SECTION 3

IDENTIFYING ASEAN'S TIPPING POINTS BY SECTOR

This section presents analyses on the six prioritized sectors in ASEAN discussed in Section 2. In each sector analysis, the report seeks to answer the following questions:

Global sector context

- What is the **global context** of how this sector will decarbonize?
- What are the **core low-carbon solutions** that will drive decarbonization?

Geographic sector context

- How is the **sectoral transition progressing** at **ASEAN level**?
- Are there **opportunities or challenges** specific to the region?

Solution status

- What is the **current status** of the core solution being adopted at ASEAN level?
- Is it only **in development**, or being adopted in **niche markets**, or starting to break into **mass market**?

Tipping point status

- How close are we to a **tipping point**, to help the solution break into mass market?
- What are the **key gaps** to be addressed to trigger one?

Tipping point calculation & levers

- What is the **comparison** of the **current** and **potential future costs** of the **low-carbon solution** versus **the incumbent**?

Target conditions progress to trigger tipping point

- What is **the current** and **potential future** status of the **tipping point conditions** (affordability, attractiveness, and accessibility)?

TRANSPORT: ELECTRIC TWO-WHEELERS (E2W)

4% OF TOTAL ASEAN GHG EMISSIONS 2020

GLOBAL SECTOR CONTEXT

- **Shifting to electric vehicles is required for full decarbonization in road transport.** In parallel, demand reduction and behavioral change are also important, e.g., usage of public transportation and better urban design.
- **Electrification happens faster in two-wheelers than cars.** Sales of E2W already accounted for 44% of new sales of BEVs[1] in 2020, dominated by China which accounted 60% of the global EV sales.[2,3]
- **95% of global 2Ws[4] are in Asia,** and ASEAN is the largest market after China and India.[3]

GEOGRAPHIC SECTOR CONTEXT

Two-wheelers are a prominent mode of transport in ASEAN, *accounting for 20% of the world's total two-wheeler fleet.*[5]

- **Indonesia (47%), Vietnam (31%), Thailand (9%) are** 2W hotspots, accounting for **90%** of ASEAN 2W fleet.[6] Dominated by **scooters and mopeds,** comprising **90% of fleet.**[7]
- **Adoption rates in ASEAN are still not as high as China or India**, due to sticker price being 1-2x higher vs. ICE 2W8 (~$600–800 vs. $1000–1250 for 1–1.5 kWh battery class),[9] as well as issues with accessibility and attractiveness.
- **Countries are implementing incentives** such as 0% VAT on electric vehicles.[10]

SOLUTION STATUS IN ASEAN

Solution status stages: ● *Solution development* › ● *Niche market* › ● *Mass market*

NICHE TO MASS MARKET

This sector is on the border of niche to mass market with numerous countries implementing purchase subsidies to help close price gap.

Two-wheeler electrification is starting in ASEAN. Total cost of ownership (TCO) is competitive, but only 2% (~42,000) are electrified.[7]

Fleets electrify faster than mass market in ASEAN. Overall growth projected 4-5% p.a., with sales at ~12,000 p.a.,[7] mostly to ride-hailing/logistics.

Charging and battery technology landscape. There is still a differing battery (li-ion vs lead acid[11]), and charging (plug-in vs. swap-based) technology, as well as scarcity of charging stations.

TIPPING POINT AND ADOPTION RATE STATUS

Tipping point status

TIPPING POINT 1
TCO of E2W < TCO of ICE[12] 2W

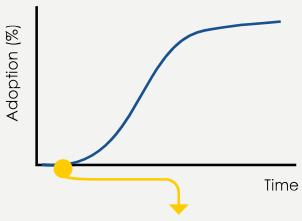
- **This has been reached in major ASEAN countries.** Vietnam, Thailand, Malaysia, and the Philippines have reached this due to lower operational expenses and VAT exemption.[10]
- **This tipping point is aligned with fleets market**, with total cost of ownership being the main driver in decision making.
- Key drivers to this tipping point are **sticker price, price of electricity, and availability of charging stations.**

TIPPING POINT 2
Sticker price of E2W < Sticker price ICE 2W

- **This has been not reached for similar class vehicles across ASEAN.** Main driver for this tipping point is the battery price.
- **Implementing VAT exemption or direct subsidy** is key to E2W purchases to make these electric vehicles more competitive compared to ICE.
- **This tipping point should be viewed from cashflow perspective, which is an important decision-making factor:** higher sticker price, even with similar financing costs, discourages mass market adoptions.

Legend: ✓ *Mostly reached* ○ *Reached in certain cases* – *Not reached*

Current adoption status

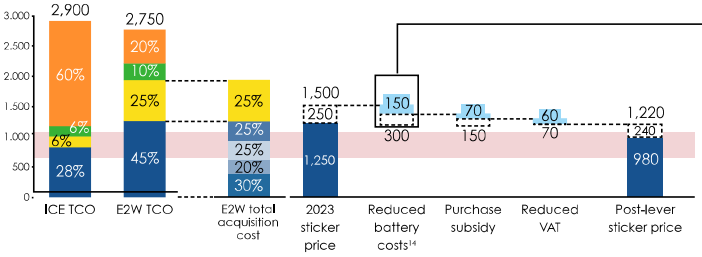


Even though **TCO is competitive, the increase in adoption rate is still very low.** The first-mover markets, fleets and high-end market, are facing issues ranging from accessibility (e.g., charging stations) and attractiveness (e.g., branding, product-market fit, charging time).

Notes: [1] BEVs = Battery Electric Vehicles; [2] BloombergNEF (2022), Electric Vehicle Outlook; [3] IEA (2023), Global EV Outlook 2023; [4] 2Ws = Two-wheelers (including Moped, Scooter, Motorcycle); [5] Data in ASEAN (n.d.); [6] ICCT (2022), Market Analysis of Two- and Three-wheeler Vehicles in Key ASEAN Member States; [7] McKinsey (2023), The real global EV buzz comes on two wheels; [8] ICE = Internal Combustion Engine Two-wheelers; [9] Systemiq analysis, BloombergNEF (2022), Electric Vehicle Outlook; [10] HKTDC Research (2023), Philippines: VAT Zero-rating Rules on Inputs Clarified; Malaysia Budgeting Announcement; [11] ICCT (2023), Total Cost of Ownership Comparison for Electric Two-wheelers in Vietnam.

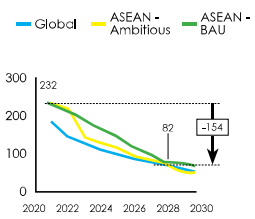
TIPPING POINTS FOR E2W

5-year TCO (in $) for mass market E2W vs ICE for 2W[13]



Mass-market sticker price (in $) E2W reduction levers

Battery cost curve[15], global vs ASEAN ($/kWh)



- **TCO tipping point** has been **reached.**
- **Sticker price,** which is a more relevant factor for mass-market adoption **is not close to tipping** unless **reduction in battery price.**
- **Potential solutions:** 1) Investment in battery industry, 2) Incentives (e.g., VAT/subsidy).

Battery cost, which represents 30% of E2W sticker price, could be further reduced following a learning rate of battery deployment and increased R&D in battery manufacturing.

Sticker Price *Financing Cost* *VAT* *Fuel & OM* *Battery* *Suspension* *Chassis* *Electronics* *Range of cost* *Target range for cost parity*

ENABLING CONDITIONS TO TRIGGER TIPPING POINT

PROGRESS

AFFORDABILITY

- **Cost parity for sticker prices** (i.e., pre-tax retail prices) for E2W vehicles across the region—primarily dependent on the price of the battery.
- **Reduce cashflow during usage** by availability of lowinterest financing, providing free after-sales service, and better insurance.
- **Adjusted policy to close the price gap** between E2W and ICE 2W and provide direct subsidy on E2W purchase.
- **Operationalized subsidy system** to further reduce the sticker cost.

✓ **Sticker price parity is still an issue.** The sticker price of low-end E2W is 1–2x higher compared to ICE in ASEAN.[7]

✗ **Low-interest financing is being developed by banks,** but interest in product is still lacking.

✓ **Supporting incentives.** Some countries, such as Malaysia, the Philippines and Brunei have already imposed 0% VAT[10] on green transportation, while Indonesia only charged 1%.[15]

✓ **Subsidy systems in ASEAN countries have not been able to materialize.** Indonesia has recently rolled out a purchase incentive subsidy for E2W to boost the uptake.[16]

Key actions to accelerate progress:

❑ **Policy adjustment:** Additional policy to incentivize E2W penetration to manufacturer, to further reduce costs.

❑ **Investment for battery:** Scaling up battery production to obtain benefit from the economies of scale.

❑ **Improved financing costs:** Banks and lenders need to reduce the cost of financing and lease rates.

ATTRACTIVENESS

- **Performance and design fit with target market.** Achieving product market fit that resonates with market characteristics.
- **Comparable brand awareness for E2W and ICE 2W.**
- **Availability of further incentives** outside of TCO and sticker price.
- **Raised awareness of the health benefits** of using E2W due to less emissions emitted.
- **Scaled-up after-sales networks** that is comparable with ICE.

✓ **Businesses are buying, but consumers are not ready.** Only 2% of 2W are electrified,[7] mostly fleet owners as it is still seen as not attractive for mass market consumers.

✓ **Brand awareness for E2W OEMs** are still very low.[14]

✗ **No further incentives implemented** e.g., free parking and access to preferred lanes.

✓ **Low-interest BEV financing is being developed** by banks.[14]

Key actions to accelerate progress:

❑ **Support R&D for OEM:** To achieve product-market fit and reduce technology manufacturing costs.

❑ **Improved financing costs:** <see above>.

❑ **Introduce more incentives:** Identify non-cost incentives to further attract markets.

ACCESSIBILITY

- **Improved electricity reliability** to fulfil the rising demand due to EV penetration.
- **Scaled-up charging public station locations** both in quantity and dispersion to ensure greater coverage and accessibility.

✗ **Still big-city centric.** Around 6,000 charging stations across ASEAN countries, but most are in major cities.[17]

✓ **Need to improve electricity reliability.** Longer charging time (6-8 hours at home vs 4-hours in public), means electricity reliability will be key. Some ASEAN countries are still struggling with a 0.74 and 0.82 SAIDI an SAIFI.[18]

Key actions to accelerate progress:

❑ **Infrastructure advancement:** Enhancing public charging infrastructure and electricity reliability.

Legend: ✓ Progress is moving well ✓ Progress is mixed ✗ Progress is not happening (or happening far too slowly)

Notes: Tipping point enabling condition's rating guide: Affordability: Green – Parity achieved, Amber: Parity could be achieved with the help of levers before 2030, Red: Parity might only be achieved after 2030. Attractiveness & Accessibility: Green – No barrier to tipping point, Amber – Currently impeding tipping point but strong progress underway, Red – Currently impeding tipping point with limited progress to date.

[12] TCO is calculated for moped/scooters with battery range of ~1–1.5 kWh; [13] Battery cost are assumed to be at ~250 $/kWh, based on industry interview; [14] BloombergNEF (2022), Electric Vehicle Outlook. Global battery learning curve uses 17 and 18% learning rate. ASEAN battery learning curve is adjusted to have 15% learning rate to reflect developing battery value chain in the region; [15] Kantor Staf Presiden Republik Indonesia (2023), Government's VAT Incentives to Boost Electric Vehicle Ecosystem; [16] Indonesia Investments (2023), Indonesian Government to Offer USD $275 Subsidy to Encourage Electric Motorcycles Sales; [17] Systemiq analysis, Power Technology Research (2022) and government reports; [18] D. Kammen (2019)., ASEAN grid flexibility: Preparedness for grid integration of renewable energy. SAIDI = System Average Interruption Duration Index, SAIFI = System Average Interruption Frequency Index.