



Urban
Pathways

PILOT CONCEPT NOTE



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Wuppertal
Institut

UN HABITAT
FOR A BETTER URBAN FUTURE

UN
environment

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URBAN PATHWAYS REPLICATION CITIES

URBAN PATHWAYS

PROJECT CONCEPT

The Urban Pathways project helps delivering on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

The project follows a structured approach to boost Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.



Where We Work

This project implements integrated urban services solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals. This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative.

PROJECT AIMS



Urban Pathways



WHAT IS A PILOT PROJECT CONCEPT?

One of the core objectives is the development and implementation of projects that help decarbonising urban energy, mobility and resource sectors. The projects concepts that are considered to be viable will be later developed into bankable projects for which funding will be sought.



KEY FACTS & FIGURES



City

Population

2.1 million people in Kerala

3,200 USD GDP per capita

Kochi is located in the state of Kerala on the south-western coast of India. The city's economy mainly relies on its industrial and port activities. The city has a corporation limit population of 612,343, and a metropolitan population of 2.1 million, making it the largest urban agglomeration in Kerala.

The city has a Municipal Corporation limit population of 612,343, and a metropolitan population of **2.1 million**, making it the largest urban agglomeration in Kerala.

GDP per capita

For 2018-19, The State of Kerala's GDP per capita is estimated at Indian Rupees (INR) 220,826 (3,200 USD) (Pre Legislative Research, 2018). Ernakulum, the district in which Kochi is located, has the highest GDP per capita in the State. In 2011-12, while the average State GDP per capita was 82,750 INR (1,200 USD), that of Ernakulum was 85,070 INR (1,243 USD) (Central Statistics Office, 2017).

CO2 emissions (total & per capita)

In 2004, the State of Kerala's annual Road Transport CO₂ emissions were estimated to be in the range of 14.45 to 19.26 million metric tonnes (Ramachandra et al., 2009). For the city of Kochi, the road transport sector contributes 233 tons of tons of CO₂ emissions per day or 85,000 tons annually (Rao Ghorpade et al., 2014). These emissions are estimated to more than double to approx. 230,000 tons by 2030 in the absence of effective sustainable transport measures (CDM Smith & KMRL, 2013).

Mode share

Public transport – Buses and Ferry 42% (without the Metro system, which was projected to account for 30%), Private cars – 10%, Two-wheelers – 26%, Auto-rickshaws – 7%, **Bicycles – 3%**. Walking trips are estimated to be 12% as compared to 88% of the total vehicular trips (Rao Ghorpade et al., 2017).

only 3% ride a bike in Kerala

85,000 tons annually CO₂ emissions
annually from road transport



MEASURES BEING CONSIDERED

E-vehicle subsidies

The Indian e-mobility sector has seen steady growth in momentum, especially since the national Ministry of Roads Transport declared intentions to achieve 100% electrification of cars by 2030. Accordingly, the Central Government has pursued multiple action plans, including **subsidies on sales of e-vehicles** as well as prioritising setting up charging infrastructure. These efforts have moderately improved Electric Vehicles (EV) uptake across the country. Between 2012 and 2016, the share of **EV purchases for all passenger vehicles sold grew** from 0% to 1.3% (ICCT, 2016). Particularly, the passenger vehicle segments to have achieved maximum EV adoption have been two-wheelers and three-wheelers. It is estimated that the number of electric two-wheelers presently plying on Indian roads is 450,000 while that for electric rickshaws is over 500,000 (TERI and YES Bank, 2018). The current growth of e-rickshaws market has also attracted the attention of app-based cab services to invest in it. In March 2018, Ola, one of India's largest app-based transport service aggregators declared its plans to **launch a fleet of 10,000 e-rickshaws in three cities** (not including Kochi) (Shu, 2018).

EV purchase increased

Launch a fleet of
e-rickshaws

Pilot project

The State of Kerala which includes the city of Kochi gave a principle approval for operations of e-rickshaws in 2016. However, except for a few private operators, the e-rickshaws sector in Kochi is still at a nascent stage and yet to reach its potential as mainstream Intermediate Public Transport (IPT). Additionally, the sector is presently not organised enough to advocate the policy-related demands of individual operators. This is unlike some larger Indian cities where e-rickshaw fleets have been operating since almost a decade. In 2012, the number of e-rickshaws plying in Delhi alone was over 100,000 (Dhanuraj and Madhu, 2014). Such a gap presents an opportunity for the proposed **pilot project** to demonstrate e-rickshaws as a viable IPT mode in Kochi which is both financially and environmentally sustainable. The project also aspires to build synergies with upcoming EV-related policies and programmes currently being drafted by State Government authorities.



DRAFT KERALA EV POLICY

In January 2018, the Kerala State Government declared a preliminary draft of the policy to promote the use of 'eco-friendly electric vehicles'. Under its first phase, the State Government is targeting to electrify bus services and auto-rickshaws, currently being fueled by petrol or diesel.

Additionally, the State Government also plans to issue future **taxi-permits** to only e-rickshaws in order to reduce the number of conventional three-wheelers. As a means to promote this initiative, there will be no hike in power tariffs during the first four years of e-rickshaw operations. Towards this, the State Government has even commenced **talks with major e-vehicle manufacturers in India** such as Mahindra and Gogoro (Manoramaonline, 2018).

**taxi-permits to
e-rickshaws**

**talks with EV
manufacturers**

- 1.
- 2.
- 3.
- 4.
- 5.

Key recommendations in the Preliminary Draft of the EV Policy include –

Setting up of battery-swapping kiosks at fuel stations in cooperation with Bharat Petroleum (one of the largest state-owned oil and gas companies) and Kerala State Electricity Board (primary power utility)

Low-cost programmes to convert conventional Auto-rickshaws into e-rickshaws

Tax **incentives** for e-vehicles

Avoidance of monopoly prices and agreements with auto manufactures in the initial phase

Convert the existing vehicles operating in ecologically-fragile areas into electric vehicles in a time-bound manner and create 'e-vehicles only' zones



KOCHI'S SOLAR PANELS & WASTE MANAGEMENT INITIATIVES

The Kochi Municipal Corporation (KMC) is currently implementing its Solar City Development programme in collaboration with ICLEI. Kochi is the first city in the State of Kerala to be a part of this programme which is supported by the National Ministry of New and Renewable Energy (MNRE). The initiative aims at reducing 155 million units (MU) of conventional power usage (with 29.5 MU for the institutional/commercial sector) in 5 years and increasing renewable energy consumption. Projects under the scheme consist installation of PV-systems and solar water-heaters (KMC & ICLEI, 2014). Several metropolitan agencies in Kochi have launched their efforts in alignment with the State Government's 'recent Waste-free Kerala' initiative (The Hindu, 2017). These consist of constructing decentralised waste-to-energy plants and setting up door-to-door collection services for biodegradable waste.





POLICY ENVIRONMENT



With the objective of decarbonising the transport sector, the Central Government of India has made promoting of electric mobility one of its major priorities along with a declaration to achieve 100% EV sales by 2030. This was reiterated by the premier federal think tank NITI (National Institute for Transforming India) Aayog through its landmark report – ‘India Leaps Ahead: Transformative Solutions for All’ to guide national e-mobility-related policymaking. Accordingly, it prescribes India’s passenger mobility to transition to become ‘shared, electric, and connected’. This has the potential to reduce the country’s energy demand by 64% and carbon emissions by 37% in 2030 (NITI Aayog and Rocky Mountain Institute, 2017).

The NITI Aayog has also proposed the formation of a Committee for ‘Zero Emissions Vehicles’ and has submitted a draft Cabinet note to the Parliament proposing steps to promote Electric Vehicles (EVs) in India to accomplish the Centre’s aim of complete electrification by 2030. Further, the NITI Aayog has proposed the formation of six Committees to consider various aspects required to create a sustainable ecosystem for EVs in India. The draft also recommended that green number-plates to designate EVs, incentives such as free parking, a country-wide toll-waiver as well as 10% of reserved parking space in residential and commercial complexes (NDTV, 2018). Following the directives of NITI Aayog, the Central Government’s policies that address electric mobility and the e-rickshaw sector are elaborated as follows.



NATIONAL ELECTRIC MOBILITY MISSION PLAN (NEMMP) 2020

The Minister of Heavy Industries and Public Enterprises launched its flagship National Electric Mobility Mission Plan (EMMP) 2020 in 2013. The programme aimed at addressing the demand side of EVs by creating a favourable entrepreneurial environment for their indigenous manufacturing. The programme targets rolling out up to 7 million units of a wide range of EVs such as hybrids and full-electric (TERI and Yes Bank, 2018). The plan also has the objective of establishing India's leadership in EV production as well as expanding the domestic market. The NEMMP has four key principles to achieve its objectives:

- Create consumer acceptability for EVs
- Develop infrastructure to support ownership and use of EVs
- Development and acquisition of EV battery technology
- Create local manufacturing capability

FAME INDIA SCHEME 2015

Under the directives of the NEMMP, the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) scheme was launched in 2015 with a budget of 795 Crore INR (116 million USD). This is a national programme focused on promoting e-mobility across the country through four focus areas – technology development, demand creation, pilot projects and charging infrastructure. FAME India is aimed at incentivising the sale of all vehicle segments, including two-wheelers, three-wheelers, four-wheelers, light commercial vehicles and buses. The current FAME subsidy offered for e-rickshaws is in the range of 3,300 to 6,000 INR. Among other initiatives, FAME also earmarked a funding of Indian Rupees 437 Crores (64 million USD) for 11 selected cities (excluding Kochi) to subsidise electric public transport with e-buses, e-taxis and e-rickshaws. Projects under this initiative are currently being implemented. FAME's pilot Phase I was planned for a duration of only two years from 2015-2017 and was recently extended up to March 2018. Consequently, a Phase II is also being planned by NITI Aayog (The Economic Times, 2017).



NATIONAL E-MOBILITY PLAN 2018

This programme was launched by Minister of Power in 2018 and is being implemented by the Energy-efficiency Services Limited (EESL), a public company under the Ministry. It aims to provide an impetus to the entire e-mobility ecosystem including vehicle manufacturers, charging infrastructure companies, fleet operators and service providers etc. This is aimed to be achieved by mainly by purchasing EVs in bulk from the private sector and intended for governmental use.

A set of national guidelines for charging infrastructure and related policy framework has also been declared by the Ministry of Power with intention that, by 2030, more than 30% of India's vehicles are EVs. Recently, the Ministry also declared that charging stations would not require a license, stating that charging e-vehicles would be considered as a 'service' and not sale of electricity (Business Standard, 2018). The Ministry also aims to release a set of guidelines for power distribution companies (DISCOMs) and EV charging service providers in 2018. Lower power tariffs for charging stations are also being considered (Ganguly, 2018).



POLICY ENVIRONMENT

NATIONAL URBAN TRANSPORT POLICY 2014

The National Urban Transport Policy marked a paradigm shift in India's transport planning through its objective of 'moving people and not cars'. It prescribes an 'Avoid (cars), Shift (to sustainable modes), Improve (infrastructure)' framework to guide municipalities and State Government agencies in mobility planning. The policy emphasises the critical role of Intermediate Para-transit (IPT) for an organised mass-transit network and its potential to provide 'clean mobility, low emissions and improved safety'. Towards this, the policy also recommends adopting e-rickshaws and regulating their ownership, driver's license, routes and fare structure (Government of India, p.18, 2014).

DRAFT NATIONAL ENERGY POLICY 2017

This policy drafted by NITI Aayog governs India's foreseeable energy roadmap. It emphasises on scaling up emerging energy technologies such as EVs. It also addresses setting up charging infrastructure and creating measures for Renewable Energy to support electric mobility as well as inclusion of hybrid and EVs in future transportation systems.

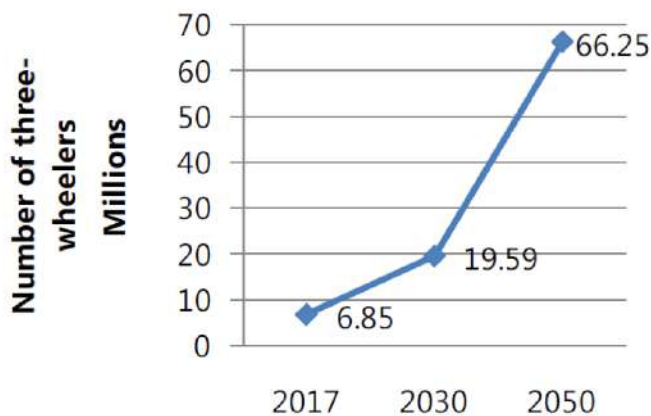
EV ACTION PLAN 2018

In 2017, with the intent of banning of fossil-fueled cars by 2030, the Minister of Road Transport and Highway had indicated that a draft policy was being put forth for the Cabinet to consider. However, it was subsequently decided by the Ministry and NITI Aayog to not create a policy but instead an action plan. This was widely perceived as a turnaround by the media, civil society and especially, the automobile manufacturers. Lack of federal funds for creating an expensive policy has been stated as a major reason for this decision. While the Central Government's initiatives have resulted in facilitating an entrepreneurial ecosystem, India's Manufacturers' Associations (for e.g., the Society of Indian Automobile Manufacturers or SIAM), have expressed an urgent need for a clear policy direction for creating a viable business roadmap without uncertainty.



FACTS & FIGURES

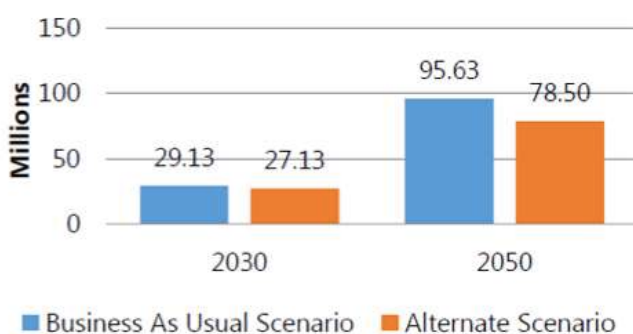
Three-wheelers or Auto-rickshaws are one of the most used public transportations in India for intra-city and suburban movement. India is presently the largest market for three-wheelers in the world (ICCT, 2016). It is estimated that three-wheelers in India could increase from 6.8 million presently to 66.25 million in 2050 as indicated in Figure 1 (TERI and YES Bank, 2018). Figure 1: Estimated growth of three-wheelers in India (Source: TERI and YES Bank, 2018)



The significant rise in three-wheelers necessitates transitioning from conventional internal-combustion engine (ICE)-based Auto-rickshaws to battery-powered e-rickshaws. The proposed pilot project aims to be one of first steps for the city of Kochi towards catalysing such a large-scale transition. Simultaneously, the measure also intends to generate a range of co-benefits resulting in improvement in diverse areas. These are discussed as follows –

1. DECARBONISATION OF KOCHI'S TRANSPORT SECTOR

The transport sector in India accounts for 142 million tons of CO₂ emissions, making it 7.5% of the country's cumulative emissions. Facilitating the transport sector's clean energy transition would not only address India's mitigation objectives, but also potentially save USD 27.8 billion of foreign exchange annually by 2030. Estimates also suggest that 30% adoption of e-Rickshaws would result in 7% reduction of India's CO₂ emissions while 100% electrification would result in cutting 75% of the same (Figure 2) (TERI and YES Bank, 2018). This especially applies to Kochi where Auto-rickshaws are the largest contributor to the city's transport-related emissions at 93 tons per day. Conversely, e-rickshaws are a clean mode emitting no CO₂ emissions. Figure 2: Estimated reduction in tons of India's CO₂ emissions from electric three-wheelers (Source: TERI and YES Bank, 2018)



● **2. REDUCTION OF KOCHI'S AIR POLLUTION AND IMPROVEMENT IN PUBLIC HEALTH**

The transport sector in Kochi accounts for 20.2% of the Particulate Matter 2.5 concentration, which is known to cause physiological damages (APNA, 2017). At present, Kochi's IPT segment mostly comprises of petrol/diesel-fueled rickshaws operating at an average distance of 63 km per day. This mode is also responsible for emitting significant amounts of harmful pollutants per day – carbon monoxide (3.1 million gm), Particulate Matter 2.5 (148,000 gm) and nitrous oxide (384,000 gm) (Rao Ghorpade et al., 2014). On the other hand, e-rickshaws release zero pollutants and their large-scale adoption results in air quality improvement.

● **3. FACILITATE MODAL-SHIFT FROM PRIVATE VEHICLES THROUGH SUSTAINABLE TRANSPORT**

The Kochi Metro, inaugurated in June 2017, has an average daily ridership of 36,500 and currently expanding its 19 km network (Gopal, 2018). Kochi Metro Rail Limited (KMRL) aims at a 30% mode-share with the first year of operations. However, as evidenced in other cities and recommended by the NUTP, such a substantial shift would necessitate last mile connectivity in the form of IPT as a feeder for existing transit systems (buses and Metro). With their passenger capacity and technical specifications, e-rickshaws are especially suited to provide such last-mile connectivity and thereby increase the efficiency of Kochi's public transport.



● **4. REDUCTION OF OIL IMPORTS AND RESULTANT SAVINGS**

About 98% of the energy requirements for the transport sector in India relies on imported crude oil. Moreover, these oil imports account for 22.6% of entire imported products of the country (2016-17) (TERI and YES Bank, 2018). The NITI Aayog estimates that e-mobility would result in a reduction of 156 metric tonnes of diesel and petrol consumption and at USD 52 per barrel of crude oil, which would imply a net savings of roughly 60 billion USD in 2030. The e-rickshaws fleet in the proposed pilot shall rely on solar powered for charging their batteries, thereby eliminating any expenses on expensive fossil fuels.

● **5. LEVERAGE NATIONAL INCENTIVES AND REMOVE FINANCIAL BARRIERS**

To avail of the financial incentives for EV adoption offered under Central Government's schemes such as 'NEMMP 2020' and 'FAME India' require submission of well-drafted proposals to concerned ministries. Framing such proposals by city authorities requires extensive data collection and technical knowledge for EV-related public transport projects. Successfully implemented local pilot projects not only help create an up-to-date repository of technical knowledge and best practices, but also facilitate capacity building for municipal staff. Additionally, the proposed pilot has funding attached (both capital and operational expenditure) and is aimed at being financially self-sustaining. Therefore, it would not burden existing municipal budgets.

● **6. FACILITATION OF CHARGING STATION FOR INCREASED EV ADOPTION**

While privately owned EV's could be charged at home, the electric Intermediate Public Transport (IPT) modes rely on public infrastructure for this purpose. Electric rickshaws are still a nascent mode in Kochi unlike India's larger metropolitan cities. However, the enabling infrastructure to refuel conventional fossil-fueled vehicles far outweighs that for charging EVs.

As of February 2018, India had only 206 communal EV charging stations as opposed to 56,000 fueling stations for petrol or diesel (TERI and YES Bank, 2018). This has resulted in the absence a necessary support infrastructure of charging stations throughout the city. This is also the biggest barrier for mainstreaming EV adoption. The proposed measure includes charging provision for its the e-rickshaws fleet, thereby eliminating the dependence on public infrastructure. Moreover, since this facility is proposed to be integrated with solar PV panels, the pilot fleet would use clean energy.



● **7. PROMOTE RENEWABLE ENERGY CONSUMPTION**

Institutional buildings are a part of the commercial sector which accounts for 4% of the total power consumption in Kochi. The pilot proposes that the solar panels installed for the charging stations be also used to supply clean electricity for the selected school premises. Thereby, the pilot also serves to upscale the use of renewable energy (RE) consumption, which is KMC's objective under its 'Solar City Development Plan'. The plan when implemented, would significantly reduce the city's dependence on DISCOM's power and save 0.84 million units of KSEB's electricity supply grid (KMC and ICLEI, 2014).

● **8. INCREASE PUBLIC AWARENESS ABOUT NEWER TRANSPORT, ENERGY AND WASTE MANAGEMENT CHOICES**

Since EVs and RE are still nascent technologies, there exists a gap in citizens' general awareness about its efficiency, costs and benefits as well as its environmental role. This demands extensive efforts through effective campaigns to not only overcome knowledge gaps, but also dispel popular prejudices which may hinder quicker adoption. Towards this, clear branding, public events and successful pilot initiatives also provide greater visibility. This also applies to the RE and Solid Waste Management sectors. Advocacy, outreach and communication are integral elements of the proposed project.



PILOT PROJECT STRUCTURE DEPLOYMENT & MONITORING

TIMEFRAME: 1 YEAR & 6 MONTHS

1. Memorandum of Understanding (MoU) between Urban Pathways and the Kochi Municipal Corporation (KMC)/Educational Trust of selected school
2. Preparation and submission of Detailed Project Report (DPR) by Urban Pathways; approval from KMC/Educational Trust
3. Online tender invitation (publicised on Urban Pathways and KMC websites) from e-rickshaw manufacturers; market research for – recycling bins, solar panels and charging station procurement and installation
4. Tender assessment; finalizing of – e-rickshaw models, PV and charging station installation vendor, recycling-bins vendor
5. Identification and finalizing of operation routes and tariffs with KMC and Traffic Police
6. Selection of beneficiary and drivers
7. E-rickshaws procurement; registration and permit acquisition from Regional Transport Office (RTO)
8. Provision of support infrastructure by KMC (designated parking, signage etc.); solar PV and charging station installation by selected vendor; recycling-bins procurement from selected supplier
9. Capacity building for drivers; communication and public awareness campaign before roll-out and inauguration
10. Operations monitoring and assessment



PILOT PROJECT STRUCTURE DEPLOYMENT & MONITORING

TIMEFRAME: 3 YEARS LARGE SCALE PROJECT

1. Pilot phase – deployment and monitoring (as specified in the earlier section)
2. Feasibility report for scale up
3. E-rickshaw road map – medium and long-term goals for KMC
4. Financial proposal for submission to national/international agencies (based on Phase 2 and 3)



FINANCE

OVERALL INITIAL CAPITAL INVESTMENT WOULD COMPRISE OF THE FOLLOWING PROJECT COMPONENTS

1. PROCUREMENT OF E-RICKSHAWS - A CHOICE BETWEEN LEAD ACID AND LITHIUM ION BATTERY MODELS

- Cost with registration and insurance: Average 135,000 Rs. (LA) and 242,000 Rs. (Li)
- Possible selection: 12 LA models (fleet of 12 e-rickshaws)
- Total cost: 1,620,000 Rs. (Approx. 20,250 EUR)

2. ANNUAL MAINTENANCE AND BATTERY REPLACEMENT COST FOR E-RICKSHAW

- 42,000 Rs. (LA)
- Total cost: 504,000 Rs. (Approx. 6,300 EUR)

3. CHARGING STATION INSTALLATION

- 3 charging stations (50 kW capacity each which power 4 e-rickshaws each for full charge)
- Cost approx. 75,000 Rs. each unit with installation.
- Total cost: 210,000 Rs. (Approx. 2,625 EUR)

4. SOLAR PV PANELS PROCUREMENT AND INSTALLATION FOR SCHOOLS

- Cost per kW on-grid/hybrid RE system (without back-up batteries and with net-metering): approx. 50,000 Rs; including government subsidy of 20,000 Rs.
- A mid-sized school in India would require 30 to 50kW of power generation capacity
- Charging 12 e-rickshaws would require 3 charging stations with cumulative capacity of 150 kW (with around 60 km average distance traveled everyday and 8-9 hours of full charging time)
- Largest investment within the project at 9 million Rupees (approx. 112,500 EUR)



- Cost: 15,000 Rs. per unit (190 EUR)
- Total Cost: 60,000 (750 EUR)

	Project component	Rate (Rs.)	Qty.	Unit	Investment cost (Rs.)	Investment cost (EUR)
1	e-rickshaws (Lead Acid battery model)	135000	12	e-rickshaws	1620000	20250
2	e-rickshaw battery replacement and annual maintenance cost	42000	12	per e-rickshaw	504000	6300
3	Charging stations (50 kW each for 4 e-rickshaws)	70000	3	units	210000	2625
4a	On-grid solar PV installation: 30 to 50 kW capacity per school (cost without battery backup; including 20,000 Rs. govt subsidy per kW)	50000	30	kilo-watt capacity	1500000	18750
4b	On-grid solar PV installation: 12.5 kW per e-rickshaw (cost without battery backup; including 20,000 Rs. govt subsidy per kW)	50000	150	kilo-watt capacity	7500000	93750
5	Recycling bins	15000	4	units	60000	750
	Total initial project cost				11394000	142425

Total initial cost (for first year of operations) would be approx.
142,500 EUR for a fleet of 12 e-rickshaws (Lead Acid battery model).



BARRIERS

1. LACK OF CLEAR POLICY & REGISTRATION PROCEDURE AT THE STATE/MUNICIPAL LEVELS:

To clear legal hurdles in purchasing and operating e-rickshaws, the Central Government has taken two important steps. Firstly, the Ministry of Transport has decided that e-rickshaws would not require a conventional legal permit to ply on Indian roads (The Economic Times, 2016). Secondly, to clarify what constitutes an ‘e-rickshaw’ the Ministry has laid down clear guidelines. These define an e-rickshaw as a ‘special purpose battery-operated three-wheeler’ which provides last-mile connectivity, carries 4 passengers (excluding the driver), with a maximum net power of 2000 Watts and a maximum speed of 25 km/hour (The New Indian Express, 2018).

The Central Government has mandated individual State Governments and the Municipal Corporations to decide their own regulations and how to apply national guidelines. Accordingly, the Transport Minister has also directed State Governments to urgently resolve their e-rickshaw-related regulations. This puts significant onus on subnational governments to define their e-rickshaws implementation process. However, in Kerala and in Kochi, such policymaking has only begun this year and the underlying rules have yet to be established. Such a situation has led the local authorities responsible for issuing registration and permits (such as Regional Transport Offices) to continue following regular procedures. Moreover, the prevailing confusion has resulted in thick bureaucracy, lengthy documentation and delays in implementing e-rickshaw projects in Kochi (Mathrubhumi, 2017).

2. NEGATIVE PUBLIC PERCEPTION OF E-RICKSHAWS DUE TO ITS LOW SPEED:

Because of low output power, technical limitation and legal specifications, the maximum speed 25 km/hour. When fully loaded with 4 passengers this speed comes down to 20 km/hour and even lower while climbing sloped terrains. Comparatively, a conventional Auto-rickshaw can reach a maximum speed of 60 km/hour and better-suited for long distance trips. Due to these factors, the assessment of e-rickshaw projects in other Indian cities indicates a negative public perception and avoidance of e-rickshaws (CapaCITIES, 2017). The proposed pilot will have to devise ways to overcome this bias through careful route selection and outreach efforts.

3. LACK OF SUPPORTING STREET INFRASTRUCTURE

For hassle-free and efficient operations of e-rickshaws, provision of support infrastructure is a critical requirement. While charging stations are integrated in the proposed pilot, there are some project components which KMC will need to facilitate. These include – designated parking spots for charging (rickshaw-stands), shelter for waiting areas, lighting, garbage-bins and signage along the selected routes. This could be challenging since – firstly, space is premium (especially in commercial and tourist areas), and secondly, Kochi’s old areas are dense with extremely narrow and parking provision may entail acquiring land from private properties. Additionally, basic facilities such as walkable sidewalks along many roads are presently missing. This may hinder pedestrian accessibility to the proposed e-rickshaw services.



4. LONG CHARGING TIME AND EXPENSIVE BATTERY TECHNOLOGIES:

Most of the presently available e-rickshaws in India are based on lead-acid batteries. This vehicle can ply 65 km on a single charge. However, the charging time is 8 to 9 hours. The proposed project will need to ensure that adequate charging infrastructure and time is available for the entire e-rickshaw fleet. Further, since the charging stations would be powered by solar energy, it will have to be ensured that the fleet has access to back-up power, especially for months with less sunlight (such as the monsoons). Furthermore, alternative power storage, battery-swapping stations and lithium batteries (with less charging time) are expensive options and may prove difficult to procure.

5. LACK OF PROFESSIONAL ASSOCIATIONS FOR KOCHI'S E-RICKSHAW MANUFACTURERS AND OPERATORS

Kochi's e-rickshaw sector is currently unorganised and lacks a professional association. This is unlike larger Indian cities such as Delhi with its active professional bodies representing regional e-rickshaw retailers and operators (for e.g., the Battery Rickshaw Welfare Association). Such organisations are not only an important for advocating local policies but also a good resource to understand technical issues in implementation (Harding, 2015).

6. AVAILABILITY OF MAINTENANCE FACILITIES AND SPARE PARTS:

Despite the Central Government's FAME Scheme, there have been numerous cases of EV manufacturers shutting down business due to low demand. This was also the case with maintenance workshops, spare part suppliers and charging station vendors (CapaCITIES, 2017). At present, such facilities are limited in Kochi. The scalability of e-rickshaw operations relies heavily on a continued presence of robust supply chains for technical components.



POLICY & GOVERNMENT REQUIREMENTS

NATIONAL LEVEL:

1. Ministry of Power
2. Ministry of Roads Transport & Highways
3. Ministry of New & Renewable Power
4. NITI (National Institute for Transforming India) Aayog

STATE LEVEL:

1. Power Department
2. Transport Department
3. Kerala State Electricity Board (KSEB)
4. Kerala State Electricity Regulatory Commission (KSERC)
5. Agency for Non-conventional Energy and Rural Technology (ANERT), Department of Power, Kerala

STATE GOVERNMENT:

6. Research/advisors: Indian Institute of Technology (IIT), Chennai
7. Non-profit sector: Centre for Public Policy Research (CPPR), Kochi

LOCAL LEVEL:

1. Kochi Municipal Corporation (KMC)
2. Kochi Metro Rail Limited (KMRL)
3. Urban Metropolitan Transport Authority (UMTA)
4. Non-profit sector: Centre for Public Policy Research (CPPR), Kochi



STEPS TOWARDS IMPLEMENTATION

There are several political, policy and regional factors in Kochi which work favourably towards making the proposed measure feasible. These are elaborated as follows –

CURRENT INITIATIVES BY THE KERALA STATE GOVERNMENT

As of March 2018, the State Government has declared measures to support the adoption of e-mobility and clean fuel transition. Led by Chief Minister P. Vijayan, these potential efforts include – (a) Invitation to 29 EV companies to market e-rickshaws, e-cars and e-bikes in Kerala along with their after-sales services, (b) Exemption of permits for EVs, (c) Allocation of special colour to e-rickshaw for easy identification in traffic, and (d) Tax reduction for special categories of rickshaws by up to 500 Rupees (Manoramaonline, 2018).

KOCHI METRO EXPANSION IN PROGRESS

Studies have indicated that Kochi modal share of public transport is declining at 5.6% annually. Increased ownership of personal vehicles is a major reason for this (Rao Ghorpade et al., 2014). To counter this situation, KMRL is rapidly expanding the Metro network and has also identified 40 routes for feeder services (Krishna, 2017). The proposed pilot could align with one of these feeder corridors.

‘KOCHI SMART CITY’ PROJECTS CURRENTLY UNDER IMPLEMENTATION

The Central Government launched its flagship Smart Cities Mission in 2015. This competitive programme offered earmarked funding to 100 Municipal Corporations (with over 1 million population) to implement their strategic urban development proposals. Kochi was selected as one of the top ten cities and was approved to receive a grant of 1,000 Crores Rupees (approx. 147 million USD) over 5 years. Transport and EV-related projects are key components of KMC’s official proposal. These are – seamless multi-modal connectivity to Metro and other mobility hubs via 4 km of waterways, 110 km of non-motorised transport (NMT) friendly streets and EV services. Therefore, the proposed pilot aligns with these ‘Smart City’ initiatives and could be instrumental in facilitating their scaling up.



● PRESENCE OF LOCAL MANUFACTURING IN AND AROUND KOCHI

While conventional Auto-rickshaws form the largest section of the market, India also has a substantial network of e-rickshaw manufacturers. There exist 340 e-rickshaw companies only in the city of Delhi (TERI and YES Bank, 2018). Such regional entrepreneurial ventures in the sector are presently being undertaken across multiple Indian states, including Kerala and in Kochi. Such a decentralised supply of e-rickshaws would not only help meet the increasing future demand, but also provide the proposed project with a range of models to choose from at competitive prices. Larger companies in India such ‘YC Electric’ have now up to 6 passenger and freight models ready for sale.

● KERALA DISCOM’S PLANS TO PROMOTE EV ADOPTION

In December 2017, Kerala State Electricity Board (KSEB) finalised procurement of EVs for use in major cities in the State to promote EV usage (exact figure not declared). It also intended to set up charging stations as per national specifications across three cities, including Kochi. The cars would also be available to be rented by public, as per their statement in the State Assembly (August 2017) and a budget of 17 million Rupees (250,000 USD) has been earmarked.

● KOCHI’S URBAN METROPOLITAN TRANSPORT AGENCY (UMTA) AND ITS RESPONSIBILITY IN PROMOTING E-MOBILITY

Legislated in January 2018, this new regional agency is responsible for coordinating the initiatives of all urban transport-related agencies in metropolitan Kochi. In 2017, the Ministry of Urban Development (MOUD) launched its ‘Green Mobility Scheme’ which funds municipalities (with over 1 million population) for shifting to electric/hybrid vehicles for public transport as well as transitioning to non-fossil fuels for public transport projects (MoUD, 2017). The UMTA is the nodal agency for acquiring and disbursing these funds. Within this capacity, UMTA could play an important role in promoting e-mobility for the city.



● EXISTING TOURISM IN SELECTED PILOT AREAS

Both the selected pilot areas of Fort Kochi and Mattancherry have extensive tourist footfalls and a large number of sight-seeing spots located within short distances. The speed and passenger capacity of an e-rickshaw lends itself well to these activities. Additionally, facilitating electric mobility for such trips could be promoted as one of the methods for reducing environmental externalities of Kochi's existing tourism.

● GROWING TRENDS OF SOLAR ENERGY ADOPTION BY KOCHI'S SCHOOLS

There exists an extensive network of over 4,000 government-run schools in Kerala's urban areas (Thomson Reuters Foundation, 2014). Many of these schools have been selected for RE transition projects by governmental agencies since 2014. Additionally, India's Central Board of Secondary Education (CBSE) has recently directed all their affiliated schools (including those in Kerala) to install solar panels for solar energy generation (Nedumudy, 2017). The proposed project could leverage this trend and demonstrate a successful model which addresses low-carbon growth challenges for both energy and transport sectors.



INSTITUTIONS INVOLVED IN THE IMPLEMENTATION

● FOCAL POINT: C-HED and the Municipal Corporation, headed by the Mayor

Other stakeholders:

1. Kochi Metro Rail Limited KMRL

2. Kochi Municipal Corporation: Town Planning Department (headed by Town Planning Officer)/Engineering Department (headed by Superintendent Engineer)

3. Greater Cochin Development Authority (GCDA)

4. Kochi City Police - Traffic Unit

5. Sub-regional Transport Office (RTO), Mattancherry

6. Private sector: Cochin Chamber of Commerce

7. Private sector: Local Industries Associations (especially, regional e-rickshaw manufacturers, dealers and suppliers)



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