



Case Studies in Low Carbon Urban Development in India

#2

Towards Low Carbon Urban Development in High Altitude Region: Leh, Ladakh

Introduction

Ladakh is spatially the largest, second least populous and the youngest Union Territory (UT) of India formed on October 31, 2019. Located in the Hindu Kush Himalayan Region (HKH), the high-altitude terrain and cold desert climate makes it a unique geographical region of India. Endowed with the natural beauty of Himalayan landscape, a pristine environment and cultural heritage of the Tibetan Buddhism, the region is a favoured tourism destination among both domestic and foreign tourists.

The Union Territory of Ladakh has embarked on the ambitious carbon neutral Ladakh 2050 vision as envisaged by the Government of India. India's Ministry of Environment, Forests and Climate Change (MOEFCC) mentioned in 2021 that "Carbon neutrality for Ladakh is not a mitigation goal, but a development vision". This is the sustainable development pathway in an ecologically sensitive cold desert. Accordingly, several initiatives under the Action Plan for Carbon Neutral Ladakh are in various stages of planning and implementation. Leh town, the administrative headquarters of the UT and its largest urban centre (population of 30,870 persons as reported by the Census of India, 2011) is spearheading this revolution under the aegis of Municipal Committee Leh (MCL) and the Housing and Urban Development Department of the UT Administration.

With almost 90 per cent of the year under clear sunny days (320 out of 365 days) and an average daily global solar radiation of 2022 kWh/m²/annum (<https://www.ibef.org/states/ladakh>) Ladakh is most suited for harnessing solar energy for power generation for various sectors. Mobility and Solid Waste Management (SWM) are the two key sectors for intervention.

Mobility

The Motor Garages Department having a fleet of 10 E-buses has successfully piloted E-bus service on the heavily travelled Leh-Khardungla section and for two popular tourist routes, viz. Leh-Sangam and Leh-Thiksey. The Tourism Department has collaborated with the Motor Garages department for the second pilot. Similarly, 10 E-cars procured through Convergence Energy Service Limited (CESL) – a subsidiary of Ministry of Power are being put into service of various government officials. Carbon neutral integrated solar EV charging station, the first of its kind in India has been set up in Leh for charging requirements of this initial fleet of 10 E-buses and 10 E-cars.

Solid Waste Management

MCL has installed a 30 tonne per day capacity solar power-based integrated solid waste management (ISWM) plant spread over an area of 38 acres on the outskirts of Leh town. This facility runs on electricity generated from the 100kW solar power supply installed by Ladakh Renewable Energy Development Agency



(LREDA). The manual segregation at the ISWM site is able to provide livelihood option for waste workers, and at the same time there is nearly 90% material recovery of recyclables. A composting unit within the ISWM plant is managing the biodegradable waste which is turned into compost. It is being utilised by the MCL and monasteries in the public parks maintained by it while the rest is sold to farmers.

Besides these sector specific interventions, MCL has other carbon neutral projects in the pipeline. These include:

- i. 15 TPD capacity Bio-methanation Plant to process organic waste. It will also produce green energy from biogas and digested slurry for use as organic manure.
- ii. A plastic waste recycling unit to convert plastic into pellets for industrial utilisation.
- iii. Construction and Demolition waste collection, segregation, and recycling plant.
- iv. Development of solar park and solar rooftop on government buildings.

Further 70 solar power plants with an installed capacity of 630 KW have been established in various institutions in Leh District by LREDA.



Picture Title: E-Mobility (E-Cars & E-Buses)

Low-Carbon Impact

Transition to green fuels such as electric vehicles is expected to improve the deteriorating air quality of Leh which witnesses poor air quality particularly during tourist season. As part of the Leh Vision 2030, concerted efforts in improving existing public transport system with E-buses, promoting shift to E-vehicles for commercial and domestic uses are suggested interventions towards low carbon. As per an MCL, it is estimated that the Municipal Solid Waste (MSW) generated by MCL will result in an increase in the Green House Gas (GHG) emissions from 1.1 Gg/year to 2.29 Gg/year in 2035 and 3.5 Gg/year in 2030. However, the initiatives for MSW management are projected to result in significant GHG mitigation up to 2,848 tonnes of CO₂ by 2030 from 221.75 tonnes of CO₂ (till 2021).

Institutional Enablers

The carbon neutral Ladakh 2050 vision while being led by the Ladakh UT Administration, however, has on



boarded all key stakeholders including Municipal Council Leh (MCL) as the primary implementation agency for all projects within the jurisdiction of Leh MC; government departments such as Housing and Urban Development, Tourism, Agriculture, Power Development, Transport, Public Health Engineering, Department of Urban Local Bodies; LREDA. Active participation of the citizens is sought through Ladakh Autonomous Hill Development Council (LAHDC), NGOs such as Ladakh Ecological Development Group (LEDeG), Himalayan Institute of Alternatives Ladakh (HIAL).

The Ladakh Electric Vehicle and Allied Infrastructure Policy 2022 is the backbone of the E mobility projects. With the objective of promoting sustainable mobility in Ladakh through sale and use of EVs, the policy promotes EVs in public transport and targets 509 domestic and commercial EVs during 2023-27.



Picture Title: Solar Panels for SWM & Street Lighting

Learnings for Cities

Low-Carbon urban development interventions in Leh, Ladakh provide two key learnings for cities in the Hindu Kush Himalayan Region (HKH) in India and other countries which have extremely cold climatic regions with vulnerable environments.

1. Institutionalising Low-Carbon Initiatives: Leh as a city has always embraced low-carbon solutions due to various challenges of electricity supply in the region and a variety of initiatives by various civil society organisations which have proliferated the use of solar energy and passive solar housing (PSH) technologies in the region in an effective manner. For Leh, this transition to an urban scale solar power-based interventions for mobility and SWM is a natural transition towards a low carbon, cost-effective and environmentally friendly solutions. It will be useful for all cities in the HKH region to internalise such technologies in various forms within their urban development initiatives so that upscaling them to an urban scale is easier; as it was for Leh, Ladakh.
2. Understanding the Challenges and Localised Contexts: While it was possible for some cities in the plains to go for battery swapping technology to bring efficiency in e-mobility, up scaling of e-bus service to cover Leh and its surrounding settlements was a challenge due to the absence of E-waste processing and disposal guidelines. Therefore, Leh decided to set up charging stations at designated distances within the region instead of encouraging battery swapping. Even in SWM



where it was impossible to construct and manage a large-scale scientific landfill due to financial and environmental challenges, Leh concentrated its efforts on processing its collected solid waste and achieved 90% efficiency. Such interventions also kept the costs low for a smaller urban local body like Leh and ensured financial viability of the project in the long run without being dependent on conventional fuels. Other cities in the HKH region will have to also understand their local contexts and challenges before adopting any low-carbon interventions for reaping longer-term benefits.

Contact the Authors

Dr Bhawna Bali, Assistant Professor, Department of Sustainable Engineering,
bhawna.bali@terisas.ac.in

Dr. Abhijit Datey, Assistant Professor, Department of Sustainable Engineering,
abhijit.datey@terisas.ac.in

TERI School of Advanced Studies (Deemed to be University)
Plot No. 10, Institutional Area, Vasant Kunj, New Delhi, India, 110070

This material has been funded by UN HABITAT under the project titled “Urban Living Lab Centre for India” within the programme titled “Urban Pathways: Supporting Low Carbon Plans for Urban Basic Services in the Context of the New Urban Agenda”. However, the views expressed do not necessarily reflect the views of the funding agency.