De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

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Foreword

The International Energy Agency (IEA) estimates that the transport sector accounts for 30% of the worldwide fossil fuel consumption, contributing to as much as 20% of the GHG emissions. The Indian automobile industry is emerging as one of the world's largest, recording annual sales worth 25.3 million vehicles in FY16-17. It is also one of the fastest growing auto markets, with an expected annual demand for passenger vehicles, commercial vehicles and two-wheelers to be 10 million, 2.7 million and 34 million units, respectively by 2020.

Following the Government of India's ambitious commitment for an all-electric fleet by 2030, the Indian auto-sector would experience a transition, especially with the encouraging signs on their feasibility and customer appeal as public transport modes. This transition from conventional mobility to electric mobility with motors and batteries is revolutionising vehicles and, with

> It is important to adopt a variety of measures to pave the path for clean, cost-effective, and efficient mobility services that are safe, create new jobs, reduce dependence on oil imports, and achieve more efficient land-use in cities with the least environmental footprints and impacts on human health.

them, the entire automotive industry. Among various modes of electric mobility, the most abundant, i.e. the electric-rickshaw, has proven to be a popular solution in the past years in providing low-cost last-mile connectivity across various Indian cities. However, the rapid emergence of e-rickshaws on Indian streets, coupled with a lack of regulation of their use, has made them a safety concern. Additionally, since these vehicles need to be charged, the lack of essential appropriate infrastructure is a concern along with the lack of initiatives to integrate these modes with other mass transit modes.

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Hence, it is imperative to have strict quality assurance and design specifications for these vehicles, coupled with a well-distributed network of charging infrastructure which should be solar-powered and a plan for integrating them in city's transit system.

> CEED's report focusses on the various aspects of electric rickshaw in terms of improving its safety and accessibility in order to make it a reliable and integral mode of public transport.

Hence, it is imperative to have strict quality assurance and design specifications for these vehicles, coupled with a well-distributed network of charging infrastructure which should be solar-powered and a plan for integrating them in city's transit system. I am pleased that in its endeavour to promote sustainable mobility for all, CEED's report 'De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw' poignantly focusses on the various aspects of electric rickshaw in terms of improving its safety and accessibility in order to makeit a reliable and integral mode of public transport. The study provides various recommendations for design improvement and regulations that need to be in place to achieve the complete potential of e-rickshaws. The study also proposes the idea of Solar Powered Charging Stations (SPCSs), so that the energy needed for these vehicles does not increase the existing load on the power-grids, especially in tier-2 and tier-3 cities, where it isn't able to meet the demands. I congratulate the team for their efforts on putting together this research and wish them the very best for their continued efforts for making e-rickshaws sustainable and viable for our cities' mobility needs.

— Akshima Tejas Ghate
Associate Director and Senior Fellow, Centre for Sustainable Habitat
TERI–The Energy & Resource Institute

Preface

"De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw" is a market research to explore social and environmental benefits of mainstreaming the e-rickshaw on a large scale for last mile connectivity, and identify key concerns and challenges faced by the sector with respect to technology, safety and infrastructure for charging. E-rickshaw has emerged as the fastest growing mode of intermediate public transport services that connect users to mass transport systems. E-rickshaws possess immense potential to provide low-cost mobility to many Indian cities. However, the government at the centre and state level needs to create safety regulations and build appropriate infrastructure to ensure that this transport mode is simultaneously affordable and safe. E-rickshaws are cheaper to buy and operate than its existing counterpart auto-rickshaws, and rising fuel prices have made them even more attractive compared to vehicles that run on petrol or natural gas.

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It is with this vision that CEED decided to conduct a study on electric rickshaws with a thought that it can pave the way for the future of electric mobility in the country, considering the government's ambitious target for an all-electric fleet by 2030.

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The e-rickshaws have witnessed a sporadic expansion in almost all Indian cities, coupled with a lack of regulation on their use that has raised issues on their safety. E-rickshaws generally carry 5-6 passengers; although considering their light-body design, it can only hold upto 4 passengers. Also, the braking equipment is another aspect of e-rickshaw, which has been unreliable due to a number of issues, such as limited control of the regulatory agencies and price differences that has lead to an increase in unregistered vehicles. Electric mobility in the 21st century comes with a series of constraints, ranging from problems in availability of essential resources to difficulties in disposal and management of battery waste along with lower average speed in the transportation of goods and people—all of which lead to considerations about the future role of the automobile in the cities. From numerous negative factors relating to existing urban mobility in the full sense, the biggest target for the minimisation of effects is local pollution, because increasing risk of public health. In this sense, electric mobility seems as a part of a solution. With the most abundant form of electric transport i.e., the e-rickshaw, it is important to make it safe which requires quality assurance, from inspecting body parts' load capacity, tires, brake equipment, and turning radius. These inspections should be carried out for new and existing vehicles. People who drive e-rickshaws for the city should not be penalized if vehicle violations are detected, otherwise problems will never be reported. These policies will require the cooperation of drivers, manufacturers, and Central Government to enforce such regulations.

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The time is ripe to implement fundamental changes in concepts and models of the last century's standardised transport.

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Infrastructure must also change to support e-rickshaws. Proper charging stations must be installed around the city, and auto-mechanics must be taught how to handle problems specific to e-rickshaws. Charging stations can be integrated into existing fuel stations without placing a heavy burden on fuel-station owners. In fact, developing infrastructure to support e-rickshaws can help Indian cities. Batteries currently imported from China can be made locally to help bring money to India's communities and lower the cost of batteries for e-rickshaw drivers.

— Ramapati Kumar
CEO, Centre for Environment and Energy Development (CEED)

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Executive Summary

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The Government of India has been swift to realise the potential of electric vehicles (EVs) as a means of providing low-carbon, cost effective and environmentally efficient means of transport.
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Globally, transport sector accounts for about 20% of the fossilised energy consumption making it a major source of ambient air pollution. India with an on-road fleet of 25 million+ motor vehicles is the fourth largest automobile manufacturer in the world, the collateral effect of which can be seen in the air quality trends in all major cities of India. The Government of India has been swift in realising the potential of Electric Vehicles (EVs) as a means of providing low-carbon, cost effective and environment-efficient means of transport. The National Mission on Sustainable Habitat (NMSH) recognises that emissions from transport can be reduced by adopting a synergistic approach to introduce and popularise electric vehicles. Amongst various available modes of electric mobility, electric rickshaw, popularly known as 'e-rick', has presented itself as a means of clean urban mobility and last mile connectivity solution in the the public transport sphere.

E-rickshaws have experienced a sporadic expansion, not just in Delhi but in tier-2 and tier-3 cities like Varanasi, Patna, Lucknow, etc.. However, the existing design of e-rickshaw have many challenges, such as inconsistent battery system, congested seating for passengers, and non-ergonomic design for passengers and drivers for safe riding. The vehicle still uses lead acid battery which takes 8 hours or even more to charge completely; with a battery life of only 8 hours or 70-80 km. The duration required to charge the battery in turn impacts the income generation for the driver.

The conventional lead acid battery weighs upto one-third the actual weight of the vehicle, with the effective life-span of only 6-8 months; the short life span of the battery is attributed to inefficient charging practices like deep-charging coupled with poor maintenance. In comparison to the conventional battery system, Lithium ion is a relatively newer concept, and has a much more promising performance. With one-fifth the weight of the conventional battery of same capacity, the life cycle is as long as 4-5 years. There also exists a number of regulatory gaps in terms of registration,certification and compliance specifications. Currently, e-rickshaw rules only exist in

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An interesting avenue in terms of charging can be its confluence with solar power, with rooftop solar models for charging infrastr-uctures installed on government buildings, metro stations, bus depots, etc..
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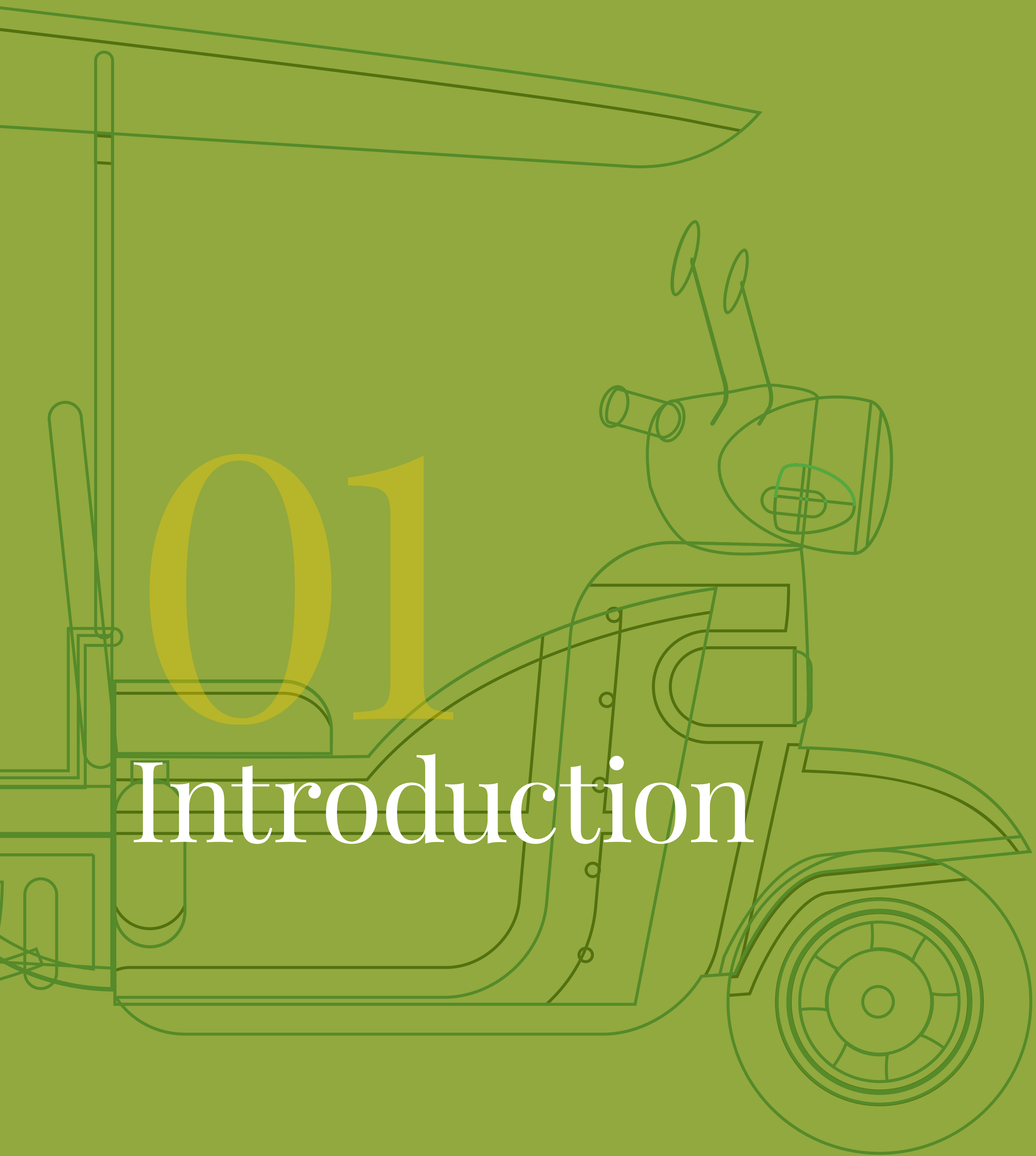
Union Territories like Delhi, Puducherry, and north-eastern state, Tripura; despite being accepted as an integral mode of public transport in most of the Indian cities with massive surge in its number. This gap has not only lead to ambiguity in the minds of end-user, but also puts the safety of the passenger at risks, as the absence of compliance specification leaves a lot of room for sub-standard and low-quality products in the market. The absence of any regulatory framework has also adversely affected the financial inclusion of these vehicles, which in turn, has led a majority of non-registered fleet of these vehicles on the road.

Despite the various challenges associated with electric rickshaws, it has continued to be a popular urban mobility option. The primary reason responsible for the continuous rise can be attributed to the environmental and socio-economic benefits provided by e-rickshaw, like alternative to diesel powered auto-rickshaws, better livelihood option through increased income and significant reduction in physically-draining labour. Beyond consuming less energy and better equipped to use renewable energy sources, considering its potential integration with grids, e-rickshaw also offer to defossilize Indian public transport to quite an extent by providing alternative to polluting auto-rickshaws for last mile connectivity and local transport. With the rise of PM2.5 and PM10 in ambient air at an alarming level in Indian cities, auto-rickshaws and other intermediate transport modes are emerging as significant point source of pollution. Further, the technical advantages in e-rickshaws lead to the possibility of reducing petroleum use, air pollution, and carbon emissions on a massive level. The report examines the role of the electric-rickshaw sector as an integral part of electric mobility in promoting sustainable urban transport in India, develop an essential vision for this sector, recommend reforms to the various institutional and infrastr-uctural challenges faced by these vehicles to consume their maximum potential. Deployment and even distribution of the charging infrastructure is essential to build the foundations of electric mobility, the lack of availability of basic charging infrastructure not only encourages unregularised charging practices, but also the use of sub-standard charging devices. These methods pose big obstacles in widespread adoption of EVs, and also restrict any investment in the business. The situation is ripe to adopt measures for EVs and its confluence with solar powered charging stations (SPCSs), as the barrier of acceptance of these vehicles have been successfully overcome. India stands at a critical juncture in terms of providing clean infrastructure, which has the potential to provide energy efficient urban mobility.



01 Introduction

Efficient and affordable means of mobility is one of the important enablers of economic growth. India, the fourth largest automobile manufacturer of the world, has an on-road fleet of over 25 million motor vehicles[1]. Naturally, vehicular pollution is the major cause of ambient air pollution in all the major Indian cities. Even smaller cities like Gwalior and Allahabad[2] have been identified as the most polluted cities over megacities like Delhi and Mumbai[3]. Evidently, India is at a critical juncture in terms of clean infrastructure, which has the potential to provide energy efficient urban mobility. The second most populous country in the world, India's potential to create a shared, electric, and connected mobility system could produce major benefits domestically and globally.

Vehicular pollution may not be the single most source of air pollution, but it is a significant contributor to the deteriorating air quality. The fourth largest emitter of GHG gases, Indian transport sector accounts for 13% of these total emissions (Indian Network on Climate Change Assessment, 2010). India's National Action Plan for Climate Change (NAPCC) recognises that emissions from transport can be reduced by adopting a synergistic approach to introduce and popularise electric vehicles. These vehicles, beyond consuming less energy, enable greater use of low-carbon and renewable energy sources, than are available from conventional petroleum-based fuels. These technical advantages lead to potential for greatly-reducing petroleum use, air pollution, and carbon emissions.

The Government of India recognizes the potential and urgency to promote the electric vehicles as a sustainable mobility solution to reduce dependency on energy imports, reduce GHG emissions, and mitigate adverse impacts from transportation. The formation of National Board for Electric Mobility (NBEM), and Faster Adoption and Manufacturing of Electric vehicles (FAME) scheme shows commitment and proactive approach of the government towards the recognition and popularisation of electric vehicles. Amongst various modes of electric mobility, e-rick has presented itself as a source of clean urban mobility and last mile connectivity solution in the the public transport sphere. The word 'rickshaw' which finds itsorigin in the Japanese language, which literally translates to "a human-powered vehicle", is considered as one of the oldest modes of transport across the world. Considering the following advantages of this new form of electric mobility and to eventually phase out the physically taxing cycle-rickshaws, 4000 electric battery rickshaws were introduced in New Delhi in 2010, during the

[1] www.knowindia.net/auto.html

[2] www.timesofindia.indiatimes.com/life-style/health-fitness/health-news/10-of-worlds-20-most-polluted-cities-in-india-list-inside/articleshow/52249911.cms

[3] www.secured-static.greenpeace.org/india/Global/india/Airpoclypse--Not-just-Delhi--Air-in-most-Indian-cities-hazardous--Greenpeace-report.pdf

Commonwealth Games for the following major objectives:

1.1 Environment

Being environment-friendly and emission-free vehicles (i.e. zero emission); E-rickshaws can reduce the CO2 emission by over 1.6 lakh tonnes annually, considering it travels 70km a day and are over 1 lakh in number. The on-road fleet of e-rickshaws is expected to increase five-fold by 2020, with the potential saving of over 8 lakh tonnes of CO2 equivalent. E-rickshaws can potentially reduce the most prominent pollutants such as Particulate Matter (PM) along with Oxides of Sulfur (SOx) and Oxides of Nitrogen (NOx), considering tailpipe emission contribute 20-40% of the total vehicular emissions[4].

Additionally as the vehicles run on a battery, the noise created by them is very less, hence, e-rickshaws avoid the noise pollution that the other vehicles create. The existing auto-rickshaws i.e. motorised rickshaws, are a common sight in most cities in India and have been responsible for providing last mile urban connectivity solution. However, these motorised rickshaws are also among the major contributors of ambient air pollution. As expected in a few cities, these rickshaws still run on fossilised source of energy.

Vehicle	Propulsion technology	Maximum speed (km/h)	Maximum distance per recharge (km)	Specific energy consumption (kJ/passenger-km)	Specific energy cost (INR/passenger-km)	Specific CO_2 emission (gm/passenger-km)
Auto rickshaw	SI* engine	60	230–280	362.4	0.62	23.556
E-rickshaw	BLDC** motor	25	80–100	53.76	0.096	19.129

*Spark ignition **Brushless DC

Table 1: Specific energy consumption and carbon dioxide emission for auto-rickshaws and electric rickshaws.

1.2 Commuters

Accessibility to travel distance plays an important role in welfare, making transport an important network infrastructure. Affordable and safe means of transport increases the movability of a commuter to explore economic and socio-cultural opportunities.

These vehicles are capable to provide last mile connectivity from residential colonies to metro stations/bus stops/major traffic points, along with long-distance travel if the structural issues with the design are dealt properly. Especially in the case of tier-2 and tier-3 cities with prevalence of low income groups, these vehicles are more economical for commuters, compared to auto-rickshaws and cycle-rickshaws for distances of over 2 to 3 km. Additionally, these vehicles also provide green drive to the commuters as well as tourists.

[4] www.insideevs.com/examining-electric-cars-particulate-matter/

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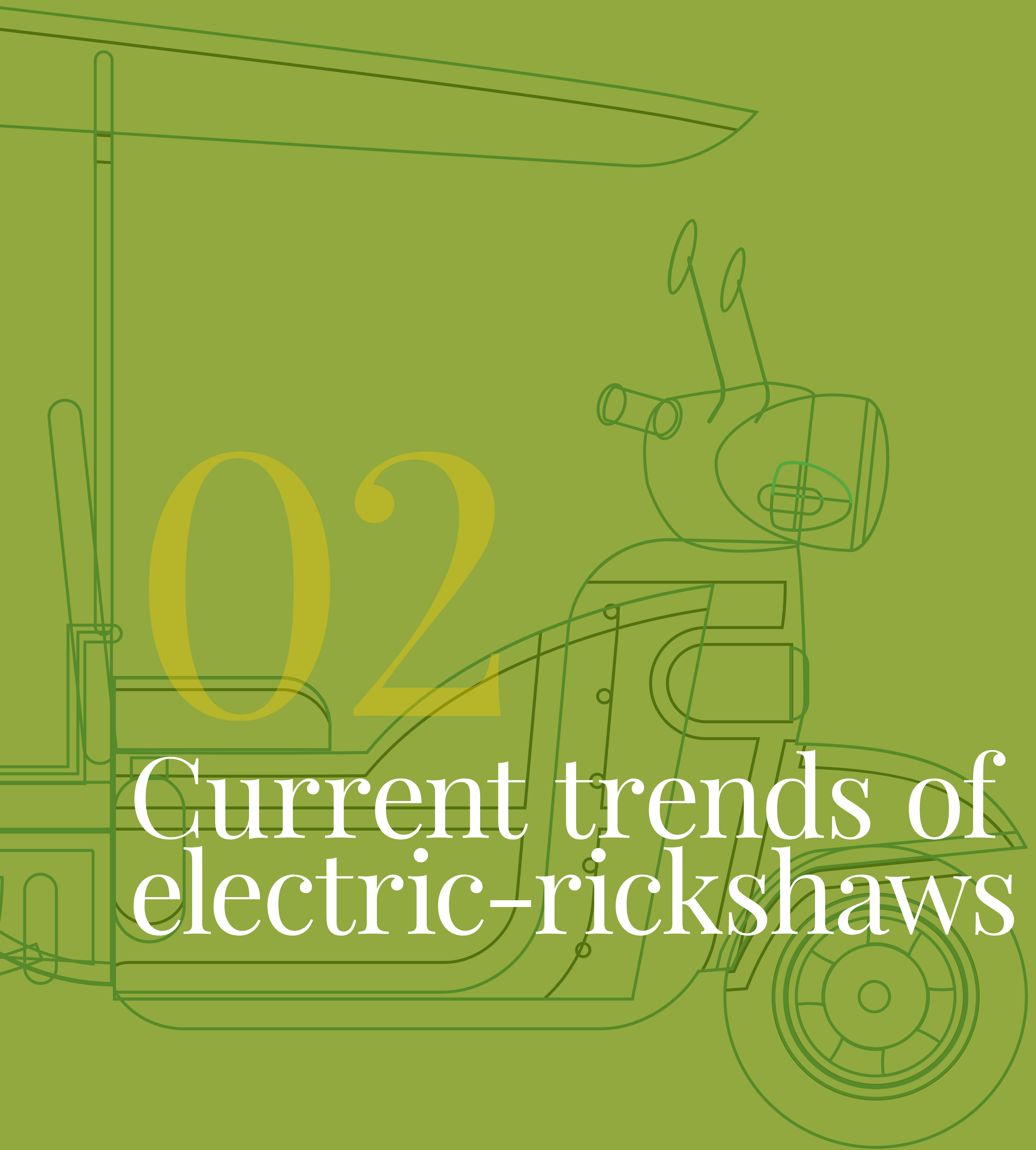
1.3 Government and Society

E-ricks have the potential to create large-scale skilled employment for the immense work-force in India. Further, there is a huge potential to reduce gas import bill. Conversion of 1 lakh auto-ricks to e-rickshaws would reduce our oil/gas import bills by over Rs. 2.78 billion annually, which can increase savings by Rs. 13.94 billion annually by 2020.

> The conversion of 1 lakh auto-rickshaws to e-rickshaws would reduce India's oil & gas import bills by over INR 2.78 billion annually.

In wake of the sporadic expansion of the electric rickshaw and their advantages during 2014-15, the Government of India amended The Motor Vehicle Act in 2015 defining an e-cart/e-rickshaw, and bringing it under the ambit of the parent act (The Motor Vehicle Act 1988).

However, inspite of the popularised mode of public transport, there are many concerns, such as the use of substandard parts which put the life of the driver and commuter at risk. The next section deals with similar issues related to the e-rickshaws.



02 Current trends of electric-rickshaws

2.1 Number of electric-rickshaws in various cities

In the absence of official data on electric rickshaws, both in terms of the on-road fleet and number of registered drivers; the number of e-rickshaws plying on roads of Delhi, Lucknow, Patna and Varanasi are based on the discussion with various battery rickshaw manufacturers.

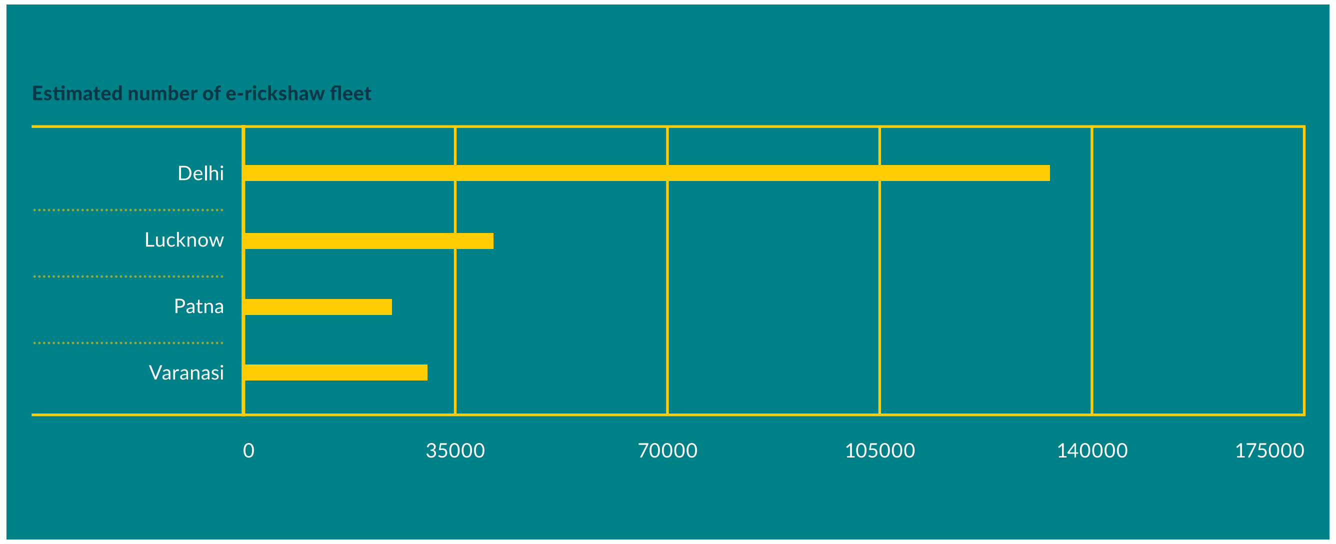


Figure 1: Estimated number of electric rickshaws in Delhi, Lucknow, Varanasi and Patna

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The presence of unregistered e-ricks is a huge cost to the DISCOMs, which are losing money in the tune of Rs.12–15 lakhs everyday in Delhi alone.

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City	Formal/registered	Informal/unregistered
Delhi	33%	67%
Varanasi	25%	75%
Lucknow	20%	80%
Patna	15%	85%

Table 2: The contribution of formal and informal sector.

The presence of the majority of unregistered e-rickshaws is a huge cost to the DISCOMs, since these are charged at the owner's premises with domestic connection (tariff), due to which DISCOMs are losing money in the tune of Rs.12–15 lakhs everyday in Delhi alone.

2.2 Spread of electric-rickshaw in various states

E-rickshaw has been recognised a mode of public transport in as much as 18 states and 2 union territories. The sale of the electric rickshaw has increased exponentially in almost each city after the amendment of Motor Vehicle Act 2015. With regularisation, new avenues of the market were opened in collaboration with companies, such as Ola and Bhartiya Micro Credit (BMC), along with FreeCharge providing financial support.

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The proactive attitude of the central government towards e-rickshaw and recognising it as a means of achieving flagship projects like “Stand Up India” and “Empower India” has increased inclination of riders and buyers in e-rickshaws

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“Stand Up India” and “Empower India”, have proved to be advantageous; with increased inclination of both the riders and buyers in e-rickshaw. The exponential increase of electric rickshaw may be attributed to a number of reasons:

01. Socio-economic upliftment of drivers. A number of studies have reported an in crease in the income of the driver along with upliftment in the social status.

02. It minimises physical labour of the driver.

2.3 Socio-economic trends

In spite of the above mentioned issues with the electric rickshaws and its operational challenges, there has been an exponential growth in the on-road fleet. The primary reason responsible for this continuous rise can be attributed to the increase in livelihood. A socio-economic survey was conducted in 2014-15 by the Centre for Civic Society (CCS). The major findings are listed below:

01. 37% of the respondents (e-rickshaw drivers) were either unemployed or were cycle-rickshaw pullers, before they became e-rickshaw drivers. 21% were either factory workers or daily wage labourers involved in jobs such as painting or carpentry, where the job security is low and the physical work is relatively higher.

02. A staggering 89% of the rick drivers saw an increase in their income.

03. There were examples of a few who earned lesser, compared to their

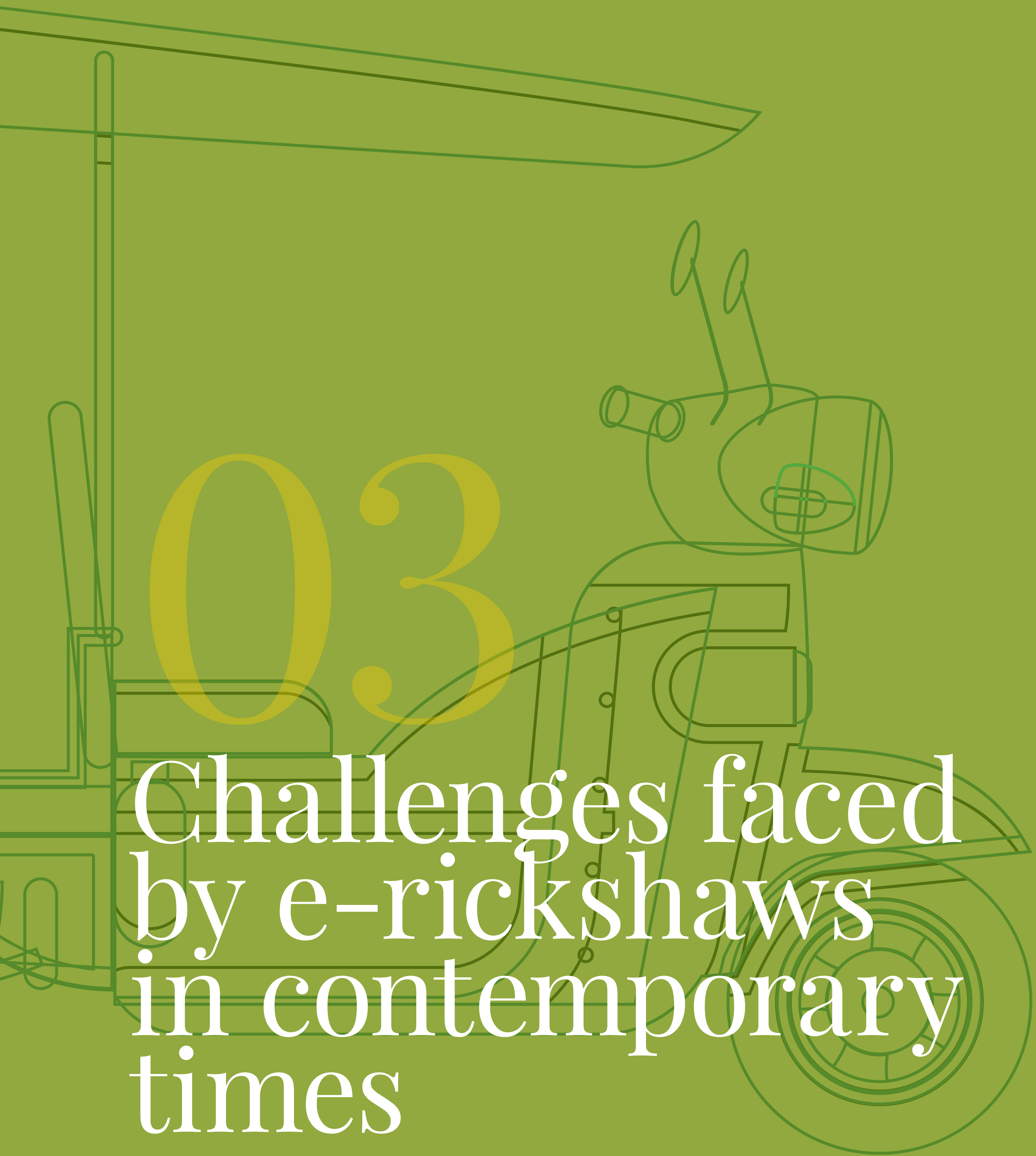
previous employment. But they were happy to exchange the economic loss with more individual freedom and dignity of labor.

04. It also allows the drivers to stay within a particular location, which is a significant advantage over other occupations.

05. Electric rickshaws can be an appropriate alternative as almost 65% drivers believed that there was an increase in their social status after buying or running the battery rickshaws.

The survey[5] also showed that e-rickshaws can be the real game changers in the recent future by becoming the most dependable public transport, not just for last mile connectivity, but also for longer distances with the required structural changes. In order to make electric rickshaw safer and more regulated, it is important that the above issues are dealt with immediate effect, and the complementing charging infrastructure are able to support the growth of these vehicles.

[5] www.ccsinternship.files.wordpress.com/2014/06/323_study-of-the-battery-operated-erickshaws-in-the-stateof-delhi_shashank-singh.pdf



03

Challenges faced by e-rickshaws in contemporary times

3.1 DESIGN

The e-rickshaw's design is attributed as unstable and has an uneven weight distribution. It has often been reported that the vehicle experiences usual toppling during the turns. The vehicle is designed to ply under the speed of 25 km/h and is reported to wobble at a speed above 20 km/h.

- Electrical issues in rainy seasons
- Congested and uncomfortable passenger seating
- Absence of side support; safety concerns while in transit
- Excessive height + the increased centre of gravity, causes rolling
- Difficulty in accessibility + use of brake pedal and parking brake lever
- Ergonomical issues with boarding + disembarking
- Improper battery charger provision; makes charging cumbersome[6]

3.2 Technology

The deployed technical specification of the electric rickshaw has some fundamental challenges in terms of battery and charging.

Parameters	Mean Values
Motor power (peak)	850W (mode value–650W)
Battery voltage (system value)	48V
Single battery capacity	85AH
Maximum load capacity	380 kilograms (5 people)
Vehicle weight (app. figure–large variations)	215 kilograms (with batteries)
Maximum speed	25–30 kmph
Charging time	Charging time
Distance covered (1 charge)	60–70 kilometers
Battery recycling time period	6–8 months

Table 3: Technical specification of electric rickshaws

The opportunity cost to the driver due to overnight charging is the primary reason of low net income in a day. The other challenges are:

01. The battery weighs over a 100 kgs which restricts the battery-swap model to be used for charging.

02. The disposal of the battery is another issue. Since it contains lead as a primary product, it should be handled by professional e-waste recyclers only.

03. The efficiency of the battery decreases within 3 months of usage and it drops to 50% in some cases.

04. The durability of the battery is a challenge, which increases the payback time for the driver/ owner.

05. The vehicle is competing with high-speed vehicles on the arterial roads, which causes congestion of traffic.

06. The distance covered by the vehicle in one complete charge is lower than the anticipated need of the commuters in a megacity like Delhi. Although, it potentially satisfies the consumer in smaller cities like Varanasi and Patna.

3.3 Infrastructure

The on-road electric vehicle fleet has not been complemented by adequate charging infrastructure, a prerequisite for electric vehicle which in turn can impede growth. Absence of basic infrastructure for charging, halting and parking areas restricts the further growth of these vehicles in tier-2 and 3 cities. The absence of charging points can prove to be a huge hindrance for the adoption of electric vehicles, considering a consumer who is anyway paying money for going green, would not want to face further problems of getting stranded in the middle. There is almost a complete absence of a public charging network in India with just 206 charging points[7]. The extent of electric mobility is highly limited in India at the moment in comparison to countries such as China, USA and Japan where there is distributed network of 30,000 to 50,000 charging points.

3.4 Financial Support

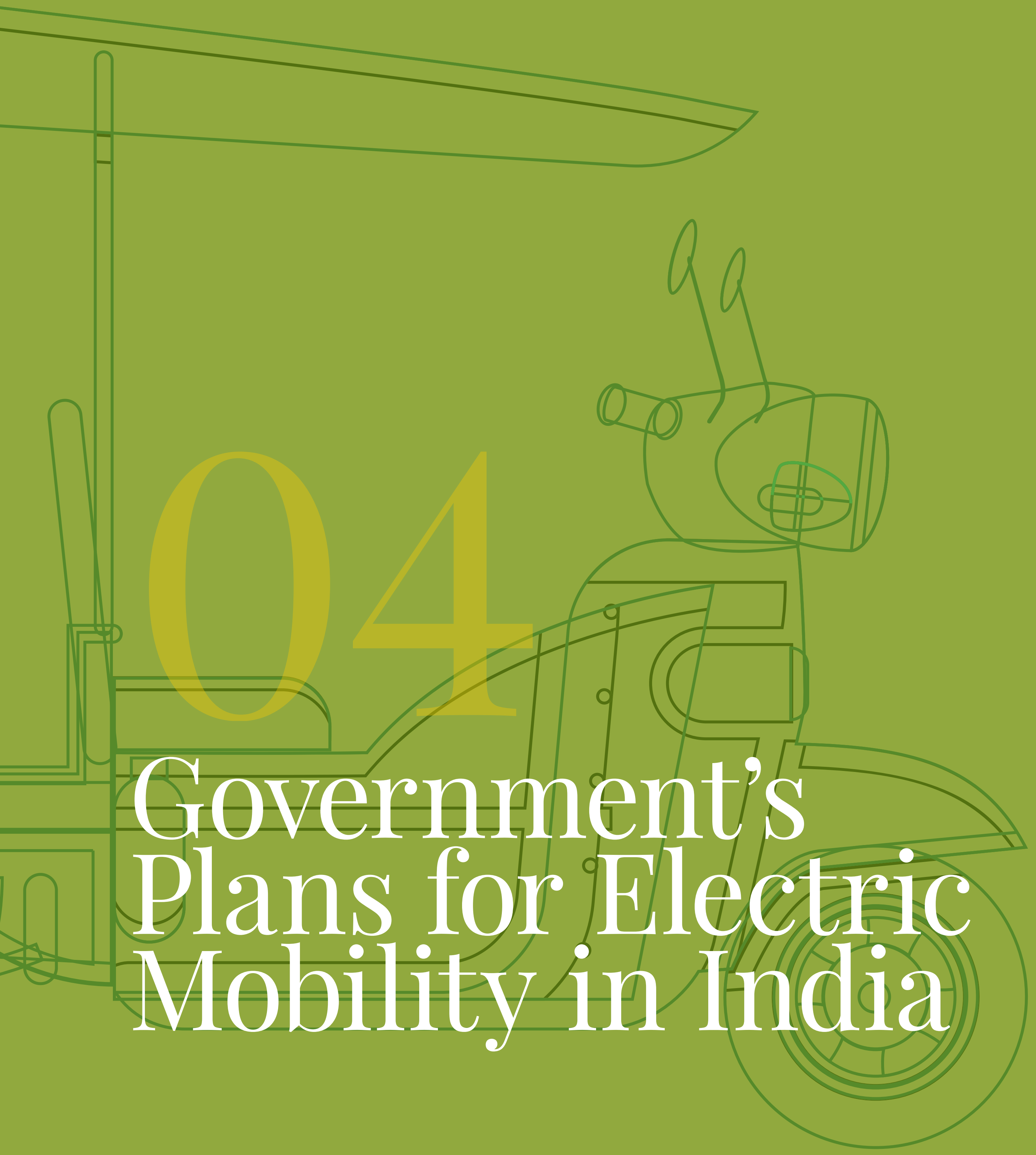
Financial Institutions (FIs) i.e banks, micro-finance companies, etc. are not keen on offering credit for electric vehicles as they have a low resale value. The provisions for financing must be eased so that the drivers can become the owners themselves. Customised finance schemes for e-rickshaws must be introduced with the support and guarantee of the government aimed at promoting electric vehicles. The policy should encourage the finance operations through a regulated market action where the supplier, owner and financial institutions will take active interest in developing the market.

3.5 Regulatory Framework

Although electric rickshaw has been accepted as a mode of public transport, the regulations only exist in Delhi, Puducherry and Tripura. The rules for both union territories i.e. Delhi and Puducherry are similar, except that the Delhi Government announced the new E-Rickshaw Subsidy Scheme preceding the previous E-rickshaw Sewa Scheme[8]. There exists an ambiguity on the issuance of "learner's license", as the MVA 2015 waives off the necessity of learner's licence for the electric rickshaw driver; but the rules notified by the Government of NCT of Delhi categorically mentions the process of obtaining the learner license.

Although, the Delhi Electricity Regulatory Commission (DERC) recently announced that the e-ricks and other electric vehicles can be charged on domestic connections, there is a need for regulation to be in place so that these charging points do not increase the existing load on the power grid. The Government of India launched the National Electric Mobility Mission Plan to speed-up and incentivise the electric mobility in India, the mission aims at increasing the acceptability of newer technology and provide necessary infrastructure for electric vehicles. However, it has neither included electric rickshaw as a mode of transport nor provided any demand incentive.

[7] www.greenworldinvestor.com/2017/04/13/the-biggest-challenge-for-indias-electric-vehicles-just-206-public-charging-stations/
[8] www.delhi.gov.in/wps/wcm/connect/68855600475e7edb9c6dfc825d7a2a20/E-RICKSHAW+SEWA+SCHEME.pdf?MOD=AJPERES&lmod=-1542501104&CACHEID=68855600475e7edb9c6dfc825d7a2a20&E-RICKSHAW%20SEWA%20SCHEME



04 Government's Plans for Electric Mobility in India

The FAME scheme focuses on technological development, demand creation, pilot projects and charging infrastructure.

The formation of National Board of Electric Mobility (NBEM) and declaration of the launch of FAME 2.0 policy shortly, shows the proactive stand of the Union Government to address the issues of electric urban mobility. The key points of the existing government policies on electric mobility below.

National Electric Mobility Mission Plan-2020

The National Electric Mobility Mission Plan (NEMMP) 2020 was launched in 2013 by the Government of India, which was operated under the Department of Heavy Industries until 2017 after which it was transferred to the NITI Aayog to make it more transparent. The scheme aims to promote hybrid and electric vehicles and work towards achieving fuel security in the country. The plan to go electrical should envisage a total fuel saving of 9500 million litres by 2020 that will be around INR 62,000 crore of fuel cost. This step by the government will not only reduce the country's fuel dependency on imports, but will also help in reducing GHG emissions in India. The FAME scheme was launched under NEMMP 2020, the overall scheme was implemented to be commissioned over a period of 6 years. The FAME scheme focuses on technological development, demand creation, pilot projects and charging infrastructure. The fund allocated under various components in the first phase of the scheme are[9]:

Component of the scheme	FY 2015–16 (crores)	FY 2016–17 (crores)
Technology platform (including testing infrastructure)	70	120
Demand incentive	155	340
Charging infrastructure	10	20
Pilot projects	20	50
IEC/operations	5	5
Total	260	535
Grand Total	795 CRORES	

Table 4: Fund allocated for various components of FAME (first phase)

[9] www.dhi.nic.in/writereaddata/UploadFile/Fame_India_Revised_270415.pdf

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E-vehicles will be able to avail a subsidy of up to INR 61,000 under the category of electric 3 wheelers installed with advanced battery i.e., lithium ion.
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The fund allocation in the Union Budget for 2017-18 stands at INR 175 crores; the reduction in the budget is attributed to the withdrawal of the subsidy on mild-hybrid vehicles[10]. However, the exact allocation of fund to the various components of the scheme will be announced with the launch of FAME 2.0 policy in this financial quarter.

The scheme aims to encourage buyers to purchase electric cars over the traditional fuel based cars. The Government of India shall reimburse the discount that the automakers will pass on to the customers. Salient features of the India FAME Scheme:

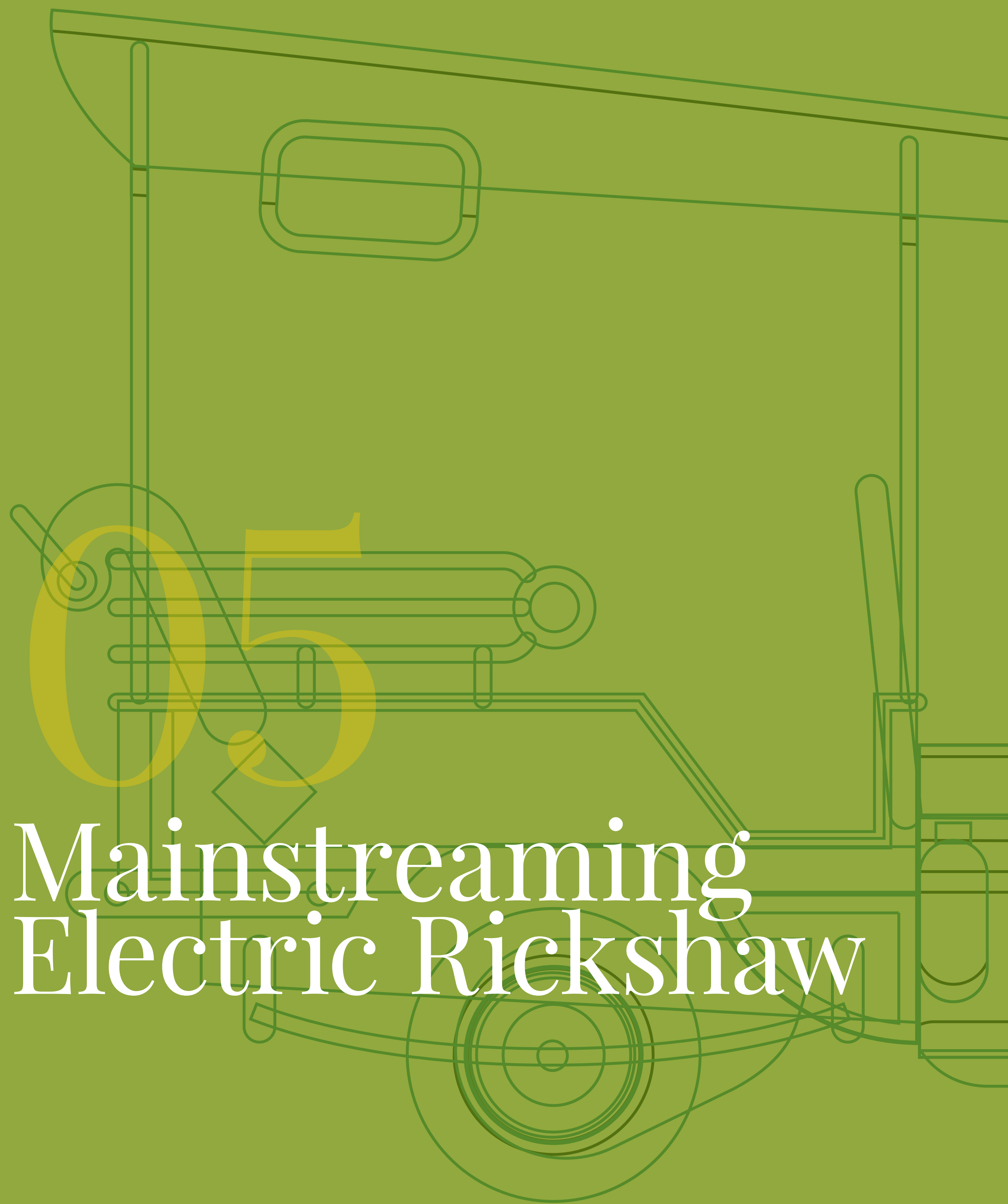
01. INR 795 crore Allocation: This amount has been provisioned for the development and promotion of electric and hybrid vehicles, which is to be used for the development of technology platform (including testing infrastructure) and charging infrastructure, demand incentives, pilot projects, and operations. Almost 60% of these funds are allocated towards demand incentives. However, out of the 795 crore allocated to the scheme, only 166 crore was utilised until November 2016.

02. Applicability: The scheme will be applicable to all cities and towns, and will apply to all vehicle segments, i.e. two, three and four wheelers, cars, LCVs, buses etc.

03. Focus will be to develop indigenous technology and R&D capability to develop and manufacture components and systems for these hybrid vehicles in India.

However, the first phase of FAME regulation did not recognise the e-rickshaws as part of the scheme. Considering it as an important mode of public transport, it should be covered under the ambit of this scheme. In which case, these vehicles will be able to avail a subsidy of up to INR 61,000 under the category of electric three wheelers installed with advanced battery i.e. lithium ion.

[10] www.economictimes.indiatimes.com/industry/auto/news/passenger-vehicle/cars/budget-2017-govt-extends-subsidy-for-electric-vehicles-to-fy-18-with-42-higher-allocation/articleshow/56940069.cms



05

Mainstreaming Electric Rickshaw

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E-rickshaws have immense potential to provide low-cost mobility solution while addressing the issue of vehicular pollution that is gripping all of the major cities in India.
—

E-rickshaws have emerged as a form of intermediate public transport that connect consumers to mass transport systems like buses or metros. These vehicles are a cheaper alternative in comparison to the existing para-transit mode of travel, i.e. auto rickshaw. E-rickshaws have immense potential to provide low-cost mobility solution while addressing the issue of vehicular pollution that is gripping all the major cities of India.

However, in order to make the vehicle more reliable and safe, the government has to place stringent conditions of checks, similar to the automobile industry. Only a multi-level approach from all respects can streamline this industry and the emerging opportunity.

5.1 Safety and Design

The rapid emergence of e-rickshaws on Indian streets, coupled with a lack of regulation of their use, has created valid concerns for their safety. The constant overloading practiced by the drivers, with existing technical structural issues, like malfunctioning brake system and toppling on road-corners, makes the vehicle unreliable for public use.

To ensure that e-rickshaws are a safe mode of public transport, quality assurance must be given priority, and covering all aspects, including inspection of body parts' load capacity, tires, brake equipment, and turning radius. These inspections should be carried out for new and existing vehicles by Automotive Research Association of India (ARAI) and International Council of Automotive Technology (ICAT). It should be understood that penalising the drivers/owners in the first phase would rather complicate the problem and lead to non-reporting of these problems. The policies require the cooperation of drivers, manufacturers, and government authorities to be successful. The Government of India's ambitious programme, 'Make in India', has encouraged dealers to manufacture the components in India itself; thereby, reducing the cost drastically and providing a wide domain for design improvement.

5.1.1 Body Structure

To counter the challenges, following design changes can be implemented:

01. By suitably positioning the battery, the weight of the vehicle can be distributed and the defect can be minimised. For instance, if the battery is mounted in the middle, the evenly distributed weight improves the ride and handling of the vehicle. Also, using a soft fabric for the roof material will reduce the weight at the top.

02. The integrations of the chassis and the superstructure should be in a way that the modification required in the chassis is minimum. Any modification (cutting/drilling/slotting) might adversely affect the strength of the chassis.

03. The structure should be compact from outside, so that it takes less traffic space but should have spacious interiors for a non-claustrophobic feeling.

5.1.2 Ergonomics

01. The seating space, position and entry/exit should be designed considering the average body structures of Indian male/female; so that seating positions are not congested, and it accommodates 95% physique of the Indian population.

02. The most comfortable seat in the vehicle should be the driver's seat as he will be the one driving the rickshaw and will spend most of his/her time in it. The following factors should be considered while designing the driver's compartment:

> 01. The position of the hand brake and brake pedal should be such that it should not hinder the movement of the driver and should be easily accessible.
>
> 02. Rear view mirror should be accessible to the driver with minimal movement.
>
> 03. The design of the steering handle should be such that the driver should have sufficient space for movement in its extreme positions.
>
> 04. The battery power switch should be given in the driver's compartment for driver's accessibility.

5.2 Technical Advancement

It is rather surprising that this sector has remained untouched by technological developments, the electric rickshaw manufacturing companies have not even added a gear shift mechanism till date on their mass produced models. As a result, electric rickshaws remain a slow, exploitative means of transportation.

The following area of innovation and technological advancement need to be addressed:

01. Introduction of lithium batteries: The lithium battery is an advanced technology that has five times more life than the ordinary lead-acid battery. It's lighter in weight and charges in almost half the time as compared to the ordinary battery.

02. Turbo charging system: A major problem with electric rickshaw is that it takes a long time to charge the battery fully. A turbo charging mechanism provides energy at higher voltage and helps charge faster.

03. Connectivity of e-ricks through GPS (Global Position System) tracker.

04. Panic Button, similar to the ones in private taxi systems.

05. E-challan system for easy payments of fines and dues.

06. Confluence of renewable energy with electric mobility[11]: One of the most efficient and cost effective solution to regale the expansion on electric rickshaws is to set-up Solar-Powered Charging Stations (SPCS). However, the drivers might experience the challenge of not being able to charge at night, but solar power can be fed into the grid and drawn when needed.

5.3 Policies and Schemes

In order to tap the potential of electric rickshaws, it is important that they are governed in the same manner as the other modes of public transport, hence it is important that e-rickshaws are incorporated in municipal or panchayat laws that can prove to be a successful method of checks and balances. The incorporation of e-rickshaws would not only provide legal status to these vehicles, but would also bring it under the control of urban local bodies to keep a check of the safety aspect. The Municipal Corporation across Indian cities have already been given the mandate for registration and issuance of identity cards; relevant mechanisms shall be created to ensure the smooth functioning of the registration process.

01. A list of all registered and authorised dealers of e-rickshaw shall be furnished to Municipal Corporations or office-in-charge.

[11] www.solaractionalliance.org/solar-power-importance-electro-mobility/

—

Minimal interest rates with easy formalities shall be enabled to support e-rick drivers/owners. Customised finance schemes shall be introduced with the support & guarantee of the government aimed at promoting e-vehicles.

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Charging stations are the most important infrastructure requirement for the deployment of EVs; the absence of a proactive plan and schedule can be a major impediment to mass market adoption.

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02. Accreditation Certificate from Council for Scientific and Industrial Research (CSIR) required for ensuring uniformity in design and specifications with testing of the vehicles vested on experienced personals from Municipal Corporation/RTO or from Private authorised Consultants.

03. Registration shall be completed only after furnishing of adequate identity proof of the owner/driver of the vehicle.

04. Penalty shall be fixed for not furnishing or wrong furnishing of information.

05. Specifications of e-rickshaws shall be made public and displayed for the information of all manufactures; so as to avoid violations and uniformity in designs.

Rules and regulations as stated above would in turn lead to financial inclusion of e-rickshaws, the Draft policy prepared by South Delhi Municipal Corporation has stipulated an interest rate of 3%, which is a welcome step and shall be made applicable for all states.

5.4 Operational Interventions

The measures taken to regulate the operations of the e-rickshaw can really help in city planning, and increase the efficiency of the transport system.

5.4.1 Route-regularisation

The area of route should be specified by the urban local bodies to regulate the functioning of the vehicles. Special zones should be made to regulate the number of vehicles within a specified area. These vehicles can be a step towards introducing low carbon transport, especially in congested areas of the city, like old town and also in ecologically sensitive regions. These vehicles have zero-emission and create minimal noise pollution.

5.4.2 Parking Places and Halting Stations

In order to avoid traffic problems and obstruction of the path, special parking places and halting stations should be designated for these battery rickshaws. Halting stations can be started around metro stations in cities like Lucknow, and other major bus-stops and bus-depots for other cities.

The peak power deficit in India stands at 7566 megawatts, with the excess load of these e-vehicles, it is important that the authorities realise the potential of solar-powered charging stations.

Deployment of solar-powered charging station will not only zero-down the overall emissions of these vehicles, but will also help India in achieving its INDC targets.

5.4.3 Rate of Fare and Hire

The rates should be specified according to the distance, location and the zoning of the e-rickshaws. This is to introduce a system of common metering and then can be further updated into the system adopted in case of auto-rickshaws, where vehicles are available for personal hire for long distances.

5.5 Infrastructural Development

There is an imminent need for government intervention in improving the current infrastructural deficiencies. To naturally promote the e-rickshaw market:

01. Night parking facilities along with charging facilities and halt, and go stands will be highly helpful in minimising traffic congestion causedby these vehicles.

02. The smooth functioning of e-rickshaws depends on quality and access to charging infrastructure (primarily low speed charging stations) in the city. The resounding success of Amsterdam in boosting electric mobility by providing charging infrastructure in combination with policy measures sets a precedent for countries like India to learn from[12].

03. Charging spots must be installed at existing fuel stations, parking areas, road-side kiosk. An effort like this will not only help in developing a viable business model but also create avenues for income for non-drivers.

Charging stations are infrastructural elements enabling power recharging of electric vehicles including plug-in hybrids. The charging infrastructure includes all of the hardware and software that ensures energy is transferred from the electric grid to the vehicle. The peak power deficit in India stand at 5.4% (7566 megawatts)[13], with the excess load of these electric vehicles, it is important that the authorities realise the potential of "Solar-Powered Charging Stations".

5.6 Solar Charging Infrastructure[14]

In order to reap the benefits that the newly popularised vehicle can offer, the efficient integration of electric rickshaws into the system is required. With only 5% tax under the new GST (Goods and Service Tax) and state subsidy on solar equipment, this process is further smoothened. The limited availability of charging infrastructure is both a challenge and an opportunity,

[12] Plan Amsterdam: Electric mobility is here. https://www.amsterdam.nl/publish/pages/799470/planam-03-2016_art1.pdf
[13] www.indianpowersector.com/home/tag/power-deficit/
[14] www.eurelectric.org/media/285584/ev_and_charging_infrastructure_final-2016-2310-0001-01-e.pdf

Considering the tropical location of India where the solar insolation levels are high, solar-powered charging stations can really proveto be a leapfrog move for a cleaner source of energy.

as there is no specific business and financial model that exists in the context of the charging infrastructure.

The primary obstacle for the service provider is the absence of required infrastructure that can potentially satisfy the demand of the present market system. In the present scenario, the charging infrastructure can be distinguished in five categories:

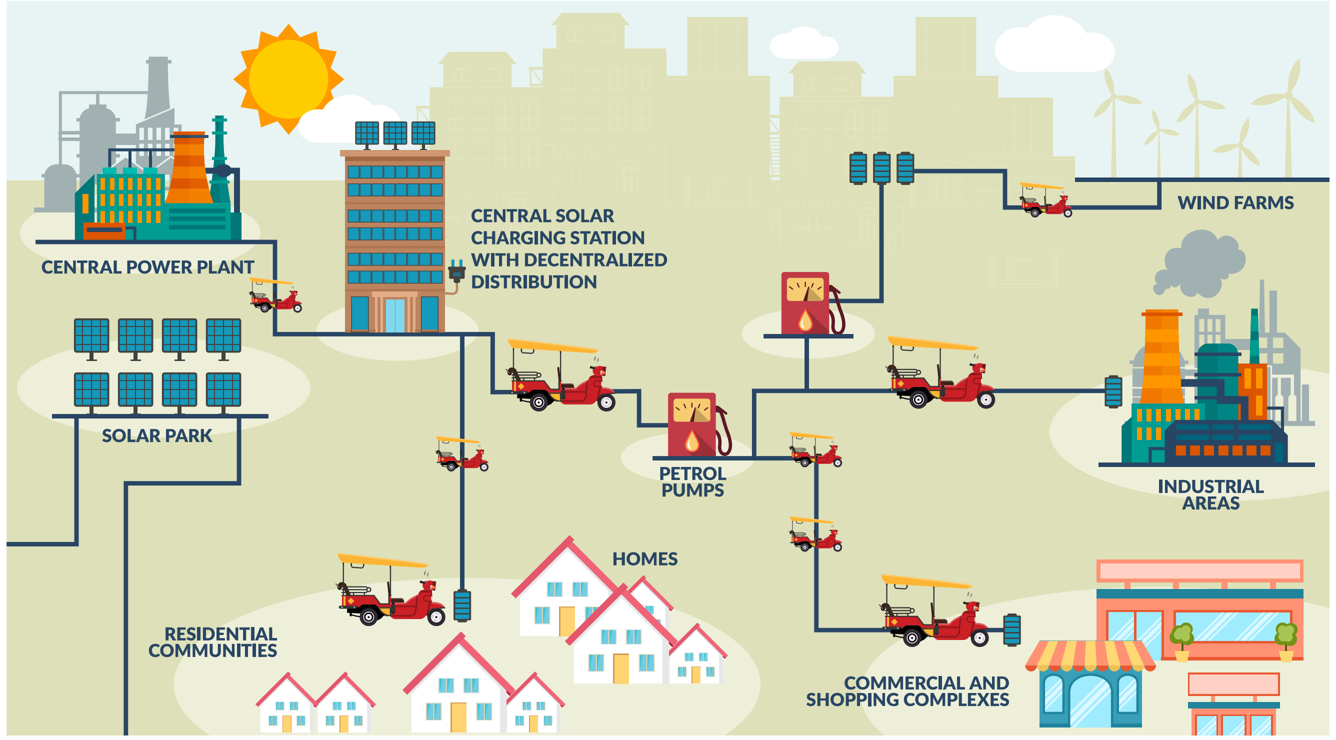
01. Public charging station on public land (e.g. sidewalk, metro stations).

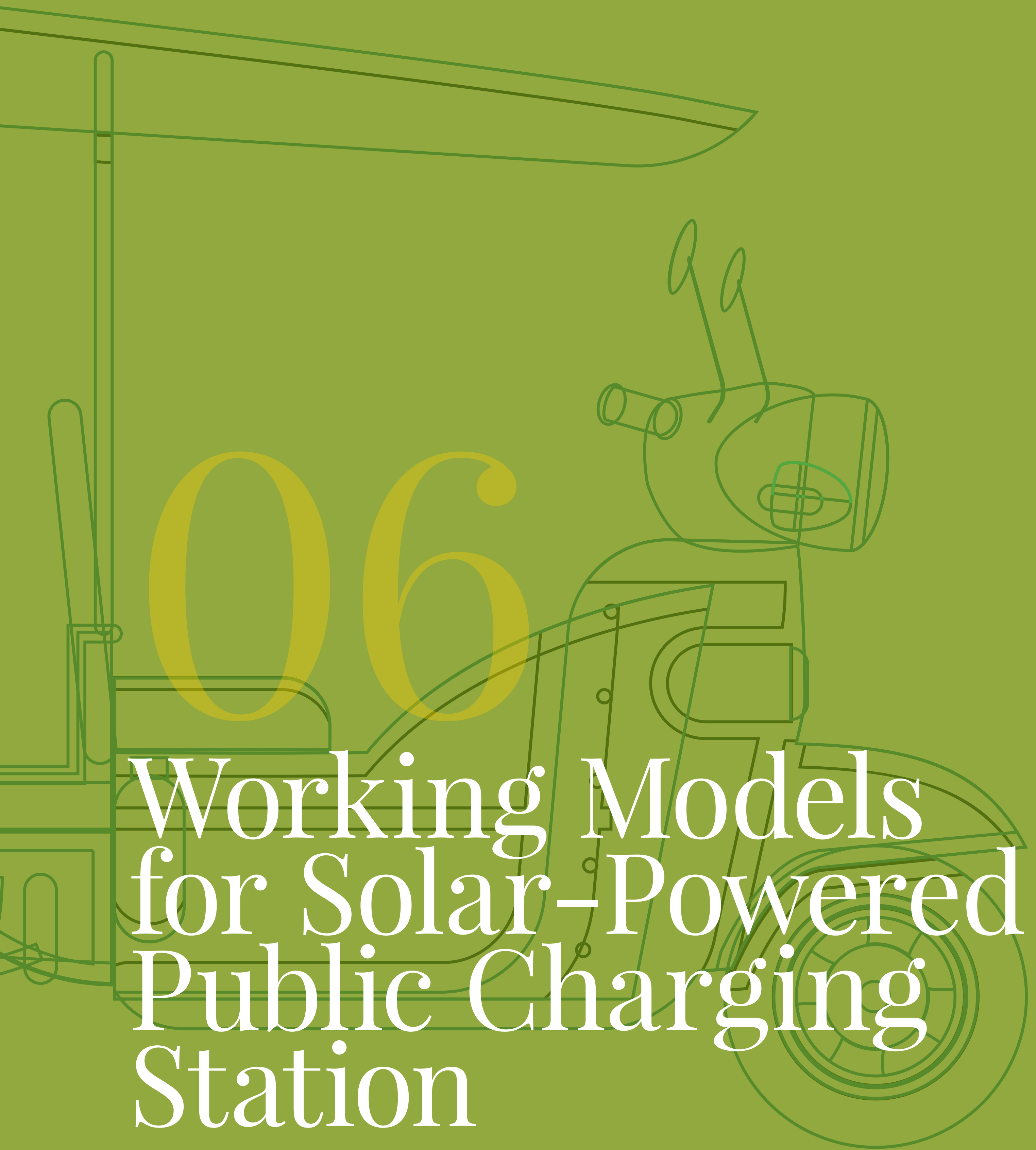
02. Stand-alone private charging station which may be solar-powered or can take energy of the grid.

03. Publicly accessible charging station on private land (for e.g., commercial areas such as shopping malls, existing petrol pumps).

04. Semi-public charging station on public or private land (e.g., car sharing CS, hotels or business parking for visitors and customers).

05. Privately accessible charging station (e.g. home or office locations) which may also be solar-powered.





06 Working Models for Solar-Powered Public Charging Station

De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

01

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For owners: A discharged e-ricks can be exchanged for a fully-charged electric rickshaw

—

For non-owners: They can rent an e-rickshaw in the morning, and in case of discharged battery, they can swap it for a charged vehicle.

—

6.1 Model 01

E-rickshaw swapping

01. In this model, a facility can be developed at the periphery of the city which has a solar potential of 5MW and has a capacity to rentout 5,000 electric rickshaws.

02. Such a facility would need support of solar developers, investors, manufacturers and self-help groups/unions/cooperatives.

03. The facility will also provide "rent-a-rickshaw" service in case the driver doesn't own an e-rickshaw, in which case, the model will be applicable for both owners and non-owners.

Advantages:

01. Improvement in livelihood lost due to charging
02. Reduced chances of battery theft
03. Overnight parking and charging

For megacities, tier 2 and 3 cities, the best model of smaller cities like Patna and Varanasi is to have an exchange and recharging facility, and a distributed network of charging stations throughout because:

01. The land cost is cheaper in the suburbs and creating an infrastructure for over-night parking in main city will be difficult considering the congestion

02. The distance of tier 2 and tier 3 cities is not over 15-20km in a single direction, so the driver doesn't have to travel a lot to procure his vehicle

03. In case of a megacity like Delhi, which has an expanse of over 1400 sq. mt, it will be hard to travel from the periphery of the city towards the centre

04. The metro stations and DTC parking depots can provide charging stations for these vehicles and become a part of Integrated Paratransit Model (IPM).

02

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The average cost paid by a driver to recharge the battery: INR 80-100

—

The units consumed by an e-rickshaw to recharge: 7-7.5 units

—

The cost spent/unit: INR 10.67

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Cost for charging annually: INR 24000-30000 (considering 300 working days)

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6.2 Model 02

Decentralised Charging powered by Solar PV

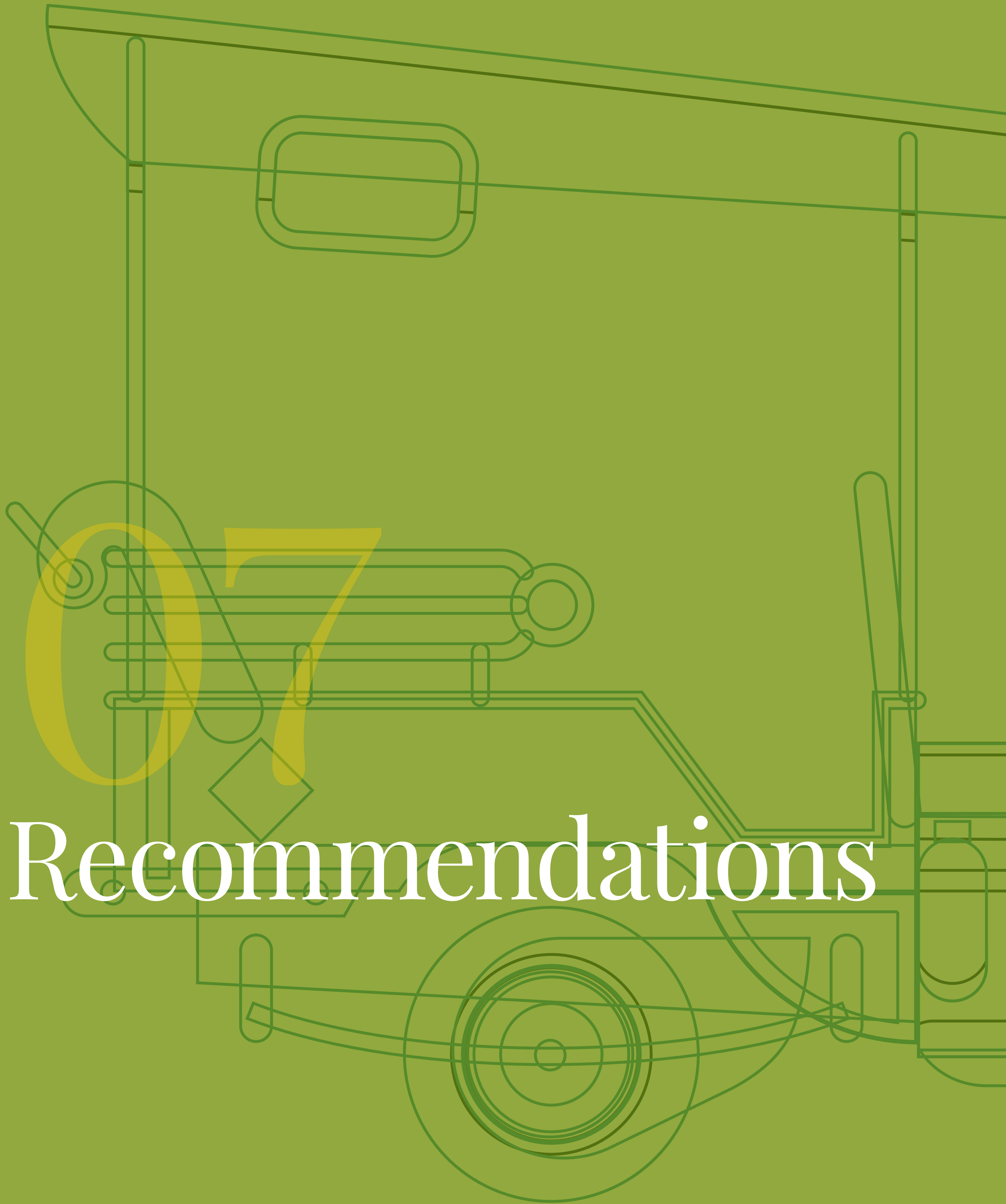
The model analyses the viability of photovoltaics that can be installed in two ways i.e. (a) roof-top model and (b) ground mounted model.

In case of Varanasi, the landing cost/unit of solar-electricity generated is INR 6.36, while the e-rickshaw drivers pay over INR 10/unit. The margin of INR 3.5-4 is the excess price that the driver has to pay.

In case of sustainable charging solutions, the mode that can work hand in glove is the roof-top solar model, wherein an e-rickshaw driver/owner can be a “third-party” buyer; or independent power generator, wherein the electricity provider can produce it’s own energy by installing photovoltaics through net-metering or gross metering system. The excess energy generated by these solar-powered charging station can either be stored or transferred back to the grid. Additionally, in case of excess power demand, the charging station can buy electricity off the grid directly.

Considering, that the cost/unit of solar-electricity will further drop in the coming 5 years, the RoI (Return of Investment) will be quick.

Additionally, with the existing practice, the DISCOMs do not earn anything from this electricity being used, since the consumer is either using it at the cost of residential slab or in an unregulated manner which can go as theft. The increased demand can prove to be a push for the installation of photovoltaics and infrastructural development, as the cost of electricity (i.e. unregulated) available to the consumer at present is higher than the cost/unit by solar-energy.



07 Recommendations

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India must learn from global examples which can be done considering it is dynamic & entrepreneurial culture along with a unique confluence of IT & manufacturing skills.

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The existing electric vehicle market of India is comparatively nascent, with a lot of infrastructural development required in the field, the EVs have a huge potential in the years to come. As mentioned earlier, the Indian EV market is comparable to the European market a decade ago. However, it should also be taken into account that e-rickshaws can prove to be the stepping stone for the future EV market for India.

As mentioned, auto-rickshaws are a means for last mile connectivity solution in Indian cities. These auto-rickshaws run on fossil fuel which emit harmful pollutants. In some cases, these auto-rickshaws may also be using adulterated fuel, i.e. a mixture of a low-grade gasoline like Kerosene to reduce the fuel cost. In such case, the emissions are even higher. E-ricks can be a solution to this problem by steadily replacing these high-polluting old public vehicles of the road, and providing a cost-effective and affordable mobility solution to the consumer.

The present market system restricts the growth of EVs in more than one way. In order to address these challenges, public sector intervention is indispensable. To ensure better mobility choices, equitable distribution and employment generation; the aforementioned challenges can be dealt by:

7.1 Regularising and Registering E-rickshaw

01. The e-rickshaws should be registered under respective state's Motor Vehicle Act, so the number plates, driving license along with other mandatory documents are procured by the owner/driver.

02. A time frame of 6 months should be provided in the policy to complete the registrations of already existing e-rickshaws along with the issuance of license to the drivers.

03. A new vehicle segment can be created for registering these e-rickshaws, which will also ensure the implementation of on-speed limit, maximum number of passengers, and safety standards along with the age limit of the e-rickshaw drivers.

7.2 Setting up Regulatory Authority

01. It is important to formulate and invigorate regulatory authority to head the existing multiplicity of institutions working in an incoherent and isolated way for a single goal.

De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

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Setup of a single, unified command for planning, coordination, management & monitoring of infrastructure, functioning, etc., of the urban transportation system will help eliminate duplication costs.

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01. The primary role of the so formed regulatory authority should be managing the permits to be issued to the electric rickshaws; which will ensure steady growth of e-rickshaws. Steady and regulated expansion will facilitate the transition of old auto-rickshaws (15 years or older) to new and evolved e-ricks which can serve a complementary role, avoiding sudden jerk in the system.

02. The authority or legal entity should have dispute resolution mechanisms. Data and information sharing with transparency at its centre are instruments for ensuring compliance with the given norms and provisions.

03. The authority should be responsible for saving the interests of the consumer in coordination with various other government bodies, like the electricity distributors to ensure price regulation and to restrict monopoly in the market.

7.3 Encourage use of Lithium Battery

01. No heavy metal content in the lithium ion batteries makes it safer and environmentally friendly, in comparison to the ordinary lead-acid battery.

02. The lithium ion battery not only has five times more life than the ordinary battery, but will also decrease the weight of the electric rickshaw.

03. As the lithium ion battery charges faster, the viability of battery swapping charging model can also be assessed, unlike the ordinary battery.

04. Due to its high initial costs, it can act as a deterrent to e-rickshaws to shift towards lithium ion batteries. So, policy can be made that offers subsidies towards usage of lithium ion batteries and the batteries can be provided on lease.

7.4 Safe and Authorised Disposal of Battery

01. Battery manufacturers must be made responsible for the recycling of the lead-acid batteries under the Battery (Handling and Management) Rules of 2016. The recycling process should be certified because even a small quantity of lead can affect the ecosystem for a long time.

02. Registered e-waste recyclers should be allowed to handle and dispose the batteries. Regular audits should be undertaken to control and check the process adopted by the scrap handlers.

—

Following physical entities would be required to set up a charging location:

—

Safe battery storage

—

Distilled water and storage capacity

—

Fire extinguishers

—

Regularised battery supply

—

Meters for each socket

—

Clamping system to hold the vehicle still during charge

—

Battery swapping pulley

—

Charging cables & socket (15 A)

—

Energy meters for each socket with the main-metering box

—

7.5 Standardisation of Parts

01. Policy must ensure the usage of spare parts and should follow the standards as prescribed by the certification agencies like International Centre for Auto-motive Technology (ICAT) and Automotive Research Association of India (ARAI).

02. The control of ICAT over the assembly line and Conformity of Production (CoP), like in the case of other modes of transport. This will ensure of restriction on use of substandard parts and would increase the accountability of the manufacturer.

03. The control of certification is also required in terms of charging infrastructure and installation of ICAT approved charging parts and physical entities to minimise accidents.

04. The Certificate of Fitness should be issued to every driver after registration of the vehicles. The Certificate should be renewed after a specified period of time.

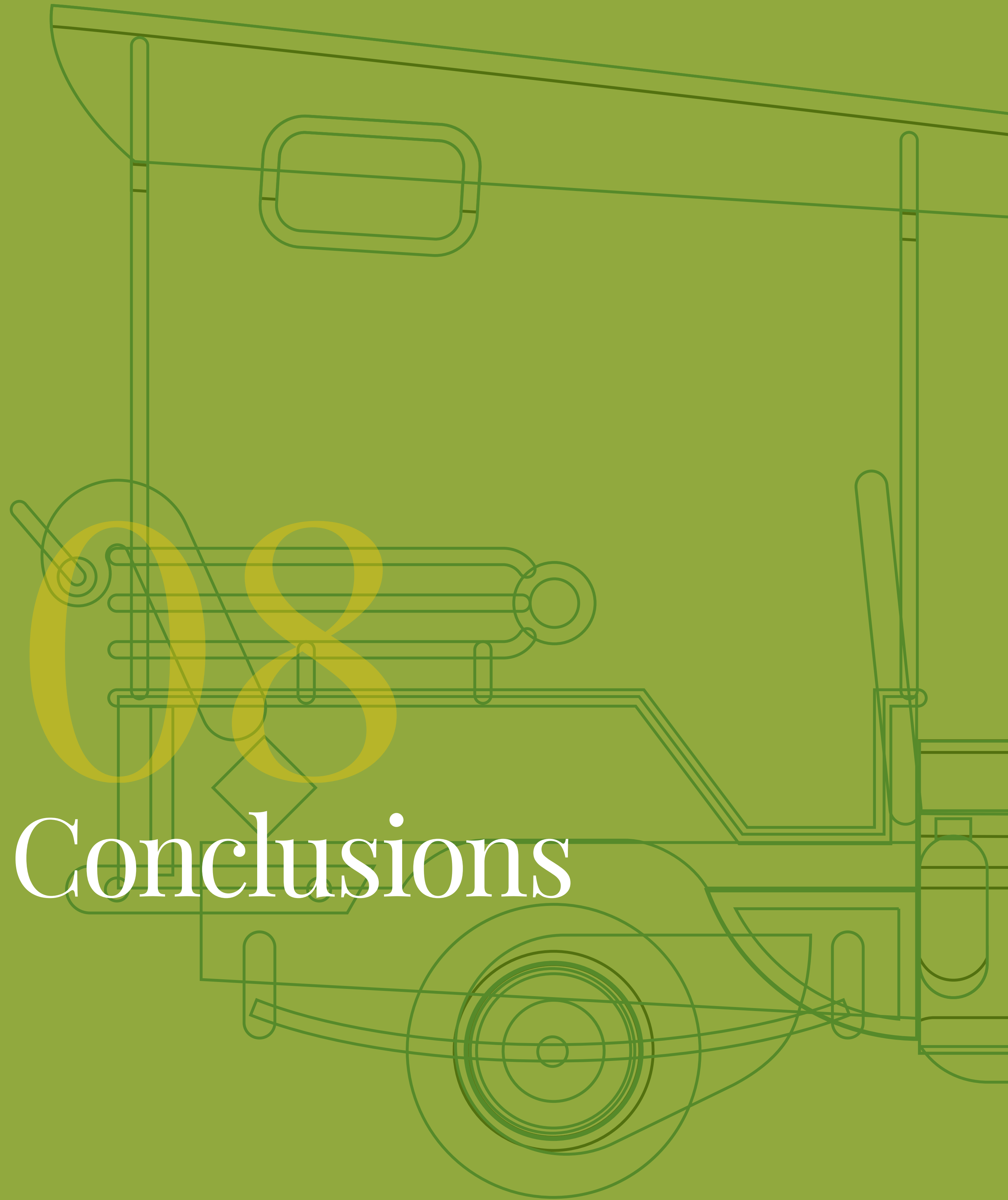
05. A prototype of the vehicle should be submitted to the concerned transport dept of the state and to the certification agencies for clearance.

7.6 Encourage Setting up Charging Locations

01. Initiate public charging infrastructure at places where there are electric rickshaw concentration, so that the e-ricks can be charged at commercial tariff and illegal charging stations can be completely removed.

02. DISCOMs, road transport authorities and the regulatory authority established for electric rickshaw should collaborate to set up the necessary infrastructure, keeping in view the future prospects of the EV market.

03. Promotion of solar-powered charging infrastructure should be encouraged.



08 Conclusions

De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

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New & fundamentally different pathways are emerging to provide clean, cost-effective mobility services, creating new jobs, reducing oil import dependence, achieving more efficient land use in cities, and improving public health by significantly lowering the air pollution.
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—
Successful and wide-spread deployment of EVs and its supporting infrastructure is key to reduce greenhouse gas emissions, and mitigating the effects of climate change.
—

Rapidly evolving technologies and business models for delivering mobility services have dramatic potential to transform the global transportation sector in the years ahead. New and fundamentally different pathways are emerging to provide clean, cost-effective mobility services, creating new jobs, reducing oil import dependence, achieving more efficient land use in cities, and improving public health by significantly lowering the air pollution.

India is uniquely positioned to take advantage of these developments due to a set of advantageous conditions and capabilities. Electrification of transport sector is gaining popularity, and emphasis on low carbon development and clean air is rapidly becoming the central theme in infrastructure planning. Successful and wide-spread deployment of EVs and its supporting infrastructure is key to reducing greenhouse gas emissions, and mitigating the effects of climate change.

In order to achieve multi-pronged benefits of the EVs in terms of:

01. Lowering air pollution and mitigating climate change

02. Skill Development

03. Low-cost, affordable mobility solutions; it is important that various stakeholders should realise their role to accomplish the task of a successful e-rickshaw market.

1. E-rickshaw and Battery Manufacturers
This group of stakeholders is responsible for the technological upgradation of the vehicle. The present design of the electric rickshaw faces difficulties with the following issues:

01. Design: Safety concerns, unsteady design leading to frequent wobbling. Additionally, a battery takes 7-8 hours to charge completelyand starts to loose its efficiency after 3 months.

02. The main chassis of the e-rickshaw is composed of a single rod which is incapable of carrying a load of over 400 kgs.

03. Durability: Battery can only last for 200-220 recharge cycles and runs for 80 km in a complete charge. There is a need of design improvement to make the vehicle more safe and durable.

De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

—
The most promising model to kick start the process is when the Government & regulatory authorities to incentivise and organically support the solar-charging market which will give enough security to solar developers and investors.
—

2. Solar Developers and Investors
This group would be responsible for setting up solar charging stations.

3. Civil Society Groups
This group would be responsible to support e-rickshaws on the following aspects:

01. Zero-carbon emission vehicle

02. Means to tackle rising air and noise pollution issues in Indian cities

03. A means to increase livelihood

04. To develop the skill set of the e-rickshaw drivers

05. Capacity building of the drivers and the union

06. Supporting the regulatory authorities

4. Banks, Micro Financing Institutions, and other Financial Institutions
To support the buyers and drivers for easy procurement of vehicles and also in case of accidents.

The most promising model to kick start the process is when the Government and regulatory authorities to incentivise and organically support the solar-charging market which will give enough security to the solar developers and investors.

Annexure 1: Existing Regulations

License Obtainment

Tripura (Tripura Battery Operated Rickshaw Rules 2014)
The act demarcates battery rickshaw as contract carriage and notifies it in conjunction with “Tripura Rickshaw Niyamak Act 1357”.

- Age limit: 20 years and above
- Application for license
  - Proof of present resident
  - Proof of age
  - Medical fitness certificate
  - Fee as prescribed
  - Three coloured passport photographs

- Grant of license
  - Candidate should satisfy the person conducting the test
  - No such test at the time of renewing the license

- Validity: 3 years
- Registration of E-rickshaw
  - Sale certificate by manufacturer
  - Proof of present address
  - Offer of Permit
  - Facility of charging battery installed in the rickshaw as certified by TSECL

- Certificate of Fitness: Valid for 2 years from the date of purchase and to be issued by the State Transport Authority, which has to be renewed after second year by the state transport authority.

De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

Delhi & Pondicherry

In accordance to the amended Motor Vehicle Act 2015, the government of Pondicherry acknowledges e-rickshaw and e-cart as a new vehicle category that are not to be grouped with three-wheeled auto rickshaw or any other similar vehicle as the purpose of these vehicles is to provide last mile connectivity.

The eligible persons to operate these vehicles require training in road traffic rules and signs and driving such vehicle.

The transport department, has made the following procedural guidelines for granting licence to drive e-ricks, grant of badge, certificate of fitness, registration of e-rickshaws. It is decided that the applicant shall apply to the licensing authority/registering authority in whose jurisdiction he/she resides along with requisite documents.

- Grant of Learner’s License:
  - Application and declaration of physical fitness
  - Medical certificate
  - Proof of age and residence
  - Minimum age: 20 years
  - Learners’ license to be granted only to individuals possessing license to drive a light motor vehicle for over a year

However, the test for obtaining/passing the license has to be prescribed by the Central Government under CMVR.

- Grant of Permanent License:
  - Application
  - Original learner’s license
  - A certificate with unique serial number issued by the registered e-rickshaw/e-cart association, or a manufacturer producing e-rickshaws or e-carts, as the case may be to the effect that the applicant has undergone a training at least for a period of 10 days (Commercial Licence).

Annexure 1: Existing Regulations

For Registration of New E-rickshaw

- Application for registration in Form-20. Sale Certificate in Form-21 (from manufacturer/dealer)
- Certificate of Roadworthiness in Form 22 (from the manufacturer [Manufacturer's Invoice]
- Dealer's invoice
- Proof of residence
- Certificate of Insurance/Cover note
- Certificate of Fitness [Form 38 under CMVR]
- Antecedent verification of vehicle driver from Police Department, Puducherry Region
- Possession of driving license to drive an e-rickshaw is required for the owner or its driver. Only one e-rickshaw could be registered per e-rickshaw driving licence
- Effective public service vehicle (PSV) badge authorising to drive an e-rickshaw appropriate fee as specified in Rule-81
- One-time road tax (if applicable)

De-fossilizing the Urban Public Mobility: Mainstreaming the E-rickshaw

No Permit for E-Rickshaw & E-Cart

As per the Ministry of Road Transport and Highways notification of Motor Vehicles Act, 1988 shall not apply to any transport vehicle of the category e-cart and e-rickshaw as defined in section 2A, provided that the State Governments may impose restrictions under appropriate traffic laws on plying of these vehicles in specific areas or specific roads.

Key Features of E-Rickshaw Sewa Scheme–Delhi

- E-rickshaws will have a seating capacity of four persons, excluding the driver, with maximum luggage weight of 40 kg.
- E-rickshaws will be registered as transport vehicle under registration series DL-1ER and will be granted contract as per carriage permits.
- The model of vehicle must be in accordance with provisions of section 126 of Motor Vehicle Act, 1988.
- Every e-rickshaw should have a yellow colour reflective strip on its rear side.
- The owner of the e-rickshaw should possess a valid license to drive the vehicle besides a public service badge.
- Besides, the name, address and telephone number of permit holder should be painted on the left side of the vehicle.
- The dimensions of the e-rickshaw should not exceed length of 2.8 meters, 1.8 meters height and 1 meter width.
- Every such vehicle should also have valid fitness certificate issued from the department.

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