

AN UPDATE ON THE  
'PROMOTING LOW-CARBON  
TRANSPORT IN INDIA'  
PROJECT, IMPLEMENTED IN  
VISHAKAPATNAM, RAJKOT  
AND UDAIPUR.

UPDATE ON RAJKOT CITY.

For more information  
on the project, access  
the project website at  
[www.unep.org/  
transport/lowcarbon](http://www.unep.org/transport/lowcarbon)



# LOW-CARBON COMPREHENSIVE MOBILITY PLAN FOR RAJKOT:

## SUSTAINABLE MOBILITY WITH LOWER EMISSIONS

### ABOUT THE CITY

The fourth-largest city in the state of Gujarat, Rajkot has experienced significant growth in recent years. As a participant in UNEP's Promoting Low Carbon Transport in India project, the city has been selected as a case study for preparing Low Carbon Comprehensive Mobility Plans (LCMPs). Managed by Rajkot Municipal Corporation (RMC), the city itself is around 104 sq km. The larger metropolitan region, which is under the jurisdiction of Rajkot Urban Development Authority (RUDA), has an area of about 483 sq km. This larger metropolitan area, which is the subject of the LCMP study, includes the city of Rajkot as well as 54 nearby villages, the total population of which is 1.48 million.

### CITY VISION

Rajkot's vision for urban mobility is to ensure optimum use of resources and sustainability in the urban environment in order to provide efficient and cost-effective basic services to each and every citizen of Rajkot. This, in turn, will facilitate economic, social, cultural and educational development.

### CURRENT SITUATION AND KEY CHALLENGES

In terms of transport infrastructure, Rajkot is currently considering proposals for road widening, incorporation of pedestrian footpaths and other road infrastructure facilities. The city has already started constructing a Bus Rapid Transit (BRT) system using Jawaharlal Nehru National Urban Renewal Mission (JnNURM) funding, and 10.7 kms of the system is currently operational. Although Rajkot has already taken steps to provide public transport, pedestrian and cyclist infrastructure, these measures need to be assessed regarding demand, as well as what kind of benefits these and other strategies will bring to Rajkot in terms of improving transport, accessibility, and reducing CO<sub>2</sub> and other transport-related air pollution.

During the study, Rajkot's city structure and transport systems were analysed. The study found that jobs have spread out with residential sprawl, so the overall trip lengths are rather short. However, the city is rapidly expanding in all directions with very little transport infrastructure in peripheral areas. Moreover, a large por-

### PROJECT PARTNERS:



tion of trips (around half), use Non-Motorized Transport (NMT) modes. On the up side, footpaths are present on all major roads. However, in most areas the footpaths are less than 1.5 metres wide, and walking is often difficult due to encroachment of activities and motorized vehicles. While Rajkot has a dedicated cycle lane on one stretch along the BRT corridor, bicycle use is difficult on most other city roads. BRT is the only public transit system in the city, as there is currently no city bus service. For the moment, Rajkot's public transport demands are met by a large fleet of para-transit vehicles. The road network suffers from narrow roads and bottlenecks which constrain the free flow of motorized vehicles.

The study found that on an average, individuals residing in Rajkot make 1.40 trips per day, with men travelling more than women. As stated earlier, most trips are made using NMT modes, including both walking and bicycle trips. In the absence of public transport, auto-rickshaws are used for public transport, with a modal share of 11%. As in most other Indian cities, the two-wheeled motorcycle is the most preferred mode, and the share of trips made by car is comparatively low. The city's average trip length, including walking trips, is approximately 3.8 km.

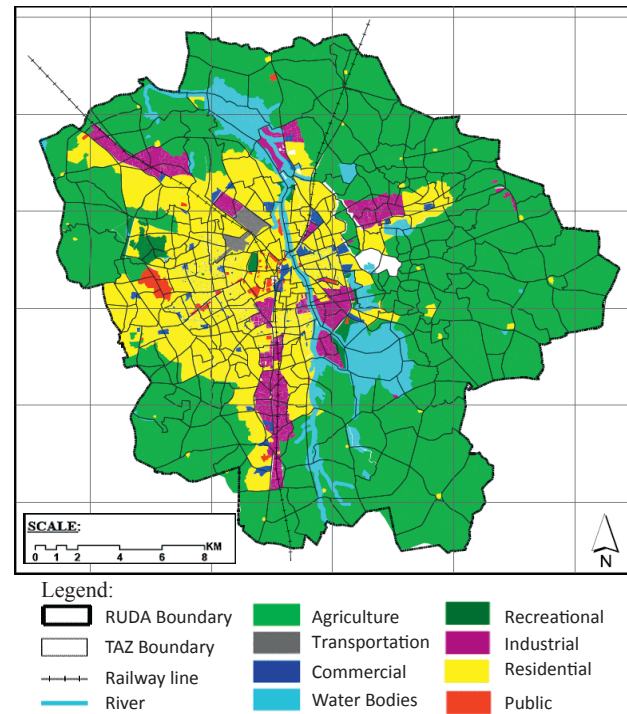


Figure 1: RUDA Land Use Map, 2011 (Source: RUDA)



Individuals tend to travel longer distances for work trips, while most shopping trips are less than 1 km.

Given the statistics noted above, the key challenge in developing a LCMP for Rajkot was twofold. First, the plan needs to maintain the present modal splits and lower average trip length. Second, to achieve the study's first target for the horizon year 2031, the plan needs to identify short-term (5 years), medium-term (10 years) and long-term (more than 10 years) transport planning measures. In order to do this, two urban development scenarios were analysed, the Business As Usual (BAU) and the Sustainable Urban Transport Scenario (SS). In both scenarios, the city's socio-economic projections were kept constant.

## BUSINESS AS USUAL SCENARIO

In the BAU scenario it is assumed that urban development will follow past trends with no change in urban development policy.

In this scenario, by 2031, the modal share for NMT would drop to less than 30%, and if the planned public transport system becomes operational, 14% of trips will be made by

public transport. Moreover, as the city sprawls, the average trip will be 6 km. with an average travel time of 27 minutes, which is significantly higher than the present mean. The consequent CO<sub>2</sub> emissions are estimated at 7.8 million tonnes.

## SUSTAINABLE URBAN TRANSPORT SCENARIO (SS)

The SS scenario relies on four broad strategies to achieve lower CO<sub>2</sub> emissions, improved mobility, accessibility, safety and environmental quality, namely land use, NMT, public transport and improved technology.

While the BAU scenario models individual revealed preferences, the SS scenario conducted stated preference surveys as well as household surveys in order to understand individual choices. These preferences were used to determine how individual travel behaviour would change under SS scenarios.

### LAND USE STRATEGY

When analysing the relationship between land use and individual travel in Rajkot, the study found that accessibility to jobs, poly-centric development and a balanced job-housing ratio encourages individuals to use NMT and public transport modes. For this reason, the plan proposes a strategy that ensures increased accessibility to jobs and poly-centric development with major and minor nodes. The major nodes would have a Floor Space Index (FSI) of 4 and minor nodes FSI of 2.5. These nodes will feature a good land use mix, ensuring a balanced job-housing ratio. As a result of this strategy, the study found that the public transport mode share increased to 22% and vehicle kilometres travelled (VKT), average trip length and average travel time were lowered by 8%, 35% and 41% respectively as compared to the BAU, resulting in 4% lower CO<sub>2</sub> emissions.

### NON-MOTORIZED TRANSPORT STRATEGY

The NMT strategy proposed that footpaths should be more than 2 metres wide on all major roads and roads in areas with high walking demand. By doing so, it was possible to retain the present 38% walking share for the next twenty years. Dedicated bicycle routes were identified along major roads where individuals stated that they would use a bicycle if dedicated cycling corridors were provided. As a consequence, the bicycle share in the SS virtually doubled, from the current 7% to 14%. Overall, the study found that a significant number of trips (including all short trips, educational trips and some of the work trips) would shift to NMT, thus decreasing vehicle use and in turn, reducing CO<sub>2</sub> emissions by 16%.

### PUBLIC TRANSPORT STRATEGY

A three-stage strategy was adopted for public transport. This strategy included use of lower capacity buses on routes that have low public transport demand, city bus on roads that have higher demand, and BRT on corridors where city bus service cannot keep up with demand. According to the study, adopting this strategy would result in a combined trip share of public transport, including BRT, of 37%, and that motorized modes would significantly decrease to less than 15%. This strategy results in a 20% drop in CO<sub>2</sub> emissions.

TABLE 1 SHOWS RAJKOT'S CURRENT SITUATION, BAU SCENARIO, AND SUSTAINABLE URBAN TRANSPORT SCENARIO, AS REFLECTED BY INDICATOR VALUES

Indicators	Base Year 2011	Business As Usual Scenario (2031)	Sustainable Urban Transport Scenario (2031)
Modal share (% of total)	NMT – 48% PT – 15% Private – 37%	NMT – 29% PT – 14% Private – 57%	NMT – 54% PT – 33% Private – 13%
Average travel time (min)	22	27	14
Average trip length (km)	4.3	6.5	3.5
Vehicle kilometres travelled (km)	145,349	204,218	159,477
Accident rate / million population	163	217	130
CO <sub>2</sub> emission (million tonnes)	6.7	7.8	6.1



# URBAN MOBILITY PLANS

## INTEGRATED LAND USE AND URBAN MOBILITY PLAN

Mixing high-density residential areas with high-density employment areas, encourages the formation of nodes around transit stops.

## PUBLIC TRANSPORT IMPROVEMENT PLAN

Important consideration must be given to optimizing the bus fleet according to demand. Furthermore, as a given city is likely to grow into a larger metropolitan area, a gradual progression in public transport technology is recommended, for example, from city bus to BRT to metro. System planning should address not only where to place the routes and stops, but also how accessible the system is to all segments of the population, including pedestrians, cyclists, the disabled and the elderly, as well as private vehicle users after they have parked their vehicles.

## ROAD NETWORK DEVELOPMENT PLAN

When designing a road network, it is important to remember that streets are used by all types of people. Furthermore, since over half

of the trips made in Rajkot use NMT modes, it is essential that roads provide adequate space for NMT. Proposals for increasing road space for private vehicle under the pretext that there is latent demand is avoided, as far as this is possible.

## TIMELINE

In the short term (i.e. by 2016), the priority is on NMT infrastructure projects such as footpaths and cycle lanes, followed by PT investments. Investments in 2016 are estimated to cost Rs. 4474 million, of which NMT and PT account for 23% and 63% respectively.

In the medium term (i.e. by 2021), emphasis is on developing BRT, as well as other investments such as footpaths, junction improvements, etc. These investments are expected to cost Rs. 3809 million, of which PT would account for 83%.

Long-term projects (i.e. for 2031) include significant spending on developing new roads and BRT, as well as other infrastructure. This phase is expected to cost Rs. 11274 million, of which road works and PT would account for 33% and 63% respectively.



The 'Promoting Low - carbon Transport in India' project is supported by:



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the Parliament of the Federal Republic of Germany