



TUKTUK

Powering the Future of Electric Vehicle Transportation

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Abstract

270 million internal combustion engine (ICE) TukTuks and other two- and three-wheeler vehicles are having a detrimental impact on developing nations across the globe.

eTukTuk has spent the last 5 years developing a revolutionary ecosystem that will have a direct impact on reducing air pollution, CO₂-related health conditions, and financial exclusion in developing nations; and ultimately worldwide. The following White Paper outlines how eTukTuk is building a dynamic network that balances sustainability with scalability.

Evidence obtained from trusted publications has been incorporated into this White Paper, which highlights the severity of the problems faced by these nations, the urgency for eTukTuk's network, and the reasons why it is well placed to change the lives of billions.

The Mission

The number of internal combustion engine (ICE) vehicles is on the rise across the globe. **270 million** TukTuks and other two- and three-wheelers underpin the transportation sector throughout many regions worldwide, yet they all emit more CO₂ than an everyday car.

Energy prices have risen by as much as **50%** in some countries, and policies are now in place to make ICE vehicles obsolete. As a result, TukTuk drivers are struggling to earn a basic wage to support their families.

Right now, there are **0** countries on the planet that have a sustainable and scalable solution.

We are building an affordable network of charging stations and proprietary electric vehicles to tackle pollution and financial exclusion directly. We strive to:

- Develop sustainable solutions
- Create a culture of innovation
- Act with integrity
- Empower the masses

This mission comes at a crucial time for our planet. With eTukTuk, anyone can be involved in tackling air pollution, CO₂-related health conditions, and financial exclusion.

The eTukTuk ecosystem has the potential to empower the lives of billions; revolutionising the transportation sector in developing economies and beyond.



Contents

Abstract	2
The Mission	3
Glossary of Abbreviations & Acronyms	5
1. The Challenge	6
2. Market Size & Demand	8
3. Sharing the Solution	9
3.1 Electric Vehicle Supply Equipment (EVSE)	10
3.2 Zero-Emission Vehicles (ZEVs)	10
3.3 Territories & Territory Partners	11
3.4 The eTukTuk Sharing Economy	11
3.4.1 <i>Power Staking and The Sharing Economy</i>	12
4. Network Overview	12
4.1 Why Blockchain?	13
4.2 Banking the Unbanked	14
4.2.1 <i>Building for Awareness</i>	14
4.3 Building on BNB Chain	14
4.4 opBNB	17
4.5 The Multi-Chain Approach	18
4.6 Smart Contracts	19
4.7 Rewards	20
4.8 Applications	20
4.8.1 <i>Driver App</i>	20
4.8.2 <i>Passenger App</i>	21
5. Token Economics	21
5.1 On-Chain Rewards Mechanics	22
5.2 Tokenomics Distribution	22
6. Conclusion	26
7. Forward Looking Statements and Liability Disclaimer	27
8. Bibliography	29

Glossary of Abbreviations & Acronyms

AQLI - Air Quality Life Index

BC - Black Carbon

BNB - Build and Build

BSC - Binance Smart Chain

C - Celsius

CAGR - Compound Annual Growth Rate

CO₂ - Carbon Dioxide

EV - Electric Vehicle

EVSE - Electric Vehicle Supply Equipment

GHG - Greenhouse Gas

Gt - Gigatonnes (measurement/unit)

ICE - Internal Combustion Engine

IEA - International Environment Agency

IOHK - Input Output Hong Kong

IRJET - International Research Journal of Engineering and Technology

kW - Kilowatt (measurement/unit)

kWh - Kilowatt [per] Hour (measurement/unit)

NRDC - National Resources Defense Council

PM - Particulate Matter

PV - Passenger Vehicle

TWh - Terawatt Hour (measurement/unit)

UN - United Nations

UNDP - United Nations Development Programme

USD - United States Dollar

WHO - World Health Organisation

ZEV - Zero-Emission Vehicle

1. The Challenge

Air pollution is now considered to be the world's largest environmental health threat [1]. Almost the entire global population - 99% - is breathing polluted air that exceeds WHO air quality guidelines [2].

In South Asia [3] and Africa [4], there are nearly 3.4 billion people, where 45% of Africans [5] [6] and 35% of South Asians [7] [8] are living in densely populated cities where air pollution has life-shortening effects [9]. In some areas of Southeast Asia, for example, air pollution can account for a 1.5-3 years reduction in life expectancy, and a 4-year reduction for people living in Africa [10].

Without access to modern technology that could reduce carbon emissions and increase the quality of life, 7 million annual premature and preventable deaths from non-communicable diseases¹ are on the rise [11]. Pollution from carbon particulates (key transportation emissions) has a more devastating impact on life expectancy than communicable diseases like tuberculosis and HIV/AIDS, as well as behavioural killers, like cigarette smoking [10].

The increase of chronic, non-communicable diseases in developing countries is threatening developing nations and their ability to improve the health of their populations [12]. Nearly 90% of deaths caused by air pollution occur in these regions [13]. According to the Center for Global Development, 63% of the world's total carbon emissions are generated from the developing world [14]. 88% of these emissions originate in Asia or Africa, representing a disproportionate contribution to the global CO₂ emissions crisis [1]. In 2021, Asia was found to be home to 46 of the world's 50 most polluted cities [1].

Humans are being impacted significantly by air pollution at all stages of life. For example, exposure to CO₂ emissions in pregnant women can affect foetal brain growth, as well as have a significant result on the health of young people [15]. 14% of children globally have been found to have asthma related directly to air pollution [15], and 543,000 children die globally each year from respiratory diseases linked to CO₂ emissions, which are also linked to childhood cancers [15].

¹ Non-communicable diseases, like ischaemic heart disease, stroke, chronic pulmonary disease (COPD), and lung cancer, as well as acute respiratory infections in children [11].

As well as this, noise pollution is a considerable factor in the detriments of internal combustion engine (ICE) vehicles. Epidemiological studies have found that noise pollution from transportation increases the risk of higher mortality rates, and morbidity of the cardiovascular system², with further evidence linking ischaemic heart disease directly to noise pollution in many of the documented cases [16].

Aside from impacts on health, transportation in developing countries is a leading cause worldwide of rising GHG emissions [17] compared to other sectors³. Global energy-rated CO₂ emissions reached 36.3 Gt in 2021; a figure that rebounded by 2.1 Gt after the latent effects of COVID-19 in 2020 [20]. These figures need to be reduced by a further 7.6% by 2050 if the planet is to remain under the optimum global average temperature of 1.5C [19].

The rapid increase in petrol-powered vehicle numbers on these roads is the driving factor in the substantial increase in carbon emissions, to date [9]. However, ICE vehicles, like TukTuks, are highly popular in developing countries [21], despite being one of the largest contributors to global air pollution [22].

In 2022, energy prices increased (in some regions) by over 50% - a significant rise in the average global price recorded within the last five years [23]. This is having a considerable effect on developing economies, where measures are required to meet consumer demand, reducing the cost and consumption of fuel, which threatens the stability of economies [24]. Without strong policies in place to intervene, risks remain high that the global economy will fall off track without the chance of recovery [24], leaving consumers without a solution to their energy needs.

Reducing the impact of carbon emissions in the transportation sector could be significant in regions like Central and South Asia, where an accelerated transition to ZEVs in the region could reduce CO₂ emissions to 53% below [25] the 2020 level, where CO₂ emissions fell by as much as 50% of previous yearly emissions due to COVID-19 restrictions on travel [25].

As a result, a Zero Emissions Vehicle (ZEV) Policy has been announced by some Eurasian countries. These agreements firmly lay out targets for ASEAN 7 member countries⁴ [25]. In Sri Lanka, for example, the policy designates the replacement, by 2040, of 100% of state-owned vehicles, 100% of passenger

² The cardiovascular system pertains to the heart and blood vessels [16].

³ Other sectors contributing to GHGs include; Agriculture (11% GHGs, Commercial and Residential (13%), Industry (24% GHGs), and Electricity (25% GHGs) [18].

⁴ ASEAN 7 countries include; Thailand, Malaysia, Indonesia, Vietnam, the Philippines, Singapore, and Cambodia [21].

cars, and 100% of two- and three-wheeler vehicles, with EVs or hybrid models [25].

However, there are current limitations to the development of solutions. According to the UN, the biggest factor in limiting the progression of climate change is the availability of finance [18], which would lead to further investment in infrastructure and the switch from passenger cars to ZEVs [18]. A lack of solutions, coupled with the high cost of ZEV purchase, compared with low-cost ICE vehicles, are also significant barriers to entry for drivers [25].

Countries like Sri Lanka, Pakistan, and Nepal (adopters of ZEV policy) are moving towards consumer-based incentives for cost-inclusive purchasing of electric vehicles, by waiving or reducing taxes such as registration, road, goods and services, carbon, sales, and green taxes, as well as VAT [25].

Without sustainable financing in place to facilitate the switch from ICE vehicles to ZEVs, adoption is slow and ineffective. eTukTuk aims to address the challenges to, and the scope of, market size and demand.

2. Market Size & Demand

The electric vehicle *charging station* market is estimated to grow from USD 17.59 billion to USD 111.90 billion by 2028, at a CAGR of 30.26%, which is attributed to market demand returning to pre-pandemic levels [26]. The electric vehicle charging station market in Asia-Pacific, for example, was valued to represent the largest market worldwide for electric vehicle charging systems. This was valued at USD 2.6 billion in 2021 - with a projected forecast of increase rising to USD 30.8 billion by 2028, at a CAGR of 42% - representing a 38% global market share [27].

Many existing charging stations are found in primarily developed economies, like Japan, and Korea, as well as countries like China where the development of fast-charging stations is designated by national policy [26]. However, in other parts of the world, the EV market is growing exponentially. India's EV charging station market is forecast to realise a strong CAGR of 25% in the period 2023-2028, with Government expectations for further expansion across the country [28]. Significant growth is also forecast for the Middle East and Africa (MEA). The charging station market in the region was valued at USD 72.43 million in 2020, with a projected rise to USD 161.2 million by 2027; a CAGR of 12.11% [29].

There is potential for further growth in this sector, but with a current lack of an affordable electric vehicle model, the charging station market is expected

to face challenges and is likely to be hampered by the high initial cost of electric vehicles [29].

The global market share of *electric vehicles* was valued in 2020 at USD 163.01 billion, with a projected CAGR growth of 18.2% to reach USD 823.75 billion between 2021 and 2030 [30]. This demonstrates the enormous scope for innovation in this sector.

ICE vehicles are becoming obsolete, as a growing number of national, provincial, and state governments have set time frames for phasing out their sale [31]. Restrictions are being brought into effect, permitting the sale of EVs only [31]. By 2050, the global fleet of two- and three-wheeler vehicles is set to rise from 270 million (currently) to 400 million vehicles - a 50% increase in under 28 years [22], demonstrating a strong demand that could be addressed by ZEV production.

Electric two- and three-wheelers are projected to become the largest EV sector by 2030 [22]. The Sustainable Development Scenario by the IEA lays out a prediction as to the trajectory of the EV market and denotes that there will be a 75% increase in EVs to 490 million between now and 2030, with most growth predicted to come from Asian markets [32]. This represents opportunistic possibilities for growth in this sector.

eTukTuk aims to be scalable, acting as a blueprint that could see expansion across developing countries. The infrastructure could grow to meet the compulsory switch to electric vehicles and mitigate the challenges faced by developing countries [33].

3. Sharing the Solution

The deployment of an efficient and shared infrastructure could herald the eradication of fossil fuel-powered TukTuks in line with ZEV policy and reduce black carbon (BC) and particulate matter (PM) emissions in developing cities. As predicted by the UN, such missions have the scope to join the effort in reducing carbon emissions by up to 11 billion tonnes between now and 2050 - a 30% reduction on today's emissions [22].

Relative to this, eTukTuk seeks to create opportunities for adopters of the sharing economy model to reduce CO₂ emissions by facilitating a new generation of efficiency in transportation, powered by a sustainable infrastructure - namely through the introduction of strategically placed EVSE and ZEVs.

3.1 Electric Vehicle Supply Equipment (EVSE)

The proposal for eTukTuk charging stations (EVSE) denotes the strategic placement of infrastructure throughout urban and suburban regions to bring superior charging efficiency to the developing world.

Efficiency incorporates itself throughout the ecosystem. The eTukTuk EVSE can power eTukTuk ZEVs through DC GB/T standards (7-22kW), allowing for efficient charging for eTukTuk vehicles and any compatible EV. The charging stations will be compliant with OCPP 2.0 (or newer) protocol, allowing for interoperability with most EVs and widening the market to other models, facilitating the adoption of the eTukTuk ecosystem.

Through consultation with Territory Partners (*see Section 3.3*), eTukTuk will strategically place EVSE to ensure accessibility and frequency of charge. With a 250-kWh battery, the storage capabilities of eTukTuk renewable station batteries optimise performance, with elongated capabilities that form a reliable system for drivers and passengers.

eTukTuk aims to become fully self-sufficient from local power grids. Solar-powered charging stations will ultimately provide a permanent solution that underpins a sustainable charging network and reduces costs to the ecosystem.

Through frequent analysis of data collected from eTukTuk EVSE, eTukTuk's Management team will have clarity over the most appropriate placement of future charging stations.

TUK tokens, and other selected currencies, will be used by drivers to pay via the charging stations to charge their vehicles through the Driver App. (See Section 4.7.1.)

3.2 Zero-Emission Vehicles (ZEVs)

eTukTuk's ZEV is fully compatible with all eTukTuk EVSE, and its design incorporates multiple features which enhance opportunities for scalability across the ecosystem.

The ZEV is proprietary and can be manufactured locally with fewer than 200 components, including a patented roll cage design. Initially, up to 85% of these

parts can be sourced domestically. The batteries installed in the ZEV could have a lifespan of up to 8 years and will expand further as technology advances. Service network providers will replace these batteries and give them a second life to ensure long-term sustainability.

Through EVSE infrastructure, domestic production, and unique partnerships, the capital and operational expenditure of owning a ZEV could see up to a 78% reduction compared to an ICE TukTuk, increasing the earning potential of each driver. Other benefits to drivers will include the ability to use the TUK utility token for ease of payment for charging their ZEV, and reward scheme participation, as depicted in Section 4 (Fig 1).

Versatility in function expands the scope of use cases for each ZEV, including last-mile delivery services, allowing for widespread adoption for drivers across multiple industries.

3.3 Territories & Territory Partners

A Territory is a region where eTukTuk will deploy EVSE and ZEVs. Each Territory will require infrastructure partners to install and operate essential services for the smooth delivery and operation of vehicles, charging stations, power, and technology. These infrastructure partners are known as “Territory Partners”.

The support of Territory Partners in setting up and managing infrastructure can mitigate unnecessary costs to the ecosystem by leveraging intellectual capital; reducing teething and start-up inefficiencies in the network.

3.4 The eTukTuk Sharing Economy

eTukTuk’s peer-to-peer (P2P) sharing economy contributes multiple utilities which can improve the quality of the transportation system for both drivers and Territory Partners. Frequent placement of eTukTuk EVSE operated by designated Territory Partners will provide frequency and ease of charge for the driver community.

Territory Partners have the opportunity to join with eTukTuk to operate and maintain the charging stations, providing drivers with access to the network. By doing so, they will earn rewards for operating the service. Rewards will be generated every time a driver of an eTukTuk or a compatible EV charges their vehicle at any one of the charging stations.

3.4.1 Power Staking and The Sharing Economy

Staking mechanisms will allow participants who stake into the network via TUK, to share in the success of the ecosystem, where they can earn rewards in return for supporting the shared economy. This is called “Power Staking”. Participants can stake TUK into Staking Contracts in each jurisdiction the project operates in. Our Territory Partners will help power the network that allows drivers to make the switch away from ICE TukTuks to the cleaner, more affordable eTukTuk.

More information regarding Power Staking can be found in our upcoming Staking Paper.

eTukTuk's ecosystem is designed to facilitate the growth of the sharing economy so that everyone can accelerate and share in the cleaner air, financial inclusivity, and healthier outlook as the network expands.

4. Network Overview

The TUK utility token powers the ecosystem through carefully designed tokenomics that aims to provide rewards for long-term network participants.

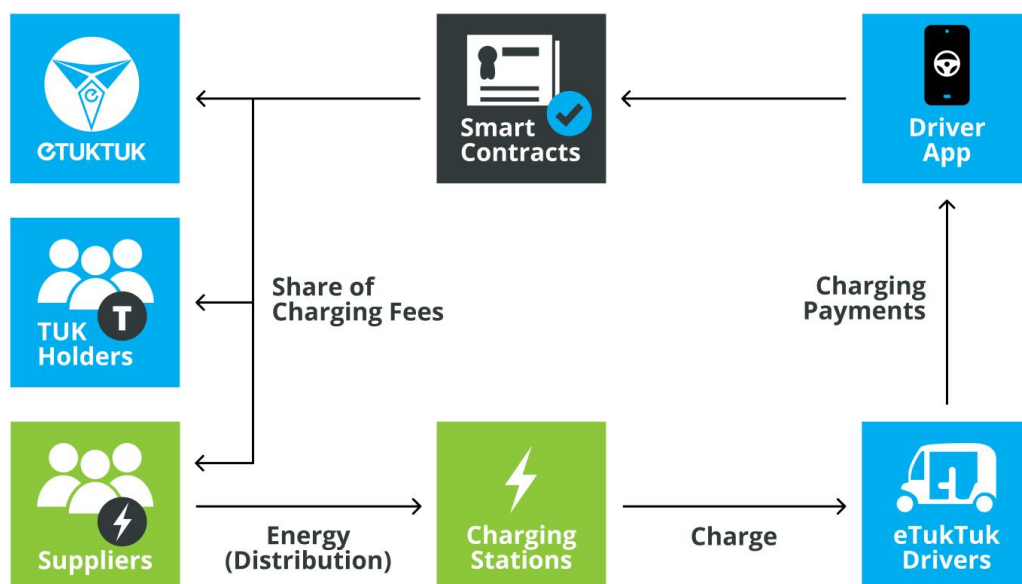


Fig. 1. A diagram showing an overview of the eTukTuk network.

4.1 Why Blockchain?

Blockchain is used in the eTukTuk ecosystem because of its advantages over traditional payment and technology systems. Specifically, it will be used to host the TUK token and the smart contracts associated with token distribution, decentralised identity, and Power Staking (rewards/incentives). These uses leverage the benefits of the blockchain:

Better Transparency

- All transactions are stored on the blockchain in perpetuity and are visible to anyone. This adds an unprecedented layer of accountability.

Enhanced Security

- Transactions on the blockchain are immutable. No central authority controls the network or can affect a retroactive amendment of the financial ledger.
- Transactions on the blockchain are 'trustless', which means that a transaction can take place with assurance of completion without the need for third-party escrow-type facilities or intermediaries.

True Traceability

- With enhanced transparency comes true traceability. All transactions can be traced back to their original source wallet, which will aid in future-proofing the ecosystem against future regulation.

Improved Speed and Efficiency

- Without the need for centralised entities, those costs that would normally be paid to them are saved. Additionally, as transactions are peer-to-peer, they are often faster and more efficient than traditional fiat payment networks. This is particularly true in cross-border payments that would normally go through multiple intermediaries.

The Sharing Economy

- Staking mechanisms allow participants to share in the success of the ecosystem by earning rewards in return for supporting the shared network. With little to no barriers to entry, other than owning and staking a token, a true sharing economy is created.

Less Friction (Barriers to Entry)

- All that is required to be a participant in a blockchain is an internet connection and a wallet (a piece of software to interpret the blockchain and provide cryptographic verification).

- A decentralised identity allows users to have full control of their digital ID, allowing them to prove identity without relying on third-party entities to prove those claims.

4.2 Banking the Unbanked

eTukTuk believes that one of the keystones to banking the unbanked will be decentralised identities. There are currently 1.4 billion⁵ adults worldwide that are considered unbanked [34] [35]. eTukTuk is determined to do its part in addressing this wealth imbalance and will ensure that digital identities and verifiable credentials that meet the highest standards are issued to all drivers who join the ecosystem.

Binance offers a combination of digital identity solutions and eTukTuk will leverage these to onboard millions of digital identities as part of the network. eTukTuk is creating the use case for these solutions to enable and empower drivers to diversify their income and earning opportunities.

4.2.1 Building for Awareness

eTukTuk will utilise blockchain technology to impact real lives across the globe. To achieve this, we need to make the project widely accessible and visible to the masses in order to reach out to as many people as possible.

To ensure the project is interoperable, scalable, and sustainable, we will provide a Multi-Chain ecosystem in order to boost awareness and accessibility for as many people as possible.

4.3 Building on BNB Chain

Blockchain provides the solution that powers the eTukTuk ecosystem in ways far superior to the infrastructure that currently exists in the developing world. The underpinning technology supports an expanded payment system for drivers; facilitating the utility of the TUK token that will allow for more efficient transactions and the decrease of wasted resources.

The system can support seamless communication between the eTukTuk vehicle, charging stations, the drivers, the mobile app, and the control centre that manages the entire network. Primarily, eTukTuk will build on the Binance decentralised public blockchain BNB Chain which will underpin the network. The

⁵ According to the 2021 Findex report by The World Bank Group, 1.4 billion adults are unbanked in 2021, in comparison to the 1.7 billion unbanked in 2017 [35].

reasons for this are defined below.

(i) Alignment of Vision

The Green Blockchain: At a time when many Layer 1 blockchains remain under heavy criticism for their lack of sustainability, BNB Chain is designed for energy efficiency and scalability [36]. With its revolutionary Proof of Staked Authority (PoSA) consensus mechanism, it achieves exceptional efficiency over other blockchains like Ethereum [37]. BNB Chain also offers Ethereum Virtual Machine (EVM) compatibility [36].

With a limited number of validators (chosen for their stake in the network) and even further backup candidates, BNB Chain eliminates heavy gas fees with a unique consensus mechanism dedicated to improving safety and security - even when under threat [37].

Throughout 2022, BNB Chain typically achieved around 140 million block gas limits. However, scalability is driving change at BNB Chain and the goal is to reach 300 million block gas limits by the end of 2023 [38].

Technological Vision: Blockchain is one of the most groundbreaking technologies in recent human history. By taking away problems of trust that otherwise stand in the way, it will undoubtedly achieve more.

Binance uses formal verification through elected Validators to ensure censorship resistance and the validity, security, energy efficiency, and decentralisation of its chain. This allows more confidence in the contracts written on Binance than on other blockchains, as security is guaranteed - even tolerating Byzantine players (malicious or hacked) [37].

Vision: BNB Chain's mission is to provide a fully fledged environment for building high performance decentralised apps [39]. Its vision is to build cross-chain or multi-chain financial infrastructure to accelerate mass adoption of digital assets and blockchain technology [39].

This aligns with eTukTuk, who also seeks to accelerate mass adoption of its charging networks and vehicles to reduce carbon emissions and bring financial inclusivity as early as possible to as many as possible.

(ii) Tech Considerations

Proof of Staked Authority: BNB Chain combines both Delegated Proof of Stake (DPoS) and Proof of Authority (PoA) on the BNB Smart Chain (BSC) to ensure

that the network is maintained securely to maintain community governance [37]. Blocks are produced by a limited set of validators who take turns to produce the blocks in a PoA manner (similar to [Ethereum's Clique](#) consensus design). [37] Security is upheld through Validator set elections based on staking-based governance.

BNB Chain's PoSA takes only 3 seconds to verify a transaction, resulting in a much higher throughput than Ethereum's 13-15 seconds on the PoW consensus mechanism. The upcoming Proof of Stake PoS mechanism will allow Ethereum to complete the transactions in around 10 seconds, but the throughput is still much lower than that of BNB Chain.

eTukTuk believes that PoSA is more environmentally friendly than proof-of-work, as gas fees are kept low because Validators do not have to compete with one another to validate blocks on the chain, like on Ethereum.

Fast Finality: Fast finalisation is crucial to the network for blockchain security and BNB Chain's Fast Finality feature (enabled with the Plato upgrade) is very useful as users can make sure they get the accurate information from the latest finalised block, and then decide what to do next instantly without delay [37].

Block reorganisations become a thing of the past, bringing enhanced security against double-spend and MEV reorg attacks, irreversible transactions upon confirmation, and efficient operations for exchanges and DeFi protocols [40].

eTukTuk believes this will provide greater security to the network and greater reassurance for first-time adopters that transactions will be completed safely.

TPS: Notably, the core transactions per second (TPS) limit of Cardano is also higher than Ethereum's, but is currently less than that of BNB Chain. In 2022, the gas limit on the BNB Chain was increased from 80M to 140M, which enabled up to 2,000 transactions per second (TPS). [38] However, the aspirations of planned scalability solutions could see the network increase to as much as 5,000 TPS in 2023 alone, with further increases likely to be made beyond 2023 [38].

EVM Compatible: BNB Chain is equipped with the smart contract functionality and compatibility with the Ethereum Virtual Machine (EVM). BNB Chain supports Ethereum Virtual Machine (EVM)-compatible smart contracts and protocols. EVM is responsible for executing smart contracts [41].

Cross-chain and multi-chain transfer (as well as other communications) are possible due to the native support of interoperability. This feature supports all existing tooling on Ethereum, faster finality, and cheaper transaction fees [37].

Transaction Fees and Processing: This allows the parties to know how a transaction will behave before it has been submitted. Once a block is created, it cannot be reverted [37]. This differs from Ethereum where the activities of others will affect any transaction, such as slowing it down, major swings in transaction fees (gas), or even making it fail entirely with the loss of the gas fee [37].

Binance Pay: This is a contactless, borderless, and secure cryptocurrency payment system supporting over 50 cryptocurrencies and stablecoins, including Binance USD (BUSD). This will allow a smoother and more secure transaction processing for drivers at the charging stations, as well as low fees and quick settlement times. This will be a payment gateway for crypto payments for charging.

Binance Connect: This will power fiat-to-crypto on- and off-ramps, processing millions of transactions across the network and allowing for seamless integration in territories where digital identities are not yet widely used.

Layer 2 Chain Support: Where other blockchains have initially demonstrated fast and cheap transactions at launch, many projects have struggled as the chains have experienced more volume.

To control transaction speed and costs, BNB Chain has been designed with Layer 2 Chain support so that the core chain's success and resulting high transaction volumes do not make the Layer 1 chain unfeasible [42]. This will be key to increasing scalability for eTukTuk on the BNB Chain.

4.4 opBNB

eTukTuk will launch on Layer 1 of BNB Chain, however, we will utilise BNB Chain's Layer 2 opBNB network, to further reduce transaction fees and boost scalability for the project.

It is designed to provide high levels of performance, efficiency, scalability, security, and interoperability across the network [43].

These plans will take into consideration the progress being made with Binance's scaling solutions and a timescale that allows eTukTuk to move forward with the full project architecture based on extensive due diligence.

4.5 The Multi-Chain Approach

At eTukTuk, we are driven by the principles of interoperability, sustainability, and scalability. We believe that the power of blockchain technology should be harnessed to create real-world solutions that transcend borders and empower communities. As we advance towards our mission of providing sustainable transportation solutions to people in developing regions, we embrace a multi-chain approach to maximise our impact and reach.

BNB Chain as the Primary Blockchain

After careful consideration, and in alignment with our business goals, we have chosen the Binance Smart Chain (BSC) as our primary blockchain for the initial phase of our project. BNB Chain's proven scalability and extensive presence in emerging economies are key factors that align seamlessly with our vision. By building on the BNB chain, we aim to expedite our growth and bring accessible transportation solutions to regions like South Asia and Africa, beginning with Sri Lanka.

TUK Token Accessibility

While the BNB chain serves as our primary blockchain, we recognise the importance of inclusivity and cross-chain interoperability. Therefore, the TUK token, the backbone of our ecosystem, will be accessible on both the Binance Smart Chain and Cardano. This approach ensures that users from both communities can engage with our project, fostering collaboration and supporting our mission across multiple platforms.

An Evolving Landscape

It is important to emphasise that the multi-chain approach we are adopting is the construct for our first region of launch. As we grow and expand to serve additional territories, we remain committed to exploring other blockchains that align with our mission and values. This approach reflects our dedication to continuous innovation and adaptability in the ever-evolving blockchain landscape.

With the multi-chain approach at the core of our project development strategy, we strive to be a bridge between transportation and sustainability for the communities we serve. Our unwavering commitment to making a tangible difference in the lives of people in emerging economies propels us forward on this transformative journey.

As we venture into the future, eTukTuk is excited to explore new possibilities and collaborations across different blockchains, further solidifying our position as a pioneering force in the sustainable transportation space.

4.6 Smart Contracts

Staking rules and logic will be encoded into the smart contracts to be visible and transparent. These smart contract staking rules and logic will be automatic and do not require third-party interaction.

Power Staking

As the number of stations grows and the network is used for more transactions, stakers will collectively earn a greater yield. The Power Staking contract will allow adjustments to be made to create more staking opportunities and to change yields within set limits.

Charging Payments

In all territories, drivers will pay to charge their vehicles. The smart contracts that determine the price of a charge and other variables can be adjusted to balance supply and demand, taking into account local and national network usage, energy costs, and demand for Power Staking.

Since drivers will have the option to pay for charging their vehicle in several currencies, eTukTuk will manage the conversion of these so that reserve levels contain desired ratios. This will take into account the flow of TUK to stakers, suppliers and other network participants.

Global Settings

Here, variables are set that apply to Territory Settings and flow into the various smart contracts to adjust economics. Such variables can include which currencies, on-ramps, and oracles are used.

Territory Settings

Depending on settings flowing down from the Global Settings smart contract, the smart contracts will receive inputs based on the economics of the territory, such as charges to drivers per kW of energy. Combined settings from Global and Territory Settings smart contracts are applied to transactions.

4.7 Rewards

There will be opportunities for all holders of the TUK utility token to earn rewards in ways that encourage maximum decentralisation and participation over a prolonged period, as shown in Fig. 2 below.

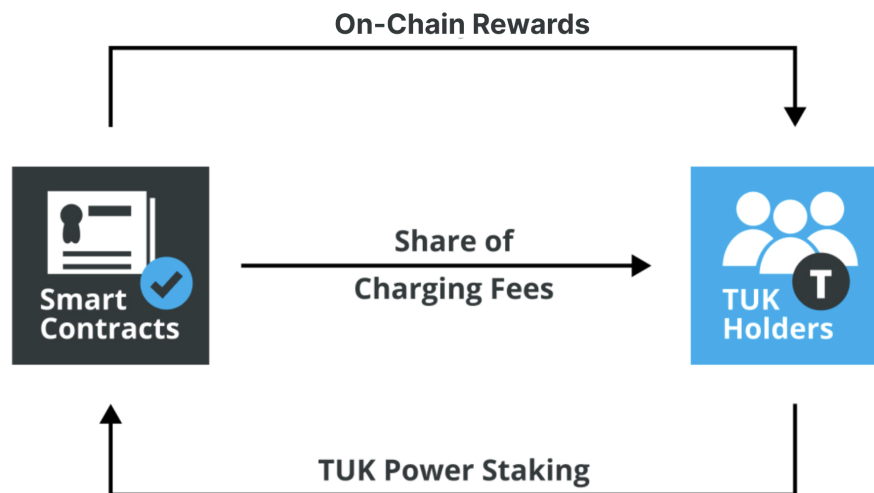


Fig. 2. A diagram showing the flow of rewards in the eTukTuk network.

Essential to the rollout of eTukTuk's ZEVs, the EVSE (charging stations) will form the basis for transactions of the TUK utility token. This can be done by paying with TUK, and/or other supported currencies.

The ability for participants to earn a share of the transactions processed by charging stations in a Territory comes through the process of "Power Staking". This is done by staking TUK tokens into the chosen Territory's smart contract.

Smart contracts will be adjustable within Territories as required. When any new token or currency support is added, it will be programmed to incentivise network participants. (See Section 4.6.)

4.8 Applications

eTukTuk will look to develop two key front-facing apps, each focused on two of the major stakeholders in the ecosystem: Drivers and Passengers.

4.8.1 Driver App

In all territories, drivers will pay to charge their eTukTuk at charging stations. Payments will be taken through the Driver App using the TUK utility token and other selected currencies.

The Driver App will facilitate these payments through cryptocurrency exchanges and fiat onramps, meaning payments can effectively be made using crypto as well as fiat with automated conversion into the underlying TUK utility token. Anonymous and aggregated data will be collected on driver movement throughout the day – movements, queuing for chargers, charging time, speed, and more.

4.8.2 Passenger App

After the network launches, eTukTuk will explore the development of a Passenger App to enable seamless and secure payments to drivers.

5. Token Economics

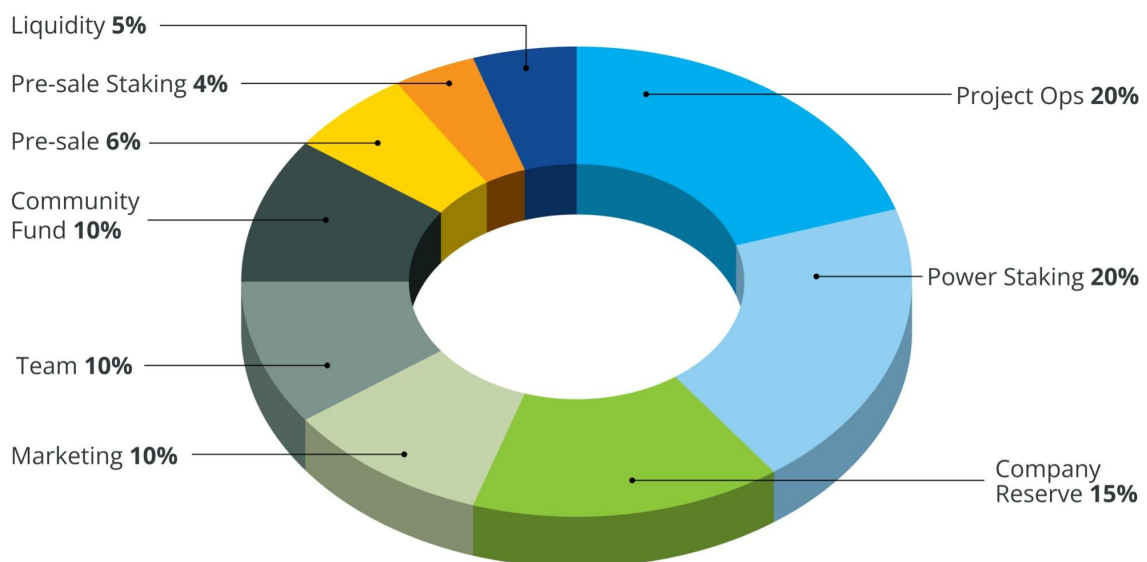


Fig. 3. A pie chart showing the allocation of the TUK token.

There will only ever be 2 billion TUK tokens in existence.

- For private sale participants, there will be a randomised release function. This will avoid large quantities of tokens being released on any single day.
- Partnership tokens will be allocated on a per-deal basis.

5.1 On-Chain Rewards Mechanics

Once the network launches, a controlled, gradually reducing token release will be used to incentivise token holders towards long-term network participation. See Fig. 4.

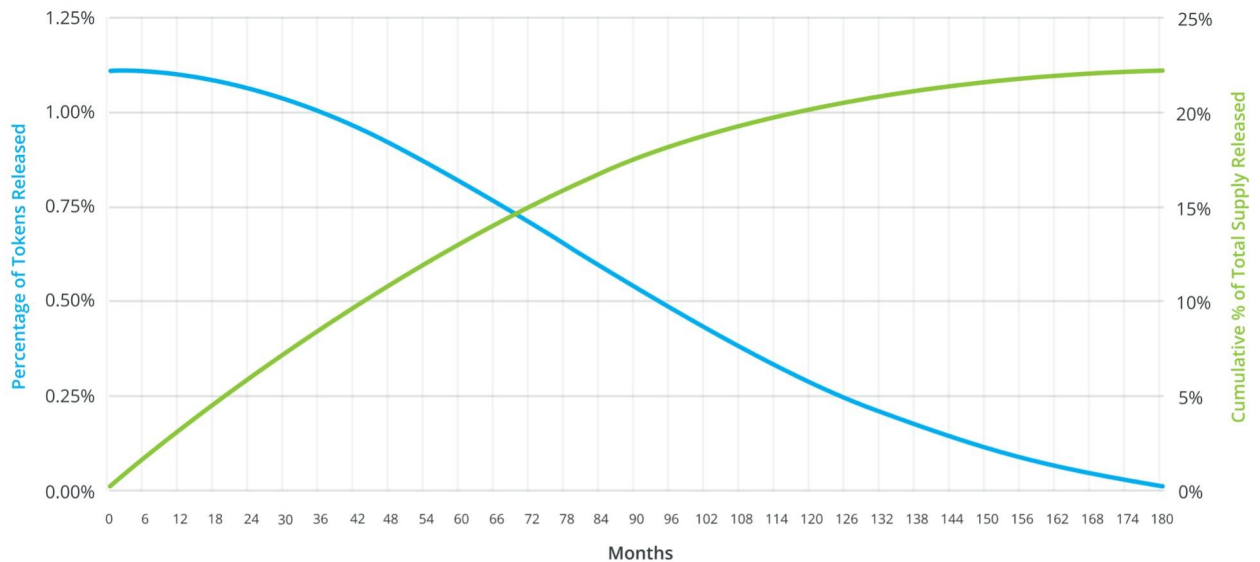
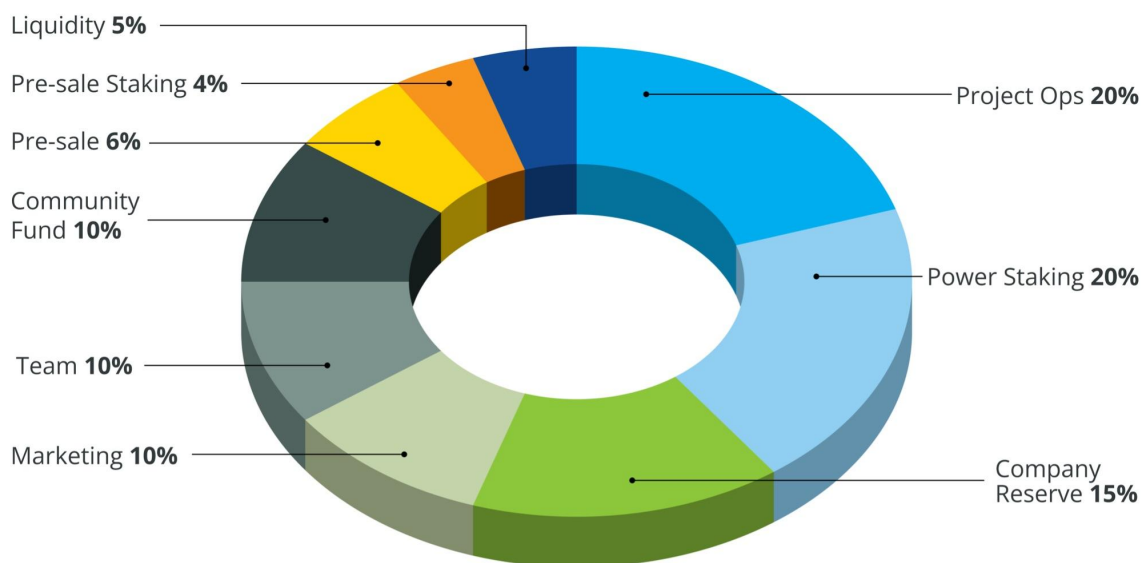


Fig. 4. A 15-year chart showing token release for the TUK token. During this time, there will be two overlapping phases of rewards for stakers, as defined in Section 4.6.

On-chain rewards will be distributed to TUK token stakers over a 15-year period and will be released in decreasing quantities from the Staking Rewards pool.

5.2 Tokenomics Distribution



Project Operations Fund

Proposed percentage of total supply: 20%
Number of tokens: 400,000,000

The Project Operations Fund will be used for a variety of purposes, all centred around the long-term growth and sustainability of the project. This fund will operate as the operations token account, funding the following:

- The eTukTuk tangible infrastructure of the ecosystem, including (but not limited to) paying for charging stations and the purchase and manufacture of electric vehicle fleets.
- Onboarding of additional team members and independent contractors after launch that perform social media, marketing, legal, operational, and other developmental duties, as needed.
- Liquidity provision for both centralised and decentralised exchanges in order to ensure robust and stable markets for the token.

Team Allocation

Proposed percentage of total supply: 10%
Number of tokens: 200,000,000

The team token allocation will be a fixed number of tokens, the full amount of which has been used to hire core and early team members prior to the occurrence of the token offering. These tokens are locked in a team wallet and

distributed to team members as they are earned, in accordance with any and all contracts negotiated by the Company.

This wallet will not account for team members brought on during or after the token offering, as those funds will be distributed from the project development token allocation, as described above.

Company Reserve

Proposed percentage of total supply: 15%

Number of tokens: 300,000,000

The Company Reserve allocation is intended to provide a buffer for the company to handle unforeseen circumstances, future development needs, and strategic initiatives. It serves as a reserve fund that can be used to ensure the long-term sustainability and growth of the ecosystem.

Marketing

Proposed percentage of total supply: 10%

Number of tokens: 200,000,000

The Marketing allocation of tokens is designed to allow the company to publicise the company leading up to and including all events.

The Marketing allocation is dedicated to promoting the eTukTuk ecosystem and increasing its visibility among potential users, partners, and stakeholders. These funds will be utilised for marketing campaigns, advertising, branding, community engagement, events, public relations, and other initiatives to raise awareness and drive adoption.

Pre-Sale

Proposed percentage of total supply: 6%

Number of tokens: 120,000,000

The pre-sale allocation represents a portion of tokens that are offered to a broader range of purchasers of the token before the public sale. These funds will be used to secure additional capital for project development, marketing efforts, and ecosystem expansion. The Pre-Sale phase of eTukTuk will be structured into multiple rounds, each offering a decreasing discount percentage. This strategic approach aims to incentivise early-stage token purchases by providing them with greater discounts as a reward for their early adoption of the project. By offering this tiered discount structure, we encourage early participation and recognise the

value of early supporters in driving the success and growth of the eTukTuk ecosystem.

Pre-Sale Staking

Proposed percentage of total supply: 4%

Number of tokens: 80,000,000

This mechanism offers early token purchasers the opportunity to immediately stake their acquired tokens, initiating a dynamic Annual Percentage Yield (APY) that decreases as more participants stake their tokens. This design encourages early adoption and rewards those who stake their tokens early with higher returns, creating a fair and enticing incentive structure.

Power Staking

Proposed percentage of total supply: 20%

Number of tokens: 400,000,000

On-Chain Staking Rewards - Dynamic staking rewards pools ("On-Chain Staking") will be offered to TUK token holders, with rewards based upon the following formula:

$$F(x) = \frac{h}{\sigma\sqrt{2\pi}} e^{(-\frac{1}{2}(\frac{x}{\sigma})^2)}$$

Fig. 5. The formula used to calculate rewards.

The Company has modelled its On-Chain Staking pools on a fifteen (15) year gradually reducing rewards curve, charted in order to maintain a balance between token supply and an attainable APY. This modelling allows token holders to be long-term market participants and receive rewards passively within the eTukTuk ecosystem.

Liquidity

Proposed percentage of total supply: 5%

Number of tokens: 100,000,000

The Liquidity allocation is dedicated to ensuring that there is sufficient liquidity for the eTukTuk token on decentralised exchanges and other trading platforms.

These funds will be used to provide initial liquidity, support market-forming activities, and enhance the trading experience for token holders.

Community Fund

Proposed percentage of total supply: 10%

Number of tokens: 200,000,000

The community fund is an all-encompassing pool of tokens that is used to help develop eTukTuk's digital footprint, as well as to address and create tangible goodwill on a global scale.

eTukTuk will be utilising funds from this pool of tokens to manufacture and donate electric TukTuks to communities in need, alongside ride credits and related services. eTukTuk also plans to work with governmental entities to support the public sector in other areas, such as infrastructure and healthcare, which are vital to developing long-standing relationships in different jurisdictions globally.

6. Conclusion

eTukTuk has combined blockchain and EV technology to create a sharing economy model that aims to address the problems of pollution that are prevalent in the developing world.

The evidence is clear. Challenges faced by the developing world will grow as the market share of ICE TukTuks and other two- and three-wheeler vehicles increases to 400 million by 2050, adding further economic distress to developing countries. The impact of carbon emissions continues to compound the strain on the health and welfare of people in these regions, and across the globe. Countries are desperate for a solution, but a distinct lack of resources inhibits advancements to develop modern, sustainable solutions.

The eTukTuk ecosystem provides a significant opportunity to bring powerful infrastructure to developing countries, crucially reducing air and noise pollution. If action is taken now, by 2050, we could be part of the solution that drives carbon emissions down by 11 billion tonnes, capping the average global temperature of the planet at 1.5°C.

As a real-world use case for blockchain technology, the eTukTuk ecosystem demonstrates the scope of the collective power of the community, who, together, can effect real-world change whilst earning rewards and eliminating financial divides for those living in developing countries.

Anyone, *anywhere*, can participate.

Clean air is a fundamental human right, and eTukTuk hopes to become a pioneer in innovation and trust within the transportation sector. Through the use of a sharing economy model, it is possible to facilitate the switch to electric vehicles whilst empowering the lives of *billions*.

7. Forward Looking Statements and Liability Disclaimer

YOU ARE RESPONSIBLE FOR KNOWLEDGE OF THE INFORMATION IN THIS SECTION.

Through this White Paper and our website, we are not advising, promoting, or recommending that you take any action. You should always get advice from legal, financial, taxation, and/or other professionals or advisors before making any business decision. The information provided here is not intended to be complete or comprehensive, and you should not rely on it. None of the information in this White Paper creates any contractual arrangement or agreement, and it should not be construed as any type of offer.

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Cryptocurrency, and Token Offerings in particular, are some of the most volatile and risky purchases you can make.

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FORWARD-LOOKING STATEMENTS

Except for historical information contained herein, this White Paper contains forward-looking statements. Such forward looking statements involve risks and uncertainties and include, but are not limited to, statements regarding future events and eTukTuk's plans and expectations. The actual results of our operations and token activities may differ materially from such statements. Factors that cause or contribute to such differences include, but are not limited to, regulatory uncertainty, market uncertainty, world events, and those discussed in this White Paper. Although the Company believes that the assumptions underlying its forward-looking statements are reasonable, any of the assumptions could prove inaccurate and, therefore, there can be no assurance that any outcome contemplated in such forward-looking statements will be realised. In addition, our operations are subject to substantial risks, which increase the uncertainties inherent in the forward looking statements included in this White Paper. The inclusion of such forward-looking information should not be regarded as a presentation by the sponsor or any other person that the future events, plans or expectations contemplated by us will ever be achieved.

8. Bibliography

- [1] IQ Air. (2021). Empowering the World to Breathe Cleaner Air. URL: <https://www.iqair.com/world-air-quality-report>. Accessed: 26th July 2022.
- [2] WHO. (2022). Billions of People Still Breathe Unhealthy Air: New WHO Data. URL: <https://www.who.int/news/item/04-04-2022-billions-of-people-still-breathe-unhealthy-air-new-who-data>. Accessed: 25th July 2022.
- [3] Worldometer. (2022). Southern Asia Population. (Live). URL: <https://www.worldometers.info/world-population/southern-asia-population/>. Accessed: 23rd July 2022.
- [4] Worldometer. (2022). Africa Population. (Live). URL: <https://www.worldometers.info/world-population/africa-population/>. Accessed: 23rd July 2022.
- [5] Statista. (2022). Number of People Living in Urban Areas in Africa from 2000 to 2026. URL: <https://www.statista.com/statistics/1267863/number-of-people-living-in-urban-areas-in-africa/>. Accessed: 25th July 2022.
- [6] Statista. (2022). Total Population of Africa from 2000 to 2022. URL: <https://www.statista.com/statistics/1224168/total-population-of-africa/>. Accessed: 25th July 2022.
- [7] The World Bank. (2021). Population, Total - South Asia. URL: <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=85>. Accessed: 24th July 2022.
- [8] The World Bank. (2021). Urban Population - South Asia. URL: <https://data.worldbank.org/indicator/SP.URB.TOTL?locations=85>. Accessed: 26th July 2022.
- [9] WHO. (2016). Air Pollution Levels Rising in Many of the World's Poorest Cities. URL: <https://www.who.int/news/item/12-05-2016-air-pollution-levels-rising-in-many-of-the-world-s-poorest-cities#.~text=According%20to%20the%20latest%20urban%20air%20quality%20database%2C,in%20high-income%20countries%2C%20that%20percentage%20decreases%20to%2056%25>. Accessed: 26th July 2022.
- [10] Lee, Ken, et al. AQLI. (p. 12-14). (2022). Air Quality Life Index. Annual Update. | June 2022. Annual Update. URL: <https://aqli.epic.uchicago.edu/reports/>. Accessed: 27th July 2022.
- [11] WHO. (2014). 7 million Premature Deaths Annually Linked to Air Pollution. URL: <https://www.who.int/news/item/25-03-2014-7-million-premature-deaths-annually-linked-to-air-pollution>. Accessed: 27th July 2022.
- [12] Public Library of Medicine. (2008). Chronic Diseases in Developing Countries: Health and Economic Burdens. URL: <https://pubmed.ncbi.nlm.nih.gov/18579877/>. Accessed: 29th July.
- [13] WHO. (2018). 9 out of 10 People Worldwide Breathe Polluted Air, But More Countries Are Taking Action. URL: <https://www.who.int/news/item/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action>. Accessed: 23rd July 2022.
- [14] CGDEV. (2021). Developing Countries Are Responsible for 63 Percent of Current Carbon Emissions. URL: <https://www.cgdev.org/media/developing-countries-are-responsible-63-percent-current-carbon-emissions>. Accessed: 25th July 2022.

- [15] WHO. (2021). How Air Pollution is Destroying Our Health. URL: <https://www.who.int/news-room/spotlight/how-air-pollution-is-destroying-our-health#:~:text=As%20the%20world%20gets%20hotter%20and%20more%20crowded%2C,air%2C%20which%20kills%207%20million%20people%20every%20year>. Accessed: 18th July 2022.
- [16] Nature Reviews Cardiology. (2021). Transportation Noise Pollution and Cardiovascular Disease. URL: <https://www.nature.com/articles/s41569-021-00532-5#:~:text=%20Transportation%20noise%20pollution%20and%20cardiovascular%20disease%20,rail%20and%20aircraft%20noise%20can%20be...%20More%20>. Accessed: 19th July 2022.
- [17] Centre for Climate and Energy Solutions. (2002). Transportation in Developing Countries: An Overview of Greenhouse Gas Reduction Strategies. URL: <https://www.c2es.org/document/transportation-in-developing-countries-an-overview-of-greenhouse-gas-reduction-strategies/>. Accessed: 28th July.
- [18] UNDP. (2019). Vulnerable Developing Countries Lead World on Climate Ambition: UN Report. URL: <https://www.undp.org/press-releases/vulnerable-developing-countries-lead-world-climate-ambition-un-report>. Accessed: 25th July 2022.
- [19] United Nations Climate Change. (2019). Cut Global Emissions by 7.6 Percent Every Year for Next Decade to Meet 1.5°C Paris Target - UN Report. URL: <https://unfccc.int/news/cut-global-emissions-by-76-percent-every-year-for-next-decade-to-meet-15degc-paris-target-un-report>. Accessed: 28th July 2022.
- [20] IEA. (2021). Global Energy Review: CO₂ Emissions in 2021. URL: <https://www.iea.org/reports/global-energy-review-co2-emissions-in-2021-2>. Accessed: 26th July 2022.
- [21] Le, Huong, et al. ICCT. (p. 1). (2022). Market Analysis of Two- and Three-Wheeler Vehicles in Key ASEAN Member States. URL: <https://theicct.org/wp-content/uploads/2022/06/asia-pacificlvsNDC-TIA-23W-market-ASEAN-countries-jun22.pdf>. Accessed: 28th July 2022.
- [22] UNEP. (2022). Electric Two and Three Wheelers. URL: <https://www.unep.org/explore-topics/transport/what-we-do/electric-mobility/electric-two-and-three-wheelers>. Accessed: 22nd July 2022.
- [23] World Bank. (2022). Food and Energy Price Shocks from Ukraine War Could Last for Years. URL: <https://www.worldbank.org/en/news/press-release/2022/04/26/food-and-energy-price-shocks-from-ukraine-war>. Accessed: 10th August 2022.
- [24] IEA. (2022). Oil Market Report - July 2022. URL: <https://www.iea.org/reports/oil-market-report-july-2022>. Accessed: 10th August 2022.
- [25] Khan, Tanzila, et al. (p. 1). (2022). Zero-Emission Vehicle Deployment: Europe, Middle East, and Central and South Asia. URL: <https://theicct.org/publication/hvs-zev-deploy-eurasia-apr22/>. Accessed: 24th July 2022.
- [26] Fortune Business Insights. (2021). Electric Vehicles. URL: <https://www.fortunebusinessinsights.com/electric-vehicle-ev-charging-stations-market-102058>. Accessed: 27th July 2022.
- [27] Carlier, M. Statista. (2021). Projections For the Global Electric Vehicle Charging System Market Between 2018 and 2028, By Region. URL:

<https://www.statista.com/statistics/1261130/global-electric-vehicle-charging-system-market-regional-forecast/>. Accessed: 25th July 2022.

[28] Mordor Intelligence. (2022). India Electric Vehicle Charging Station Market - Growth, Trends, COVID-19 Impact, and Forecasts (2022-2027). URL: <https://www.mordorintelligence.com/industry-reports/india-electric-vehicle-charging-station-market>. Accessed: 30th September 2022.

[29] Knowledge Source Intelligence. (June, 2022). Middle East And Africa (MEA) Electric Vehicle Charging Stations Market Size, Share, Opportunities, COVID-19 Impact, And Trends [...] Forecasts From 2022 To 2027. URL: [https://www.knowledge-sourcing.com/report/middle-east-and-africa-mea-electric-vehicle-charging-stations-market#:~:text=The%20Middle%20East%20and%20Africa%20%28MEA%29%20electric%20vehicle,size%20of%20US\\$24161.222%20million%20by%20the%20year%202027](https://www.knowledge-sourcing.com/report/middle-east-and-africa-mea-electric-vehicle-charging-stations-market#:~:text=The%20Middle%20East%20and%20Africa%20%28MEA%29%20electric%20vehicle,size%20of%20US$24161.222%20million%20by%20the%20year%202027). Accessed: 30th September 2022.

[30] Allied Market Research. (2022). EV Market 2022-2030. URL: <https://www.alliedmarketresearch.com/electric-vehicle-market>. Accessed: 26th July 2022.

[31] The ICCT. (2022). Growing Momentum: Global Overview of Government targets for Phasing Out Sales of New Internal Combustion Engine Vehicles. URL: <https://theicct.org/growing-momentum-global-overview-of-government-targets-for-phasing-out-sales-of-new-internal-combustion-engine-vehicles/>. Accessed: 24th July 2022.

[32] IEA. (2021). Prospects for Electric Vehicle Deployment. URL: <https://www.iea.org/reports/global-ev-outlook-2021/prospects-for-electric-vehicle-deployment>. Accessed: 8th August 2022.

[33] The UN. (2022). Sustainable Development Goals: Climate Action. URL: <https://www.un.org/sustainabledevelopment/climate-action/>. Accessed: 26th July 2022.

[34] World Bank. (2020). Universal Financial Access. URL: <https://ufa.worldbank.org/en/ufo>. Accessed: 21st October 2022.

[35] World Bank. (p. 33). (2021). The Global Findex Database. URL: <https://www.worldbank.org/en/publication/globalfindex/Report>. Accessed: 8th August 2022.

[36] BNB Chain. (2022). BNB Chain: An Ecosystem of Blockchains. URL: <https://docs.bnbchain.org/docs/overview>. Accessed: 15th July 2023.

[37] BNB Chain. (2023). BNB Chain: Introduction. URL: <https://docs.bnbchain.org/docs/learn/intro>. Accessed: 15th July 2023.

[38] BNB Chain. (2023). BNB Chain Tech Roadmap 2023. URL: <https://www.bnbchain.org/en/blog/bnb-chain-tech-roadmap-2023/>. Accessed: 16th July 2023.

[39] Binance Blog. (2022). Introducing BNB Chain: The Evolution of Binance Smart Chain URL: <https://www.binance.com/en/blog/ecosystem/introducing-bnb-chain-the-evolution-of-binance-smart-chain-421499824684903436>. Accessed: 16th July 2023.

[40] BSC News. (2023). BNB Chain Implements BEP-126 Update, Introduces Fast Finality for Unparalleled Security. URL: <https://www.bsc.news/post/bnb-chain-implements-bep-126-update-introduces-fast-finality-for-unparalleled-security#:~:text=With%20Fast%20Finality%2C%20block%20reorganizations,for%20exchanges%20and%20DeFi%20protocols>. Accessed: 15th July 2023.

[41] BNB Chain. (2023). BNB Chain - Getting Started. URL: <https://docs.bnbchain.org/docs/getting-started>. Accessed: 18th July 2023.

[42] BNB Optimistic Rollup. (2023). What is opBNB? URL: <https://docs.bnbchain.org/opbnb-docs/docs/intro>. Accessed: 17th July 2023.

[43] BNB Optimistic Rollup (2023). Why Do We Need opBNB? URL: <https://docs.bnbchain.org/opbnb-docs/docs/core-concepts/why-opbnb>. Accessed: 16th July 2023.