THEMATIC BRIEF

# **Breathe Easy**

## Air Quality and Transportation in the CapaCITIES Project





s per International Energy Agency (IEA), the transportation sector globally accounts for 30% of worldwide energy consumption. It is the second largest source of  $CO_2e$  emissions contributing to 20% of Global GHG. By 2030, the global energy consumption is likely to rise by 53% and the transportation sector will consume about three quarters of oil production. For emerging economies like India, the urgency to find viable alternatives for sustainable

mobility is also accentuated by rapid economic development which is accelerating the demand for transportation. The transportation sector alone accounts for about one-third of the total crude oil consumption; and the road transportation accounts for more than 80% of this consumption. To this end, the Government will need to focus on this sector and partner with industry for investing in sustainable mobility solutions for the future.

## Air Quality and Transportation: Priority Areas in India

Trends influencing urban mobility in India are rapid urbanization, rapid motorization and a dwindling share of non-motorized transportation. This leads to road congestion, parking, air pollution and deteriorating road safety. Each one of these factors need to be addressed with appropriate interventions that can be adopted as a part of a multi-pronged strategy for increasing transportation efficiency levels, and mitigation of the adverse impact of transportation sector on the environment and climate change. There has also been a substantial growth in the total transportation energy consumption in India. Energy consumption is also projected to increase from 3.3 quadrillion British Thermal Units (Btu) in 2012 to 10.9 quadrillion Btu in 2040, with an average annual increase of 4.4%. Fuel consumption by India's light-duty vehicles grows by 7.7% each year, accounting for 51% of the total increase in transportation energy use. Additionally, energy use by heavy-duty vehicles has also been increasing on an average of 4.4% per year since 2012, and will continue till 2040. This will account for 18% of the total increase in India's transportation energy use.

## The CapaCITIES Project in Air Quality and Transportation

It is under this impetus for change that the 'Capacity Building for Low Carbon and Climate Resilient City Development' (CapaCITIES) project focused on the transportation sector and works towards improvement of air quality. The SDC supported project in close collaboration with the City Authorities of Coimbatore, Rajkot, Udaipur and Siliguri, identified quickwin interventions, viable bankable projects fortified with technical studies. The ClimateResilientCITIES Action Plans (CRCAPs) have



Ambient Air Quality Monitoring Station (AAQMS) in Siliguri



E- Rickshaw Pilot Deployment in Udaipur

## The ClimateResilientCITIES Process

The CapaCITIES project supported the city municipal corporations to identify baseline data from various departments in order to develop a profile for the city. These activities were conducted by a Core Team- officials from the local government, and a Stakeholder Group -individuals from different parastatal bodies in the city / NGOs / institutions / local stakeholders A city level inventory is gene the ULBs and co level activities HEAT+ to been outlined in consultation with the city authorities for each of the four cities specifically targeting actionable interventions to the transportation sector to reduce the challenges outlined towards improving air quality, mitigating GHG emissions and continuing along a low carbon development pathway. The CapaCITIES project has been conducting its work since 2016 at the city level, in order to support the citizenry with access to clean air and enhanced mobility options, thereby accelerating the Gol's efforts for sustained urbanization.

## The ClimateResilientCITIES Action Plan (CRCAP) Process

While the primary goal of the **ClimateResilientCITIES** Action Plan (CRCAP) is to support a low carbon development pathway for the cities and at the same time mitigating GHG. The plans also addresses economic implications of implementing the interventions sectorally. Based on the vulnerability assessment, the GHG emissions inventory; the stakeholder meetings and the Shared Learning Dialogues in consultation with the appropriate local authorities, the Cities with the CapaCITIES team generated sector specific city wise CRCAPs outlining the primary points of action and the associated financial inferences.

City	Key Resilience Interventions Proposed in the area of Air Quality and Transportation QT from the CRCAPs	Total Mitigation Potential (tCO2e)
UDAIPUR	<ul> <li>Replacement of existing street lighting with LED lamps through ESCO</li> <li>Rooftop SPV for renewable energy for electric buses and IPT</li> <li>Electric buses in place of diesel buses</li> <li>Replacement of traditional auto-rickshaws across the city by electricity powered IPT</li> </ul>	47,876.9
RAJKOT	<ul> <li>Deployment of e-busses with solar PV based charging</li> <li>Public bike sharing system</li> <li>CNG goods vehicle instead of chhakda (locally made diesel-based vehicles)</li> <li>Replacing inefficient bulbs with 52,000 energy efficient street lights</li> </ul>	14,796 (5.61% of total)
SILIGURI	<ul> <li>Introduction of 30 electric buses to replacement diesel operated city buses</li> <li>Measures for providing infrastructure for traffic de-congestion</li> <li>Replacement of existing street lighting with LED lamps through ESCO</li> <li>Solar PV Systems</li> </ul>	4,484.65 (3% of total)
COIMBATORE	Replacing inefficient bulbs with 21,000 energy efficient street lights	11,000 (0.6% of total)

## **Challenges at the City Level**

According to the fragility statement generated as part of the CapaCITIES project; the largest source of GHG is from the transportation sector in **Coimbatore.** As the city is growing, there is a high likelihood of an increase in the number of vehicles contributing to the liberation of more GHG and air pollution across the city. Similarly, **Rajkot** is second highest at 28% in city wide GHG emissions liberated from transportation. Though Rajkot has various mobility plans, the city doesn't have a holistic traffic management plan. Traffic management at junctions is a major concern. Lack of traffic signals in many of the junctions

exacerbates this problem. Therefore, for Rajkot, the challenge of decongestion and strengthening public transportation while mitigating GHG emissions are essential for the cities sustainable and climate resilient growth.

For **Udaipur**, the transportation sector accounts for 17% of the cities GHG emissions. The number of registered vehicles in Udaipur increased from 1,60,431 in 2004-05 to 3,39,594 in 2011-12 with two-wheelers constituting 90% of the total registration, car constituting 9%, while buses constitute only 1%. Therefore,

GHG erated for mmunity using the ool. Through the GHG inventory; possible mitigation measures were identified to reduce the cities' emissions. The Shared Learning Dialogues (SLDs) contributed to determining fragile urban systems in the city and the climate risks to these systems.

The vulnerability assessments helped in identifying the affected areas and populations within the city by these climate risks. A second SI to identify intervention fragile system them to form Resilient City (CRC transport options and policies that will help reduce the number of two-wheelers while offering better shared public mobility option are essential.

**Siliguri** is the converging/diverging point for all major modes of transport, connecting the traffic from other parts of India moving towards the North-eastern part of the country, and adjoining countries of Nepal and Bhutan. Hence, it has two mobility interfaces – local traffic local and transit traffic passing through the city. Though the Siliguri Jalpaiguri Development Authority (SJDA) has an existing plan namely '*Traffic and Transportation Master Plan - Siliguri Jalpaiguri Planning Area 2030'* (2013); an

#### Quickwin Project Ambient Air Quality Monitoring Station (AAQMS)

With increase in traffic, air pollution is a significant health concern for people living in the cities. Therefore, given the need for better transportation and traffic planning in the four project cities and their potential impacts on improving air quality; the CapaCITIES project installed sensory based ambient air quality monitoring stations (AAQMS). These will measure particulate matter (PM 2.5 and PM 10) of the project cities. The AAQMS have been installed in strategic locations throughout Coimbatore (4), Siliguri (4), Rajkot (2) and Udaipur (4). In some cities, such as Rajkot, environmental sensors have been deployed by the City, which measure temperature, humidity, light, UV, noise, CO<sub>x</sub>, NO<sub>x</sub>, SO<sub>x</sub>, but they do not measure PM 2.5 and PM 10, which are the reference pollutants for assessing transport emission impacts on air quality, providing critical information for transport planning, health impacts and awareness and urban planning. The improved air quality data from multiple locations will help prepare relevant policies to improve air quality such as forming data based city level mobility plan to have better traffic management and City Level Clean Air Plans.

## **Technical Studies**

In the 'City Planning Assessment Report for Siliguri' the present scenario of the transportation sector was analysed with issues identified and recommendations provided. In the study, the integrated public transportation system is required to address the concerns of decongestion, low vehicular speed, provision of better public transportation.

For all the cities, the primary aggregators of vehicular congestion are a lack of public transportation options (buses, railways etc.), therefore, there is an increase in private vehicles, and lack of footpaths have led to jaywalking, encroachment by street vendors, haphazard parking and heavy reliance on intermediate public transportation (IPT). These issues led to increased fuel consumption and GHG emissions with air pollution as a significant health concern for all the citizens.

#### E- Rickshaw Pilot Deployment

Bridging the lacunae in last mile connectivity was identified as a priority for Udaipur. After an extensive study, the e-rickshaw pilot was deployed. Based on the study, 18 e-rickshaws of various types and makes was procured, with batteries customised to identify efficiency under the cities topographic conditions and tested for performance on the city roads. Keeping inclusivity in mind, the drivers of the e-rickshaws included unemployed men and women, and the disabled. They were selected through a lottery process in consultation with the National Urban Livelihoods Mission (NULM). Training and capacity building was provided to teach operations and maintenance of the machines to the e-rickshaw drivers. In addition, there has been an annual emission reduction from the pilot project i.e. 45.62 tCO<sub>2</sub>e of GHG emission, 261 kg of NOx and 132 kg of particulate matter. Lessons learnt was that while the pilot has value to be scaled up and replicated, for the EV to be effective in undulating landscape of Udaipur, more powerful motor is required and therefore an e-autorickshaw is better suited. In order to avoid traffic congestion, the e-autorickshaws should ply on designated routes only, and provide adequate charging infrastructure for the daily charging on the EV.

proposed measures outline future actions that can be taken up as individual projects, such as creating a comprehensive transportation survey by traffic experts and forming a road

D helped resilience ns for each and prioritise n a Climate Action Plan AP). The interventions detailed in the CRCAPs also help identify timelines, size of projects-cost, financing models and potential linkages to financing. This leads to an overarching climate strategy for the city that addresses projects in each thematic area not just technically, but in a holistic manner

Quickwin Projects and Bankable Projects with specific technical studies further enhanced city level climate resilience. map for implementation and gradual realization of the Electric Mechanical Units (EMU) with a focus on Naxalbari, that borders Nepal, and New Jalpaiguri Junction Station or the local transportation of persons between Naxalbari - the Airport Bagdogra - Siliguri - Jalpaiguri as initial steps. Another study on 'Decongesting Streets and Designing Junctions' involved a deep analysis of the road networks in Siliguri and recommends a strategy based on enhancing public awareness, policy planning based on empirical data as well as a focus on the enforcement of the recommended strategies. Actioning these studies would greatly contribute to reducing traffic congestion, air pollution as well as to mitigating GHG emissions improving quality of life, preserving the environment and enhancing human health conditions.

The study 'GHG Transport Inventory and Mitigation Options for Udaipur' used a methodological approach to collecting and analysing data to form a 'GHG baseline projection 2015-2030', where GHG baseline projections for passenger and freight transport were realized based on the expected Business as Usual (BAU) development of major parameters in the city, and mode share in percentage of trips by different types of vehicles. These data were compared between 2013 and the 2030 projections. The core results of this study indicates the absolute GHG emissions for transport sector increasing from the baseline by more than factor 3. Thereby doubling the total transport emissions per inhabitant from the current 0.18 tCO2/inhabitant to 0.38 tCO2 per inhabitant.

An 'Assessment of the E-Rickshaw Operations in Siliguri' revealed that the absence of a legal framework for e-rickshaw operations in Siliguri is a major threat to its effective utilization. As the demand for private vehicles is increasing rapidly; the current road infrastructure and public transportation options are inadequate. Introducing private vehicles, will not only add to further traffic congestion, but will add to the pollution. Therefore, a fresh influx of e-rickshaws must be pre-planned according the road capacity and projected future travel demand. Routes need to be planned to increase the profitability of the drivers, offer convenienceto the passengers while not contributing further to the traffic congestion. Additionally, similar to the learnings from the e rickshaw quickwin conducted in Udaipur; provision of charging infrastructure, capacity and training on maintenance of the EV is essential.

## **Bankable Projects**

In Udaipur, the 'Development of City Level Low Carbon Intermediate Para Transit (IPT) Action Plan and Financing' was conducted in the absence of a robust public transport facilities in Udaipur. IPT is a preferred mode of travel in the city. It caters to more than 11% of trips in the city and provides employment both directly and indirectly. The primary objective is to develop an action plan for improving IPT, allowing for integration with public transport. The target is to increase ridership in public transport in a sustainable manner whilst reducing emissions per kilometre.



Consultation for the 'Development of City Level Low Carbon Intermediate Para Transit (IPT) Action Plan and Financing'



In Rajkot, the Bankable Project 'Assessment and Plan for Ensuring Last Mile Connectivity along the BRT Stretch, including Pre-Feasibility of Potential Electrification of the Corridor' was conducted. The study explores the feasibility of improving ridership and sustainability of the existing 10.7 km BRT corridor by improving its accessibility, identifying a Last Mile Connectivity Plan and scoping the feasibility options for the electrification of the BRTS corridor.

A 'Pre-feasibility Study to Assess the Viability of Operationalizing a Mass Public Transport System in Siliguri' has been initiated to improve travel conditions and reduce on road congestion, improve environment quality, and enhance safety and energy security.

## What contributed to the success of CapaCITIES

The CapaCITIES project in the thematic area of transportation lays a specific emphasis on building a strong base through the technical studies by the use of a multipronged approach of using empirical data; a participatory and consultative approach by involving the City Authority as well as the citizens to guide policy recommendations. The CRCAPs has been developed based on interactions with the city core team and various stakeholders through in person individual interactions and group dialogues to reach its current form. The cities have been involved in every step, and therefore the ownership of the strategies and recommendations are more acceptable. The recommendations derived from this scientific and participatory method can be applied as individually financially viable bankable projects by the city authorities themselves. Additionally, the pilot quickwin projects provide real world results; after having been tested on ground. Therefore are based on concrete observations that can be successfully scaled up. Finally, the interventions identified in the CRCAPs are based on this robust method combining pilot projects and technical studies and on being implemented are capable of supporting low emission development of the cities while mitigating GHG emissions thereby contributing to their climate resilience.

## Conclusion

Across the project cities, the major areas of concernin the thematic domain are congestion, lack of adequate and comfortable public transportation options, last mile connectivity, sufficient traffic management and haphazard parking. With increasing climate change the incidents of high intensity, low frequency rainfall will also increase that will further exasperate water logging, traffic congestion and stress. The existing inadequate public transportation system including first/last mile connectivity is generally hampering daily life of the citizens. Looking forward, the financial viability of key bankable projects as well as a citywide holistic traffic management plan needs to be actioned upon. This would also address reduction of air pollution and mitigation of GHG emissions, primarily caused by the addition of more fossil fuel based private vehicles, which contributes to climate change.



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