vehicles (cars)			Commercial vehicles			2022		
	Production	Sales	Export / Import	Production	Sales	Export / Import	Production	Sales	Export / Import
Indonesia	1,241,250	783,563	457,687	255,896	264,477	-8,581	1,497,146	1,048,040	449,106
Malaysia	650,190	641,773	8,417	52,085	78,885	-26,800	702,275	720,658	-18,383
Philippines	41,663	88,015	-46,352	50,560	264,581	-214,021	92,223	352,596	-260,373
Singapore	0	32,972	-32,972	0	9,578	-9,578	0	42,550	-42,550
Thailand	594,057	343,349	250,708	1,289,458	506,039	783,419	1,883,515	849,388	1,034,127
Vietnam	162,491	316,940	-154,449	69,919	87,695	-17,776	232,410	404,635	-172,225
Total	2,689,651	2,206,612	483,039	1,717,918	1,211,255	506,663	4,407,569	3,417,867	989,702

Source: Asean Automotive Federation

Fig 118d: 2021-22 production and sales data for 2-wh

Country	2021			2022		
	Production	Sales	Export / Import	Production	Sales	Export / Import
Indonesia	NA	NA		NA	NA	
Malaysia	496,136	497,262	-1,126	685,828	680,749	5,079
Philippines	867,453	1,435,677	-568,224	934,685	1,564,817	-630,132
Singapore	0	11,428	-11,428	0	12,016	-12,016
Thailand	1,780,654	1,606,481	174,173	2,015,940	1,792,016	223,924
Vietnam	NA	NA		NA	NA	
Total	3,144,243	3,550,848	-406,605	3,636,453	4,049,598	-413,145

Source: Asean Automotive Federation

Fig 119: ASEAN: FDI in the EV industry (selected cases)

Company	Project cost (USDm)	ASEAN country	Year	Purpose of investment
BMW	16	Thailand	2019	Battery assembly plant in partnership with Dräxlmaier Group (Germany)
CATL	5,200	Indonesia	2021	Build EV battery production plant in partnership with PT Aneka Tambang
ENPlus	101	Philippines	2021	Build EV manufacturing plant (for production of electric cars & jeepneys)
Evlomo	1,060	Thailand	2021	Construct lithium battery plant in Thailand's Eastern Economic Corridor advanced development zone, operations to commence by 2H24
FOMM	31	Thailand	2019	Expand electric car assembly plant
Ford	900	Thailand	2022	Increase automation and expand models including EVs
Foxconn	8,000	Indonesia	2022	EV cars, electric bikes, and buses to battery production and supporting industries
Kymco	1,000-2,000	Thailand	2022	Produce EVs in partnership with PTT (Thailand)
GWM	30	Singapore	2020	Invest in GrabWheels (Grab's new mobility arm)
Honda	71	Thailand	2022	Upgrade Rayong plant to produce EVs
Hyundai	136	Thailand	2021	Build EV battery factory in Prachin Buri
Hyundai Motor & LG Chem	1,500	Indonesia	2021	Build EV production facility
Mercedes-Benz	1,100	Indonesia	2021	Build EV battery factory at Karawang
Mitsubishi	200	Thailand	2019	Expand manufacturing of PHEV
	644	Thailand	2021	Build EV battery factory at Karawang
	175	Thailand	2019	Expand manufacturing of PHEV
Nissan	352	Thailand	2020	Expand capacity for production of HEVs at Samut Prakan facility
	15	Thailand	2019	Construct EV battery plant
SAIC	75	Thailand	2022	Produce batteries (through a joint venture of SAIC Motor-CP)
	782	Thailand	2022	Expand production capacity for PHEV and EV recharging network
Energy Efficiency Services	5	Thailand	2020	Invest in SWAG EV, an electric bike company
SK Group	553	Malaysia	2021	Manufacture electro-deposited copper foil for EV batteries
	2,000	Indonesia	2022	Develop and produce EVs
	65	Malaysia	2021	Expand manufacturing facility for HEVs
Toyota	622	Thailand	2019	Produce HEVs
	119	Thailand	2019	Extend a plant in Samut Prakan and build a hybrid battery assembly parts in partnership with Thonburi Automotive Assembly Plant

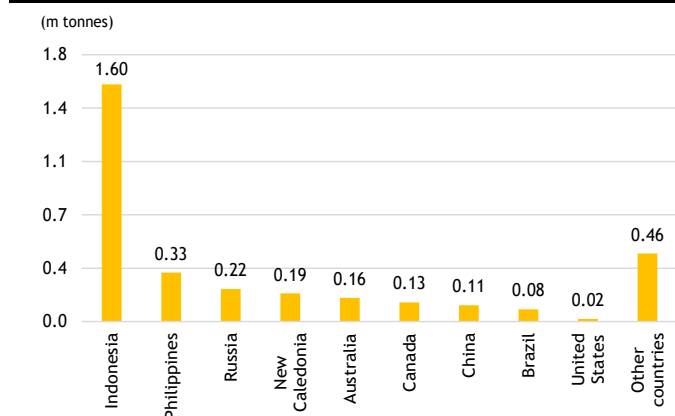
Source: ASEAN Investment Report 2022 research

Fig 120: Top 10 global EV battery manufacturers and their presence in ASEAN (2021)

Manufacturer	Global market share (%)	Presence in ASEAN (Selected cases)	Activity
Contemporary Amperex Technology (CATL)	32.5%	Indonesia	Establishing a USD5.2b EV battery production plant, which broke ground in 2021
LG Energy Solution	21.5%	Indonesia	Established a USD9.8b integrated EV battery plant in 2021 in a joint venture with Hyundai (Republic of Korea) and Indonesian state-owned Battery Corporation
Panasonic	14.7%	Indonesia, Thailand	Established battery manufacturing facilities; major supplier of EV batteries to Toyota, which has a significant presence in ASEAN
BYD	6.9%	Singapore	Established an office and market presence in ASEAN
Samsung SDI	5.4%	Malaysia	Established a USD175m facility in 2021 to expand lithium battery production capacity (Samsung SDI Seremban plant)
SK Innovation	5.1%	Indonesia	Established an office in early 2022
		Malaysia	Establishing a USD553m battery copper-foil manufacturing facility in Sabah, which will be part of the SK Group's EV value chain
China Aviation Lithium Battery	2.7%	NA	NA
Envision AESC	2.0%	Singapore	Established the Envision Group (China) global technology innovation centre, focused on sustainable energy and other solutions
Guoxuan	2.0%	Singapore	Established the Guoxuan-Nanyang Technological University Smart Energy Joint Laboratory
Toyota Motor	1.3%	Thailand	Invested in a USD622m battery plant through Toyota Motor Thailand in 2018; opened a battery life-cycle management plant in 2019

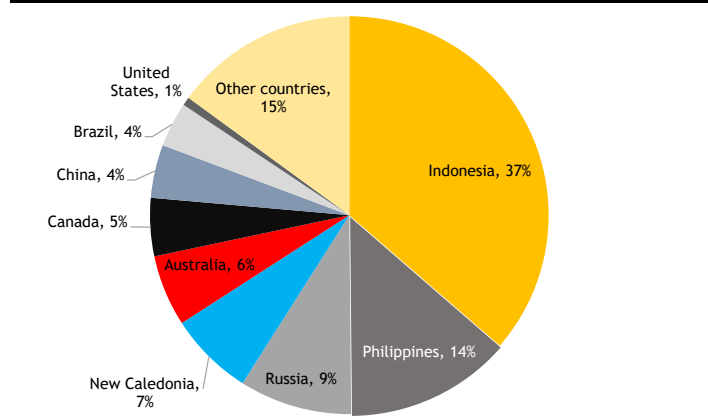
Source: ASEAN Investment Report 2022 research

Fig 121: Indonesia mined 1.6m tonnes of nickel in 2022, 48% of global nickel production



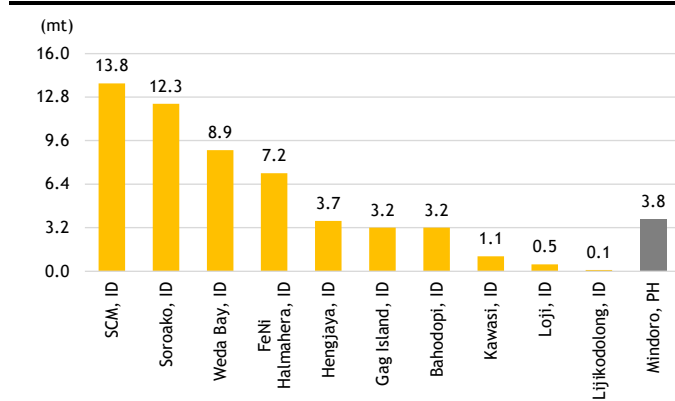
Source: Statista

Fig 122: Indonesia and Philippines accounted for more than 50% of global production of nickel in 2021



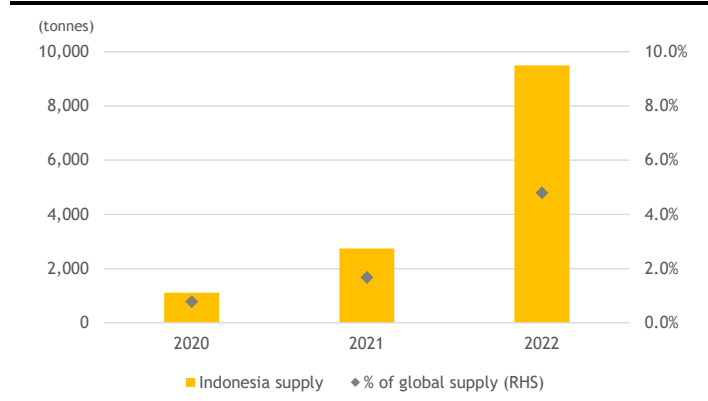
Source: Statista

Fig 123: Largest nickel mines in Indonesia and Philippines, Indonesia top-10 mines totals to 54m tonnes of capacity



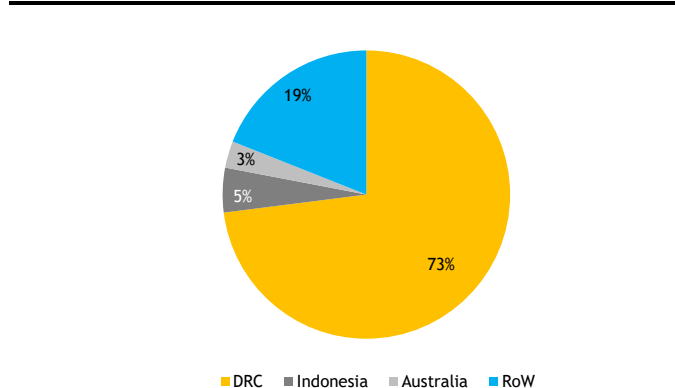
Source: MBM prospectus

Fig 124: Indonesia became world's second largest cobalt producer in 2022 at 5% of global supply



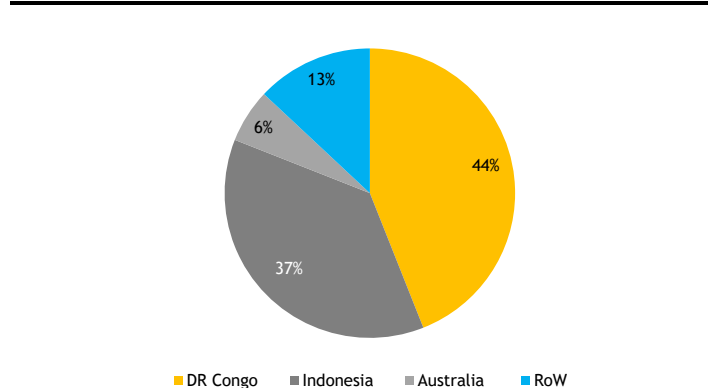
Source: Cobalt Market Report 2020, 2021, 2022

Fig 125: Country-wise share of mined cobalt supply in 2022: DR Congo leading with a 73% share



Source: Cobalt Market Report 2022 by Cobalt Institute

Fig 126: Projected country-wise share of mined cobalt supply in 2030: Indonesia projected to achieve 37% share by 2030



Source: Cobalt Market Report 2022 by Cobalt Institute

15. Affordability of EVs vs ICE - green premium is still very high

If we compare the total cost of ownership of an EV vs an ICE vehicle, we see EVs as still very costly for owners, even if we include government subsidies. Below we compared EV and ICE model pricing and running costs in India. In the private vehicle segment, we see that the government subsidy at the time of purchase and the tax incentive offered for buying an EV helps the customer save more vs buying an ICE vehicle. But the upfront cost of purchasing an EV remains 45-50% higher than an ICE 4 wheeler. It is only after including the total usage period that the ownership costs for an EV come down vs an ICE vehicle. The high upfront cost is a major issue for many aspiring car buyers who want to shift from ICE to EV. For a high-priced electric bike (>INR135,000), there are no savings even after government subsidy and the upfront price remains much higher than an ICE 2-wh.

Fig 127: India - Tata Nexon XM EV Prime (Base model) vs ICE

Particulars	EV	Petrol	Difference
Mileage in km (per full charge or per litre)	312	17.33	
Fuel tank capacity (litres)		44	
Battery	30.2 kW		
Charging time			
AC (hours)	9.16		
DC	1		
Price (post subsidy)	1,449,000	889,900	
RTO charges	0	102,842	
Insurance	62,704	49,023	
Other charges	14,490	600	
Total	1,526,194	1,042,365	483,829
Cost of charging (INR10/kWh)	302		
Cost of petrol (INR/ltr)		107	
cost per km (INR)	1	6.7	
cost of running 100,000 km (INR)	100,000	668,750	-568,750
Service cost for 5 years (INR)	30,000	32,000	-2,000
Down payment (INR)	152,620	104,240	
EMI 60 months @ 9.8% (INR)	29,041	20,680	
Total payment (INR)	1,895,080	1,345,040	
Interest payment over 5 years (INR)	368,886	302,675	66,211
Tax benefit on interest @30% over 5 years (INR)	-110,666	0	-110,666
Savings (INR)			-131,376

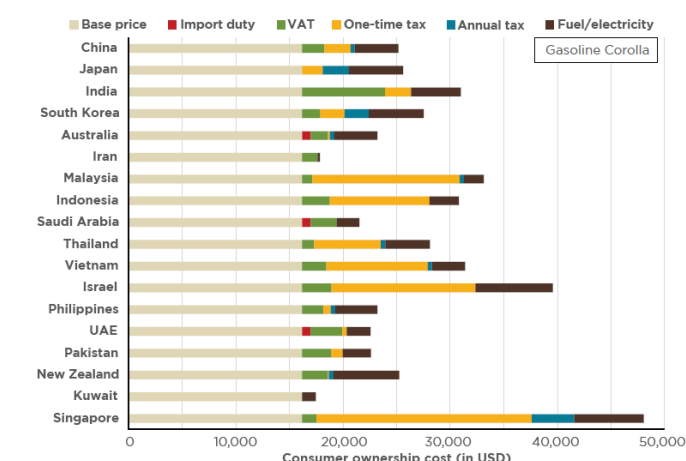
Source: Maybank IBG Research

Fig 128: India - TVS Jupiter (ICE) vs iQube (EV)

Particulars	EV	Petrol	Difference
Mileage in km (full charge or ltr)	100-115	50	
Fuel tank capacity (ltrs)		5	
Battery	3.04 kW		
Charging time			
AC (hours)	5-6		
DC	NA		
Price (post subsidy)	135,105	74,806	
RTO charges	658	9,729	
Insurance	5,828	6,033	
Other charges			
Total	141,591	90,568	51,023
Cost of charging (INR10/kWh)	18.75		
Cost of petrol (INR/ltr)		107	
cost per km (INR)	0.19	2.7	
cost of running 15,000 km (INR)	2,813	40,125	-37,313
Service cost for 5 years (INR)	2,500	5,000	-2,500
Down payment (INR)	7,591	4,528	
EMI 36 months @ 10% (INR)	4,321	2,775	
Total payment (INR)	163,157	104,415	
Interest payment over 3 years (INR)	21,566	13,847	7,719
Tax benefit on interest @30% over 5 years (INR)	NA	NA	
Savings (INR)			18,930

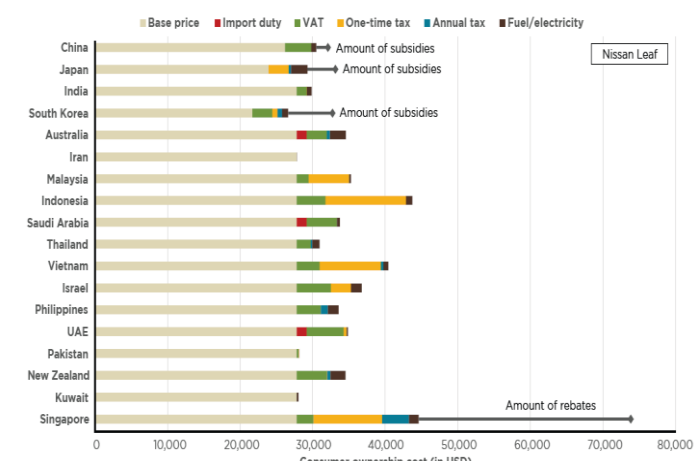
Source: Maybank IBG Research

Fig 129a: Six-year ownership cost of the gasoline Toyota Corolla across 18 markets is cheaper



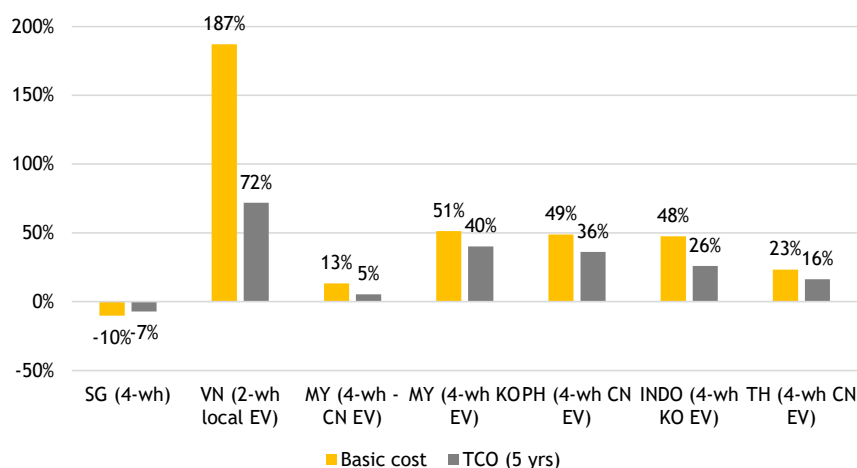
Source: Cobalt Market Report 2022 by Cobalt Institute

Fig 129b: Six-year ownership cost of the EV Nissan Leaf across 18 markets is costlier except Singapore, S.Korea



Source: Cobalt Market Report 2022 by Cobalt Institute

Fig 130: EV premium in the range of 13-51% for ASEAN 6 countries except Singapore for cars



Source: Maybank IBG Research

Fig 130a: Malaysia TCO ICE vs EV -- the premium at 5-40%

Particulars	ICE Honda HRV 1.5 Turbo E	EV BYD - Atto 3 Standard range MYR	Premium / discount	EV Hyundai Ioniq 5 MYR	Premium / discount
Price - Before government support	130,900	149,800	14.4%	199,888	52.7%
Insurance	3,682	4,174		5,444	
Registration	340	0			
Any other charges	967	0			
Total cost (ex-insurance)	132,207	149,800	13.3%	199,888	51.2%
Less: subsidies/benefits	0	0			
Net cost to customer (ex-ins.)	132,207	149,800	13.3%	199,888	51.2%
Running cost					
A: Cost per charge/fuel price	2.05	13.08-34.26			
B: Mileage (km/charge or litre)	15.4km/litre	8.4km/kwh		6.6km/kwh	
Fuel Cost per km (A/B)	0.13	0.03		0.04	
Total fuel cost (10,000km/yr)	1,331	311	-76.6%	393	-70.5%
Maintenance/servicing cost per annum	797	Offers warranty		Offers warranty	
Tax (road)	450	20		20	
Insurance cost	3,682	4,174		5,444	
Financing cost	2,618	2,756		3,678	
Total running cost (10,000km/Yr)	8,878	7,262	-18.2%	9,535	7.4%
Total running cost 5 years	44,389	36,308		47,673	
TCO for 5 years	176,596	186,108	5.4%	247,561	40.2%

Source: Maybank IBG Research

Fig 130b: Philippines EV vs ICE -- green premium at 36%

Particulars Model	ICE Honda City Hatchback	EV BYD EA1 Dolphin	Premium / discount
Capital cost	PHP	PHP	
Ex-showroom price	1,153,000	1,688,000	46%
Less: subsidies/benefits	0	0	
Price - After government support	1,153,000	1,688,000	46%
Insurance	15,854	39,069	
Registration	2,000	2,000	
Total cost	17,854	41,069	
Net cost to customer	1,188,708	1,770,138	49%
Running cost			
Fuel tank/Battery capacity	40Ltr	44.9kWh	
Cost per charge/fuel price	62	404.1	
Mileage (km/charge or litre)	25	405	
Fuel Cost per km (A/B)	2.5	1.0	
Total fuel cost (10,000km/yr)	24,800	9,978	
Maintenance/servicing cost per annum	20,000	0	
Insurance cost	15,854	39,069	
Financing cost	63,205	92,533	
Total running cost (10,000km/Yr)	123,859	141,580	14%
Total ownership cost for 5 years	1,792,151	2,438,967	36%

Source: Maybank IBG Research

Fig 130c: Indonesia EV vs ICE - green premium at 26%

Particulars/USD	Honda HRV 1.5 Turbo RS	Ioniq 5 Signature Standard	Premium / discount
Currency (USD/IDR - 15,000)	USD	USD	
Mileage in km (full charge)	420	384	
Fuel tank capacity (ltrs)	40	-	
Battery		58 kWh	
Seater	5	5	
Dealer Price (including tax, USD)	33,327	53,933	62%
Govt. incentive		4,767	
Govt. incentive (% of dealer price)		9%	
Dealer Price with Govt. tax incentives	33,327	49,167	48%
Operating costs			
Mileage in km (full tank/charge)	420	384	
Fuel tank capacity (ltrs)	40	-	
Battery		58 kWh	
Cost per charge/fuel price	IDR12,400/L (USD0.83/L)	IDR2,466/kWh (USD0.16/kWh)	
Fuel cost per km (IDR)	1,181	372	
5 year Fuel cost at 10,000 km/year (USD)	3,937	1,242	
5 years Annual Road tax (USD)	3,352	363	
Maintenance fees (50,000 km)	588	free up to 45,000 km	
Finance cost	7,153	10,325	
Total operating costs for 5 years	15,030	11,930	-21%
Total cost of ownership for 5 years	48,357	61,096	26%

Source: Maybank IBG Research

Fig 130d: Thailand ICE vs EV - green premium at 16%

Particulars	ICE Honda BR-V EL 2023 (5 seater)	EV BYD - Atto 3 Standard range	Premium / discount
Currency	THB	THB	
Base price	973,000	1,449,900	49%
Govt. subsidy		250,000	
Price after subsidy	973,000	1,199,900	23%
Registration	315	315	
Total capital cost	973,315	1,200,215	23%
Running cost			
Cost per charge/fuel price	32	4.7-7.5	
Mileage (km/charge or litre)	14	8	
Fuel Cost per km (A/B)	2	1	
Total fuel cost @10,000 km/pa	22,685	5,949	
Maintenance cost per annum	1,907	0	
Tax	2,900	260	
Insurance	23,231	37,123	
Finance cost	26,474	32,632	
Total running cost pa	77,197	75,964	-2%
TCO for 5 years	1,359,299	1,580,036	16%

Source: Maybank IBG Research

Fig 130e: Vietnam 2-wh EV vs ICE -- EV premium on TCO of 23-124%

TCO factor/VND	VinFast Klara A2 Lead-acid (e-moped)	VinFast Klara S Li-ion (e-moped)	Elegant SYM ICE (moped)	Pega Lead-acid (e-motorcycle)	VinFast Theon Li-ion (e-motorcycle)	Honda WAVE 100 ICE (motorcycle-M)	Honda Vision 110 ICE (motorcycle-A)
Base price	24,210,000	44,640,000	14,939,998	31,500,000	80,820,000	16,020,000	27,000,000
VAT	2,690,000	4,960,000	1,660,000	3,500,000	8,980,000	1,780,000	3,000,000
Ex-showroom price	26,900,000	49,600,000	16,599,998	35,000,000	89,800,000	17,800,000	30,000,000
Registration fee	1,500,000	250,000	830,000	1,750,000	4,355,000	890,000	1,500,000
License plate fee	2,000,000	2,000,000	1,000,000	2,000,000	2,000,000	1,000,000	2,000,000
Total capital cost	30,400,000	51,850,000	18,429,998	38,750,000	96,155,000	19,690,000	33,500,000
EV premium to ICE moped / Manual	65%	181%		97%	388%		
EV premium to ICE moped / Automatic				16%	187%		
Insurance fee (5yrs)	275,000	275,000	275,000	300,000	300,000	300,000	300,000
Maintenance cost (5yrs)	1,000,000	1,000,000	3,000,000	1,500,000	1,500,000	3,750,000	3,750,000
Battery replacement cost	12,000,000			12,000,000			
Fuel consumption	2,004,289	1,253,868	15,211,000	2,621,724	2,621,724	21,147,000	20,961,500
Total cost of ownership	45,679,289	54,378,868	36,915,998	55,171,724	100,576,724	44,887,000	58,511,500
EV premium to ICE M	24%	47%		23%	124%		
EV premium to ICE A				-6%	72%		

Source: International Council on Clean Transportation working paper 2023-08

Fig 130f: Singapore green premium marginal due to restrictive nature of the market

Particulars	BMW X3 (ICE)	BMW iX3 (EV)	Premium / discount
Purchase cost	SGD	SGD	
Open market value (OMV)	47,235	57,951	23%
custom duty (20% of OMV)	9,447	11,590	
GST (7% of OMV + custom duty)	3,968	4,868	
Additional registration fee (ARF)	61,747	82,107	
Registration fee	220	220	
Vehicular emission scheme (VES) + EV early adoption incentive (EEAI) rebate	15,000	-45,000	
Certificate of Entitlement (COE)	118,002	118,002	
Basic cost	255,619	229,738	-10%
Premium	75,269	112,150	49%
Ex-showroom price	330,888	341,888	3%
Insurance	3,299	3,674	
Net cost to customer	334,187	345,562	3%
Running cost	SGD	SGD	
Cost per charge/fuel price	2.72/ltr	0.523/kWh	
Mileage (km/charge or ltr)	14.3	5.4	
Fuel cost per km	0.19	0.10	
Fuel cost at 17,500km/yr	3,325	1,750	-47%
Maintenance cost/year	7,270	600	
Insurance	3,299	3,674	
Financing cost	2,435	2,256	
Depreciation	22,600	32,400	
Total running cost (17,500km/yr)	16,329	8,280	-49%
TCO for 5 years	412,533	383,288	-7%

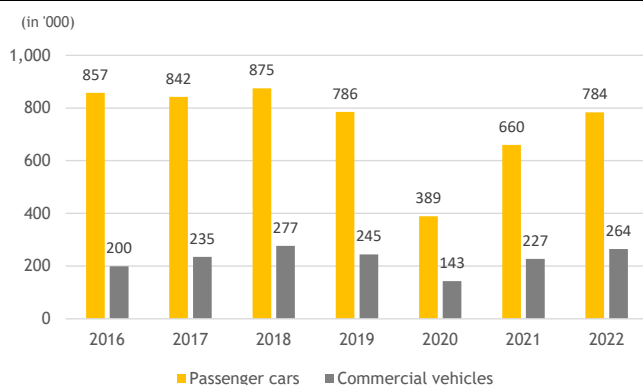
Source: Maybank IBG Research

16. ASEAN: Industry Highlights by Country

Indonesia

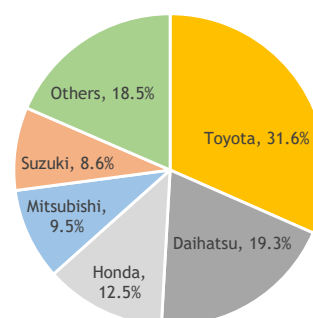
Indonesia was the largest vehicle market in ASEAN in 2022, with sales of 1,048,040 units, +18% YoY. 75% of the sales were passenger cars and the rest were commercial vehicles. Sales in 2022 were the best in five years (2018-2022). In terms of market share, Toyota led with 31.6%, followed by Daihatsu at 19.3%, Honda at 12.5%, Mitsubishi at 9.5% and Suzuki at 8.6%.

Fig 131: Indonesia: 4-wh sales - car at 783,563 and CV at 264,477 for 2022



Source: Gaikindo

Fig 132: 2022 4-wh sales market share: Toyota leads with 31.6% followed by Daihatsu at 19.3%



Source: Gaikindo

In 2022, total 2-wh sales were 5.4m, higher by 4.4% YoY making it the third-largest 2-wh industry globally. The market is dominated by Japanese manufacturers - all locally producing and exporting as well. Among them, Honda is the market leader with share of 74%, a wide gap over the followers, Yamaha (23%), Kawasaki (1.3%) and Suzuki (1.5%).

Sales of 4W EVs jumped to over 20,000 units in 2022 - six times the volume in 2021 - as more affordable options, such as the Wuling Air EV and Suzuki Ertiga Hybrid, entered the market.

The growth of electric 2-wh was strong, with L1 segment (equivalent to sub-50cc ICE vehicles) jumping 70.7% and the L3 segment increasing by 39.3%.

Fig 133: Summary of EV initiatives

Parameters	Key details
Taxation Policy and incentives	<ul style="list-style-type: none"> BEVs continue to be exempt from luxury tax and a special 0% import duty for 4-wh EVs, as long as the vehicles are imported in incomplete conditions.
	<ul style="list-style-type: none"> Hybrid EVs will be taxed 5%-12%. In addition, the government will also provide tax holiday incentives for up to 10 years if EV manufacturers make at least an IDR5t (USD346.2m) investment in the country.
	<ul style="list-style-type: none"> Subsidy of IDR 80,000,000 (USD 5,000) will be given for purchasing a new battery-electric vehicle and half that amount for purchasing a conventional hybrid. New electric motorbikes will receive a purchase subsidy of IDR8,000,000 (USD520), and the government will pay IDR5,000,000 (USD320) for converting an ICE two-wheeler to an electric 2-wh
Governments Targets	<ul style="list-style-type: none"> Indonesia's goal is too ambitious - to export 1m cars by 2025, of which 20% will be EV i.e. 400k EVs. Achieve a cumulative 2.2m EV cars by 2030. It also wants to replace all conventional cars with EVs by 2050.
	<ul style="list-style-type: none"> The country targeted more than 2m EVs including e-bikes on the roads by 2025 vs c.20k now and produce 7.7m electric 2-wh by 2025. Achieve a cumulative 13m electric 2-wh by 2030.
	<ul style="list-style-type: none"> The government targets EV cars produced in Indonesia must have at least 40% local content by 2023, at least 60% by 2029, and at least 80% by 2030. This is specified in the regulations but how the country will achieve such high levels is not mentioned.
4 Wheeler and 2 Wheeler	<ul style="list-style-type: none"> The country is pushing the EV industry to meet its target of reducing gas emissions by 29% by 2030 and achieve zero-carbon emission by 2060
	<ul style="list-style-type: none"> Actions to be taken to increase 4-wh: a) no import duty for four-wheel EVs, as long as the vehicles are assembled locally. The incentive is applicable for BEVs, including semi-trailer road tractors and vehicles that can carry 10+ passengers; b) mainstream EV as civil servants' vehicles. Targets 133k EV cars and 400k e-bikes for its government's operational needs by 2030; and c) Jakarta government has exempted EV cars from the odd-even traffic policy.
	<ul style="list-style-type: none"> There are 15 domestic e-bike OEMs with a production capacity of up to 877,000 e-bikes annually. Actions to be taken to increase 2-wh: a) 2-wh favoured over cars nationally. So the government also aims to have e-bikes to make up 20% of the total domestic production; and b) develop homegrown EV battery industry with 80% output for domestic market. This will bring parity between e-bikes and conventional 2-wh.
Public Transport and charging infrastructure	<ul style="list-style-type: none"> In Jakarta, only 10 e-buses are lined up which is very less compared to the total of c.7k buses to be added. Meanwhile, Jakarta's largest taxi operator has 30 EVs only. However, these models have a limited range and cannot go too far from the few public charging stations available in the city.
	<ul style="list-style-type: none"> Indonesia lags the most in its charging infrastructure. Currently, Indonesia has 104 public charging points distributed in 38 cities. Another 44 stations of ultrafast EV chargers and 100 home charging units will be added this year.
Battery Infrastructure	<ul style="list-style-type: none"> Indonesia has extensive cobalt reserves and the world's largest nickel reserves - the primary raw materials for Lithium-ion batteries that power EVs. In 2020, Indonesia's nickel reserves amounted to approximately 21m MT vs 94m MT globally.
	<ul style="list-style-type: none"> The country aims to be a regional EV battery hub in 2030 by rolling out various initiatives. It banned the export of nickel in 2020 and it's building domestic processing capacity. The country will set up its first EV battery plant and aims to begin production this year.
	<ul style="list-style-type: none"> Indonesia plans to relax the regulation in the establishment of EV infrastructure and invite big players in EV to invest in Indonesia. OEMs and battery component makers such as Contemporary Amperex Technology Co Ltd. (CATL) - China, LG Chem Ltd.- Japan, Panasonic Corp., and Mercedes have expressed interested to participate in the investment of a lithium battery manufacturing and recycling facility, valued at USD4b.

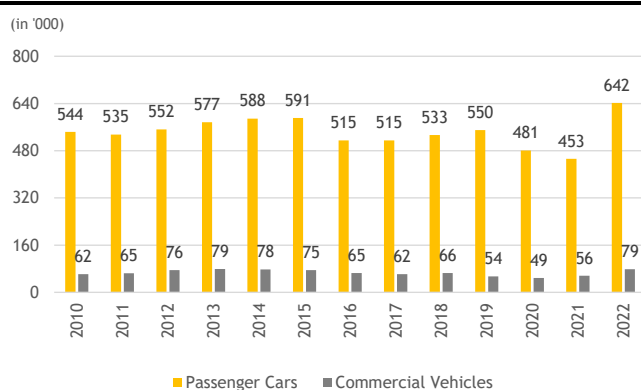
Source: Maybank IBG Research

Malaysia

After two consecutive years of declines in sales, the total industry volume in the 4-wh market turned around to register sales of 720,658 units in 2022. The increase was driven by: i) pent-up demand for new vehicles, especially during 1H22; ii) the authorities' decision to allow buyers with confirmed bookings (with sales tax exemption and submitted before 30 June 2022) to register their new passenger vehicles by 31 March 2023; and iii) partially due to the low-base effect.

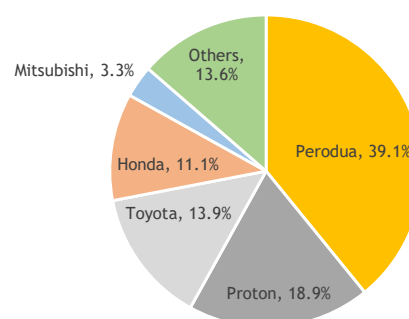
Electric 4-wh sales surged to 2,631 in 2022 from 274 in 2021. According to the road transport department (JPJ), there are more than 10,000 fully electric vehicles registered in the department's database, as of Dec'22.

Fig 134: Malaysia: 4-wh sales - passenger vehicles at 641,773 and commercial vehicles at 78,885 for 2022



Source: Malaysian Automotive Association

Fig 135: 2022 4-wh sales market share: Perodua leads with 39.1%, followed by Proton at 18.9%



Source: Malaysian Automotive Association

The Malaysian motorcycle market is the 12th largest motorcycle market globally. In 2022, Malaysia reported the sale of 671,386 motorcycles, 9% higher YoY. Yamaha is the market leader, followed by Honda. While still a very small market, electric bike sales increased by 65.3% in 2022.

The United Nations Environment Programme is working with EV associations in Malaysia, the Philippines, Singapore and Thailand to develop comprehensive recommendations for policymakers to spur the adoption of EVs among the general public and plans for government fleet electrification, which will further pave the way to instil public confidence and interest. The summary of EV initiatives in Malaysia is shown below:

Fig 136: Summary of EV initiatives and market in Malaysia:

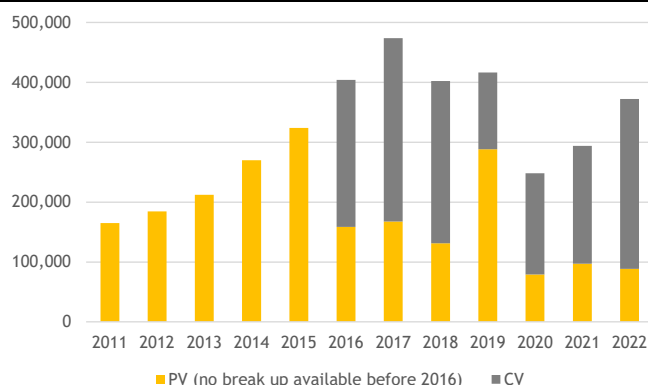
Parameters	Key details
Taxation Policy and incentives	<ul style="list-style-type: none"> Malaysia's EV tax incentives apply to three categories and apply to full EV i.e. excludes hybrid. The incentives are as follows: <ul style="list-style-type: none"> 1) Imports: Imported EVs have full import and excise duty exemptions until the end of 2023. 2) Local assembly: Locally assembled EVs have full import and excise duty exemptions, and a sales and service tax waiver until the end of 2025. 3) Owners: EV owners are exempted from road tax and can claim a personal tax exemption of up to MYR2,500 (USD571) for costs relating to EV charging hardware and services, including the purchase, installation, rental, and subscription fees of EV charging facilities, until end-2023. The above tax incentives are effective as of 1 Jan'22, except for the road tax exemption, which came into force on 15 Feb'22. These incentives will ensure buying EVs in Malaysia is more affordable. Currently, all EVs in Malaysia are imported and there is no local assembly. However, given the greater incentives for local assembly, it could lead to the development of a domestic EV assembly industry.
Governments Targets	<ul style="list-style-type: none"> Ministry of Environment and Water unveiled the Low Carbon Mobility Blueprint 2021-2030. The blueprint aims to increase the use of EVs to lower GHG emissions in the country. Currently, Malaysia has 31k EVs on road - mostly hybrids and 400 charging stations. Government targets EVs to make up 15% of total auto industry volumes by 2030 i.e. more than 100k EVs.
4 Wheeler and 2 Wheeler	<ul style="list-style-type: none"> Actions to be taken to increase 4-wh EVs are: a) adopt EVs for taxi fleet; b) provide EV incentives for the market; c) ensure sufficient EV charging infrastructure; and d) provide R&D grants and support to manufacturers of local EVs. Actions to be taken to increase 2-wh EVs are: a) use e-motorcycles for delivery services; b) develop battery swapping standard for e-motorcycles; c) provide support to manufacturers of local e-motorcycles and d) provide tax incentives for purchase of e-motorcycles for delivery service. For mass adoption of EV, PHEV (plug-in hybrid EV) is considered a transition technology to move towards full BEV (battery EV). The government will adopt EV for its fleets to catalyze for wider adoption. It targets 10%/50% of its fleet to be EV by 2022/2023-2025. It has provided PHEV support for EV charging infra development fund - MYR5k per PHEV in 2021-2025.
Public Transport	<ul style="list-style-type: none"> Actions to be taken to increase e-buses are: a) establish e-bus central procurement agency; b) establish public transport tariff and electricity subsidy; c) Providing support to manufacturers of local EV bus. For this, the government has established a revolving fund of MYR450m for e-bus competitive leasing and annual MYR100m fund. Ministries and state government have been asked to subscribe to e-bus. Currently, there is no dedicated tax incentive for investment in 'green' production and distribution activities including cos involved in production, distribution and services related to low-carbon transport.
Charging Infrastructure	<ul style="list-style-type: none"> Currently, Malaysia has c.31k EVs on the road. To cater to this market, Malaysia should have 1,000 charging stations but it has only c.400. Malaysia's government has pledged to build 10k EV charging stations by 2025 in collaboration with the private sector and 125k by 2030. Companies that contribute to building EV infra in Malaysia will benefit from government incentives, such as tax breaks. Actions to be taken to increase e-buses are: a) facilitate private EV charging operators; b) provide EV charging infra in areas not serviced by private operators; and c) incorporate requirement for installing EV charging facility in planning permission for all new buildings. The availability of public DC chargers is among the concern of Malaysian consumers. Among the recent efforts, Malaysia Automotive Robotics and IoT Institute (MARii) and the Malay Vehicle Importers and Traders Association of Malaysia have signed a collaboration to set up a network of 1000 DC rapid charging stations around the country by 2025.
Major EV Players	<ul style="list-style-type: none"> There are only a few EV brands in Malaysia, of which all are imported. Local brands such as Proton and Perodua are yet to launch EVs in Malaysia. Companies like Eclimo have adopted a B2B model, where they rent/sell their e-bikes to corporates such as KFC. Renting EVs has been increasing in Malaysia.

Source: Maybank IBG Research

Philippines

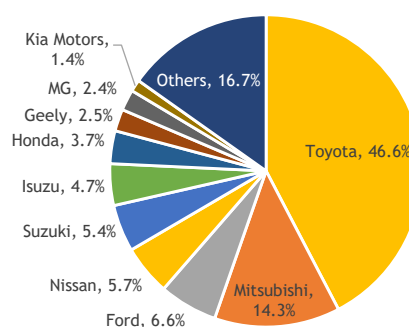
The automotive industry in the Philippines is one of the smallest in ASEAN (albeit bigger than Singapore's). In 2022, auto sales rose 27% YoY to 372,265. This surge was from a low-base due to the Covid-19 impact in 2021, and improvement in availability of jobs and employment. 75% of the sales were commercial vehicles and the rest cars. The Chamber of Automotive Manufacturers of the Philippines (CAMPI) targets 336,000 unit sales in 2023, +17% YoY.

Fig 137: 4-wh sales rose over 2020-22, however still lower than the peak in 2017



Source: AutoIndustriya.com

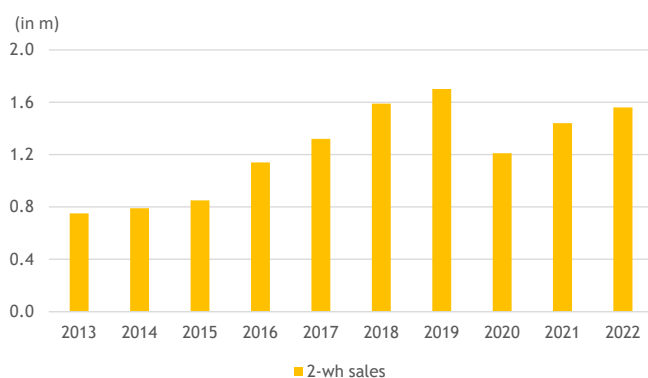
Fig 138: ...Toyota leads maintaining its top position, followed by Mitsubishi a distant 2nd



Source: AutoIndustriya.com

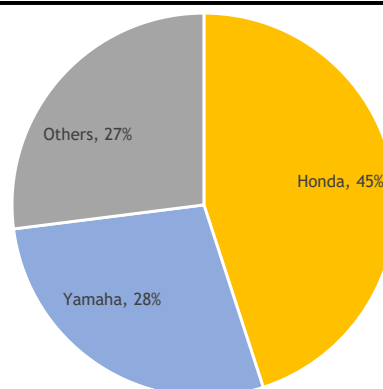
Bike sales in 2022 rose 8% YoY to 1.56m units. Scooters is the largest segment at about 900,000 units, business motorcycles (mostly converted to 3-wh) was at 21% of sales, mopeds at 16% and street motorcycles at 4%. The balance were big bikes and recreational off-road vehicles. The Motorcycle Development Program Participants Association forecasts a 10% YoY growth in 2023.

Fig 139: 2-wh sales at 1.56m in 2022, close to its peak in 2019



Source: Statista

Fig 140: ...driven by Japanese makers - Honda and Yamaha



Source: Statista

Fig 141: Summary of EV initiatives and market in the Philippines

Parameters	Key details
Taxation Policy and incentives	<ul style="list-style-type: none"> 30% discount on registration fees for BEVs and 15% for hybrid EVs. Additionally, priority registration and renewal will be given to EVs Hybrid EVs get 50% off on excise taxes, while BEVs get 100% exemption EVs will be issued a special type of license plate. New act has been enforced via which both public and private establishments are mandated to dedicate a portion of available parking spaces for EV use. In a buildings or malls with 20 parking slots, at least 5% must be set aside for EVs. The importation of completely built charging stations shall be exempt from the payment of duties for eight years from the effectivity of Electric Vehicle Industry Development Act (EVIDA) Manufacturers of EV parts, and operators of charging stations are granted a tax holiday for 3-6 years and excise tax incentives for the importation of capital equipment. The country has reduced the rates of import duty on EV components, parts, and accessories for the assembly of EVs, thereby allowing imports more affordable
Governments Targets	<ul style="list-style-type: none"> The roadmap targets to achieve 21% EVs of total vehicles in the country by 2030 with a focus on public transportation, and 50% by 2040. The Electric Vehicle Association of the Philippines has revised its growth target for EV adoption in the country from 300,000 units by 2030 to 1.0m units in anticipation of incentives for the sector, clearer regulations, and growing awareness of the benefits of using EVs.
4-Wheeler, 2-Wheeler and Public Transport	<ul style="list-style-type: none"> The country has not announced any specific actions to catalyze sales of EVs. Income tax of up to 50% is deductible from total expense on skills training and research development related to EVs.
Charging Infrastructure	<ul style="list-style-type: none"> The EV charging infrastructure is currently underdeveloped in the country as of now. The short term goal is to focus initially in "EV Lead Areas" and eventually expand throughout the country. 2,000 charging stations by end of 2030. A new law will be passed requiring gasoline stations nationwide to provide space for the installation of charging stations, which will be run either by station owners or third-party service providers. Global EV charging companies such as Delta, ABB, Wall chargers and Tritrium DC, and IMI have already entered the market in partnership with local groups. Imported charging stations shall be exempt from the payment of duties (10%-30% depending on source) for eight years
Major EV Players	<ul style="list-style-type: none"> Local EV manufacturers such as BEMAC, PhUV, PinoyAko Corporation, Star, ToJo Motors have been producing e-trikes and e-jeepneys. However, Toyota owns 95% share of the EV market with its hybrid EVs like the Prius, Prius C, and Corolla Altis Hybrid.

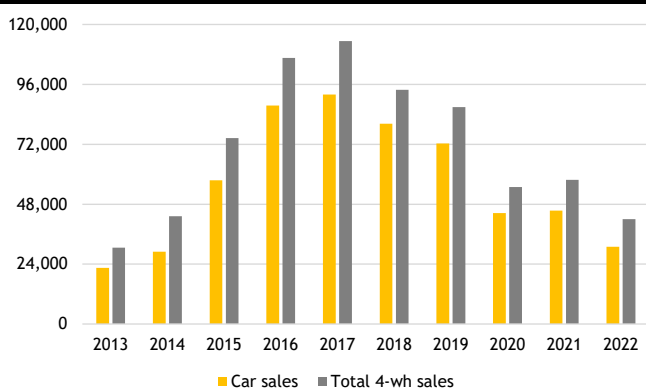
Source: Maybank IBG Research

Singapore

The Singapore automotive market is a peculiar market wherein automotive sales is dependent on a vehicle quota system (Certificate of Entitlement) approved by the government. The country does not have any manufacturing with all vehicles imported.

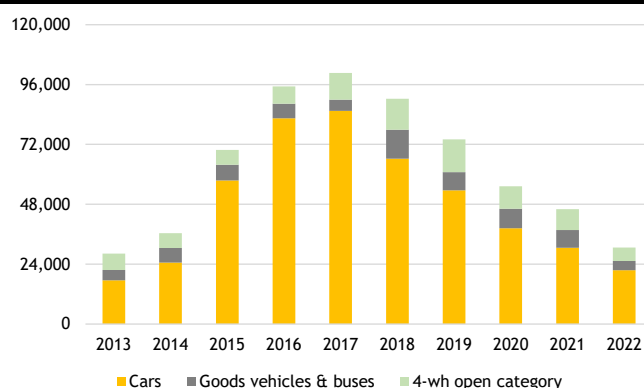
Car manufacturing is also set to return to Singapore with a new smart plant in Jurong as Hyundai plans to build up to 30,000 EVs a year by 2025. Built on a 44,000 sq.m plot, the facility will serve as an innovation lab for research and development into mobility concepts.

Fig 142: 2022 - 4-wh sales dependent on the government's vehicle quota system



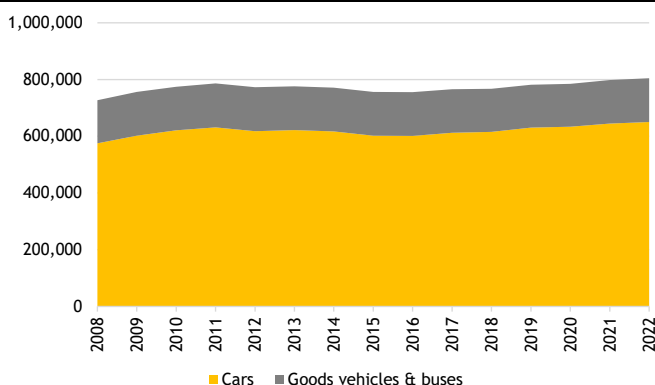
Source: Marklines

Fig 143: Yearly quota for cars, goods vehicles and 4-wh open category announced by the government



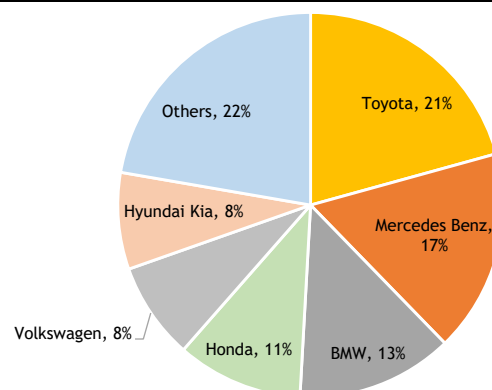
Source: Land transport Authority

Fig 144: 2022 - car sales dependent on the government's vehicle quota system



Source: Land transport Authority

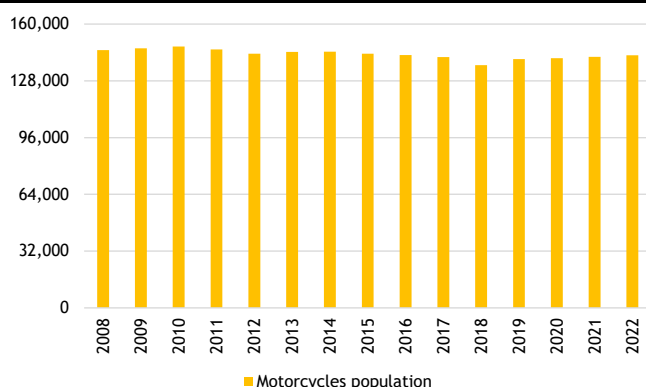
Fig 145: 2022 car sales market share: Toyota led with 21%, followed by Mercedes at 17%



Source: Marklines

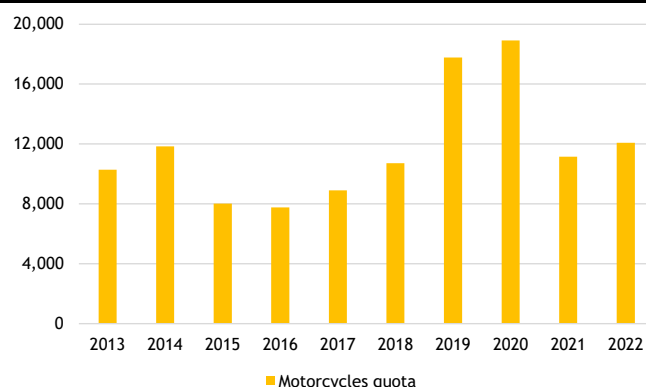
The Singaporean motorcycle market is the smallest one in the ASEAN region. Motorcycle sales are also dependent on the quota system, which has ranged between 10,000 and 19,000 in the last 11 years. As of December 2022, there were 142,404 motorcycles registered in Singapore.

Fig 146: 2022 - Motorcycle population steady at about 142k



Source: Land transport Authority

Fig 147: Motorcycles quota averaging at about 11k annually



Source: Land transport Authority

Fig 148: Summary of EV initiatives and market in Singapore

Parameters	Key details
Taxation Policy and incentives	<ul style="list-style-type: none"> The tax scheme provided by the Singapore government is based on the carbon emission of the vehicle, which is favourable for EV adoption. As EVs are carbon-free, they are placed in the A1 band and eligible for a rebate of SGD20,000 (-USD 14,500).
Governments Targets	<ul style="list-style-type: none"> Singapore has set an ambitious goal to sell only EVs after 2030 and phase out all ICE vehicles by 2040. It targets to set up 40,000 public and 20,000 private electric charging stations by 2030
4 Wheeler and 2 Wheeler	<ul style="list-style-type: none"> Additional Registration Fee (ARF) floor reduction from 1 January 2022 to 31 December 2023: The ARF floor will be lowered from SGD5,000 to NIL for fully electric cars. EV Early Adoption Incentive (EEAI) from 1 January 2021 to 31 December 2023: Owners who register fully electric cars will receive a rebate of 45% off the Additional Registration Fee (ARF), capped at SGD20,000. Enhanced Vehicular Emissions Scheme (VES): Rebates are given on the basis of carbon emissions of cars with a maximum rebate of SGD25,000. From 1 January 2021 to 31 December 2022, rebates for certain categories of vehicles were increased by SGD5,000 for cars, and SGD7,500 for taxis. Revision of road tax framework for electric cars from 1 January 2022: Road taxes for fully electric and petrol electric cars will be reduced by up to 34% for those whose cars are in the 90-230kW power rating bracket. The road tax structure for electric bikes will be aligned with that of conventional ICE bikes, with their power ratings pegged to those of ICE equivalents.
Public Transport	<ul style="list-style-type: none"> The Land Transport Agency targets to replace 400 diesel buses with electric by 2025, half of the buses to electric by 2030 and 100% electric/hybrid by 2040. It plans to expand the rail network by about 360km by 2030. Taxi companies will only need to pay the minimum Additional Registration Fee of SGD5,000 for mass market EV taxi models, as fleets like taxis stand to benefit more from the lower mileage costs of EVs.
Charging Infrastructure	<ul style="list-style-type: none"> Singapore government has proposed an initiative to install 60,000 charge points by 2030, including 40,000 in public car parks and 20,000 on private premises. With 60,000 chargers by 2030, the ratio of EVs to chargers will be approximately 5 to 1, assuming one-third of cars on the roads are EVs.
Major EV Players	<ul style="list-style-type: none"> US car brand Tesla came out top with one in three convinced of its green credentials. Other leading eco-motoring technology companies include BMW (Germany), Honda (Japan), Mercedes-Benz (Germany), Audi (Germany), Volvo (Sweden) and BYD (China).

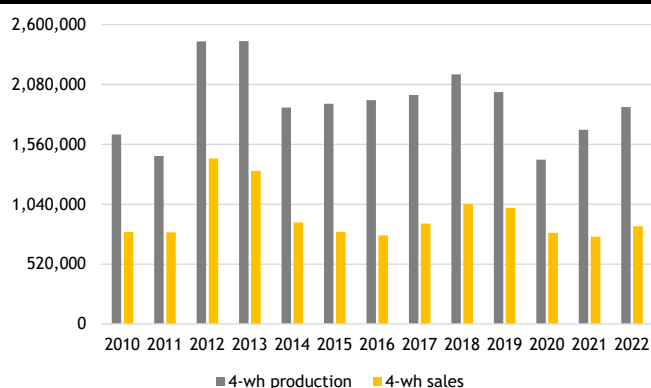
Source: Maybank IBG Research

Thailand

The automotive industry in Thailand consists of 27 motor vehicle makers and 18 motorcycle producers. Over 90% of these are owned by multi-nationals. 525 suppliers are in the 1st tier. About 65% of these are majority owned by foreigners. There are 1,760 suppliers in the 2nd and lower tiers, about 70% of which are Thai-owned. Thailand has all the ingredients for becoming a manufacturing hub for exports within the region and other western markets.

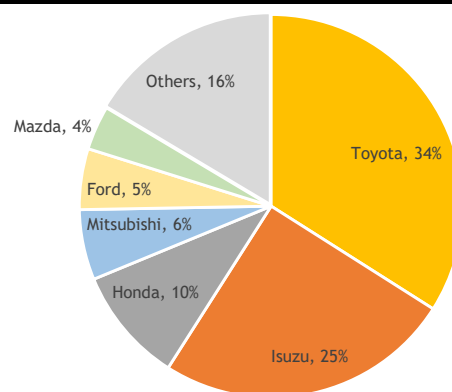
In 2022, Thailand's car production totalled 1.88m. Of this, 0.84m cars were assembled for domestic distribution and 1m for export. Total car production is forecast at 1.95m for 2023, up 3.5% from 2022 by the Automotive Industry Club - The Federation of Thai Industries. Pickups represented 62% of total car production in Thailand, while passenger cars shared 35% and other commercial vehicles (trucks, vans and buses) is 2%.

Fig 149: 4-wh production and sales data, Thailand an assembly hub for the region



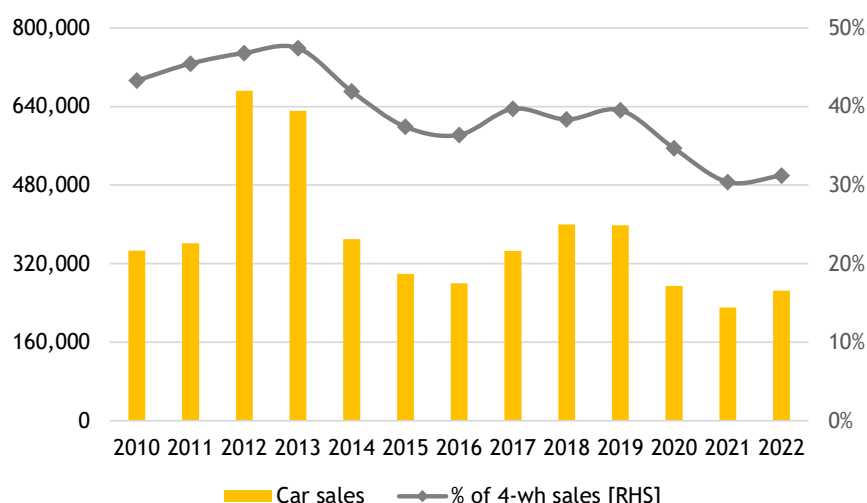
Source: Federation of Thai Industry

Fig 150: 2022 - Toyota leads 4-wh sales at 34%, followed by Isuzu at 25%



Source: Headlight Magazine

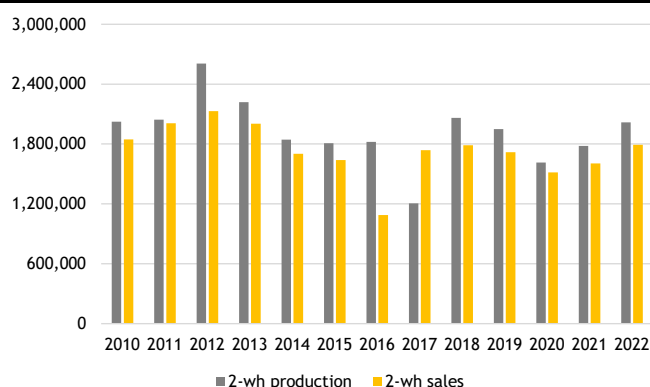
Fig 151: Thailand car sales at 30-31% of total 4-wh sales



Source: Federation of Thai Industry

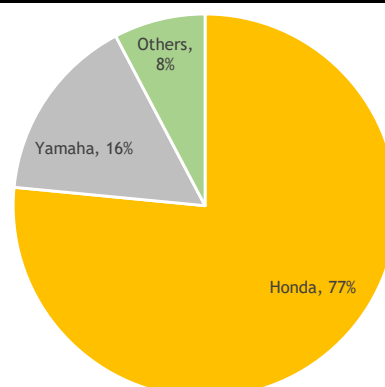
In 2022, about 2.0m motorcycles were produced in Thailand. Of the total, 1.99m were for domestic sales and 0.42m for export. The 2023 figure is expected at 2.1m, up 4% from 2022, by the Automotive Industry Club - The Federation of Thai Industries. Commuters represented 82% of total motorcycle production, sport (<150 cc, 150-399 cc, >400 cc) shared the remaining 18%. Meanwhile, the BEV motorcycle production was small.

Fig 152: 2022 - 2-wh sales at 1.8m best in last nine years



Source: Federation of Thai Industry

Fig 153: ...Honda holds 77% market share



Source: Statista

Fig 154: Summary of EV initiatives and market in Thailand:

Parameters	Key details
Taxation Policy and incentives	<ul style="list-style-type: none"> Thailand promotes EVs by reducing import tariff on EVs ranging from 80% to 0-60%, depending on the battery capacity, until 2023. In addition, the government also agreed to reduce the excise tax and import duties on completely knocked down and completely built-up units to stimulate wider and faster use of EVs in the country. The Thai Cabinet also approved measures to promote domestic manufacturing of EVs, including exemption of import duties on significant electrical parts between 2022-2025. The government will cut excise tax on imported EVs to 2% from 8% for BEVs and 0% for pickup trucks. Eligible car manufacturers will also receive excise tax subsidy for passenger cars and motorcycles both imported up to 2023 and assembled in Thailand up to 2025 and pickups only if manufactured in Thailand
Governments Targets	<ul style="list-style-type: none"> Thailand aims to be an EV production hub in Asia and the country expects to produce EVs at 30% of Thailand's total auto production or 725,000 units/year by 2030. The EV committee 2021 formulated a bold roadmap for EV adoption with a target for ZEV production of 725,000 EV cars and pick-ups plus 675,000 EV motorcycles, and 34,000 buses and trucks. The National Electric Vehicle Policy Committee has set the target of EV production (HEV, PHEV, BEV and FCEV) at 1.05m units in 2025, 6.22m in 2030, and 18.4m in 2035.
4 Wheeler and 2 Wheeler	<ul style="list-style-type: none"> Also receive excise tax subsidy of THB70,000 - 150,000 (USD2200-4400) for each EV passenger car (price ≤ THB2m) depending on the battery capacity, THB150,000 for domestically manufactured pickups (price ≤ THB2m) and battery size of over 30kWh and THB18,000 for electric motorcycles (price ≤ THB150,000)
Public Transport	<ul style="list-style-type: none"> EV adoption with a target of 34,000 buses Government EV fleet policy usage.
Charging Infrastructure	<ul style="list-style-type: none"> As of Sep 2022, there were 12 EV charging service providers with a total of 2,572 EV chargers (1,384 AC chargers - type 2, 246 CHAdeMO chargers and 942 DC chargers- CSS2) Electricity price for EV charging station was set at THB2.6/kWh Adding to the 5-year corporate income tax exemption available to investments in charging stations with at least 40 chargers, 25% of which are the DC type, the revised measures now allow smaller charging stations to be eligible for 3-year tax benefits. According to the EV roadmap, the National EV Policy Committee has set a target to have 12,000 DC quick chargers in 2030 and 36,500 in 2035.
Major EV Players	<ul style="list-style-type: none"> Mine Mobility develops EVs, while its other subsidiary, Energy Mahanakhon, provides "EA Anywhere" charging stations. So far, MINE has developed three EVs: MINE SPA1, MINE bus, MINE Smart Ferry. Thai firm SHARGE has 250 EV charging stations across Bangkok, Hua Hin, Pattaya and Khao Yai. It set up its first charging station in Bangkok's Central Embassy shopping mall and then in Central Chidlom.

Source: Maybank IBG Research

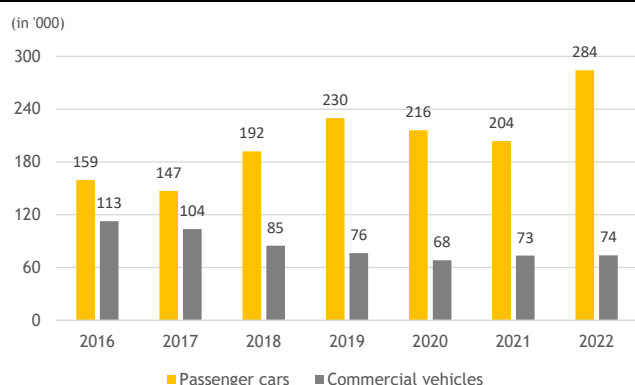
Vietnam

While Vietnam is the fourth largest auto market in ASEAN, it has one of the lowest average localization levels. The auto industry has not invested in core and high technology products such as engine production and transmission systems. Only low-tech products such as tires, seats, mirrors, glass, etc. are available locally. Due to this, Vietnam imports 80-90% of the main raw materials, which results in domestic auto production cost being 10%-20% higher vs other countries in ASEAN.

Vehicle sales in Vietnam rose 29% YoY to 358,063 units. 79% of the sales was passenger cars and the rest commercial vehicles. Sales in 2022 was the best in at least the last seven years. In terms of market share, Toyota led with 25.4%, followed by Kia at 17%, Mitsubishi at 11.1%, Mazda at 10.1%, Honda at 8.6% and Ford at 8.1%.

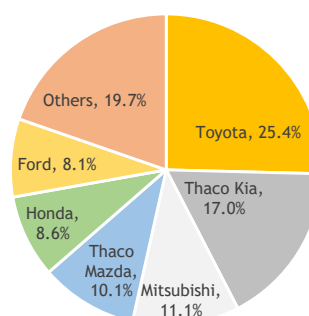
Although Vietnam has a high import tax for autos, imported cars are more popular, primarily due to the limited capacity and capability of the domestic sector. The automobile market has thus been dominated by foreign brands, especially by Japanese and South Korean manufacturers.

Fig 155: Vietnam: vehicle sales - passenger vehicles (cars) at 284,317 and commercial vehicles at 73,746 for 2022



Source: Vietnam Automotive Manufacturers Association (VAMA)

Fig 156: 2022 vehicle sales market share: Toyota leads with 25.4%, followed by Kia at 17%



Source: Vietnam Automotive Manufacturers Association (VAMA)

In Vietnam, 2-wh sales in 2022 reached 3.3m units, +18.1% YoY. This is the best sales numbers in the last three years. The market leader in the electric bike market is currently Honda with 63% market share.

Vietnam is the second largest electric bike market after China and unit sales data confirms this trend with the L1 segment up 11.5% YoY and L3 segment up 59.7% YoY.

With a population of about 100m, more than 60% of Vietnam's population owns bikes. Vietnam's car ownership rate of 6.5% is low. This rate is expected to increase to 9% by 2025 and to 30% by 2030 as per capital markets consulting firm ARC Group, making Vietnam one of the countries with the fastest-growing demand for cars. We expect Vietnam's 2-wh market to grow at a formidable rate, driven by the rapidly expanding auto sector and increasing R&D investments by foreign players.

The EV market in Vietnam is in its infancy but there is potential for significant growth.

Fig 157: Summary of EV initiatives and market in Vietnam:

Parameters	Key details
Taxation Policy and incentives	<ul style="list-style-type: none"> Vietnam's EV policies are still considered as measures to promote the EV market over the short term only. BEV cars are exempt from the registration fee for three years from Mar'22. After Mar'25, this fee will be 50% of that for conventional cars till Mar'27. The country will reduce the excise tax placed on EVs to 2-15% depending on the number of seats to encourage investment in developing EV battery. The country has implemented a special consumption tax for EVs, which have only increased from 5% to 15% since 2018 vs an increase of 35% to 150% in the same period for conventional cars. The government previously introduced a number of tax reduction preferences for assembling components and producing EVs, although these policies were not viewed as attractive to manufacturers.
Governments Targets	<ul style="list-style-type: none"> The Vietnamese government established three future transportation goals by 2025: a) 250,000 EV units production annually; b) 20,000 charging stations; and c) 15 - 20% of Hanoi public transportation will use renewable energy by 2025.
4 Wheeler and 2 Wheeler	<ul style="list-style-type: none"> Actions taken for 4-wh EV sales: BEV cars are exempt from the registration fee for three years from Mar'22. Vietnam currently does not have specific incentives for electric bikes. The country targets e-bikes to reach 5% of total in Hanoi by 2030. Startup companies are also trying to promote electric bikes. VinFast is also currently producing many models of electric bikes.
Public Transport	<ul style="list-style-type: none"> Ensure 100% of buses and taxis will run on electricity or green energy by 2050. Aims to develop 200 e-buses in circulation by 2025 in Nha Trang region.
Charging Infrastructure	<ul style="list-style-type: none"> Vietnam has no charging infrastructure. Aims for complete nationwide charging infrastructure by 2050. To expand its EV ecosystem, this year, VinFast will set up more than 2,000 charging stations across 63 provinces and cities with nearly 40,000 charging ports.
Major EV Players	<ul style="list-style-type: none"> VinFast is the only domestic enterprise investing in EV production in Vietnam. VinFast has launched its VF 8 VND1.1b-1.2b (USD45k-53k) and VF 9 models VND1.4b-1.5b (USD62k-67k) in 2022. Thaco, the local assembler and distributor of Kia, has debut its Kia EV6 in 2022. Pega, a local start-up producing electric scooters, opened a factory with an annual production capacity of 40,000 units in Bac Giang province in 2017.

Source: Maybank IBG Research

Company reports section

Merdeka Copper (MDKA IJ)

Diversified multi-asset with multiple operations and growth projects

MDKA's portfolio

Supported by its vast resources and strong operational excellence, MDKA has grown rapidly as a well-known diversified multi-asset mining group with multiple operations and long-term growth projects. MDKA currently has three producing assets: Tujuh Bukit Gold (TB gold) mine, Wetar copper mine and Merdeka Battery Materials (MBM); and three developing assets: Tujuh Bukit Copper (TB copper) project, Pani gold project and Acid Iron Metal (AIM) project.

Key growth driver

MDKA's main growth driver is its TB copper project as it has one of the world's largest copper and gold resources, with inferred resources of 1.78bt containing 8.2Mt of copper and 28.6Moz of gold. We expect the Upper High Grade Zone to begin operation in 2026, generating USD696m in EBITDA per annum by FY30E, more than tripled FY21 EBITDA. Meanwhile, AIM and Pani projects is scheduled to start operation in FY23E/FY25E, generating USD95m/USD218m EBITDA per annum respectively.

Until the TB copper project commences, the bulk of MDKA's earnings growth will be led by its existing nickel operation. MBM owns one of the largest nickel resources (1.1bn dmt containing 13.8Mt nickel) and three NPI smelters with total capacity of 88Kt per annum. We forecast nickel segment FY26E revenue/EBITDA to grow to USD1.3b/478m, registering a 33%/63% CAGR respectively.

BUY with TP of IDR5,300

On a consolidated level, we forecast MDKA's EBITDA/NPAT to register a 27%/32% CAGR over FY21-30E to USD1.6b/806m, once all assets fully operate. Earnings growth will come in stages as new projects come on line, driven by: 1) nickel [FY22E-26E]; 2) AIM project [FY22E-26E]; 3) Pani gold project [FY25E-28E]; and 4) TB copper gold project [FY26E-30E]. For FY30E, we expect revenue to be driven by nickel (51%), gold (24%), copper (22%) and others (3%).

FYE Dec (USD m)	FY20A	FY21A	FY22E	FY23E	FY24E
Revenue	322	381	864	1,114	1,676
EBITDA	130	184	304	335	496
Core net profit	56	59	73	87	136
Core FDEPS (cts)	0.3	0.3	0.3	0.4	0.6
Core FDEPS growth(%)	(30.6)	0.2	18.5	18.3	56.6
Net DPS (cts)	0.0	0.0	0.0	0.0	0.0
Core FD P/E (x)	65.9	nm	74.6	63.1	40.3
P/BV (x)	6.9	8.1	4.9	4.6	4.1
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
ROAA (%)	6.0	5.3	3.2	2.6	3.8
EV/EBITDA (x)	29.4	33.4	22.2	20.4	14.4
Net gearing (%) (incl perps)	23.5	19.0	28.6	23.6	30.5
Consensus net profit	-	-	57	70	116
MIBG vs. Consensus (%)	-	-	103.8	23.8	17.0

BUY

Share Price IDR 3,400
12m Price Target IDR 5,300 (+56%)

Company Description

PT Merdeka Copper Gold Tbk operates as a holding company, which engages in the mining, exploration, and production of gold, silver, copper and nickel.

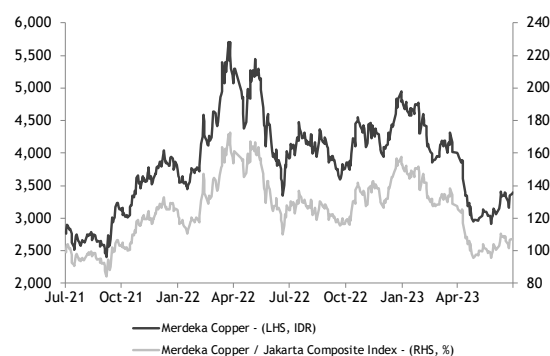
Statistics

52w high/low (IDR)	4,950/2,910
3m avg turnover (USDm)	10.2
Free float (%)	51.4
Issued shares (m)	24,111
Market capitalisation	IDR82.0T
	USD5.5B

Major shareholders:

Saratoga Investama Sedaya	18.3%
Mitra Daya Mustika	12.1%
Garibaldi Thohir	7.4%

Price Performance



	-1M	-3M	-12M
Absolute (%)	8	(15)	(13)
Relative to index (%)	4	(17)	(14)

Source: FactSet

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FYE 31 Dec	FY20A	FY21A	FY22E	FY23E	FY24E
Key Metrics					
P/E (reported) (x)	61.0	120.2	45.8	63.1	40.3
Core P/E (x)	65.2	101.4	72.8	63.1	40.3
Core FD P/E (x)	65.9	nm	74.6	63.1	40.3
P/BV (x)	6.9	8.1	4.9	4.6	4.1
P/NTA (x)	6.9	8.1	4.9	4.6	4.1
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
FCF yield (%)	2.0	0.6	nm	0.8	nm
EV/EBITDA (x)	29.4	33.4	22.2	20.4	14.4
EV/EBIT (x)	51.4	89.9	34.9	37.7	22.1
INCOME STATEMENT (USD m)					
Revenue	321.9	381.0	864.4	1,114.0	1,676.0
EBITDA	129.9	183.6	303.6	335.4	495.8
Depreciation	(42.5)	(74.0)	(101.8)	(146.3)	(162.9)
Amortisation	(13.1)	(41.3)	(8.6)	(7.6)	(10.1)
EBIT	74.3	68.2	193.3	181.4	322.8
Net interest income / (exp)	(18.1)	(11.5)	(13.7)	(35.0)	(32.5)
Associates & JV	0.0	0.0	0.0	0.0	0.0
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	0.0	0.0	0.0	0.0	0.0
Pretax profit	56.2	56.7	179.6	146.5	290.3
Income tax	(27.3)	(23.3)	(43.1)	(32.2)	(63.9)
Minorities	7.3	2.8	(20.0)	(27.6)	(90.8)
Discontinued operations	0.0	0.0	0.0	0.0	0.0
Reported net profit	36.2	36.1	116.5	86.6	135.7
Core net profit	56.0	58.8	73.3	86.6	135.7
BALANCE SHEET (USD m)					
Cash & Short Term Investments	51.0	185.5	471.1	473.1	191.0
Accounts receivable	2.1	0.6	110.0	71.3	107.2
Inventory	101.0	131.4	263.7	339.8	511.2
Property, Plant & Equip (net)	296.6	298.2	1,045.3	1,163.9	1,466.0
Intangible assets	0.0	0.0	0.0	0.0	0.0
Investment in Associates & JVs	0.0	0.0	0.0	0.0	0.0
Other assets	478.9	662.9	1,354.3	1,386.7	1,436.6
Total assets	929.6	1,278.6	3,244.3	3,434.8	3,712.0
ST interest bearing debt	59.1	207.5	298.0	278.0	258.0
Accounts payable	20.2	29.6	110.0	256.2	377.0
LT interest bearing debt	124.5	126.3	735.7	685.7	635.7
Other liabilities	162.0	136.0	136.0	136.0	136.0
Total Liabilities	366.0	499.2	1,279.5	1,355.7	1,406.5
Shareholders Equity	535.0	755.6	1,111.0	1,197.6	1,333.3
Minority Interest	28.7	23.8	853.8	881.4	972.2
Total shareholder equity	563.6	779.4	1,964.8	2,079.0	2,305.5
Total liabilities and equity	929.6	1,278.6	3,244.3	3,434.8	3,712.0
CASH FLOW (USD m)					
Pretax profit	56.2	56.7	179.6	146.5	290.3
Depreciation & amortisation	55.6	115.4	110.4	154.0	173.0
Adj net interest (income)/exp	(18.1)	(11.5)	(13.7)	(35.0)	(32.5)
Change in working capital	(19.7)	(19.6)	(161.2)	108.8	(86.6)
Cash taxes paid	(27.3)	(23.3)	(43.1)	(32.2)	(63.9)
Other operating cash flow	0.0	0.0	0.0	0.0	0.0
Cash flow from operations	120.0	132.9	65.6	349.5	222.1
Capex	(45.6)	(98.3)	(1,548.9)	(305.0)	(525.0)
Free cash flow	74.3	34.5	(1,483.2)	44.5	(302.9)
Dividends paid	0.0	0.0	0.0	0.0	0.0
Equity raised / (purchased)	0.0	168.3	238.9	0.0	0.0
Change in Debt	(103.1)	150.2	699.9	(70.0)	(70.0)
Other invest/financing cash flow	29.9	(215.8)	830.0	27.6	90.8
Effect of exch rate changes	0.2	(2.8)	0.0	0.0	0.0
Net cash flow	1.4	134.4	285.6	2.1	(282.2)

FYE 31 Dec	FY20A	FY21A	FY22E	FY23E	FY24E
Key Ratios					
Growth ratios (%)					
Revenue growth	(19.9)	18.4	126.9	28.9	50.5
EBITDA growth	(40.9)	41.4	65.4	10.5	47.8
EBIT growth	(41.6)	(8.1)	183.3	(6.1)	77.9
Pretax growth	(48.2)	0.9	216.6	(18.4)	98.2
Reported net profit growth	(48.9)	(0.2)	222.3	(25.6)	56.6
Core net profit growth	(29.0)	4.8	24.7	18.3	56.6
Profitability ratios (%)					
EBITDA margin	40.3	48.2	35.1	30.1	29.6
EBIT margin	23.1	17.9	22.4	16.3	19.3
Pretax profit margin	17.5	14.9	20.8	13.1	17.3
Payout ratio	0.0	0.0	0.0	0.0	0.0
DuPont analysis					
Net profit margin (%)	11.2	9.5	13.5	7.8	8.1
Revenue/Assets (x)	0.3	0.3	0.3	0.3	0.5
Assets/Equity (x)	1.7	1.7	2.9	2.9	2.8
ROAE (%)	na	na	na	na	na
ROAA (%)	6.0	5.3	3.2	2.6	3.8
Liquidity & Efficiency					
Cash conversion cycle	125.8	127.2	91.4	78.2	49.7
Days receivable outstanding	1.3	1.3	23.0	29.3	19.2
Days inventory outstanding	170.9	160.4	105.7	124.5	119.3
Days payables outstanding	46.4	34.4	37.4	75.5	88.8
Dividend cover (x)	nm	nm	nm	nm	nm
Current ratio (x)	1.0	1.4	2.0	1.6	1.3
Leverage & Expense Analysis					
Asset/Liability (x)	2.5	2.6	2.5	2.5	2.6
Net gearing (%) (incl perps)	23.5	19.0	28.6	23.6	30.5
Net gearing (%) (excl. perps)	23.5	19.0	28.6	23.6	30.5
Net interest cover (x)	4.1	5.9	14.1	5.2	9.9
Debt/EBITDA (x)	1.4	1.8	3.4	2.9	1.8
Capex/revenue (%)	14.2	25.8	179.2	27.4	31.3
Net debt/ (net cash)	132.6	148.3	562.7	490.6	702.8

Source: Company; Maybank IBG Research

Vale Indonesia (INCO IJ)

Best proxy to class-1 supply and LME nickel price

Best proxy

INCO is best positioned to capture growing demand for class-1 nickel, as it produces Ni-matte (78% Ni, 2% Co, 20% S), an intermediary nickel product that can be refined into nickel sulfate, which is used as raw material for EVs and battery. INCO produces ~72kt of nickel matte per annum, accounting for ~5% of Indonesia's 2022 nickel output.

INCO will develop all of its three existing mines

Additionally, we expect INCO to become one of the largest nickel producers in Indonesia with a total production capacity of 328kt in FY26E, driven by: 1) its existing 75kt Ni-matte production in Sorowako; 2) 120kt + 60kt new HPAL plant in Pomalaa and Sorowako; and 3) 73kt new FeNi RKEF plant in Bahodopi.

New growth projects

INCO has partnered with Zhejiang Huayou Cobalt (603799 CH, CNY65.26, Not Rated), a Chinese supplier of raw minerals for EV batteries, to build 2 HPAL plants with a total capacity of 180kt in Pomalaa and Sorowako. Both parties had signed the agreement and performed ground-breaking for the 120kt HPAL plant in Pomalaa in Nov-22. Construction will take three years, and the operation is targeted to start at the end of FY25. Meanwhile, construction of the 60kt HPAL plant in Sorowako will begin in FY23-24 and the operation is targeted to start in FY27-28.

BUY on INCO with IDR8,800 TP

We expect earnings contribution from the new projects to kick in beginning FY26E once operation fully commences. We expect it will take 2-3 years for the new plants to reach their full utilization rate and ramp up production. We forecast INCO's FY30 earnings will grow to USD527m once all plants reach full capacity, or by a 14% CAGR in FY21-30F.

FYE Dec (USD m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	953	1,179	1,292	1,156	1,097
EBITDA	388	458	554	498	481
Core net profit	166	200	273	230	212
Core EPS (cts)	1.7	2.0	2.7	2.3	2.1
Core EPS growth (%)	100.2	20.9	36.3	(15.9)	(7.8)
Net DPS (cts)	0.0	0.0	0.0	0.0	0.0
Core P/E (x)	19.7	22.6	16.1	19.2	20.8
P/BV (x)	1.5	1.9	1.7	1.5	1.4
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
ROAE (%)	7.9	8.9	11.0	8.4	7.2
ROAA (%)	6.9	7.8	9.7	7.1	5.9
EV/EBITDA (x)	7.1	8.5	7.2	9.0	9.2
Net gearing (%) (incl perps)	net cash	net cash	net cash	3.3	0.6
Consensus net profit	-	-	272	267	251
MIBG vs. Consensus (%)	-	-	0.4	(14.1)	(15.6)

BUY

Share Price IDR 6,650
12m Price Target IDR 8,800 (+32%)

Company Description

INCO is a subsidiary of Vale SA, which produces nickel in matte. It's building RKEF and HPAL plants.

Statistics

52w high/low (IDR)	7,600/5,650
3m avg turnover (USDm)	2.7
Free float (%)	21.2
Issued shares (m)	9,936
Market capitalisation	IDR66.1T
	USD4.4B

Major shareholders:

Vale Canada Limited	43.8%
Indonesia Asahan Aluminium (Inalum)	20.0%
Sumitomo Metal Mining	15.0%

Price Performance



	-1M	-3M	-12M
Absolute (%)	6	1	19
Relative to index (%)	1	(1)	18

Source: FactSet

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FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	21.1	21.2	16.1	19.2	20.8
Core P/E (x)	19.7	22.6	16.1	19.2	20.8
P/BV (x)	1.5	1.9	1.7	1.5	1.4
P/NTA (x)	2.1	2.9	2.5	1.8	1.7
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
FCF yield (%)	4.5	2.5	1.4	nm	1.2
EV/EBITDA (x)	7.1	8.5	7.2	9.0	9.2
EV/EBIT (x)	11.9	13.3	10.5	13.8	14.3

INCOME STATEMENT (USD m)

Revenue	953.2	1,179.5	1,291.6	1,155.8	1,096.6
EBITDA	388.5	458.1	554.1	498.4	481.1
Depreciation	(157.3)	(164.2)	(175.3)	(175.2)	(174.4)
Amortisation	0.0	0.0	1.0	2.0	3.0
EBIT	231.2	293.8	379.8	325.2	309.7
Net interest income / (exp)	(2.4)	3.8	(0.6)	(9.6)	(18.3)
Associates & JV	0.0	0.0	0.0	0.0	0.0
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	(8.1)	(21.8)	(15.0)	(5.0)	(5.0)
Pretax profit	220.6	275.8	364.2	310.5	286.4
Income tax	(54.8)	(75.4)	(91.1)	(80.7)	(74.5)
Minorities	0.0	0.0	0.0	0.0	0.0
Discontinued operations	0.0	0.0	0.0	0.0	0.0
Reported net profit	165.8	200.4	273.2	229.8	211.9
Core net profit	165.8	200.4	273.2	229.8	211.9

BALANCE SHEET (USD m)

Cash & Short Term Investments	508.3	634.0	401.9	205.9	281.0
Accounts receivable	102.0	141.4	138.2	123.7	117.3
Inventory	162.0	155.8	199.5	181.2	171.3
Reinsurance assets	0.0	0.0	0.0	0.0	0.0
Property, Plant & Equip (net)	1,517.9	1,549.9	1,744.6	2,489.4	2,635.0
Intangible assets	0.0	0.0	0.0	0.0	0.0
Investment in Associates & JVs	0.0	0.0	0.0	0.0	0.0
Other assets	182.6	177.1	482.2	482.2	482.2
Total assets	2,472.8	2,658.1	2,966.4	3,482.3	3,686.8
ST interest bearing debt	0.0	0.0	0.0	0.0	0.0
Accounts payable	122.2	115.6	150.7	136.9	129.4
Insurance contract liabilities	0.0	0.0	0.0	0.0	0.0
LT interest bearing debt	0.0	0.0	0.0	300.0	300.0
Other liabilities	196.0	188.0	188.0	188.0	188.0
Total Liabilities	318.4	303.3	338.4	624.6	617.2
Shareholders Equity	2,154.5	2,354.8	2,627.9	2,857.7	3,069.7
Minority Interest	0.0	0.0	0.0	0.0	0.0
Total shareholder equity	2,154.5	2,354.8	2,627.9	2,857.7	3,069.7
Total liabilities and equity	2,472.8	2,658.1	2,966.4	3,482.3	3,686.8

CASH FLOW (USD m)

Pretax profit	220.6	275.8	364.2	310.5	286.4
Depreciation & amortisation	157.3	164.2	174.3	173.2	171.4
Adj net interest (income)/exp	2.4	(3.8)	0.6	9.6	18.3
Change in working capital	(28.7)	(34.1)	(75.7)	46.7	23.6
Cash taxes paid	(67.7)	(80.2)	(91.1)	(80.7)	(74.5)
Other operating cash flow	0.0	0.0	0.0	0.0	0.0
Cash flow from operations	326.8	330.6	429.7	406.4	372.6
Capex	(180.7)	(218.8)	(370.0)	(920.0)	(320.0)
Free cash flow	146.2	111.8	59.7	(513.6)	52.6
Dividends paid	(33.1)	0.0	0.0	0.0	0.0
Equity raised / (purchased)	0.0	0.0	0.0	0.0	0.0
Change in Debt	0.0	0.0	0.0	300.0	0.0
Other invest/financing cash flow	6.2	13.2	13.2	17.7	22.5
Effect of exch rate changes	0.0	0.0	0.0	0.0	0.0
Net cash flow	119.2	125.0	72.9	(196.0)	75.1

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	24.6	23.7	9.5	(10.5)	(5.1)
EBITDA growth	46.3	17.9	21.0	(10.1)	(3.5)
EBIT growth	97.7	27.1	29.3	(14.4)	(4.7)
Pretax growth	110.9	25.0	32.1	(14.7)	(7.8)
Reported net profit growth	100.2	20.9	36.3	(15.9)	(7.8)
Core net profit growth	100.2	20.9	36.3	(15.9)	(7.8)
Profitability ratios (%)					
EBITDA margin	40.8	38.8	42.9	43.1	43.9
EBIT margin	24.3	24.9	29.4	28.1	28.2
Pretax profit margin	23.1	23.4	28.2	26.9	26.1
Payout ratio	0.0	0.0	0.0	0.0	0.0
DuPont analysis					
Net profit margin (%)	17.4	17.0	21.1	19.9	19.3
Revenue/Assets (x)	0.4	0.4	0.4	0.3	0.3
Assets/Equity (x)	1.1	1.1	1.1	1.2	1.2
ROAE (%)	7.9	8.9	11.0	8.4	7.2
ROAA (%)	6.9	7.8	9.7	7.1	5.9
Liquidity & Efficiency					
Cash conversion cycle	48.4	53.8	57.1	61.7	60.0
Days receivable outstanding	30.6	37.1	39.0	40.8	39.6
Days inventory outstanding	76.9	66.1	72.3	85.4	83.6
Days payables outstanding	59.0	49.4	54.2	64.5	63.1
Dividend cover (x)	nm	nm	nm	nm	nm
Current ratio (x)	5.0	5.7	3.8	2.9	3.3
Leverage & Expense Analysis					
Asset/Liability (x)	7.8	8.8	8.8	5.6	6.0
Net gearing (%) (incl perps)	net cash	net cash	net cash	3.3	0.6
Net gearing (%) (excl. perps)	net cash	net cash	net cash	3.3	0.6
Net interest cover (x)	97.2	na	nm	33.8	16.9
Debt/EBITDA (x)	0.0	0.0	0.0	0.6	0.6
Capex/revenue (%)	19.0	18.5	28.6	79.6	29.2
Net debt/ (net cash)	(508.3)	(634.0)	(401.9)	94.1	19.0

Source: Company; Maybank IBG Research

Greatech Technology (GREATEC MK)

Niche assembler of EV battery production lines

Domestic leader in e-mobility PLS manufacturing

Being one of just two listed domestic players in the PLS segment for EV batteries (the other being Genetec, GENE MK, N/R) and boasting an international clientele of marque brands, GREATEC is well-placed to ride on the tailwinds of growing global EV adoption trends. To note, GREATEC is also a key beneficiary of accommodative government taxation policy towards high-growth industries.

EV battery assembly line foray is relatively recent...

GREATEC's domain expertise for EVs lies in its ability to manufacture production line systems (PLS) for lithium-ion battery modules/packs. PLS are self-contained systems comprising multiple single automated equipment (SAE) modules. Having predominantly been an SAE manufacturer since the early-2000s, it ventured up the value chain in 2017 with the assembly of higher-margin (>c.30% GP margin) PLS for its key US-based customer, First Solar (FSLR US, Not Rated). It subsequently won its first EV-related PLS contract (c.MYR100m) in 2H20 from US-based electric pick-up truck maker Lordstown Motors (RIDE US, N/R) - the first of multiple contracts (totalling c.MYR250m) it executed and received full payment for, notwithstanding Lordstown's Chapter 11 recent bankruptcy filing in June.

... but it has now established itself as a key player.

GREATEC's Lordstown contract served as the springboard for its securing of more established EV marques in FY22. As of end-1Q23, it had three int'l customers in the e-mobility segment with a combined outstanding orderbook (O/B) of MYR201.5m. We believe one of these to be Rivian (RIVN US, N/R), a leading US electric SUV/4WD manufacturer that counts Amazon (AMZN US, N/R) among its clientele and is on track to produce c.50k BEVs this year (up from 24.3k in 2022). GREATEC is also in active discussion with three other prospective customers (including a Tier-1 US automaker), has submitted tenders with a combined sum of c.MYR500m, and having already secured a MYR23m contract in 1Q23, targets to win a further c.MYR225m e-mobility contracts for the remainder of FY23.

Expecting e-mobility growth to rebound in FY23

With GREATEC's e-mobility segment contributing just MYR82m to the group's top-line in FY22 (-68% YoY) following the winding-down of its business relationship with Lordstown last year, segmental traction and revenue contribution should pick-up again in FY23 (1Q23: MYR44m) with timely O/B execution and increased customer diversification. Having also delivered its first pilot PLS projects for EV inverters and chargers late last year, the group could secure additional contract wins in this sub-segment, further buttressing the group's future prospects in the e-mobility space.

FYE Dec (MYR m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	402	546	649	686	805
EBITDA	150	136	222	266	326
Core net profit	146	127	187	217	261
Core EPS (sen)	11.7	10.1	14.9	17.3	20.9
Core EPS growth (%)	57.8	(13.4)	47.6	16.0	20.5
Net DPS (sen)	0.0	0.0	0.0	0.0	0.0
Core P/E (x)	57.6	47.9	30.4	26.2	21.7
P/BV (x)	19.5	10.3	7.3	5.7	4.5
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
ROAE (%)	39.5	25.9	27.5	24.6	23.3
ROAA (%)	27.5	16.3	17.9	17.4	17.5
EV/EBITDA (x)	54.1	42.3	23.7	19.0	15.0
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Consensus net profit	-	-	184	215	241
MIBG vs. Consensus (%)	-	-	1.3	0.7	8.3

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BUY

Share Price MYR 4.53
12m Price Target MYR 6.05 (+34%)

Company Description

A niche automation specialist with core expertise in customisable capital equipment for the solar photovoltaic (PV) and electric vehicle (EV) industry

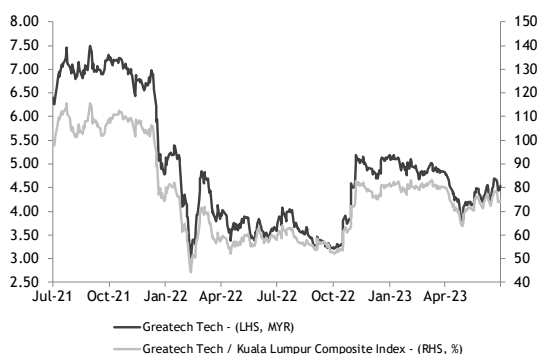
Statistics

52w high/low (MYR)	5.19/3.19
3m avg turnover (USDm)	0.8
Free float (%)	31.3
Issued shares (m)	1,252
Market capitalisation	MYR5.7B
	USD1.2B

Major shareholders:

TAN ENG KEE	61.7%
Kenanga Investors Bhd.	2.5%
LLH Holdings Sdn. Bhd.	2.5%

Price Performance



	-1M	-3M	-12M
Absolute (%)	6	(6)	26
Relative to index (%)	4	(6)	30

Source: FactSet

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	55.0	38.7	30.4	26.2	21.7
Core P/E (x)	57.6	47.9	30.4	26.2	21.7
P/BV (x)	19.5	10.3	7.3	5.7	4.5
P/NTA (x)	19.5	10.3	7.3	5.7	4.5
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
FCF yield (%)	0.4	0.1	2.0	3.2	3.0
EV/EBITDA (x)	54.1	42.3	23.7	19.0	15.0
EV/EBIT (x)	55.9	45.2	26.0	21.0	16.4
INCOME STATEMENT (MYR m)					
Revenue	402.2	546.2	648.7	686.1	804.9
EBITDA	150.2	135.9	221.6	266.2	326.3
Depreciation	(4.9)	(8.5)	(19.6)	(25.2)	(27.7)
Amortisation	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
EBIT	145.2	127.2	201.9	240.9	298.4
Net interest income / (exp)	0.0	0.7	(0.4)	(0.3)	(0.3)
Associates & JV	0.0	0.0	0.0	0.0	0.0
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	0.0	0.0	0.0	0.0	0.0
Pretax profit	145.2	127.9	201.5	240.5	298.1
Income tax	(3.5)	4.0	(15.1)	(24.1)	(37.3)
Minorities	0.0	(0.1)	0.4	0.2	0.2
Discontinued operations	0.0	0.0	0.0	0.0	0.0
Reported net profit	141.8	131.8	186.8	216.7	261.0
Core net profit	146.2	126.6	186.8	216.7	261.0
BALANCE SHEET (MYR m)					
Cash & Short Term Investments	320.4	326.7	437.4	621.1	791.9
Accounts receivable	93.4	111.3	132.2	139.8	164.0
Inventory	12.3	22.0	23.1	22.8	25.9
Reinsurance assets	0.0	0.0	0.0	0.0	0.0
Property, Plant & Equip (net)	107.4	193.6	249.0	273.8	346.1
Intangible assets	0.0	0.0	(0.1)	(0.3)	(0.4)
Investment in Associates & JVs	0.0	0.0	0.0	0.0	0.0
Other assets	75.1	293.3	295.2	295.2	295.2
Total assets	608.6	946.8	1,136.6	1,352.4	1,622.6
ST interest bearing debt	1.1	1.1	1.1	1.1	1.1
Accounts payable	114.2	305.1	308.6	307.8	317.2
Insurance contract liabilities	0.0	0.0	0.0	0.0	0.0
LT interest bearing debt	15.0	13.9	13.9	13.9	13.9
Other liabilities	47.0	40.0	40.0	40.0	40.0
Total Liabilities	177.6	360.1	363.5	362.8	372.1
Shareholders Equity	431.0	586.7	773.5	990.2	1,251.2
Minority Interest	0.0	0.0	(0.4)	(0.6)	(0.8)
Total shareholder equity	431.0	586.7	773.1	989.6	1,250.5
Total liabilities and equity	608.6	946.8	1,136.6	1,352.4	1,622.6
CASH FLOW (MYR m)					
Pretax profit	145.2	127.9	201.5	240.5	298.1
Depreciation & amortisation	5.0	8.7	19.7	25.3	27.9
Adj net interest (income)/exp	0.0	(0.7)	0.4	0.3	0.3
Change in working capital	(18.3)	(32.5)	(18.6)	(8.1)	(17.9)
Cash taxes paid	(3.5)	4.0	(15.1)	(24.1)	(37.3)
Other operating cash flow	(1.6)	0.0	0.0	0.0	0.0
Cash flow from operations	126.4	107.0	187.6	233.7	270.8
Capex	(89.1)	(100.8)	(75.0)	(50.0)	(100.0)
Free cash flow	37.3	6.2	112.6	183.7	170.8
Dividends paid	0.0	0.0	0.0	0.0	0.0
Equity raised / (purchased)	0.7	0.0	0.0	0.0	0.0
Change in Debt	(2.5)	(1.1)	0.0	0.0	0.0
Other invest/financing cash flow	(6.4)	(0.5)	0.0	0.0	0.0
Effect of exch rate changes	3.9	(0.6)	0.0	0.0	0.0
Net cash flow	33.1	4.0	112.6	183.7	170.8

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	54.0	35.8	18.8	5.8	17.3
EBITDA growth	59.3	(9.6)	63.1	20.1	22.5
EBIT growth	60.7	(12.4)	58.7	19.3	23.9
Pretax growth	61.2	(11.9)	57.6	19.4	23.9
Reported net profit growth	61.4	(7.0)	41.7	16.0	20.5
Core net profit growth	57.8	(13.4)	47.6	16.0	20.5
Profitability ratios (%)					
EBITDA margin	37.4	24.9	34.2	38.8	40.5
EBIT margin	36.1	23.3	31.1	35.1	37.1
Pretax profit margin	36.1	23.4	31.1	35.1	37.0
Payout ratio	0.0	0.0	0.0	0.0	0.0
DuPont analysis					
Net profit margin (%)	35.2	24.1	28.8	31.6	32.4
Revenue/Assets (x)	0.7	0.6	0.6	0.5	0.5
Assets/Equity (x)	1.4	1.6	1.5	1.4	1.3
ROAE (%)	39.5	25.9	27.5	24.6	23.3
ROAA (%)	27.5	16.3	17.9	17.4	17.5
Liquidity & Efficiency					
Cash conversion cycle	(85.9)	(113.6)	(187.0)	(186.7)	(162.2)
Days receivable outstanding	60.3	67.4	67.5	71.3	67.9
Days inventory outstanding	18.6	16.1	20.1	20.8	19.4
Days payables outstanding	164.9	197.2	274.7	278.8	249.6
Dividend cover (x)	nm	nm	nm	nm	nm
Current ratio (x)	2.9	2.0	2.3	2.9	3.4
Leverage & Expense Analysis					
Asset/Liability (x)	3.4	2.6	3.1	3.7	4.4
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Net gearing (%) (excl. perps)	net cash	net cash	net cash	net cash	net cash
Net interest cover (x)	nm	na	nm	nm	nm
Debt/EBITDA (x)	0.1	0.1	0.1	0.1	0.0
Capex/revenue (%)	22.2	18.5	11.6	7.3	12.4
Net debt/ (net cash)	(304.3)	(311.6)	(422.4)	(606.1)	(776.9)

Source: Company; Maybank IBG Research

Ayala Corp (AC PM)

Sure and steady

Creating a niche position in the EV space

The Philippines' transition to EVs is an uphill battle, as EVs are still more expensive than conventional ICE vehicles and power costs in the country is inherently high. However, this has not deterred Ayala Corp from committing to the cause. Cognizant of the challenges, Ayala Corp has made small but foundational investments in EVs through its real estate, technology manufacturing and vehicle distribution businesses.

Market still skewed to ICE due to price

Despite the country's poor public transportation system, car ownership in the Philippines remains low (1 car for every 90+ Filipinos) because of Filipinos' constrained purchasing power, which is further exacerbated by inflation. This price sensitivity dictates much of the direction of the auto industry, which continues to cater to the low- to middle-income segment via entry-level, affordable ICE models. Although there are some tax and non-tax incentives for EV purchase, the percentage of Filipinos that can afford an EV or hybrid model is limited to begin with.

Options during transition to EVs

The Group, through its subsidiary, AC Motors (unlisted), distributes hybrids and EVs of Honda, Kia and Volkswagen in the Philippines. Meanwhile, Ayala Corp, together with Gogoro Inc, launched Gogoro Smartscooter and battery swapping in the Philippines in Apr'23. While we do not expect smartscooters to fully replace Filipinos' needs for 4-wheel transport options, we expect it to be an affordable transitional vehicle for Filipinos, while waiting for ICE and EV to achieve price parity, which Ayala Corp expects to happen by 2025.

Beyond vehicle distribution

On Mar'23, Ayala Corp's technology and electronics manufacturing arm, Integrated Microelectronics Inc (IMI PM), and US-based Zero Motorcycles forged a strategic manufacturing collaboration for the full, partial and modular assembly of electronic motorcycles. Then locally, Ayala Corp's real estate arm, Ayala Land (ALI PM), the country's premier central business district developer, has begun to roll out charging stations across its offices, malls and estates to further encourage the use of EVs.

FYE Dec (PHP m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	225,591	263,820	277,298	311,834	348,641
EBITDA	36,247	34,297	51,525	67,840	84,098
Core net profit	27,774	27,398	37,541	44,960	54,964
Core FDEPS (PHP)	44.54	44.18	60.54	72.50	88.64
Core FDEPS growth(%)	63.1	(0.8)	37.0	19.8	22.3
Net DPS (PHP)	6.89	6.87	6.87	6.87	6.87
Core FD P/E (x)	18.7	15.7	10.6	8.8	7.2
P/BV (x)	1.4	1.2	1.0	0.9	0.8
Net dividend yield (%)	0.8	1.0	1.1	1.1	1.1
ROAE (%)	8.9	8.4	10.8	11.7	12.8
ROAA (%)	2.0	1.9	2.5	2.9	3.4
EV/EBITDA (x)	31.3	33.9	20.9	16.3	13.3
Net gearing (%) (incl perps)	68.6	80.4	65.5	61.5	55.6
Consensus net profit	-	-	35,335	41,144	54,964
MIBG vs. Consensus (%)	-	-	6.2	9.3	(0.0)

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BUY

Share Price PHP 641.00
12m Price Target PHP 1,050.00 (+65%)

Company Description

Ayala Corp is the holding company of the Ayala family and it has stakes in Ayala Land, BPI, Globe Telecoms and AC Energy.

Statistics

52w high/low (PHP)	775.00/596.50
3m avg turnover (USDm)	5.3
Free float (%)	51.9
Issued shares (m)	619
Market capitalisation	PHP396.9B
	USD7.3B

Major shareholders:

Mermac Inc	47.3%
Mitsubishi Corporation	6.0%
SM Group	1.7%

Price Performance



	-1M	-3M	-12M
Absolute (%)	4	(1)	7
Relative to index (%)	0	(2)	(0)

Source: FactSet

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	17.9	16.3	10.6	8.8	7.2
Core P/E (x)	18.6	15.7	10.6	8.8	7.2
Core FD P/E (x)	18.7	15.7	10.6	8.8	7.2
P/BV (x)	1.4	1.2	1.0	0.9	0.8
P/NTA (x)	1.5	1.3	1.1	1.0	0.9
Net dividend yield (%)	0.8	1.0	1.1	1.1	1.1
FCF yield (%)	nm	nm	32.5	12.6	17.3
EV/EBITDA (x)	31.3	33.9	20.9	16.3	13.3
EV/EBIT (x)	58.4	62.4	29.7	21.9	17.3

INCOME STATEMENT (PHP m)

Revenue	225,591.0	263,820.0	277,298.3	311,833.5	348,641.4
EBITDA	36,247.0	34,297.0	51,525.3	67,839.8	84,098.3
Depreciation	(16,852.0)	(15,672.0)	(15,291.0)	(17,356.0)	(19,254.0)
Amortisation	0.0	0.0	0.0	0.0	0.0
EBIT	19,395.0	18,625.0	36,234.3	50,483.8	64,844.3
Net interest income / (exp)	(8,749.3)	(7,578.4)	(19,299.4)	(18,267.4)	(18,345.7)
Associates & JV	23,456.0	36,129.0	38,952.6	38,914.9	43,551.7
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	6,845.8	4,912.3	4,327.6	4,327.6	4,327.6
Pretax profit	40,947.6	52,087.8	60,215.1	75,459.0	94,378.0
Income tax	(6,575.5)	(7,919.8)	(9,155.5)	(11,473.3)	(14,349.9)
Minorities	(8,261.7)	(18,476.0)	(13,518.4)	(19,025.5)	(25,064.0)
Discontinued operations	0.0	0.0	0.0	0.0	0.0
Reported net profit	27,774.2	27,398.0	37,541.2	44,960.2	54,964.1
Core net profit	27,774.2	27,398.0	37,541.2	44,960.2	54,964.1
Preferred Dividends	(1,259.8)	(1,259.8)	(1,259.8)	(1,259.8)	(1,259.8)
Distributable Income	26,514.4	26,138.2	36,281.4	43,700.4	53,704.3

BALANCE SHEET (PHP m)

Cash & Short Term Investments	90,483.9	73,847.3	92,783.4	100,271.4	108,716.3
Accounts receivable	60,792.2	62,282.5	61,566.7	88,678.5	117,760.5
Inventory	166,406.8	201,517.1	165,496.8	190,804.7	215,545.4
Reinsurance assets	0.0	0.0	0.0	0.0	0.0
Property, Plant & Equip (net)	96,682.9	114,113.6	118,822.6	121,466.6	122,212.6
Intangible assets	22,128.0	43,536.4	43,536.4	43,536.4	43,536.4
Investment in Associates & JVs	294,063.0	328,120.3	328,120.3	321,835.3	321,835.3
Other assets	618,429.1	655,127.9	685,066.9	715,005.9	744,944.9
Total assets	1,348,985.9	1,478,545.1	1,495,393.1	1,581,598.7	1,674,551.4
ST interest bearing debt	66,205.8	68,023.6	49,470.9	119,857.3	61,244.1
Accounts payable	123,704.6	158,110.1	177,983.9	194,022.9	212,125.3
Insurance contract liabilities	0.0	0.0	0.0	0.0	0.0
LT interest bearing debt	412,310.8	484,464.2	460,496.6	406,867.8	471,977.8
Other liabilities	181,452.0	172,648.0	170,283.0	167,919.0	165,554.0
Total Liabilities	783,673.2	883,246.1	858,234.8	888,666.6	910,901.2
Shareholders Equity	362,731.7	367,062.5	399,086.9	438,530.3	487,977.6
Minority Interest	202,581.1	228,236.5	238,071.4	254,401.7	275,672.6
Total shareholder equity	565,312.8	595,299.0	637,158.3	692,932.0	763,650.2
Total liabilities and equity	1,348,985.9	1,478,545.1	1,495,393.1	1,581,598.7	1,674,551.4

CASH FLOW (PHP m)

Pretax profit	40,947.6	52,087.8	60,215.1	75,459.0	94,378.0
Depreciation & amortisation	16,852.0	15,672.0	15,291.0	17,356.0	19,254.0
Adj net interest (income)/exp	(15,550.3)	(14,273.4)	(25,994.3)	(24,962.3)	(25,040.6)
Change in working capital	(17,006.7)	(14,923.0)	56,609.9	(36,380.6)	(35,720.4)
Cash taxes paid	(6,052.8)	(4,555.9)	(9,155.5)	(11,473.3)	(14,349.9)
Other operating cash flow	(1,877.4)	(2,063.8)	0.0	0.0	0.0
Cash flow from operations	8,190.0	28,651.5	148,954.8	69,923.4	88,602.3
Capex	(18,997.0)	(33,102.6)	(20,000.0)	(20,000.0)	(20,000.0)
Free cash flow	(10,807.0)	(4,451.1)	128,954.8	49,923.4	68,602.3
Dividends paid	(7,501.9)	(6,382.6)	(9,200.4)	(8,212.0)	(9,309.9)
Equity raised / (purchased)	(5,179.0)	(8,723.8)	0.0	0.0	0.0
Change in Debt	36,762.3	73,971.3	(42,520.4)	16,757.5	6,496.9
Other invest/financing cash flow	(11,444.5)	(71,050.4)	(58,298.1)	(50,981.0)	(57,344.4)
Effect of exch rate changes	0.0	0.0	0.0	0.0	0.0
Net cash flow	1,830.0	(16,636.6)	18,936.1	7,487.9	8,445.0

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	16.5	16.9	5.1	12.5	11.8
EBITDA growth	(2.0)	(5.4)	50.2	31.7	24.0
EBIT growth	13.3	(4.0)	94.5	39.3	28.4
Pretax growth	18.7	27.2	15.6	25.3	25.1
Reported net profit growth	62.0	(1.4)	37.0	19.8	22.3
Core net profit growth	62.0	(1.4)	37.0	19.8	22.3
Profitability ratios (%)					
EBITDA margin	16.1	13.0	18.6	21.8	24.1
EBIT margin	8.6	7.1	13.1	16.2	18.6
Pretax profit margin	18.2	19.7	21.7	24.2	27.1
Payout ratio	15.4	15.5	11.3	9.5	7.7
DuPont analysis					
Net profit margin (%)	12.3	10.4	13.5	14.4	15.8
Revenue / Assets (x)	0.2	0.2	0.2	0.2	0.2
Assets/Equity (x)	3.7	4.0	3.7	3.6	3.4
ROAE (%)	8.9	8.4	10.8	11.7	12.8
ROAA (%)	2.0	1.9	2.5	2.9	3.4
Liquidity & Efficiency					
Cash conversion cycle	187.5	157.5	106.5	74.6	106.7
Days receivable outstanding	118.1	84.0	80.4	86.7	106.6
Days inventory outstanding	334.4	314.1	309.4	274.7	286.3
Days payables outstanding	265.0	240.6	283.4	286.9	286.1
Dividend cover (x)	6.5	6.4	8.8	10.6	12.9
Current ratio (x)	1.9	1.8	1.7	1.5	1.8
Leverage & Expense Analysis					
Asset/Liability (x)	1.7	1.7	1.7	1.8	1.8
Net gearing (%) (incl perps)	68.6	80.4	65.5	61.5	55.6
Net gearing (%) (excl. perps)	68.6	80.4	65.5	61.5	55.6
Net interest cover (x)	2.2	2.5	1.9	2.8	3.5
Debt/EBITDA (x)	13.2	16.1	9.9	7.8	6.3
Capex/revenue (%)	8.4	12.5	7.2	6.4	5.7
Net debt/ (net cash)	388,032.6	478,640.5	417,184.1	426,453.7	424,505.6

Source: Company; Maybank IBG Research

Grab Holdings (GRAB US)

Growing with EV

Winner from policy shifts towards public transport

61.1% of those surveyed by the Singapore Land Transport Authority said that their transport preference has changed following the pandemic. In particular, 15.7% said they rely more on ride hailing services (eg, Grab and Gojek) for their commutes as they find it more convenient than driving themselves. Moreover, owning private vehicles have become more expensive due to additional taxes and levies. This structural trend is likely to accelerate, as many countries in the region adopt green transportation policies. We believe this will provide long-term growth in demand for Grab's mobility and delivery services.

Expect COE premiums to rise further

The premium on certificate of entitlement (COE) to own a private car in Singapore has increased by 375% since the start of the pandemic in 2019, due to Singapore's policy of zero growth in its car population. Private car ownership cost is set to remain high in Singapore, especially as the government pursues net zero emissions. Government policies across the region - where almost all ASEAN countries have unveiled net-zero commitments - are likely to follow a similar pattern in terms of increasing the cost of ownership of private vehicles. Public transport, including ride hailing, are set to benefit from the higher demand for point-to-point transportation. Grab's scale and positioning across ASEAN gives it a competitive advantage as these trends accelerate, in our view.

Supporting driver-partners' transition to EVs

Grab has been strategically supporting driver-partners to transition to low-emission vehicles. The Group has introduced 13,000 low-emission vehicles to its rental fleet regionally. Grab has also adopted a three-pronged approach to encourage and make EV adoption easier: 1) ongoing partnership with Hyundai to trial EVs and understand the gaps and barriers to adoption; 2) partnering with KLeasing and automotive maker MG Thailand, to launch EV loans for driver-partners to lower cost barriers; and 3) in Singapore, Grab launched the eco-friendly rides toggle in Mar'22 for JustGrab rides. Through this feature, passengers may select EVs as their preference, driving demand for such vehicles and in turn, accelerating adoption.

Improving delivery margin with easing competition

We estimate Grab's mobility EBITDA rose 9% QoQ to USD166m in 1H23 and GMV recovered further due to tailwinds from the re-opening and recovery in tourism. Anecdotally, we observed lower frequency of surge pricing in Singapore, likely due to continued efforts to increase driver supply. Grab is enhancing its capabilities to better tap the recovery in tourism and it's re-investing gains to drive growth in lower-tier cities. We forecast mobility to see 30% GMV growth YoY in FY23 while maintaining our adjusted EBITDA-to-GMV ratio of 12.8%, slightly above its steady-state margin guidance of 12%. Maintain BUY and TP of USD4.00.

FYE Dec (USD m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	675	1,433	2,236	2,718	3,086
EBITDA	(1,210)	(1,223)	(347)	(46)	210
Core net profit	(3,450)	(1,683)	(827)	(402)	(228)
Core FDEPS (cts)	(92.1)	(44.9)	(22.0)	(10.7)	(6.0)
Core FDEPS growth(%)	nm	nm	nm	nm	nm
Net DPS (cts)	0.0	0.0	0.0	0.0	0.0
Core FD P/E (x)	nm	nm	nm	nm	nm
P/BV (x)	3.4	1.8	2.2	2.2	2.1
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
ROAA (%)	(41.5)	(16.5)	(9.7)	(5.1)	(2.7)
EV/EBITDA (x)	nm	nm	nm	nm	50.9
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Consensus net profit	-	-	na	na	na
MIBG vs. Consensus (%)	-	-	na	na	na

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BUY

Share Price USD 3.57
12m Price Target USD 4.00 (+12%)

Company Description

Grab is a leading Southeast Asian superapp with core verticals in delivery, mobility and financial services.

Statistics

52w high/low (USD)	3.98/2.31
3m avg turnover (USDm)	11.1
Free float (%)	71.3
Issued shares (m)	3,722
Market capitalisation	USD13.3B
	USD13.3B

Major shareholders:

SB Investment Advisers (UK) Ltd.	19.1%
Uber Technologies, Inc.	14.4%
Didi Global, Inc.	7.5%

Price Performance



	-1M	-3M	-12M
Absolute (%)	12	29	24
Relative to index (%)	6	20	11

Source: FactSet

Abbreviation:

GMV: Gross merchandise value
COE: Certificate of Entitlement

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	nm	nm	nm	nm	nm
Core P/E (x)	nm	nm	nm	nm	nm
Core FD P/E (x)	nm	nm	nm	nm	nm
P/BV (x)	3.4	1.8	2.2	2.2	2.1
P/NTA (x)	3.8	2.1	2.7	2.7	2.6
Net dividend yield (%)	0.0	0.0	0.0	0.0	0.0
FCF yield (%)	nm	nm	nm	nm	0.6
EV/EBITDA (x)	nm	nm	nm	nm	50.9
EV/EBIT (x)	nm	nm	nm	nm	nm
INCOME STATEMENT (USD m)					
Revenue	675.0	1,433.0	2,235.7	2,717.5	3,086.4
EBITDA	(1,210.0)	(1,223.0)	(346.6)	(45.9)	210.3
Depreciation	(109.0)	(129.0)	(129.2)	(151.0)	(176.0)
Amortisation	(236.0)	(21.0)	(146.4)	(201.0)	(234.9)
EBIT	(1,555.0)	(1,373.0)	(622.3)	(398.0)	(200.5)
Net interest income / (exp)	(1,636.0)	(353.0)	(253.0)	(53.0)	(78.2)
Associates & JV	(8.0)	(8.0)	(8.0)	(8.0)	(8.0)
Exceptionals	0.0	0.0	0.0	0.0	1.0
Other pretax income	(353.0)	0.0	0.0	0.0	0.0
Pretax profit	(3,552.0)	(1,734.0)	(883.3)	(459.0)	(285.8)
Income tax	(3.0)	(6.0)	(0.7)	(0.4)	(0.2)
Minorities	106.0	57.0	57.0	57.0	57.0
Perpetual securities	(1.0)	0.0	0.0	0.0	1.0
Discontinued operations	0.0	0.0	0.0	0.0	0.0
Reported net profit	(3,450.0)	(1,683.0)	(827.0)	(402.3)	(228.0)
Core net profit	(3,450.0)	(1,683.0)	(827.0)	(402.3)	(228.0)
BALANCE SHEET (USD m)					
Cash & Short Term Investments	8,078.0	5,086.0	3,594.7	3,538.3	3,883.9
Accounts receivable	95.0	372.0	314.7	382.5	434.4
Inventory	4.0	48.0	57.0	63.0	61.8
Property, Plant & Equip (net)	441.0	492.0	612.6	700.3	802.2
Intangible assets	675.0	904.0	1,041.5	1,107.6	1,152.6
Investment in Associates & JVs	14.0	107.0	99.0	91.0	83.0
Other assets	1,871.0	2,161.0	2,161.0	2,161.0	2,161.0
Total assets	11,178.0	9,170.0	7,880.4	8,043.6	8,579.0
ST interest bearing debt	144.0	117.0	424.7	420.6	420.6
Accounts payable	167.0	933.0	231.1	255.5	250.9
LT interest bearing debt	2,031.0	1,248.0	830.5	873.9	1,115.2
Other liabilities	817.0	215.0	215.0	215.0	215.0
Total Liabilities	3,159.0	2,513.0	1,701.3	1,765.0	2,001.8
Shareholders Equity	7,733.0	6,603.0	6,050.5	6,106.2	6,360.0
Minority Interest	286.0	54.0	(271.2)	(328.2)	(385.2)
Total shareholder equity	8,019.0	6,657.0	5,779.3	5,778.0	5,974.8
Total liabilities and equity	11,178.0	9,170.0	7,880.4	8,043.6	8,579.0
CASH FLOW (USD m)					
Pretax profit	(3,552.0)	(1,734.0)	(883.3)	(459.0)	(285.8)
Depreciation & amortisation	345.0	150.0	275.7	352.0	410.9
Adj net interest (income)/exp	1,636.0	353.0	253.0	53.0	78.2
Change in working capital	(128.0)	(44.0)	(653.5)	(49.4)	(55.4)
Cash taxes paid	(3.0)	(26.0)	(0.7)	(0.4)	(0.2)
Other operating cash flow	756.0	473.0	419.5	458.1	483.8
Cash flow from operations	(938.0)	(820.0)	(581.3)	362.4	639.5
Capex	(85.0)	(74.0)	(456.5)	(505.9)	(557.8)
Free cash flow	(1,023.0)	(894.0)	(1,037.8)	(143.5)	81.7
Dividends paid	0.0	0.0	0.0	0.0	0.0
Equity raised / (purchased)	4,408.0	(22.0)	0.0	0.0	0.0
Perpetual securities	463.0	0.0	0.0	0.0	0.0
Change in Debt	1,780.0	(945.0)	(426.3)	39.3	241.4
Other invest/financing cash flow	(2,757.0)	(1,143.0)	146.8	47.8	24.5
Effect of exch rate changes	(37.0)	(57.0)	0.0	0.0	0.0
Net cash flow	2,834.0	(3,061.0)	(1,317.3)	(56.4)	347.6

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	43.9	112.3	56.0	21.6	13.6
EBITDA growth	nm	nm	nm	nm	nm
EBIT growth	nm	nm	nm	nm	nm
Pretax growth	nm	nm	nm	nm	nm
Reported net profit growth	nm	nm	nm	nm	nm
Core net profit growth	nm	nm	nm	nm	nm
Profitability ratios (%)					
EBITDA margin	nm	nm	nm	nm	6.8
EBIT margin	nm	nm	nm	nm	nm
Pretax profit margin	nm	nm	nm	nm	nm
Payout ratio	0.0	0.0	0.0	0.0	0.0
DuPont analysis					
Net profit margin (%)	nm	nm	nm	nm	nm
Revenue/Assets (x)	0.1	0.2	0.3	0.3	0.4
Assets/Equity (x)	1.4	1.4	1.3	1.3	1.3
ROAE (%)	na	na	na	na	na
ROAA (%)	(41.5)	(16.5)	(9.7)	(5.1)	(2.7)
Liquidity & Efficiency					
Cash conversion cycle	2.5	(80.5)	(73.5)	5.9	4.9
Days receivable outstanding	47.7	58.7	55.3	46.2	47.6
Days inventory outstanding	1.2	6.9	12.8	13.2	14.0
Days payables outstanding	46.4	146.0	141.5	53.5	56.7
Dividend cover (x)	nm	nm	nm	nm	nm
Current ratio (x)	8.5	5.2	5.9	5.8	6.3
Leverage & Expense Analysis					
Asset/Liability (x)	3.5	3.6	4.6	4.6	4.3
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Net gearing (%) (excl. perps)	net cash	net cash	net cash	net cash	net cash
Net interest cover (x)	na	na	na	na	na
Debt/EBITDA (x)	nm	nm	nm	nm	7.3
Capex/revenue (%)	12.6	5.2	20.4	18.6	18.1
Net debt/ (net cash)	(5,903.0)	(3,721.0)	(2,339.5)	(2,243.8)	(2,348.1)

Source: Company; Maybank IBG Research

ComfortDelGro (CD SP)

The clean way forward

BUY

Share Price SGD 1.26
12m Price Target SGD 1.45 (+15%)

An eco-friendly transport fleet; maintain BUY

As part of its ESG roadmap, CD seeks to transit 90% of its total car fleet across all its operations globally to cleaner energy vehicles by 2030 and 100% by 2040. Management has budgeted up to SGD6b to replace the bulk of its fleet from internal combustion buses/taxis with EVs over this period. Operationally, we expect to see stronger EPS growth in 2H, driven by continued recovery in its public transport services and taxi businesses. Retain BUY and DCF-based TP of SGD1.45 (8.3% WACC and 1% LTG).

Moving towards greener and smarter mobility

The Group has grown its global fleet of cleaner energy car fleet to 65% in 2022, on track to meet its decarbonisation target. Last year, CD set up a SGD30m Autonomous Vehicle Centre of Excellence aimed at building up its capabilities in the operation & maintenance of autonomous vehicles. It also invested in Mobilion Ventures in 2022, an Israeli early-stage mobility venture fund that focuses on smart mobility and automotive after-market innovations. This is all part of CD's strategy to grow the business of smart urban mobility, fleet electrification, automotive engineering technologies, and adjacent disciplines such as clean technology, smart logistics, etc.

Distribute Chinese electric vans in SG by end-2023

CD recently said it plans to import a new Chinese EV van brand for sale or lease by the 4Q23. Its engineering arm will be the exclusive distributor of commercial EV manufactured by ChangAn KuaYue (KYC). Electric commercial vehicles represented 52.5% of all light commercial vehicles registered between Jan and May 2023 in Singapore. In fact, we note that CD has been in the environmental sustainability business since 2021 with JVs with ENGIE South East Asia to provide EV charging solutions and renewable solar energy. To-date, it has installed 500 charging points and this is expected to double to 1,000 by year-end.

Enters into green energy market with CN partner

In Jun 2023, CD entered into a strategic partnership with Guangzhou Public Transport Group to develop and promote transport-related green energy businesses. This will include investments in the construction of automotive electric charging and swapping stations and ancillary solar photovoltaic and energy storage systems to support the charging and swapping business. For a start, their initial joint project will deliver 60 chargers with 3,600kw capacity to cater to the needs of municipal buses and cars in Guangzhou, China.

Company Description

ComfortDelGro is a land transport conglomerate. Its diversified business includes interests in taxi, bus and rail globally.

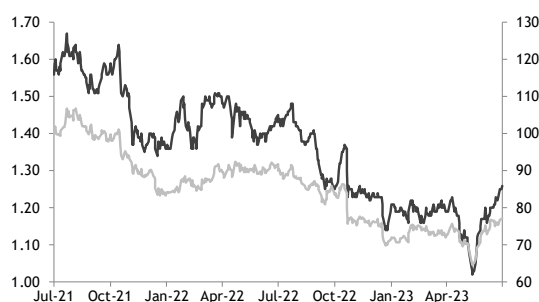
Statistics

52w high/low (SGD)	1.48/1.02
3m avg turnover (USDm)	7.5
Free float (%)	98.7
Issued shares (m)	2,167
Market capitalisation	SGD2.7B
	USD2.1B

Major shareholders:

Ameriprise Financial Inc	6.8%
BlackRock Inc	5.0%
T Rowe Price Group	2.8%

Price Performance



	-1M	-3M	-12M
Absolute (%)	8	6	(13)
Relative to index (%)	5	7	(15)

Source: FactSet

FYE Dec (SGD m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	3,503	3,781	3,939	4,023	4,106
EBITDA	576	627	596	599	600
Core net profit	123	137	150	157	163
Core EPS (cts)	5.7	6.3	6.9	7.2	7.5
Core EPS growth (%)	103.3	11.2	9.7	4.4	4.0
Net DPS (cts)	4.2	8.5	4.8	5.1	5.3
Core P/E (x)	24.7	19.5	18.2	17.4	16.8
P/BV (x)	1.1	1.0	1.0	1.1	1.1
Net dividend yield (%)	3.0	6.9	3.8	4.0	4.2
ROAE (%)	4.6	6.6	5.8	6.0	6.3
ROAA (%)	2.5	2.8	3.1	3.2	3.3
EV/EBITDA (x)	5.0	4.1	4.2	4.0	4.0
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Consensus net profit	-	-	165	192	208
MIBG vs. Consensus (%)	-	-	(9.1)	(18.2)	(21.6)

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FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	28.2	17.3	18.2	17.4	16.8
Core P/E (x)	24.7	19.5	18.2	17.4	16.8
P/BV (x)	1.1	1.0	1.0	1.1	1.1
P/NTA (x)	1.5	1.4	1.4	1.4	1.4
Net dividend yield (%)	3.0	6.9	3.8	4.0	4.2
FCF yield (%)	14.4	14.2	11.5	10.4	9.6
EV/EBITDA (x)	5.0	4.1	4.2	4.0	4.0
EV/EBIT (x)	14.4	9.5	10.2	9.5	9.0

INCOME STATEMENT (SGD m)

Revenue	3,502.8	3,780.8	3,939.0	4,023.1	4,106.0
EBITDA	576.1	627.2	596.2	598.9	599.9
Depreciation	(376.3)	(357.2)	(350.7)	(343.4)	(334.6)
EBIT	199.8	270.0	245.5	255.5	265.3
Net interest income /(exp)	(5.1)	1.9	3.3	2.7	2.0
Associates & JV	0.0	0.0	0.0	0.0	0.0
Exceptionals	0.0	36.3	0.0	0.0	0.0
Other pretax income	0.0	0.0	0.0	0.0	0.0
Pretax profit	194.7	272.7	248.8	258.2	267.2
Income tax	(41.8)	(54.2)	(49.8)	(51.6)	(53.4)
Minorities	(29.9)	(45.4)	(49.0)	(50.0)	(51.0)
Reported net profit	123.0	173.1	150.0	156.6	162.8
Core net profit	123.0	136.8	150.0	156.6	162.8

BALANCE SHEET (SGD m)

Cash & Short Term Investments	919.1	859.1	1,010.5	1,117.2	1,186.8
Accounts receivable	569.8	549.0	549.0	549.0	549.0
Inventory	116.9	125.3	135.1	140.7	146.5
Reinsurance assets	0.0	0.0	1.0	2.0	3.0
Property, Plant & Equip (net)	2,191.9	2,191.9	2,081.2	1,997.8	1,943.2
Intangible assets	646.9	646.9	640.4	634.0	627.7
Investment in Associates & JVs	0.8	0.8	0.8	0.8	0.8
Other assets	469.0	465.7	464.7	463.7	462.7
Total assets	4,914.4	4,838.7	4,882.7	4,905.2	4,919.6
ST interest bearing debt	23.9	23.9	23.9	23.9	23.9
Accounts payable	884.3	898.6	915.9	919.4	922.2
Insurance contract liabilities	0.0	0.0	0.0	0.0	0.0
LT interest bearing debt	317.1	317.1	317.1	317.1	317.1
Other liabilities	581.0	581.0	581.0	581.0	581.0
Total Liabilities	1,806.0	1,820.3	1,837.6	1,841.1	1,843.9
Shareholders Equity	2,678.6	2,596.4	2,601.1	2,597.6	2,586.2
Minority Interest	429.8	422.0	444.1	466.6	489.5
Total shareholder equity	3,108.4	3,018.4	3,045.1	3,064.2	3,075.7
Perpetual securities	1.0	1.0	2.0	3.0	4.0
Total liabilities and equity	4,914.4	4,838.7	4,882.7	4,905.2	4,919.6

CASH FLOW (SGD m)

Pretax profit	194.7	272.7	248.8	258.2	267.2
Depreciation & amortisation	376.3	357.2	350.7	343.4	334.6
Adj net interest (income)/exp	5.1	(1.9)	(3.3)	(2.7)	(2.0)
Change in working capital	106.1	26.7	7.5	(2.1)	(3.0)
Cash taxes paid	(67.0)	(54.2)	(49.8)	(51.6)	(53.4)
Other operating cash flow	0.0	0.0	0.0	0.0	0.0
Cash flow from operations	660.8	599.7	553.9	545.2	543.5
Capex	(223.8)	(222.3)	(240.0)	(260.0)	(280.0)
Free cash flow	437.0	377.4	313.9	285.2	263.5
Dividends paid	(107.4)	(142.2)	(172.3)	(187.5)	(202.2)
Equity raised / (purchased)	0.8	0.0	0.0	0.0	0.0
Change in Debt	(174.5)	0.0	0.0	0.0	0.0
Other invest/financing cash flow	12.4	(16.5)	(16.6)	(15.8)	(15.1)
Effect of exch rate changes	6.4	0.0	0.0	0.0	0.0
Net cash flow	194.2	243.5	144.9	100.3	63.2

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	8.0	7.9	4.2	2.1	2.1
EBITDA growth	4.0	8.9	(4.9)	0.5	0.2
EBIT growth	64.2	35.1	(9.1)	4.1	3.8
Pretax growth	68.1	40.1	(8.8)	3.8	3.5
Reported net profit growth	102.3	40.7	(13.3)	4.4	4.0
Core net profit growth	102.3	11.2	9.7	4.4	4.0
Profitability ratios (%)					
EBITDA margin	16.4	16.6	15.1	14.9	14.6
EBIT margin	5.7	7.1	6.2	6.4	6.5
Pretax profit margin	5.6	7.2	6.3	6.4	6.5
Payout ratio	74.0	106.2	70.0	70.0	70.0
DuPont analysis					
Net profit margin (%)	3.5	4.6	3.8	3.9	4.0
Revenue/Assets (x)	0.7	0.8	0.8	0.8	0.8
Assets/Equity (x)	1.8	1.9	1.9	1.9	1.9
ROAE (%)	4.6	6.6	5.8	6.0	6.3
ROAA (%)	2.5	2.8	3.1	3.2	3.3
Liquidity & Efficiency					
Cash conversion cycle	(31.1)	(34.7)	(33.5)	(32.8)	(31.7)
Days receivable outstanding	56.7	53.3	50.2	49.1	48.1
Days inventory outstanding	15.1	13.8	14.0	14.5	14.7
Days payables outstanding	102.9	101.8	97.7	96.5	94.5
Dividend cover (x)	1.4	0.9	1.4	1.4	1.4
Current ratio (x)	1.6	1.5	1.7	1.8	1.8
Leverage & Expense Analysis					
Asset/Liability (x)	2.7	2.7	2.7	2.7	2.7
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Net gearing (%) (excl. perps)	net cash	net cash	net cash	net cash	net cash
Net interest cover (x)	39.2	na	na	na	na
Debt/EBITDA (x)	0.6	0.5	0.6	0.6	0.6
Capex/revenue (%)	6.4	5.9	6.1	6.5	6.8
Net debt/ (net cash)	(578.1)	(518.1)	(669.5)	(776.2)	(845.8)

Source: Company; Maybank IBG Research

AAPICO Hitech (AH TB)

Outpacing industry growth

EV parts in 2023 will grow 100% but on low base

AH targets FY23 EV parts sales of about THB1.4b, growing 100% YoY, and accounting for 4.5% of sales. We maintain BUY on AH with a TP of THB44 based on 8x P/E (-0.5 SD) as we see stronger growth ahead. We expect AH's earnings growth to outpace the industry's thanks to new orders and improving gross profit margin. We expect earnings of THB1.955b (+11% growth) in FY23E and THB2.074b (growth of 6%) in FY24E.

Mgmt: 10% sales growth with potential upside risk

For FY23E, management maintains a sales growth target of 10-15% YoY, outpacing the Thai automobile industry as car production is forecast to grow by only 3.5% YoY to 1.95m units. AH's strength stems from: 1) orders for parts for Ford vehicles are projected to rise from THB700m in FY22 to THB1.1-1.2b in FY23E. 2) New orders from Vinfast, which increased from THB300m in FY22 to THB0.9-1.1b in FY23E. 3) More car showrooms opened, namely Mitsubishi (2Q22), Ford (3Q22) and Proton (4Q22). We maintain our FY23E sales growth forecast of 10% YoY, with upside risk to 15% growth YoY.

FY23E earnings likely to hit record high

Management said FY23E gross profit margin is likely to be in the upper band of the forecast range of 10-12% vs 11.4% the previous year. For FY23E, we forecast gross margin of 11.8%, driven by greater economies of scale from higher sales and as part sales in Portugal saw higher selling prices. This should lead to profit rising by 11% YoY to THB1.955b, a record high.

Sales of EV parts in 2023 will grow 100% YoY

For sales of parts for EVs in FY22, total orders reached THB700m, accounting for 2.5% of AH's sales. For FY23, the company targets EV part sales of about THB1.4b, growing 100% YoY. AH has parts manufacturing subsidiaries in China (5% of total parts sales), so it has close relationships with Chinese automakers. Management expects to receive EV parts orders from Chinese automakers that relocate their production base to Thailand in the future.

FYE Dec (THB m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	20,433	27,967	30,764	32,302	33,917
EBITDA	2,015	3,005	3,283	3,348	3,408
Core net profit	792	1,761	1,955	2,074	2,218
Core EPS (THB)	2.23	4.96	5.51	5.84	6.25
Core EPS growth (%)	393.4	122.3	11.0	6.1	7.0
Net DPS (THB)	0.94	1.54	1.89	2.05	2.19
Core P/E (x)	12.1	6.0	6.0	5.7	5.3
P/BV (x)	1.1	1.1	1.1	1.0	0.9
Net dividend yield (%)	3.5	5.2	5.7	6.2	6.6
ROAE (%)	12.8	20.1	18.6	17.7	16.9
ROAA (%)	3.5	7.3	7.6	7.9	8.3
EV/EBITDA (x)	8.6	6.0	5.5	5.1	4.6
Net gearing (%) (incl perps)	84.7	71.6	53.2	37.9	25.0
Consensus net profit	-	-	1,833	1,962	2,061
MIBG vs. Consensus (%)	-	-	4.7	5.7	7.6

BUY

Share Price THB 33.25
12m Price Target THB 44.00 (+32%)

Company Description

AH's main businesses are to design, produce, and install assembly jigs, stamping die, and OEM auto parts.

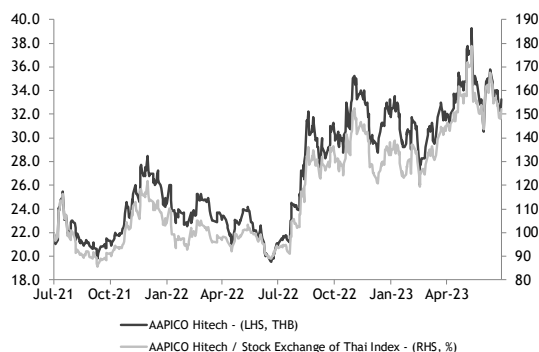
Statistics

52w high/low (THB)	39.25/20.80
3m avg turnover (USDm)	3.7
Free float (%)	50.5
Issued shares (m)	355
Market capitalisation	THB11.8B
	USD342M

Major shareholders:

Thai NVDR	13.7%
MRS. TEO LEE NGO	9.8%
MR. YEAP SWEE CHUA	9.8%

Price Performance



	-1M	-3M	-12M
Absolute (%)	3	6	58
Relative to index (%)	2	7	61

Source: FactSet

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FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	7.5	5.0	6.1	5.7	5.3
Core P/E (x)	12.1	6.0	6.0	5.7	5.3
P/BV (x)	1.1	1.1	1.1	1.0	0.9
P/NTA (x)	1.1	1.1	1.1	1.0	0.9
Net dividend yield (%)	3.5	5.2	5.7	6.2	6.6
FCF yield (%)	16.4	nm	10.9	13.3	14.9
EV/EBITDA (x)	8.6	6.0	5.5	5.1	4.6
EV/EBIT (x)	17.6	9.7	8.5	7.6	6.8

INCOME STATEMENT (THB m)

Revenue	20,433.2	27,967.2	30,763.9	32,302.1	33,917.2
EBITDA	2,015.1	3,005.0	3,282.7	3,348.4	3,407.6
EBIT	984.3	1,851.3	2,125.6	2,227.0	2,333.2
Net interest income / (exp)	(346.0)	(341.9)	(313.1)	(267.0)	(216.7)
Associates & JV	280.5	451.5	474.6	491.2	508.4
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	0.0	0.0	0.0	0.0	0.0
Pretax profit	918.8	1,960.9	2,287.2	2,451.1	2,624.9
Income tax	(113.4)	(177.1)	(308.1)	(352.8)	(381.0)
Minorities	(13.5)	(23.3)	(24.0)	(24.7)	(25.5)
Discontinued operations	232.0	63.1	(35.4)	0.0	0.0
Reported net profit	1,024.0	1,823.6	1,919.6	2,073.6	2,218.4
Core net profit	791.9	1,760.5	1,955.0	2,073.6	2,218.4

BALANCE SHEET (THB m)

Cash & Short Term Investments	742.1	767.4	830.0	875.0	925.0
Accounts receivable	2,236.6	4,330.1	4,481.6	4,571.2	4,662.7
Inventory	3,030.7	3,784.3	3,916.8	4,034.3	4,155.3
Reinsurance assets	0.0	0.0	0.0	0.0	0.0
Property, Plant & Equip (net)	8,822.2	8,649.4	8,492.4	8,121.0	7,796.5
Intangible assets	0.0	0.0	0.0	0.0	0.0
Investment in Associates & JVs	4,150.4	4,199.3	4,673.9	5,165.1	5,673.5
Other assets	3,740.6	3,738.6	3,768.8	3,785.4	3,802.9
Total assets	22,722.5	25,469.0	26,163.5	26,552.0	27,015.9
ST interest bearing debt	3,791.7	3,881.9	3,380.6	2,814.3	2,213.1
Accounts payable	4,883.7	7,010.4	7,255.8	7,400.9	7,548.9
LT interest bearing debt	4,418.0	3,992.5	3,476.9	2,894.5	2,276.2
Other liabilities	814.0	655.0	724.0	689.0	706.0
Total Liabilities	13,907.7	15,539.5	14,836.8	13,798.9	12,744.6
Shareholders Equity	8,513.0	9,611.0	10,984.2	12,386.0	13,878.6
Minority Interest	301.8	318.5	342.5	367.2	392.7
Total shareholder equity	8,814.8	9,929.5	11,326.7	12,753.2	14,271.3
Total liabilities and equity	22,722.5	25,469.0	26,163.5	26,552.0	27,015.9

CASH FLOW (THB m)

Pretax profit	918.8	1,960.9	2,287.2	2,451.1	2,624.9
Depreciation & amortisation	1,030.9	1,153.7	1,157.1	1,121.4	1,074.4
Adj net interest (income)/exp	346.0	341.9	313.1	267.0	216.7
Change in working capital	1,185.8	(883.2)	(0.1)	(113.0)	(64.7)
Cash taxes paid	(113.4)	(177.1)	(308.1)	(352.8)	(381.0)
Other operating cash flow	0.0	0.0	0.0	0.0	0.0
Cash flow from operations	2,819.6	925.6	2,288.9	2,323.7	2,503.1
Capex	(1,252.7)	(953.7)	(1,000.0)	(750.0)	(750.0)
Free cash flow	1,567.0	(28.1)	1,288.9	1,573.7	1,753.1
Dividends paid	(215.2)	(372.3)	(546.5)	(671.9)	(725.8)
Equity raised / (purchased)	32.3	0.0	0.0	0.0	0.0
Change in Debt	(1,557.6)	(335.4)	(1,016.9)	(1,148.6)	(1,219.5)
Other invest/financing cash flow	226.1	761.1	337.1	291.8	242.2
Effect of exch rate changes	0.0	0.0	0.0	0.0	0.0
Net cash flow	52.5	25.3	62.6	45.0	50.0

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	19.0	36.9	10.0	5.0	5.0
EBITDA growth	39.7	49.1	9.2	2.0	1.8
EBIT growth	121.2	88.1	14.8	4.8	4.8
Pretax growth	429.9	113.4	16.6	7.2	7.1
Reported net profit growth	593.0	78.1	5.3	8.0	7.0
Core net profit growth	442.8	122.3	11.0	6.1	7.0
Profitability ratios (%)					
EBITDA margin	9.9	10.7	10.7	10.4	10.0
EBIT margin	4.8	6.6	6.9	6.9	6.9
Pretax profit margin	4.5	7.0	7.4	7.6	7.7
Payout ratio	32.6	30.0	35.0	35.0	35.0
DuPont analysis					
Net profit margin (%)	5.0	6.5	6.2	6.4	6.5
Revenue/Assets (x)	0.9	1.1	1.2	1.2	1.3
Assets/Equity (x)	2.7	2.6	2.4	2.1	1.9
ROAE (%)	12.8	20.1	18.6	17.7	16.9
ROAA (%)	3.5	7.3	7.6	7.9	8.3
Liquidity & Efficiency					
Cash conversion cycle	11.4	5.4	8.0	8.1	8.3
Days receivable outstanding	44.8	42.3	51.6	50.4	49.0
Days inventory outstanding	55.6	49.5	51.1	50.2	49.3
Days payables outstanding	88.9	86.4	94.6	92.6	90.0
Dividend cover (x)	3.1	3.3	2.9	2.9	2.9
Current ratio (x)	0.7	0.8	0.9	0.9	1.0
Leverage & Expense Analysis					
Asset/Liability (x)	1.6	1.6	1.8	1.9	2.1
Net gearing (%) (incl perps)	84.7	71.6	53.2	37.9	25.0
Net gearing (%) (excl. perps)	84.7	71.6	53.2	37.9	25.0
Net interest cover (x)	2.8	5.4	6.8	8.3	10.8
Debt/EBITDA (x)	4.1	2.6	2.1	1.7	1.3
Capex/revenue (%)	6.1	3.4	3.3	2.3	2.2
Net debt/ (net cash)	7,467.7	7,107.0	6,027.4	4,833.8	3,564.3

Source: Company; Maybank IBG Research

Somboon Advance Technology (SAT TB)

To slightly grow in FY23E alongside auto industry

Enters into electric tricycles, but only 1% of sales

Expansion into the electric tricycle business will help support future performance, although it should make up just 1% of FY23E sales. We expect FY23E earnings to grow by 4.3% YoY. SAT is trading at just 8.1x FY23E P/E and 1.0x P/BV, below its 10-year average of 10.3x and 1.24X. It has THB3.2b cash on hand (40% of market value) and offers a potential dividend yield of 8%. Our TP of THB24, is based on 10.34x FY2023E P/E, similar to its 10-year forward P/E of 10.3x. BUY.

Electric tricycles to support sales

SAT's new company for electric tricycles, S-TRON (SAT owns 60%), has joined forces with E-tuk Factory to import parts to assemble electric tricycles. The target is to deliver 200-300 units in 2H23, representing approximately THB100m in revenue, accounting for 1% of SAT's sales.

Targets to slightly outperform the industry

SAT's management forecasts industry auto production in 2023 will reach 1.9-1.95m vehicles, growing slightly by 1-3.5%, while tractor output (20-25% of sales) should be stable at 88,000 units. SAT has received new orders worth THB400-500m to be realised in FY23E. Its electric tricycle business should realise another THB100m in sales in 2H23. Overall, SAT's sales should outperform the industry, which is expected to grow by 3.5% YoY (SAT and The Federation of Thai Industries forecast). The gross profit margin is forecast at 18.1%, in line with the previous year, driven by the price adjustment plan in 1Q23, although this year's electricity cost will rise by 13% from 4Q22.

Expecting modest growth in FY23E sales & earnings

We maintain our FY23 forecasts, expecting sales of THB9.378b, growing 5% YoY, possibly outperforming the industry, which may grow 3.5% YoY. We forecast FY23E core earnings of THB988m, growing 4.3%, in line with sales growth and vs core earnings of THB948m in FY22E (-0.7%). We forecast FY23 gross profit margin of 18.2%.

FYE Dec (THB m)	FY21A	FY22A	FY23E	FY24E	FY25E
Revenue	8,598	8,931	9,378	9,659	9,949
EBITDA	1,610	1,561	1,608	1,631	1,640
Core net profit	955	948	988	1,037	1,080
Core EPS (THB)	2.25	2.23	2.32	2.44	2.54
Core EPS growth (%)	157.5	(0.7)	4.3	4.9	4.1
Net DPS (THB)	1.50	1.50	1.51	1.59	1.65
Core P/E (x)	9.7	9.4	8.0	7.7	7.4
P/BV (x)	1.2	1.1	1.0	0.9	0.9
Net dividend yield (%)	6.9	7.1	8.1	8.5	8.8
ROAE (%)	13.0	12.1	12.2	12.2	12.1
ROAA (%)	10.2	9.4	9.4	9.5	9.5
EV/EBITDA (x)	3.9	3.7	2.8	2.4	2.1
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Consensus net profit	-	-	974	1,101	1,174
MIBG vs. Consensus (%)	-	-	1.5	(5.8)	(8.0)

BUY

Share Price THB 18.70
12m Price Target THB 24.00 (+28%)

Company Description

SAT manufactures parts for the motor vehicle industry.

Statistics

52w high/low (THB)	22.50/17.20
3m avg turnover (USDm)	0.5
Free float (%)	64.4
Issued shares (m)	425
Market capitalisation	THB7.9B
	USD230M

Major shareholders:

Somboon Holding	29.9%
THAI NVDR	9.5%
KKP LTFD	1.6%

Price Performance



	-1M	-3M	-12M
Absolute (%)	0	(7)	2
Relative to index (%)	(1)	(6)	4

Source: FactSet

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FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Metrics					
P/E (reported) (x)	8.8	9.1	8.0	7.7	7.4
Core P/E (x)	9.7	9.4	8.0	7.7	7.4
P/BV (x)	1.2	1.1	1.0	0.9	0.9
P/NTA (x)	1.2	1.1	1.0	0.9	0.9
Net dividend yield (%)	6.9	7.1	8.1	8.5	8.8
FCF yield (%)	13.6	8.2	12.4	14.9	14.7
EV/EBITDA (x)	3.9	3.7	2.8	2.4	2.1
EV/EBIT (x)	6.1	5.6	4.1	3.5	2.9

INCOME STATEMENT (THB m)

Revenue	8,598.2	8,931.4	9,377.9	9,659.3	9,949.1
EBITDA	1,609.7	1,561.5	1,608.4	1,631.4	1,639.7
EBIT	1,037.4	1,046.8	1,091.5	1,143.6	1,187.9
Net interest income / (exp)	(5.8)	(2.0)	(1.8)	(1.8)	(1.8)
Associates & JV	84.3	38.3	53.8	57.7	62.0
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	0.0	0.0	0.0	0.0	0.0
Pretax profit	1,116.0	1,083.1	1,143.5	1,199.5	1,248.1
Income tax	(158.8)	(139.7)	(155.1)	(162.1)	(168.4)
Minorities	(2.6)	4.2	0.0	0.0	0.0
Discontinued operations	(2.0)	(7.7)	0.0	0.0	0.0
Reported net profit	952.7	940.0	988.5	1,037.4	1,079.7
Core net profit	954.7	947.6	988.5	1,037.4	1,079.7

BALANCE SHEET (THB m)

Cash & Short Term Investments	2,998.5	3,135.9	3,488.0	4,029.0	4,525.0
Accounts receivable	1,531.2	1,645.4	1,694.8	1,745.6	1,798.0
Inventory	593.7	775.6	798.8	822.8	847.5
Reinsurance assets	0.0	0.0	0.0	0.0	0.0
Property, Plant & Equip (net)	3,069.1	3,213.1	3,096.2	2,858.4	2,656.6
Intangible assets	0.0	0.0	0.0	0.0	0.0
Investment in Associates & JVs	1,031.5	1,055.4	1,109.2	1,166.9	1,228.9
Other assets	606.2	525.4	539.1	547.7	556.6
Total assets	9,830.1	10,350.8	10,726.1	11,170.4	11,612.5
ST interest bearing debt	12.5	13.3	13.1	13.4	12.6
Accounts payable	1,227.7	1,335.4	1,375.4	1,416.7	1,459.2
Insurance contract liabilities	0.0	0.0	0.0	0.0	0.0
LT interest bearing debt	18.4	23.4	23.0	23.5	22.2
Other liabilities	929.0	1,012.0	998.0	1,005.0	1,001.0
Total Liabilities	2,187.7	2,384.5	2,409.1	2,458.5	2,495.3
Shareholders Equity	7,642.4	7,950.5	8,301.2	8,696.0	9,101.4
Minority Interest	0.0	15.8	15.8	15.8	15.8
Total shareholder equity	7,642.4	7,966.3	8,317.0	8,711.8	9,117.2
Total liabilities and equity	9,830.1	10,350.8	10,726.1	11,170.4	11,612.5

CASH FLOW (THB m)

Pretax profit	1,116.0	1,083.1	1,143.5	1,199.5	1,248.1
Depreciation & amortisation	572.3	514.7	516.9	487.8	451.8
Adj net interest (income)/exp	5.8	2.0	1.8	1.8	1.8
Change in working capital	(4.3)	11.2	(46.2)	(42.2)	(43.4)
Cash taxes paid	(158.8)	(139.7)	(155.1)	(162.1)	(168.4)
Other operating cash flow	0.0	0.0	0.0	0.0	0.0
Cash flow from operations	1,435.5	1,452.7	1,388.6	1,430.9	1,420.5
Capex	(173.1)	(724.0)	(400.0)	(250.0)	(250.0)
Free cash flow	1,262.4	728.8	988.6	1,180.9	1,170.5
Dividends paid	(374.2)	(629.3)	(637.8)	(642.5)	(674.3)
Equity raised / (purchased)	0.0	0.0	0.0	0.0	0.0
Change in Debt	(124.3)	5.8	(0.6)	0.7	(2.1)
Other invest/financing cash flow	(96.1)	32.1	1.8	1.8	1.8
Effect of exch rate changes	0.0	0.0	0.0	0.0	0.0
Net cash flow	667.9	137.4	352.1	541.0	496.0

FYE 31 Dec	FY21A	FY22A	FY23E	FY24E	FY25E
Key Ratios					
Growth ratios (%)					
Revenue growth	46.2	3.9	5.0	3.0	3.0
EBITDA growth	54.9	(3.0)	3.0	1.4	0.5
EBIT growth	147.3	0.9	4.3	4.8	3.9
Pretax growth	169.2	(2.9)	5.6	4.9	4.1
Reported net profit growth	156.6	(1.3)	5.2	4.9	4.1
Core net profit growth	157.5	(0.7)	4.3	4.9	4.1
Profitability ratios (%)					
EBITDA margin	18.7	17.5	17.2	16.9	16.5
EBIT margin	12.1	11.7	11.6	11.8	11.9
Pretax profit margin	13.0	12.1	12.2	12.4	12.5
Payout ratio	66.9	67.9	65.0	65.0	65.0
DuPont analysis					
Net profit margin (%)	11.1	10.5	10.5	10.7	10.9
Revenue/Assets (x)	0.9	0.9	0.9	0.9	0.9
Assets/Equity (x)	1.3	1.3	1.3	1.3	1.3
ROAE (%)	13.0	12.1	12.2	12.2	12.1
ROAA (%)	10.2	9.4	9.4	9.5	9.5
Liquidity & Efficiency					
Cash conversion cycle	30.2	34.6	37.4	37.4	37.4
Days receivable outstanding	57.3	64.0	64.1	64.1	64.1
Days inventory outstanding	30.0	33.7	36.9	37.0	37.0
Days payables outstanding	57.1	63.1	63.6	63.8	63.8
Dividend cover (x)	1.5	1.5	1.5	1.5	1.5
Current ratio (x)	2.9	2.8	3.0	3.2	3.4
Leverage & Expense Analysis					
Asset/Liability (x)	4.5	4.3	4.5	4.5	4.7
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Net gearing (%) (excl. perps)	net cash	net cash	net cash	net cash	net cash
Net interest cover (x)	nm	nm	nm	nm	nm
Debt/EBITDA (x)	0.0	0.0	0.0	0.0	0.0
Capex/revenue (%)	2.0	8.1	4.3	2.6	2.5
Net debt/ (net cash)	(2,967.6)	(3,099.2)	(3,451.9)	(3,992.1)	(4,490.2)

Source: Company; Maybank IBG Research

Thai Stanley Electric (STANLY TB)

Continued growth with potential for bigger dividends

Undemanding valuations, reiterate BUY

Maintain BUY and TP of THB240 (based on 10.1x P/E, STANLY's 10-year average). We see continued earnings growth of 4% pa in FY24-25E, based on our 5% sales growth assumption vs management's target of 5-10%. STANLY is financially strong, with no debt and THB7.9b cash on hand (52% of the stock's market value). As such, we see potential for management to raise its dividend payout ratio to ~70% (yield 8.3%) for FY24E from ~40% (yield 4.8%) for FY22A or to offer another special dividend. Valuation is undemanding at just 8.4x FY24E P/E (-1 SD) and 0.7x FY24E P/BV (-1 SD).

STANLY's lighting technology supports EVs

STANLY is Thailand's leading auto parts manufacturer with dominant share in automotive lamps (45-50%) and motorcycle (90%) lamps. Most of STANLY's automotive lamp sales are for internal combustion engine vehicles. However, STANLY's technology supports electric vehicles (EVs) too. It is currently negotiating the production of a series of lamps for EV car manufacturers, such as MG, GWM and BYD.

Continued growth

Management estimate sales growth of 5-10% YoY for FY24E. This projection surpasses the anticipated 3.5% growth rate for the automotive industry as a whole. Several factors will drive this year's performance. STANLY has already received new orders for five models since the start of the year, and there are plans to launch additional car models in 2H23. These developments will generate new orders for STANLY, consequently boosting sales. We forecast FY24 sales growing 5% YoY to THB15.17b. Our core FY24 profit forecast of THB1.816b represents 4% YoY growth.

Potential increase in dividend payout ratio

We see potential for STANLY to increase its dividend payout ratio to over 40%. (We conservatively assume the dividend payout ratio is ~42% for FY24-26E). In the past 5-6 years, STANLY has invested a hefty THB10b to support future growth. However, this year, management has indicated that investment will be much lower at less than THB1b. With THB7.9b cash on hand and strong cash flow generation (we estimate FY24 cash flow of THB2.9b), we think management has plenty of room to raise the dividend or offer another special dividend.

FYE Mar (THB m)	FY22A	FY23A	FY24E	FY25E	FY26E
Revenue	13,582	14,448	15,170	15,701	16,251
EBITDA	2,884	3,043	3,022	3,029	3,050
Core net profit	1,501	1,745	1,816	1,886	1,953
Core EPS (THB)	19.58	22.77	23.70	24.61	25.49
Core EPS growth (%)	44.7	16.3	4.1	3.9	3.6
Net DPS (THB)	8.50	20.00	9.95	10.34	10.71
Core P/E (x)	9.0	7.9	8.3	8.0	7.7
P/BV (x)	0.7	0.7	0.7	0.7	0.6
Net dividend yield (%)	4.8	11.0	5.1	5.3	5.4
ROAE (%)	7.9	8.5	8.5	8.5	8.4
ROAA (%)	6.7	7.4	7.4	7.5	7.4
EV/EBITDA (x)	2.5	1.9	2.3	2.0	1.7
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Consensus net profit	-	-	1,880	2,010	2,105
MIBG vs. Consensus (%)	-	-	(3.4)	(6.2)	(7.2)

BUY

Share Price THB 196.50
12m Price Target THB 240.00 (+22%)

Company Description

STANLY produces lighting equipment for vehicles, including auto bulbs, lamps and moulds.

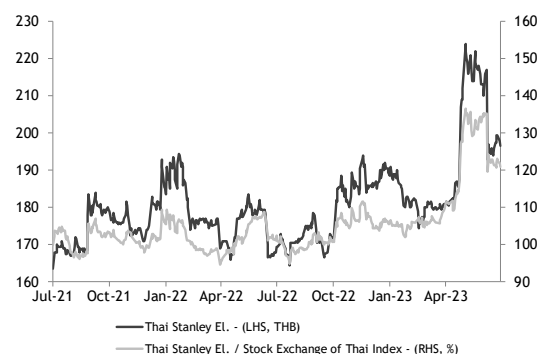
Statistics

52w high/low (THB)	224.00/164.50
3m avg turnover (USDm)	0.5
Free float (%)	34.3
Issued shares (m)	77
Market capitalisation	THB15.1B
	USD436M

Major shareholders:

Stanley Electric Holding	30.0%
Mr. Apichat Leeissaranukul	7.1%
Mrs.Porndee Leeissaranukul	5.9%

Price Performance



	-1M	-3M	-12M
Absolute (%)	(8)	9	17
Relative to index (%)	(9)	10	20

Source: FactSet

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FYE 31 Mar	FY22A	FY23A	FY24E	FY25E	FY26E
Key Metrics					
P/E (reported) (x)	9.0	7.8	8.3	8.0	7.7
Core P/E (x)	9.0	7.9	8.3	8.0	7.7
P/BV (x)	0.7	0.7	0.7	0.7	0.6
P/NTA (x)	0.7	0.7	0.7	0.7	0.6
Net dividend yield (%)	4.8	11.0	5.1	5.3	5.4
FCF yield (%)	17.9	27.4	12.5	18.4	18.1
EV/EBITDA (x)	2.5	1.9	2.3	2.0	1.7
EV/EBIT (x)	4.6	3.3	3.8	3.2	2.6

INCOME STATEMENT (THB m)

Revenue	13,582.3	14,447.8	15,170.2	15,701.2	16,250.7
EBITDA	2,884.0	3,043.4	3,022.3	3,028.9	3,050.5
EBIT	1,588.3	1,765.6	1,845.9	1,909.2	1,979.9
Net interest income / (exp)	0.0	0.0	0.0	0.0	0.0
Associates & JV	281.6	387.0	390.0	401.7	413.8
Exceptionals	0.0	0.0	0.0	0.0	0.0
Other pretax income	0.0	0.0	0.0	0.0	0.0
Pretax profit	1,869.9	2,152.5	2,235.9	2,310.9	2,393.7
Income tax	(369.4)	(407.8)	(419.9)	(424.8)	(440.5)
Minorities	0.0	0.0	0.0	0.0	0.0
Discontinued operations	20.3	0.9	0.0	0.0	0.0
Reported net profit	1,520.8	1,745.7	1,815.9	1,886.1	1,953.2
Core net profit	1,500.5	1,744.7	1,815.9	1,886.1	1,953.2

BALANCE SHEET (THB m)

Cash & Short Term Investments	6,138.9	7,976.0	8,076.2	9,034.9	9,938.6
Accounts receivable	2,617.5	2,557.4	2,634.1	2,680.2	2,727.1
Inventory	717.8	590.7	608.4	619.0	629.9
Reinsurance assets	0.0	0.0	0.0	0.0	0.0
Property, Plant & Equip (net)	9,076.8	8,469.1	8,042.6	7,672.9	7,352.4
Intangible assets	0.0	0.0	0.0	0.0	0.0
Investment in Associates & JVs	1,908.9	2,023.4	2,527.8	3,044.0	3,572.2
Other assets	2,596.7	2,708.9	2,708.9	2,708.9	2,708.9
Total assets	23,056.7	24,325.4	24,598.0	25,759.9	26,929.0
ST interest bearing debt	0.0	0.0	0.0	(0.0)	(0.0)
Accounts payable	1,054.5	1,000.8	1,030.9	1,048.9	1,067.3
Insurance contract liabilities	0.0	0.0	0.0	0.0	0.0
LT interest bearing debt	0.0	0.0	0.0	0.0	0.0
Other liabilities	1,975.0	2,038.0	1,997.0	2,017.0	2,007.0
Total Liabilities	3,029.9	3,038.7	3,027.9	3,066.3	3,074.5
Shareholders Equity	20,026.8	21,286.7	21,570.2	22,693.6	23,854.6
Minority Interest	0.0	0.0	0.0	0.0	0.0
Total shareholder equity	20,026.8	21,286.7	21,570.2	22,693.6	23,854.6
Total liabilities and equity	23,056.7	24,325.4	24,598.0	25,759.9	26,929.0

CASH FLOW (THB m)

Pretax profit	1,869.9	2,152.5	2,235.9	2,310.9	2,393.7
Depreciation & amortisation	1,295.7	1,277.8	1,176.5	1,119.7	1,070.5
Adj net interest (income)/exp	0.0	0.0	0.0	0.0	0.0
Change in working capital	(223.6)	138.1	(64.4)	(38.7)	(39.4)
Cash taxes paid	(369.4)	(407.8)	(419.9)	(424.8)	(440.5)
Other operating cash flow	0.0	0.0	0.0	0.0	0.0
Cash flow from operations	3,508.7	4,610.7	2,638.1	3,524.1	3,474.3
Capex	(1,095.3)	(806.0)	(750.0)	(750.0)	(750.0)
Free cash flow	2,413.4	3,804.7	1,888.1	2,774.1	2,724.3
Dividends paid	(421.4)	(651.3)	(1,532.5)	(762.7)	(792.2)
Equity raised / (purchased)	0.0	0.0	0.0	0.0	0.0
Change in Debt	0.0	0.0	0.0	(0.0)	(0.0)
Other invest/financing cash flow	(774.3)	(1,316.3)	(255.5)	(1,052.7)	(1,028.4)
Effect of exch rate changes	0.0	0.0	0.0	0.0	0.0
Net cash flow	1,217.6	1,837.1	100.2	958.7	903.7

FYE 31 Mar	FY22A	FY23A	FY24E	FY25E	FY26E
Key Ratios					
Growth ratios (%)					
Revenue growth	15.8	6.4	5.0	3.5	3.5
EBITDA growth	25.2	5.5	(0.7)	0.2	0.7
EBIT growth	54.1	11.2	4.5	3.4	3.7
Pretax growth	47.0	15.1	3.9	3.4	3.6
Reported net profit growth	43.3	14.8	4.0	3.9	3.6
Core net profit growth	44.7	16.3	4.1	3.9	3.6
Profitability ratios (%)					
EBITDA margin	21.2	21.1	19.9	19.3	18.8
EBIT margin	11.7	12.2	12.2	12.2	12.2
Pretax profit margin	13.8	14.9	14.7	14.7	14.7
Payout ratio	42.8	87.8	42.0	42.0	42.0
DuPont analysis					
Net profit margin (%)	11.2	12.1	12.0	12.0	12.0
Revenue/Assets (x)	0.6	0.6	0.6	0.6	0.6
Assets/Equity (x)	1.2	1.1	1.1	1.1	1.1
ROAE (%)	7.9	8.5	8.5	8.5	8.4
ROAA (%)	6.7	7.4	7.4	7.5	7.4
Liquidity & Efficiency					
Cash conversion cycle	53.9	53.1	49.5	49.0	48.2
Days receivable outstanding	68.5	64.5	61.6	60.9	59.9
Days inventory outstanding	19.4	19.9	17.4	17.2	16.9
Days payables outstanding	33.9	31.2	29.4	29.1	28.6
Dividend cover (x)	2.3	1.1	2.4	2.4	2.4
Current ratio (x)	4.6	5.6	5.6	6.1	6.5
Leverage & Expense Analysis					
Asset/Liability (x)	7.6	8.0	8.1	8.4	8.8
Net gearing (%) (incl perps)	net cash	net cash	net cash	net cash	net cash
Net gearing (%) (excl. perps)	net cash	net cash	net cash	net cash	net cash
Net interest cover (x)	nm	nm	nm	nm	nm
Debt/EBITDA (x)	0.0	0.0	0.0	nm	nm
Capex/revenue (%)	8.1	5.6	4.9	4.8	4.6
Net debt/ (net cash)	(6,138.9)	(7,976.0)	(8,076.2)	(9,034.9)	(9,938.6)

Source: Company; Maybank IBG Research

We also profile a few interesting unrated stocks, which closely reflect this theme

Malaysia

Press Metal (PMAH MK, Not Rated)

Press Metal is the largest aluminium smelter in Southeast Asia, strategically located within close proximity to raw materials and having significant energy cost advantage via its 100%-owned hydro-powered facility in Sarawak. With total extrusion and smelting capacity of 1.29m metric tonnes pa, steady annual demand growth outlook is being further bolstered by the fact that aluminium is also a key metal component for electric vehicles (EV), solar energy and recyclable packaging, thus ensuring rising demand as sustainable products become more prevalent.

For automotive, the rapid adoption of EVs is a key driver for higher aluminium demand, primarily on the back of higher aluminium content per vehicle and higher EV shares, out of the total vehicles being sold. A study by DuckerFrontier has found that there has been a steady rise in the average aluminium content per vehicle, from 186kg in 2016 to 208kg by 2020, and it expects this to further grow by 12% to 222kg per vehicle by 2026. The application of aluminium can be seen in the construction of the structural components, body sheet, as well as the casting and extrusion of the EV batteries as part of the EV's powertrain system.

In addition, the capacity of battery is also expected to improve going forward as part of the continuous innovation in battery technology, hence adding to the demand for aluminium application. Press Metal is already involved in the supply of fabricated aluminium products to one of the largest EV players in China, through its Foshan aluminium extrusion plant. This is also part of its strategy to move up the value chain by being directly involved in the application of lithium battery production through supplying the end-product of the battery casing for the EVs. The relatively close proximity of its plant with the Chinese EV's manufacturing plants also provides additional strategic advantage for the group to ride on the strong growth of EV adoption in China.

Yinson Holdings (YNS MK, Not Rated)

Yinson is the 4th largest independent FPSO (floating production storage and offloading) leasing entity globally in terms of fleet size, and continues to win contracts in this sector, the latest being the signing, in 1Q23, of a charter contract with Eni for the provision of a FPSO for the Agogo Integrated West Hub Development project (part of Block 15/06) in Angola. The contract is for a 15+5 year charter, valued at USD5.3b. However, it is also building out its renewable energy portfolio in parallel, with a target to build and/or acquire 3GW/ 10GW of RE capacity by 2023/29, respectively. It has an established strong development projects pipeline, helped by collaborations such as that with Verano for RE opportunities in Latin America (800MW greenfield pipeline).

Within the green technology space, under Yinson Greentech (YGT), management is also accelerating its e-mobility adoption agenda, having invested in start-ups like Oyika (e-2Ws), Moovita (autonomous vehicle), Lift Ocean AS (hydrofoil technology for marine harbour crafts), Sterling PBES Energy Solutions (marine battery solutions) and ChargeEV (public charging operator). Focusing on mobility, YGT has a leasing programme for

businesses to reduce the complexities and cost of transitioning to EVs while, via ChargeEV, it is a leading provider of cross-border charging infrastructure network between Malaysia and Singapore, with strategic partnerships with businesses and organizations across both countries allowing for a charging infrastructure that assures EV drivers will never be too far from a charging point. Most recently, YGT engaged with PLUS Malaysia to jointly develop the first ChargeEV hyperpower direct current fast charging hub along the backbone North-South PLUS highway. Earlier, in March 2023, Gentari, EV Connection and YGT announced they had signed a tripartite agreement to enable cross-tracking and cross-access charging of electric vehicles (EVs) on their Gentari, JomCharge and ChargeEV charging networks by June. The roaming agreement allows users of any one of the Setel, JomCharge and ChargeEV mobile apps to use chargers across the three networks nationwide. Aside from making it easier to locate and access chargers from any partner platform, payment for charging has also been made simpler, with a single payment system and roaming handling all transactions. The collaboration presently offers EV users access to a combined total of more than 600 EV charging points across Malaysia, or nearly two-thirds of all EV charging points in the country.

Genetec Technology (GENE MK, Not Rated)

Genetec Technology (GENE MK) has been a factory automation solutions (FAS) provider for the automotive industry since 2006. We postulate however, that it achieved a breakthrough in producing smart production line systems (PLS) for electric vehicles (EV) and energy storage (ES) only in around 2017-18. Between Feb and Jun 2021, it secured its first major EV/ES-related PLS contracts from a leading US marque - believed to be Tesla (TSLA US, Not Rated), for battery cells and automotive components (inc. ECUs and braking systems) amounting to MYR189.4m. Prior to the Tesla contracts, group revenue for FYE3/21 was MYR97.1m, of which the EV segment accounted for only c.29% (MYR28.2m; vs. MYR0.9m in FY3/20). By FYE3/22 however, EV & ES revenue had topped MYR164m with the segment accounting for a hefty 73% of group turnover.

We believe this explosive YoY growth (+481%) was primarily driven by Tesla-related contracts, and can be attributed to management's close working relationship and joint R&D initiatives with this key customer. During its AGM in Aug 22, management also stated that GENE was Tesla's sole supplier in the region for the range of PLS components it was supplying to the marque. Early this year, it secured an additional MYR95m/MYR85m in ES/EV contracts from Tesla respectively, taking its outstanding orderbook to a record-high MYR351m as of end-Feb 23. In the same month, management raised MYR178m in a private placement to fund the acquisition of a new factory that would increase production capacity by 50%. The private placement had initially targeted to raise only MYR94m.

In Jan 23, following Tesla's announcement of an additional USD3.6b outlay for expansion plans at its Gigafactory in Nevada that would encompass a 100GWh cell factory (with sufficient capacity to produce batteries for 1.5m light duty vehicles p.a.), GENE's management guided that it expected to receive favourable order replenishment jobs related to the project from 2H23 onwards that would likely enhance orderbook visibility by up to 24 months. Separately, related to Tesla's plans to commence production of its cybertrucks later this year (expected to reach full production by 2024), we believe GENE may have already won a small-scale PLS contract for the project. Upon timely execution and delivery of the pilot product, we

believe it has the potential to be followed up with subsequent contracts of a higher quantum.

As global demand for stationary battery storage is projected to hit 157.4GW by 2026 (2020: 19.3GW), GENE completed the pilot development of a 450kWh battery energy storage system (BESS), the first-of-its-kind domestically, as part of a 50:50 JV with Citaglobal Bhd (CITAGLB MK, Not Rated). The BESS unit comes complete with a power conversion and energy management system and has the capacity to store/manage excess power from RE generation sources (ie. solar). Having been well received by potential customers in both the private (data centres, transport and manufacturing) as well as public sectors (Malaysia and Singapore government agencies) during pilot testing, GENE's management expressed a readiness to commercialise the product in April and it's cautiously optimistic that revenue could reach MYR750m within 3 years (with gross profit margins of c.15-20%). It is currently in discussions to deploy 15MWh of BESS solutions for a prospective customer in 2H23.

Singapore

Nanofilm (NANO SP, Not Rated)

Nanofilm Technologies (NANO) designs, manufactures and integrates advanced material science and nano technology. A subsidiary of NANO has entered into a joint venture (ApexTech) with two Chinese companies to provide coating solutions for advanced battery components and systems in electric vehicles, as well as energy-storage applications in China. The Group will own 60% of the JV, and aims to develop proprietary coating solutions to replace traditional electroplating, which is extremely pollutive. Currently, the JV is on track with the initial commissioning targeted for 2H23 and full coating equipment is set to come on-stream by 2024. The pilot lines are designed and built in-house by NANO and industrial-scale mass production is expected to be reached by 2025.

Indonesia

NFC Indonesia (NFCX IJ, Not Rated)

NFC Indonesia (NFCX IJ) is expanding into green mobility through its subsidiary, Energi Selalu Baru (ESB, 35% ownership in 1Q23). NFCX sells e-bikes (brand: Volta) and provides battery swap stations.

Volta e-bikes have 47.6% local content and owners are eligible for IDR7m (USD466) government subsidies. The government is targeting to cease the sale of internal combustion engine motorcycles by 2040 (annual sales of 5.2m units in 2022). Meanwhile, Volta sold 4,923 e-bikes in 2022 and has 29% share of the e-bike market in Indonesia (16,781 units sold in 2022). Hence, the opportunity for EVs is still wide open for Volta due to the low penetration rate of e-bikes in Indonesia.

To accelerate EV adoption, Indonesia set new battery standards for e-bikes, named the Battery Asset Management System, which has 72V25Ah of power and be embedded with an Internet of thing. The Indonesia Battery Corporation (IBC, not listed) initiated the BAMS, and Volta is a consortium member.

The BAMS will enable the company to exclude batteries from the selling price, and the producer can implement a battery rental model. Volta can leverage this opportunity as it has access to 345,000-plus distribution points, ready to be upgraded to swap stations. As of May 2023, Volta had 285 swap stations in Indonesia.

VKTR Teknologi Mobilitas (VKTR IJ, Not Rated)

VKTR Teknologi Mobilitas (VKTR IJ) is focused on converting internal combustion engines (ICE) to electric. VKTR is starting with large vehicles (buses and trucks), with a total addressable market of 260,000 buses and 5.9m trucks. Annually, 180,000-plus trucks could potentially be converted to electric trucks initially by VKTR.

VKTR estimates EV bus demand of 10,200 by 2030 and 23,000 bus conversions in the next five years. Meanwhile, there are more than 17m cars and 120m ICE motorcycles in Indonesia, a potential market for EV conversion. VKTR is partnering with Equipmake (a British company) to convert buses.

VKTR also sells a brand new EV bus. VKTR is the sole brand holder of BYD's electric buses and trucks in Indonesia. VKTR partners with Tri Sakti (a non-listed local bus manufacturer) for the assembly lines to increase local content. VKTR also plans to expand into e-bikes by collaborating with Gaya Abadi Sempurna (SLIS IJ, CP IDR169, Not Rated) to sell electric bikes.

Vietnam

VinFast Trade & Service Ltd (Not Listed)

The only pure BEV carmaker in ASEAN

Vinfast is an EV brand from Vietnam and it's the only pure battery electric vehicle (BEV) carmaker in ASEAN. The company was established in 2017 by Vietnam's largest local conglomerate Vingroup (VIC VN) and it launched e-scooters in 2018 and internal combustion engine (ICE) cars in 2019. However, with an ambition to leapfrog in the EV space, Vinfast announced it will cease ICE production lines by end-2022 and it has completely transformed into a pure EV maker. USD8.2b by its parent and siblings has been invested into its highly automated and integrated manufacturing facilities that span over 350 ha in Hai Phong, Vietnam, which have more than 1,400 robots and it's capable of producing up to 300,000 BEV cars per annum.

A mission to create a sustainable future for everyone

Vinfast pursues its mission by providing a wide range of BEVs, from scooters, buses to A-E class passenger cars. It aims to address the EV and ICE markets in Vietnam, the US, Canada and Europe, which should have a total size of c.34m vehicles worth USD1.3t by 2028 (Frost & Sullivan estimates). It differentiates itself via three pillars, including premium quality BEVs, flexible pricing packages, and excellent aftersales service. To date, c.175,000 e-scooters and c.13,000 EV cars have been delivered. Aside from VF5 (class A), VF8 (D) and VF9 (E), Vinfast will introduce VF6 (B) and VF7 (C) this year and VF3 (mini car) in 2024 to its battery-electric car family. For the domestic market, Vinfast is also building a nationwide charging network and an electric taxi business to promote its brand as well as EVs. For overseas markets, the first 999 car shipment to the US was made in Mar'23 and VinFast is ttrack to open a 150,000-BEV p.a facility in the US by

2026. Vinfast is seeking approval from the US Securities and Exchange Commission to merge with Black Spade Acquisition Co, which would revalue the company at USD23b.

Medium ESK risk

Vinfast achieved a score of 23.3pts under Sustainalytics as of Jul'22, implying that the company is exposed to medium ESG risk. Vinfast has signed COP26 ZEV and the Climate Pledge. 50% of its board are females and it has independent audit, compensation, nominating and corporate committees.

Annexure I

Global auto OEM ESG and valuation comparisons

Fig 158: ESG ratings of global auto OEMs

		CDP disclosure		MSCI		Sustainalytics		ESG Book	
Company	Ticker	Climate Change	Water Security	ESG Rating	Temp score (°C)	Risk rating	Controversy Score	ESG score	Temp score (°C)
Global Auto OEMs									
BYD Co Ltd	1211 HK	NA	NA	AA	2.9	Medium	2	49.5	2.7
BMW AG	BMW GR	A-	NA	AA	1.5	Medium	3	57.1	3.0
Mercedes Benz	MBG GR	A-	NA	A	2.5	Medium	3	58.3	1.5
Deere & Co	DE US	C	C	AA	3.3	Low	2	59.3	3.0
Ford Motor	F US	A	A	BB	3.1	Medium	3	65.0	1.5
Geely Automobile	175 HK	NA	NA	A	>3.2	Low	0	58.9	1.5
General Motors	GM US	A-	A-	BBB	3.2	Medium	4	56.7	1.5
Great Wall Motor	2333 HK	NA	NA	BBB	>3.2	Medium	2	48.4	1.5
Guangzhou Auto	2238 HK	D	D	BB	>3.2	High	2	50.4	1.5
Honda Motor	7267 JP	B	C	AA	2.3	Medium	4	56.0	1.5
Hyundai Motor	005380 KS	A-	A	B	1.7	High	3	57.4	1.5
Kubota Corp	6326 JP	A-	A-	AAA	3.6	Low	1	58.8	1.5
Nissan Motor	7201 JP	A-	A	BBB	2.6	High	4	61.9	1.5
Renault SA	RNO FP	A-	B	BBB	>3.2	Medium	4	59.7	1.5
SAIC Motor	600104 CH	NA	NA	B	>3.2	High	2	44.8	3.0
Stellantis NV	STLA US	NA	NA	BB	2.4	Medium	3	63.4	1.5
Suzuki Motor	7269 JP	B	B	BB	>3.2	Medium	2	52.6	1.5
Tesla Inc	TSLA US	NA	NA	A	2.1	Medium	3	49.8	3.0
Toyota Motor	7203 JP	A-	A	A	3.3	Medium	3	53.4	1.5
Volkswagen AG	VOW GR	A-	A	B	3.2	Medium	3	55.1	1.5
India Auto OEMs									
Ashok Leyland	AL IN	NA	NA	NA	NA	Low	1	52.2	NA
Bajaj Auto	BJAUT IN	NA	NA	BBB	>3.2	Low	1	48.6	3.0
Eicher Motors	EIM IN	NA	NA	A	>3.2	Low	2	48.3	3.0
Escorts Ltd.	ESC IN	C	B-	NA	NA	Medium	1	NA	NA
Force Motors	FML IN	NA	NA	NA	NA	NA	NA	NA	NA
Hero Motocorp	HMCL IN	D	C	A	>3.2	Low	1	53.9	1.5
Mahindra & Mah.	MM IN	B	A-	A	4.0	Medium	2	59.4	3.0
Maruti Suzuki	MSIL IN	NA	NA	B	>3.2	Medium	2	NA	3.0
SML Isuzu	SM IN	NA	NA	NA	NA	NA	NA	NA	NA
Tata Motors	TTMT IN	B	NA	B	>3.2	Medium	2	54.4	1.5
TVS Motors	TVSL IN	NA	NA	A	>3.2	Low	0	NA	NA

Source: CDP, MSCI, Sustainalytics, ESG Book

Fig 159: Valuation comparison of global auto OEMs

Company	Ticker	Curr	CMP (Local CR)	MCAP (Local CR b)	P/E		1-year return (%)	3-year return (%)	5-year return (%)	ROE (%)
					2021 (x)	2022 (x)				
Global Auto OEMs										
BYD Co Ltd	1211 HK	HKD	262.6	813	247.7	46.0	(7.2)	47.4	40.7	16.1
BMW AG	BMW GR	EUR	105.82	70	5.6	3.9	46.2	29.5	12.0	22.2
Mercedes Benz	MBG GR	EUR	72.29	77	7.2	5.3	41.5	40.2	14.3	18.4
Deere & Co	DE US	USD	409.55	120	21.7	17.6	39.1	35.8	26.2	36.9
Ford Motor	F US	USD	15.19	61	7.4	8.1	40.2	38.7	11.6	(4.3)
Geely Automobile	175 HK	HKD	9.77	98	16.9	19.4	(41.1)	(17.3)	(12.1)	7.5
General Motors	GM US	USD	40.5	56	5.7	5.3	28.2	16.8	2.3	14.0
Great Wall Motor	2333 HK	HKD	9.25	193	12.7	10.2	(29.7)	14.4	16.1	13.0
Guangzhou Auto	2238 HK	HKD	4.71	102	6.5	6.0	(37.9)	(6.7)	(4.2)	7.8
Honda Motor	7267 JP	JPY	4198	7,604	11.0	10.2	25.6	19.0	8.7	7.2
Hyundai Motor	005380 KS	KRW	208500	44,104	9.0	6.0	14.2	30.7	14.3	7.3
Kubota Corp	6326 JP	JPY	2041	2,431	14.0	15.6	(3.3)	10.5	4.4	8.8
Nissan Motor	7201 JP	JPY	556.2	2,348	(4.9)	10.1	8.3	13.6	(9.8)	5.1
Renault SA	RNO FP	EUR	38.48	11	11.9	(31.0)	69.6	19.7	(10.9)	(1.2)
SAIC Motor	600104 CH	CNY	14.41	168	6.8	10.3	(15.5)	(8.3)	(12.3)	5.8
Stellantis NV	STLA US	USD	18.91	60	4.5	3.5	60.1	38.7	10.4	26.3
Suzuki Motor	7269 JP	JPY	5245	2,576	17.4	15.9	20.7	13.6	(1.6)	9.0
Tesla Inc	TSLA US	USD	277.9	881	170.8	68.3	16.6	40.1	67.1	33.5
Toyota Motor	7203 JP	JPY	2218	36,187	13.8	10.8	3.9	21.5	12.1	11.5
Volkswagen AG	VOW GR	EUR	151.2	70	5.1	5.1	(4.7)	10.4	7.3	10.6
India Auto OEMs										
Ashok Leyland	AL IN	INR	171.75	504	(140.8)	43.0	21.2	51.9	7.0	15.6
Bajaj Auto	BJAUT IN	INR	4859.6	1,406	28.0	22.9	25.8	22.8	12.8	20.5
Eicher Motors	EIM IN	INR	3347.1	916	62.7	33.9	13.3	21.6	4.7	21.1
Escorts Ltd.	ESC IN	INR	2376.75	314	35.7	40.4	46.9	30.8	21.7	8.1
Force Motors	FML IN	INR	2749.15	36	(39.8)	(48.5)	176.5	43.1	3.2	7.4
Hero Motocorp	HMCL IN	INR	3136.3	627	27.0	22.3	12.3	9.9	1.3	17.3
Mahindra & Mah.	MM IN	INR	1546.55	1,923	28.5	15.6	35.3	43.3	12.4	19.9
Maruti Suzuki	MSIL IN	INR	9603.65	2,901	74.8	35.3	12.1	19.4	1.3	14.0
SML Isuzu	SM IN	INR	1019.6	15	(14.8)	74.5	69.7	36.2	5.2	11.7
Tata Motors	TTMT IN	INR	624.9	2,247	(20.9)	99.3	46.0	81.1	18.8	5.4
TVS Motors	TVSL IN	INR	1350.75	642	84.8	48.3	61.5	53.1	19.0	26.8

Source: Bloomberg

Annexure II

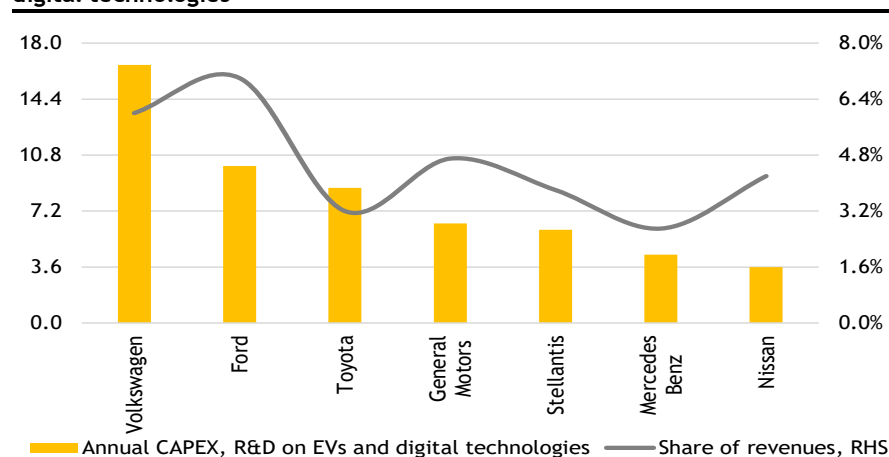
Carbon emission targets and capex plans of global automotive companies

Fig 160: Emission targets of the leading global EV players

EV Players	Emissions	Scopes Covered	SBTi Validation	2025	2030	2035	2040	2045	2050
Tesla	Carbon emissions	-	Yes	-	-	-	-	-	-
	Vehicle lifecycle	1,2,3		-	-25% (BY:2013)	-	-	-	Net zero
Toyota	New vehicles	3 Cat.11	Yes	-	-35%	-	-	-	-90% (Base Year :2010)
	Global plants	1,2		-	-35% (BY:2013)	-	-	-	Net zero
Hyundai	Carbon emissions	1,2,3	Yes	-	-	-	-75% (BY:2019)	CN	-
VinFast	Carbon emissions	-	No	-	-	-	Net zero	-	-
Honda	Carbon emissions	-	No	-	-46% (BY:2020)	-	-	-	Net zero
Yamaha Motor	Carbon emissions	1,2	No	-	-80% (BY: 2010)	CN	-	-	-
		3		-	-24% (BY:2010)	-38% (BY:2010)	-	-	-90% (BY:2010)
Nissan	Carbon emissions	-	Yes	-	-	-	-	-	CN
Tata Motors	Carbon emissions	1,2	Yes	-	-46% per car (BY: 2020)	-	CN (car)	CN (car+CV)	-
		3		-	-54% per car (BY: 2020)	-	-	-	-
	Carbon emissions	-		-	-30% per vehicle (BY: 2018)	-	-	-	CN
Volkswagen	Global plants	1,2	Yes	-50% (BY:2010)	-	-	-	-	-
	During use	3 Cat.11		-	-50% (BY: 2019)	-	-	-	-
	Lifecycle	1,2,3		-	-40% (BY: 2019)	-	-	-	-
Scania by VW	Carbon emissions	1,2	Yes	-50% (BY:2015)	-	-	-	-	-
		3		-20% per km (BY:2015)	-	-	-	-	-
BMW	Carbon emissions CO2 per vehicle & CO2 per km	- -	Yes	- -	-50% (BY:2019)	- -	- -	- -	CN -

Source: Company Note - CN: Carbon neutral, BY: base year; SBTi: Science based Target Initiative

Fig 161: Automakers continue to invest increasing sums in electrification and digital technologies



Source: IEA

Synopsis of plans and targets of leading automotive companies

Fig 162: Global auto OEMs' EV plans

Particulars	Hyundai	Toyota	Vinfast
EV Plans	a) Sell 1.87m BEVs annually by 2030; b) operating profit margin of >10% in EV businesses by 2030; c) 7% level of global market share by 2030	a) Sell 3.5m BEVs globally by 2030; b) transform Lexus into an EV-only brand by 2035; c) to release 30 BEVs by 2030 and 10 battery production lines by 2025, increasing to around 70 across the world	a) To build a plant in US and looking for locations in Germany; b) IPO in the US through SPAC route to be concluded in 2H2023; c) pre-orders globally for 2 electric SUVs with deliveries started in 4Q22
Investment Plans	a) KRW95.5t for future businesses by 2030 KRW39.1t for R&D, KRW43.6t for capex, and KRW12.8t for strategic investment; b) USD1.55b to increase the Indonesia plant production capacity to 250,000 units; c) KRW19.4t for electrification, KRW12t for software capabilities	a) INR48b (USD624m) to make EV components in India; b) JPY2t (USD17.6b) in battery vehicle technology	a) USD4b to build first North America plant of 1,800 acres. USD2b to be utilised in phase 1 by 2024 leading to a capacity of 150,000 vehicles annually; b) USD174m in the Vietnam plant to upgrade its battery production capacity to 1m USD80m funding round led in StoreDot (fast charge battery start-up).
Battery plans	a) To obtain >50% of its next-generation lithium batteries for BEVs starting in 2025; b) Secure 170 GWh of batteries by 2030	a) Production of 200GWh of batteries; b) Working on solid-state batteries	a) Building a battery cell plant in Vietnam to produce 100,000 battery packs annually; b) To build EV battery cells and packs in its planned US manufacturing complex and to start producing EVs in US in 2025
Model launches	a) To have a total line-up of 31 EV models by 2030; b) to introduce 17 new BEV models by 2030 - 11 for Hyundai and 6 for Genesis; c) Kia EV9, its first three-row seat electric flagship SUV to launch in 2023 and Hyundai Motors IONIQ 7 in 2024; d) plant in Indonesian to produce strategic model like CRETA SUV and IONIQ 5 (BEV).	a) Releasing 70 e-cars globally by 2025, including 15 BEVs, 7 BZ BEVs by 2025; b) BZ4X electric SUV was launched in China and Japan in 2021 to expand its BZ series	a) Compact SUV VF6 capacity 59.6kWh; b) Sporty SUV VF7 (battery capacity 75.3kWh); c) Passenger SUV VF8 (battery capacity 82kWh); d) SUV VF8 (battery capacity 87.7kWh); e) SUV VF9 (battery capacity 123kWh)
Partnerships	a) MoU with Michelin in 2022 to develop next-generation tires optimized for premium EVs; b) launched 'E-mobility Pilot' with SP Group and Komoco Motors in 2021 in Singapore to enhance EV Customer Experience; c) expanded partnership with Grab to explore launching new EV business models including battery-as-a-service and EV financing to drive EV adoption.		a) Partnership with StoreDot aimed at growing global EV supply chain to move into US and Europe; b) Vinfast and ProLogium (Taiwanese producer of solid-state batteries) are expected to open a JV factory in Vietnam by 2024; c) partnered with Gotion High-Tech (Chinese producer of LFP batteries) with plans to establish LFP battery cell production facility in Vietnam.

Source: Company, media reports

Fig 163: Global Auto OEM plans

Particulars	Honda	Nissan	Tata Motors
EV Plans	a) to launch 30 EV models globally by 2030; b) to build 2m EVs by 2030, with 750,000-800,000 built in North America, including those developed with GM	a) Introduce 20 new EVs and e-POWER equipped models by FY2026; b) Introduce 23 new electrified models, including 15 new EVs by FY2030 with an electrification mix of >50% globally across the Nissan and INFINITI brands; c) shifting 40% of the company's sales to EVs by 2030	a) EV contribution to portfolio is likely to increase to 25% in 5years (from FY23) and reach 50% by 2030
Investment Plans	JPY5t (USD40b) for electrification, which includes 30 BEVs and an expanded production capacity of 2m EVs per year by 2030 JPY43b (USD343.2m) to develop a pilot line to produce solid-state batteries. Overall R&D for this period is expected to be JPY8t (USD60b)	JPY2t (USD17.6b) over the next 5 years to electrification. USD1.4b to build a plant in the U.K. to manufacture EVs and increase its global battery production capacity to 130 GWh by FY2030, and launch a BEV with a solid-state battery by 2028.	INR32,000 Cr in FY23 planned capex compared to INR23,000 Cr on FY22 aiming to go big on EVs across all businesses. INR6,000 Cr for the expansion of its portfolio capacity in FY23 to support various programmes across its commercial, passenger and EV verticals. Jaguar Land Rover would be getting around INR26,000 Cr (GBP2.6b). USD2b committed in October 2021 to expand its EV business over the next 5 years.
Battery plans	GM to develop a new solid-state batteries for Honda Entered into a consortium with other motorcycle OEMs in Japan and Europe to develop technology standards for swappable batteries	To increase its global battery production capacity to 52 GWh in 2026 and 130 GWh in 2030 To have a pilot battery plant running in Yokohama by 2024 and launch vehicles with solid-state batteries by the FY2028 The solid-state batteries will reduce the price of battery packs down to USD75 per KWh by 2028 To improve its lithium-ion batteries & introduce cobalt-free technology to reduce the cost by 65% by FY2028 Working with NASA on a battery that charge quicker and be lighter yet safe.	To explore partnerships in cell and battery manufacturing in India and Europe to secure supply of batteries. Battery manufacturing facility with Envision (Chinese EV cell manufacturer) which offers warranty of 8 years or 1.6 lakh km (Whichever comes first) on its battery pack for Tata Nexon EV and Tata Tigor EV.
Model launches	Minicar to be launched in Japan targeting a price of JPY1m (USD8,000) 10 new EV models to be introduced in China by 2027, to be built at dedicated plants in Guangzhou and Wuhan To launch three new EV 2W by 2024 Introduction of new EVs based on its own Honda e-Architecture in 2026	To add 20 EVs over five years with the USD17.6b investment 2 new models to be built in Canton, US. A small pickup truck called the Surf-Out, a convertible sports car called the Max-Out, a boxy crossover called the Hang-Out, while another small SUV concept called the Chill-Out are the EV concepts revealed by the company.	AVINYA vehicle concept revealed in April 2022 based on a dedicated EV platform will be introduced to the market by 2025; b) Tata ACWE EV in the small CV segment; c) 5 EVs in passenger vehicle space in India - Tiago EV, Xpres-T EV, Tigor EV, Nexon EV Prime and Nexon EV Max
Partnerships	Partnered with GM on a new generation low cost, high volume EVs to launch in 2027 which will use the next-generation Ultrium battery cells Honda Prologue and unnamed Acura, both to be launched in 2024 built on the Ultrium architecture that underpins the GMC Hummer EV, the Cadillac Lyriq, and many more vehicles.	Renault and Nissan have announced to invest EUR23b (USD25b) in EV technology over the next five years. The alliance includes Mitsubishi Motors Corp to share research, auto parts, and technology to bring down costs and produce 35 new EV models by 2030 for the global markets. The trio announced a target of total EV battery production capacity of 220 GWh by the end of the decade. Nissan is outlining a vision around next-generation battery technology, which includes plans for a dedicated production facility and possible 15-minute charging times for EVs.	Agreement with TPG Rise Climate who along with co-investors shall invest INR7,500 Cr in compulsory convertible instruments to secure between 11% to 15% stake in this company translating to an equity valuation of up to USD9.1 bn. MoU with BluSmart Mobility in 2021 for expanding their all-electric fleet across Delhi NCR, and for the same, the Company has bagged a contract to supply 3,500 XPRES T EVs. MoU with Cummins Inc. in November 2022 to collaborate on the design and development of low and zero-emission propulsion technology solutions for CVs in India, including hydrogen-powered ICE, fuel cells, and BEV systems

Source: Company, media reports

Fig 164: Global Auto OEM plans

Particulars	Tesla	Volkswagen	BMW
EV Plans	To sell 1.8m cars in 2023. Develop new EV models and battery cell technologies. Ambitiously aims to sell 20m EVs annually by 2030	To have 70% share of e-cars of their sales in Europe by 2030. To have 50% share of e-cars of their sales in US and China by 2030. Has set milestones to be achieved to complete decarbonisation by 2050.	To have 50% EV share with the Neue Klasse (based on New Cluster Architecture) by 2025. To achieve 30% electrification by 2025 and 50% by 2030 compared to 13% in 2021
Investment Plans	USD7b to USD9b capex in each in the year 2024 and 2025 respectively, up from the estimated capex range of USD6b to USD8b in 2023. USD7.16b capital spending in 2022, up from USD6.48b in 2021, as the company invested in capacity expansion. USD3.6b (Additional) to continue the expansion of Giga factory Nevada. It has invested USD6.2b in Nevada since 2014.	Capex and R&D will be 50% of the total investments of around EUR150b. EUR800m to build a R&D centre for the development of the SSP (Scalable Systems Platform). EUR27b of capital spending on digitalization on building up software capabilities. EUR73b on electrification, hybrid powertrains and digital technology and EUR18b in e-mobility, hybridization and digitalization by 2026. EUR35b to be spent on BEVs and EUR11b for the development of hybrid vehicles of existing models.	USD1b in plant Spartanburg for the production of BEVs in the US. USD700m to build a new high-voltage battery assembly facility in South Carolina setting a footprint in the State.
Battery plans	To build a factory in Shanghai to produce 10,000 Mega pack power-storage units a year. The giant batteries could be used to stabilize power grids and prevent outages – a single unit can power an average of 3,600 homes for one hour, according to the company. Tesla uses prismatic LFP cells from CATL.	LG Chem, SKI, CATL and Samsung are the strategic battery cell suppliers. Has identified the potential of solid-state batteries. The company's goal is to enable an industrial level of production with this technology together with VWs partner QuantumScape.	Batteries and its components needed come from the company's own factories in Dingolfing, Leipzig, and Regensburg in Germany, as well as from Spartanburg (USA) and Shenyang (China). Envision AESC to build new battery cell plant in South Carolina to supply lithium-ion cells for sixth generation of BMW eDrive technology in the US. Expected to increase the energy density by 20%, charging speed by 30%, enhance range by up to 30%, and reduce CO2 emissions by 60%.
Model launches	To launch the second-generation Tesla Roadster and Tesla Cyber truck in future. It was reported by Electek that the company will make a USD25,000 car, which will be completely autonomous (Driverless). This competitive price point will be achieved by new battery cell and battery manufacturing effort that could reduce the battery costs by over 50%. Has received approval for four of its models, but the names of the models were not revealed.	VW ID.2 is expected to come in the 2H25, and the R-badged version of it will arrive as a hatchback. VW has confirmed that every new R product will be fully electric by 2030. Trinity, the first model of the VW brand based on the SSP will be built in a new EUR2b process-optimized factory close by the main site.	Plans to build at least 6 fully electric models by 2030 in the US. BMW i7 is expected to be the flagship electric sedan to be launched in the Indian market which would have a 101.7kWh battery pack offering a range of 624 km per charge. Introduced BMW XM, facelifted M340i, and BMW S1000RR.
Partnerships	Partnered with Panasonic since 2009 for the supply of batteries. Panasonic has previously invested USD30m in Tesla. Company plans to develop next-generation of battery cells for EVs. Signed a deal with mining company BHP in 2021 to secure nickel supplies for its batteries.	JV with Umicore (Belgium-based cathode materials provider) for supply chain as it pertains to battery cell production in Europe. This will begin in 2025 with an initial production capacity of 20 GWh at VW's gigafactory in Salzgitter, Germany. Investment in 24M Technologies (US based battery start up) that has redesigned the traditional battery cell using "SemiSolid" lithium-ion technology. Benefits include 40% less production area, more efficient product recycling, and less CO2 during production. Partnered with Vulcan Energy Resources Ltd (European Lithium producer looking to become the first to do so with net-zero GHG emissions).	Extended joint venture with BMW Brilliance Automotive (BBA) in China till 2040. Partnered with Jaguar Land Rover to develop next-generation electric drive units to support electrification. JV with Great Wall Motor for MINI EVs in China whose production is expected to start in 2023.

Source: Company, media reports

Fig 165: EV plans of Indian listed 4-wh companies

Company	Product and other details	EV as % of sales	Future Plans
Maruti Suzuki	NA		1) 1st EV to be launched in 2025, Six EVs to be launched by 2030 2) Targets 25% of total sales volume from hybrid and 15% from EVs by 2030 3) Setting up a battery unit with LG+Panasonic in India
Tata Motors	Nexon EV, Tiago EV, Tigor EV ACE EV buses	8%	1) Range Rover BEV launch in 2024, six new JLR BEV models by 2026 2) Plans to launch 10 EVs in India across different product segments 3) Setting up battery plant in the UK with capex of GBP4b
Mahindra	XUV and BE brands for electric vehicle		1) Targets to increase share of EV in total volume to 20-25% in the next 5 years 2) To launch 5 new SUVs, invest USD1b in the next 3 years
Ashok Leyland	Supplier of electric bus to state transport units		1) To invest USD350m in mobility unit - Switch Mobility over the next few years 2) To launch electric bus and electric light truck in FY24

Source: Company, Maybank IBG Research

Fig 166: EV plans of Indian listed 2-wh companies

Company	Product and other details	Future Plans
Bajaj Auto	Chetak 2wh, 500k units pa capacity	1) To invest INR20b in EVs through sub Chetak Tech 2) To launch joint EV products with Yulu, KTM 3) USD15m invested in Yulu for 19% stake 4) To export electric 2-wh 5) To launch electric 3 wheelers in FY24
TVS Motors	iQube	1) Targets to develop 6 brands 2) Targets to sell 25k units/month by March 2023 3) To launch electric 2-wh with BMW by 2024 4) Electric bike exports from FY24 5) Planned fund raising for electric 2-3wh USD500m 6) Invested in IOA Mobility Singapore
Greaves Mobility	Ampere Scooters Bestway e-Rick Tej e-auto	1) Partnership with battery tech companies 2) In-house production of batteries, motors, controllers, powertrain etc 3) Planned 6 new models 4) Electric 2-wh capacity to be doubled to 500,000 units pa
Hero Motocorp	Vida V1 and V1+ Ather (owns stake)	1) Plans to export to the EU and LatAm countries 2) Partnership with Gogoro for battery swap infrastructure 3) Will collaborate with Zero Motorcycles for electric motorcycle manufacturing, investment of USD60m 4) R&D investment of INR6.1b
Eicher Motor (Royal Enfield)	NA	1) 1st electric motorcycle by 2025, targets volume of 5,000 units in the 1st year 2) Invested in Stark Future, a start-up for EV tech company

Source: Company, Maybank IBG Research

Fig 167: EV plans of few Indian unlisted 2-wh companies

Company	Product and other details	Future Plans
Ola Electric	Ola S1, S1 Pro, S1 Air	1) To launch electric motorcycle this year and cars next year 2) Six new launches planned for the near term 3) Targeting 10m units pa capacity
Hero Electric	Optima NYX	1) To set up 2m units pa electric 2-wh facility in Rajasthan 2) Looking to raise USD250m to fund expansion and launch 4 new models
Ather Energy	Ather 450X	1) Plans to double production to 20,000 units per month from March 2023 2) Expanding distribution and charging network across India
Okinawa Autotech	Okinawa	1) INR5b investment in new facility, which would start from Oct 2023 and help produce 1m units pa 2) JV with Italian Tacita for scooters and motorcycles

Source: Company, Maybank IBG Research

Annexure III

Fig 168: Battery start-ups and their fund raising in 2023

Name	Activity	Location	USDm	Key investors
NanoGraf Corp	Silicone anode material for batteries	US	65	Arosa Capital, Volta Energy Tech
Cylib	Battery recycling company	Germany	9	World Fund
Quino Energy	Redox flow battery company	US	1	Energy revolution ventures
Ford & CATL	EV batteries plant (NMC, LFP)	US	3,500	Ford Motors USA
Voltfang	Repurposing batteries from cars	Germany	5	PropTech1 Ventures
RACEnergy	Battery swapping network	India	3	growX ventures
Chemix	EV battery development platform	US	10	Ibex Investors
Altris	Sodium-ion battery maker	Sweden	5	NA
Swobbee	Battery swapping company	Germany	2	SpeedUp Energy Innovation Fund
Novalith Tech	Low carbon lithium batteries	Australia	15	Grantham Environmental Trust
Nanoramic Lab	Electrode tech platform for battery	US	NA	GM Ventures
EnergyX	Lithium extraction company	Puerto Rico	50	GM Ventures
Allotrope Energy	Battery manufacturing company	UK	7	Suzano Ventures
Princeton NuEnergy	Li-ion battery recycling company	US	12	US Department of Energy
Green Li-ion	Battery recycling technology	Singapore	21	Decarbonization Consortium
Pointo	EV battery leasing for 2 and 3 wheelers	India	3	Mufin Finance
Electra Vehicles	Battery pack optimization software platform	US	21	United Ventures, Stellantis
Cirba Solutions	Battery recycling company	US	50	Marubeni
Ionblox	Silicone anode batteries developer for aviation	US	32	Temasek Holdings
Liminal	Battery manufacturing intelligence platform	US	18	Helios Climate Ventures, Northvolt
Stratus	Li-ion cathode active material	US	12	Breakthrough Energy Ventures
Vflow Tech	Vanadium redox batteries developer	Singapore	10	Zero Carbon Capital
Our Next Energy	Next-gen EV and storage batteries	US	300	Franklin Templeton, Temasek Holdings
Lithium Americas	Lithium mining company	Canada	650	GM Ventures
Log 9 Materials	Battery manufacturing platform	India	11	Cornorstone Ventures
Summit Nanotech	Lithium extraction company	Canada	50	Grantham Environmental Trust
Lithos Energy	Lithium ion battery manufacturer	US	NA	Caterpillar

Source: CTVC

Fig 169: Global EV charging start-ups and their fund raising in 2023

Name	Activity	Location	USDm	Key investors
ChargerHelp!	EV charging maintenance platform	US	18	Energy Impact Partners
Fuuse	EV charging software company	UK	3	Par Equity
ev.energy	EV smart charging platform	UK	NA	National Grid Partners
Driveco	EV charging stations provider	France	250	APG Asset, Mirova
JOLT Energy	Urban ultra-fast charging network	Germany	165	InfraRed Capital Partners
Kazaam	EV charging company	India	4	Inflection point ventures
Virta	EV charging platform	Finland	93	Future Energy Ventures
ChargeLab	EV charging ops software	Canada	15	Eaton Electrical
Veloce Energy	EV charging infrastructure platform	US	NA	Itochu Corporation
Magenta mobility	EV charging solutions platform	India	22	BP Ventures, Morgan Stanley
Charge+Zone	Fleet electrification and retail EV charging company	India	54	Blue Orchard Finance
Chargetrip	EV navigation software provider	Netherlands	11	HSBC Asset Management
itselectric	EV charging company	US	2	Brooklyn bridge ventures
EO Charging	EV charging solutions for fleets	UK	80	Vortex Energy, Zouk Capital
eDRV	EV charging API platform	US	NA	Connect Ventures
ABB E-mobility	EV charging solutions company	Switzerland	350	BeyondZero, GIC, Porsche, Just Climate
Vool	EV charging station hubs	Estonia	2	NA
Lynkwell	EV managed charging platform	US	30	Warren Equity Partners
AMPECO	EV charging management company	Bulgaria	13	BMW I Ventures
EcoG	EV charging infra software company	Germany	7	BayBG Venture Capital
ElectricPe	EV charging platform	India	5	Green frontier capital
Eco-Movement	EV charging station data provider	Netherlands	NA	Dow Jones

Source: CTVC

Fig 170: Global EV start-ups and their fund raising in 2023

Name	Activity	Location	USDm	Key investors
Ember	Electric intercity travel company	UK	NA	Pale Blue Dot
Zeekr	EV OEM	China	750	Contemporary Amperex Tech, Guangzhou Industrial Fund, Tongshang Fund
Via	Public mobility solutions company	US	110	Janus Henderson
FreshBus	Electric bus service	India	3	Ixigo
Hylane	Hydrogen truck leasing company	Germany	27	German Federal Ministry for transport
Zyngo EV	Sustainable last-mile solutions company	India	5	Delta Corp Holdings
BluSmart Mobility	Electric ride hailing company	India	37	BP Ventures
Luup	e-scooter and bikes OEM	Japan	34	SMBC Venture Capital, MUFJ Capital
Selex Motors	Electric motorcycle OEM	Vietnam	3	Schneider Electric
VinFast	EV car and motorcycle OEM	Vietnam	2.5	Grants and loans from VinGroup
Kate	Electric micro cars	France	8	NA
Ola Electric	Electric scooter company	India	300	NA
Revolv	Full service EV solutions for commercial fleet	US	15	Greenbacker Capital
Kabira Mobility	Electric bike company	India	50	Al Abdulla Group
Arrival	Electric van and buses OEM	UK	300	Westwood Capital
Evera	EV cab service	India	7	Devonshire Capital
Velotric	e-bike (premium) OEM	China	7	Fosun Capital
Simple Energy	EV scooter OEM	India	20	Purple moon ventures
Zypp Electric	Last mile delivery EV rental service	India	20	Gogoro, Goodyear Ventures
Turno	Commercial EV store and financing	India	14	Avaana Capital
Motor	EV car subscription/rental service	USA	7	AES and Mitsubishi Corp
WeMo Scooter	EV scooter rental service	Taiwan	15	National Development Fund of Taiwan
Tau Group	EV motors manufacturer	Italy	10	Solvay Ventures
One Moto	Last-mile delivery EV OEM	UK	150	NA
Outrider	Autonomous electric yard trucks	US	73	Abu Dhabi Growth Fund
Tenways Ebike	Electric bike maker OEM	Hong Kong	44	L Catterton
Scorpio Electric	Electric motorcycle OEM	Singapore	7	NA

Source: CTVC

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