

Sustainable Mobility in a Low-Carbon Future- Udaipur

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OPTIMISM
Project
(India)

Policy Brief 1

Introduction

Udaipur, a tourist city in Rajasthan, west India, has a population of 0.8 million (2016) in its Urban Control Area (UUCA) 348 sq. km. It is a small sized 12-minute city, known for its history, culture and institutions, attracting a high footfall of students and tourists. Traditionally a compact city with a dense, ring-radial road network, Udaipur is rapidly expanding along two highways, creating high travel demand. Walled city and its immediate surroundings are predominantly mixed use, allowing 56% of the non-work trips to be on foot. The land-use becomes largely residential moving towards the periphery, and industrial towards the eastern ends of UUCA. Hence majority work trips from the city are towards the industrial area, around 15 km from the city center. Road space in the city is highly contested with heterogeneous road users: motorized vehicle users, pedestrians, cyclists, street vendors and their clientele, private bus operators and their clientele, pavement dwellers, street parking, etc.

Current Transport Scenario

75% of the total population resides within the municipal area, resulting in a population density of 257 people per hectare (PPH). About half the trips in the city are made on non-motorized modes, followed by more than 37% trips on personal motorized vehicles. Details of the current transport scenario are as follows:

Motorization & Road Infrastructure: Rapid urbanization in Udaipur has led to a steep increase in motorization. The number of registered vehicles increased by 52% in a span of 6-7 years, and a compound annual growth rate (CAGR) of 11.3%. Increased vehicle motorization adds pressure on the existing road infrastructure; All 7 underpasses in the city are underused due to poor-maintenance and narrow openings. Udaipur has a total of 1,011.69 million annual motorized vehicle kilometers travelled (VKT). Personal motorized vehicles make about 85% of the vehicle composition, and 2-wheelers also contribute to more than 80% of the annual VKT.



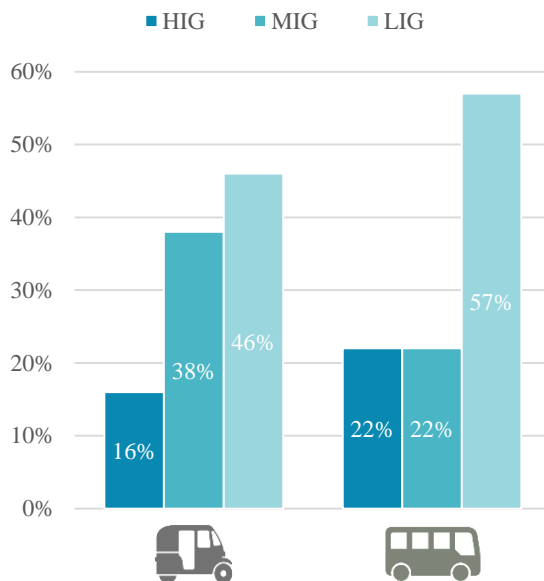
Non-motorized Transport Network & Infrastructure:

Despite high pedestrian footfall (as high as 53,338 pedestrians/day), Udaipur’s non-motorized transport infrastructure including footpaths, cycle lanes/ tracks, pedestrian/ cycle crossings, and street lighting are poorly designed and inadequate. Less than 1% of the roads have cycling and footpath infrastructure in the city. The LOS for non-motorized transport infrastructure in Udaipur is rated as 4.0. 48% of total trips are by walking. Walking is also a predominant mode of commute for the low income group (LIG), with a much higher average trip length than other income groups. An overwhelming majority of trips by women are by walk (66%) much higher than by men (35%). Data on trip rate indicates that LIG women have the highest dependence on walking than any other group.

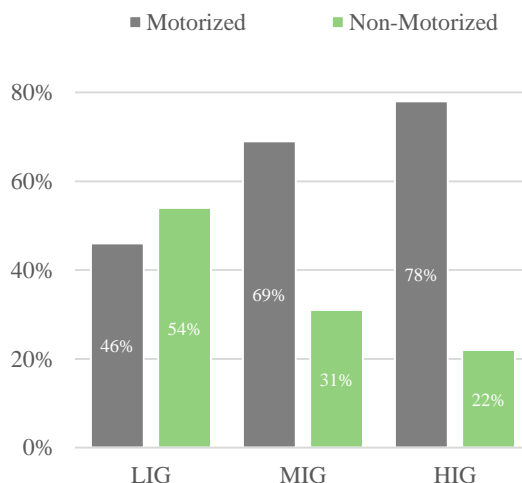
Public Transport Network & Infrastructure:

Public transport in Udaipur mainly comprises shared and personal auto-rickshaws, along with a few city buses. Although Autos and Shared Autos are a part of the Intermediate Public Transport (IPT) network, they mostly operate under fixed routes and rates mechanisms, essentially serving as Public Transport (PT). There are 27 designated IPT routes and 87 IPT stands across the city. 11% of the total trips are made on IPT.

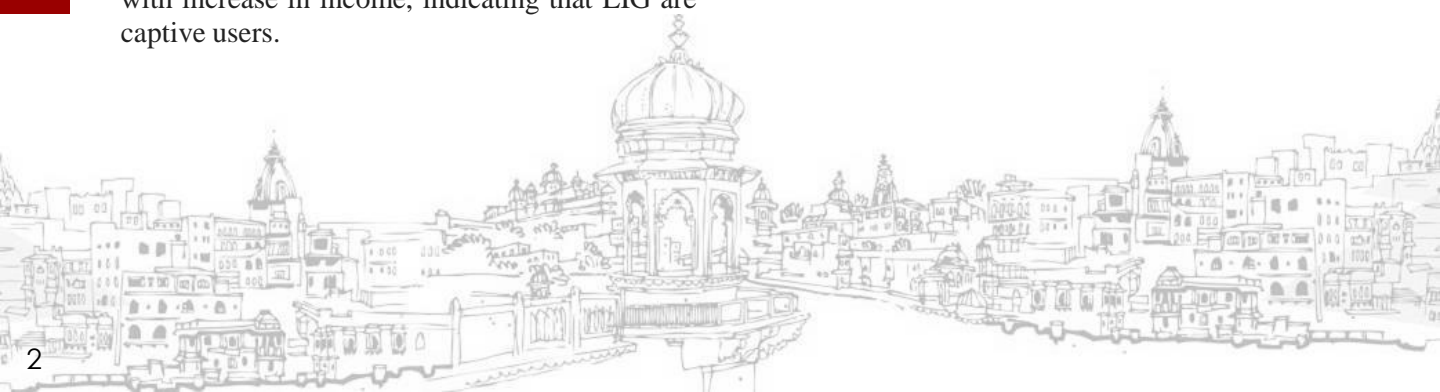
City Buses operate on 5 routes with 89 km of total route length. 25% of total IPT trips and 33% of total 2-wheeler trips have a trip length of 5 km or more. These trips should ideally be on buses, but due to lack of a robust PT network, only 2% of the total trips are by Bus. People prefer Autos and Shared Rickshaws over mini-buses, making it less economically viable for mini-bus operators to function within the city. Hence, despite being permitted, the mini-buses do not operate within the city limits. Instead, they connect the surrounding villages to the city center. Udaipur’s PT & IPT mode share declines with increase in income, indicating that LIG are captive users.



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Around 60% of all LIG trips are by non-motorized modes; 66% of all female trips are on foot, compared to 35% male trips, indicating LIG women are the most dependent on non-motorized transport



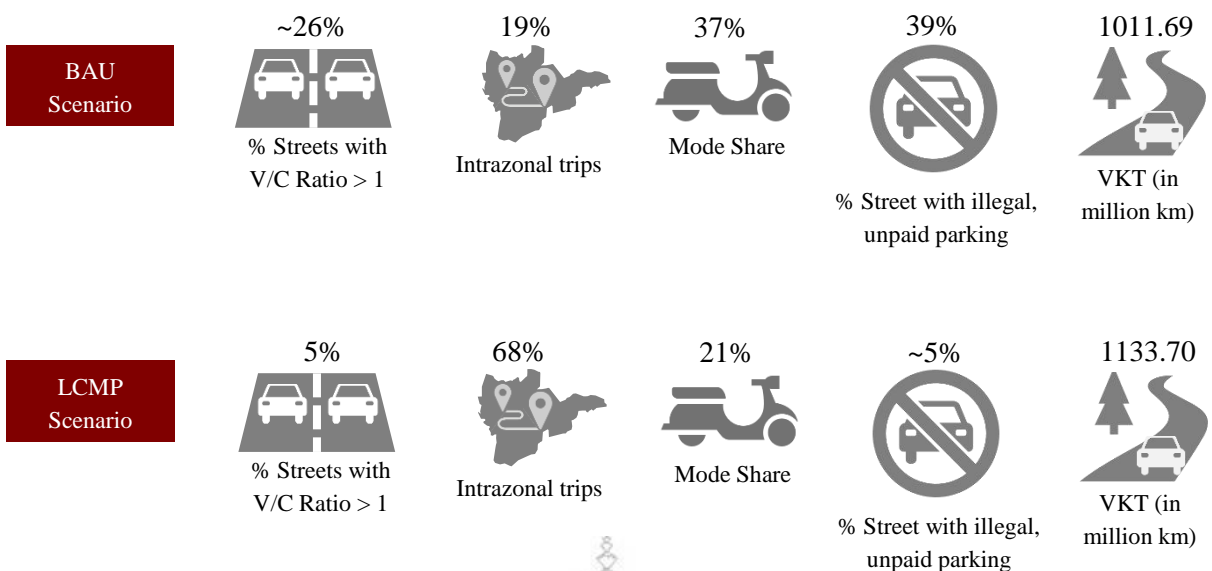
Scenario I (UNEP, 2016)

- **Strategies:** To promote a more compact and uniform growth in Udaipur, the LCMP focuses on two main strategies
 - (i) Increasing the intensity of mixed land-use in the city and
 - (ii) Increasing the density along PT corridors through infill development or green-field developments along the PT/ IPT corridors.
- **Principles:**
 - (i) Creating land-use pattern conducive for smaller trips and shorter travel distances
 - (ii) Reversing the current travel demand, increment in intrazonal trips by increasing intensity of mixed land use (commercial, education and recreational) by 40%,
 - (iii) Ensuring better connectivity between retail jobs and housing and using serviced land efficiently to create a more compact urban form.
 - (iv) Developing self-contained neighborhoods along PT corridors to decrease automobile-dependency and provide travel options for those not owning cars -.proposes three-fold increase in gross residential density, in zones falling within 500 meters' walking distance of the proposed trunk PT corridors with Non-Motorized Transport (NMT) friendly neighborhood design follows.

Proposals related to Motorization & Road Infrastructure:

- Reduce personal vehicle mode share from 37% to 21% in 2030 to mitigate air pollution & emission related impacts
- Cap annual vehicle kilometer travelled at 1335 million
- Interventions for an efficient road system that minimizes conflicts:
 - A new by-pass road with right-of-way (ROW) of 60m proposed connecting the highways,
 - A new 11 km road with ROW of 36m perpendicular to the by-pass road, for segregating intra- & inter-city traffic,
 - A 48 km of new road network with ROW 24 m,
 - A new flyover near dense areas to reduce bottlenecks,
 - New Parking Policy, Smart Parking Management System, to increase effective ROW and decrease congestion
 - 4 truck terminals in the peripheral areas along heavy freight traffic corridors.

As a result, a 20% decrease in traffic congestion is projected.



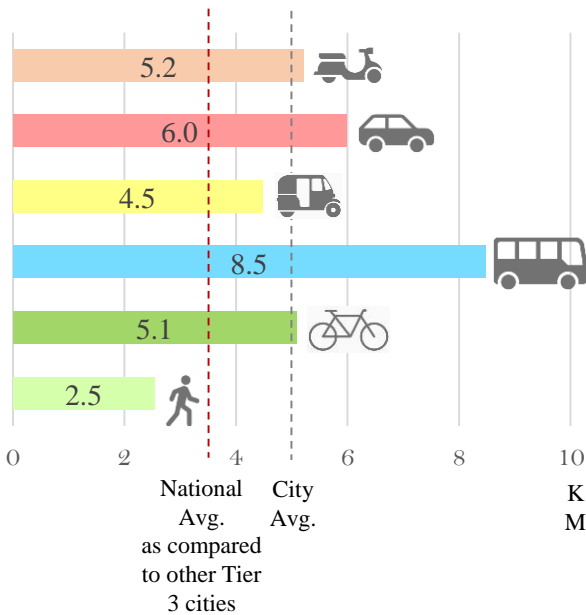
Proposals related to Non-motorized Transport Network & Infrastructure:

- (i) improving the NMT modes' use for short distances as well as last leg connectivity in case of public transport use through 133 km of new, "obstruction-free" footpath network with a desirable width of 2m or above and upgrading 10 km of existing footpaths to a minimum width of 1.5m.
- (ii) introducing signalized pedestrian crossing at intersections, night-time semi-mast lights, pedestrian crossings and handrails to ensure safety and comfort among pedestrians.
- (iii) promoting cycling in Udaipur's challenging terrain through 40 km of segregated cycle tracks, bike-sharing schemes with docking points at all tourist attractions.
- (iv) creation of three vehicle-free Heritage Walk routes having safe and inclusive access in the walled city to promote tourism
- (v) increasing share of households residing within the 10 minutes' walk of PT stop from 16% to 83%.

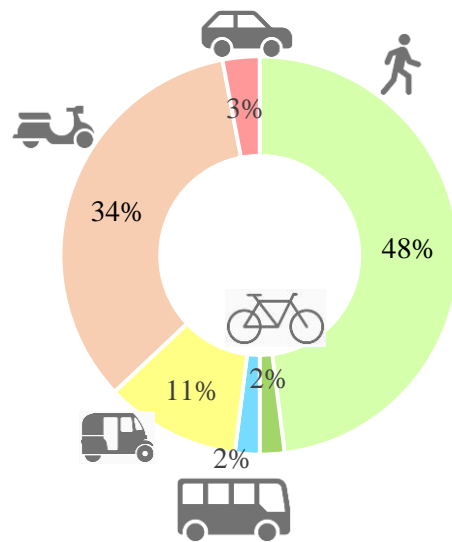
Proposals for Public Transport Network & Infrastructure:

- The proposal is to improve bus mode share from 2% to 32%, reduce VKT by 90%, reduce congestion by 20%, and reduce emissions by 35%. The specific proposals are:
- (i) Strengthening the IPT system with improved fixed routes, schedules and fare structure,
 - (ii) Phase-wise introduction of new bus-based PT system with 2 trunk routes and 7 feeder routes,
 - (iii) Providing an accessible and integrated bus system with other transport modes,
 - (iv) Provide reliable PT system using advanced ITS facilities, and,
 - (v) Providing an affordable PT system for all socio-economic groups.
 - (vi) providing adequate supporting infrastructure like Bus Shelters, Bus Terminals, and Depots,
 - (vii) running public participation and mass awareness programs to enable a modal switch to PT/ IPT.
 - (viii) converting the old IPT fleet to BS VI norms.

Travel characteristics



Fatalities by users



Scenario III (2016)

Strategies: To mitigate trade-offs of LCMP proposals, and foster synergies with SDG 1, 3, 5, 8, 11 & 13, this scenario relies on:

- (i) accounting for a higher for a travel demand caused by higher workforce participation rates for women and poor
- (ii) ensure 100% NMT coverage within the city
- (iii) promote long-term, paid parking mechanisms to increase effective ROW in commercial and dense areas
- (iv) preserve tangible cultural heritage with minimal intervention to mitigate trade-offs with SDG 1, 8 & 11

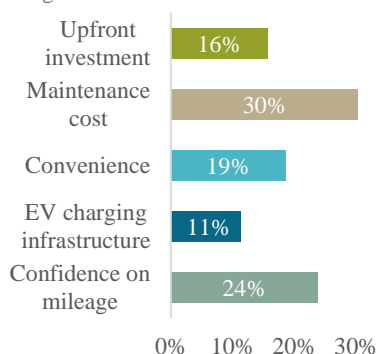
Principles:

- (i) mitigating the trade-offs caused by intensive road infrastructure expansion
- (ii) discourage the use of private motorized vehicles and promote PT and Mobility-as-a-Service (MaaS)
- (iii) inclusive street design to promote safe, multi-functional streets for all, with designated spaces for street vendors and curbside pick-up/drop-off points for MaaS
- (iv) leveraging the cultural & built heritage in the walled city through pedestrianization and NMT-priority zones

Proposals related to Motorization & Road Infrastructure:

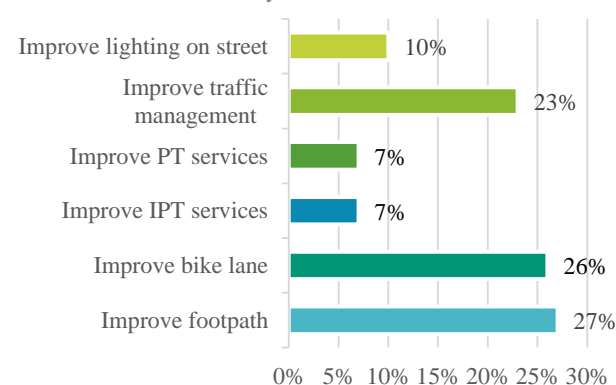
- (i) avoid 50 km of new road/ flyover construction and all proposed road widening project to prevent displacement and eviction of residents and businesses (SDG 1 & 8) in the area,
- (ii) formulate a robust traffic management plan with focus on equitable distribution of road space,
- (iii) formulate a parking management, freight management to reduce traffic congestion and road safety concerns
- (iv) introduce congestion pricing for private vehicles within walled city as decongestant measure
- (v) subsidize a shift to electric vehicles, specially for IPT fleet and 2-wheelers for emission & pollution reduction.

Recommendations from private vehicle users for shifting to electric vehicles



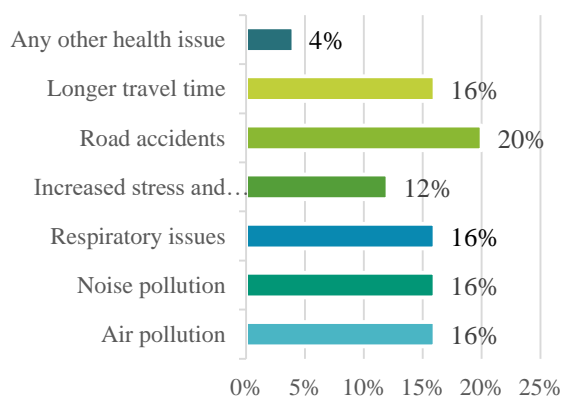
Source: Primary Survey, October 2020

Recommendations made by tourists

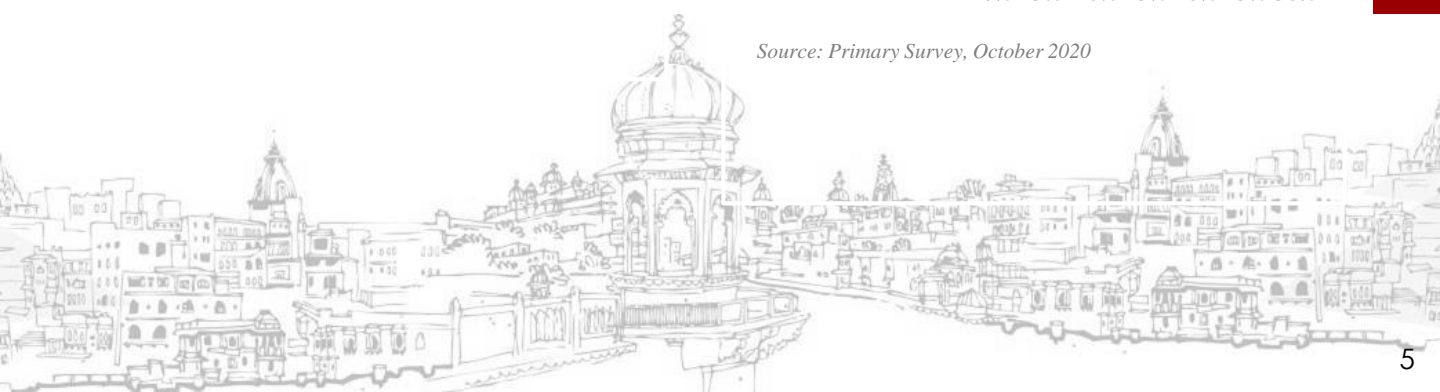


Source: Primary Survey, October 2020

Issues encountered by households due to proximity to flyover/ bridge/ major road (6 lanes or above)



Source: Primary Survey, October 2020



Proposals related to Non-motorized Transport Network & Infrastructure:

- (i) increase footpath width to 4m along commercial fronts and tourist spots for safe & easy pedestrian access.
- (ii) redesign high-conflict intersections with refuge islands, smoother/ flattened turning curves, pedestrian/ cycling signals and reduced carriageway widths.
- (iii) prioritize cycle lanes to build a robust cycling network; supplement with wide-spread bike-sharing network.
- (iv) pedestrianize all local and collector streets in and around walled city to ensure mobility for all;
 - (a) To ensure access to all, main circulation streets within walled city can allow PT (smaller buses) and IPT
 - (b) To ensure public safety, intermediate streets must enable emergency vehicles (fire-brigade, ambulance)
 - (c) Pedestrianize with an operation hour window- like 8 am to 10 pm, to allow walled city residents access
- (v) Supplement pedestrianization with reliable PT/ IPT services and parking spaces for private vehicle users.

80% of tourists responded that they would enjoy pedestrianization of the old city.

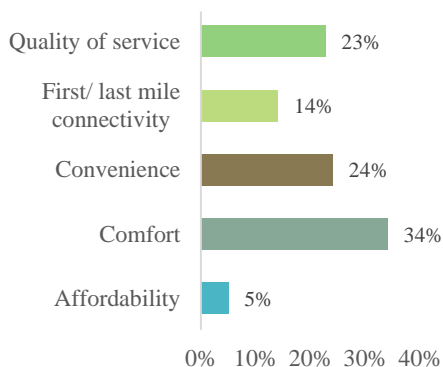
95% Shop owners and street vendors believe pedestrianization will positively affect their businesses.

“Fateh Sagar lake front and adjoining streets have an interesting model: during mornings and evenings, no traffic is allowed there, so people can leisure... An upscaled version of that model needs to be implemented within and around the walled city, especially around major stretches like City Palace Road, Museum Road to Jagdish Chowk and others. UNESCO also recommended the same, but since Udaipur is now a Smart City, they are considering only certain smaller segments. The UMC really must consider pedestrianizing entire walled city.”- FGD Participant (Expert)

Proposals for Public Transport Network & Infrastructure:

- (i) shaded bus stops/ stands every 500m with adequate seating space, route information, signages and raised platforms for easy boarding and alighting;
- (ii) provide cycle parking, docking stations and designated drop-off/pick-up points at all major bus-stops & stations
- (iii) redesign streets to accommodate bus bays along all routes and bus-priority lanes along trunk routes.
- (iv) increase number of feeder routes to increase access for 20% households left-out of routing
- (v) Mini-Buses serve a much more vulnerable and sparsely located population, hence integrating it with the high-demand routes as feeder busses enables access to peri-urban households within UUCA
- (vi) bus stations should have drinking water, public toilets, and resting facilities for bus drivers for decent working conditions.
- (v) develop the solar-powered ferries as PT specially to connect the lakes/ green spaces to the walled city.

Recommendations for enabling a modal shift to IPT/ PT services by other users

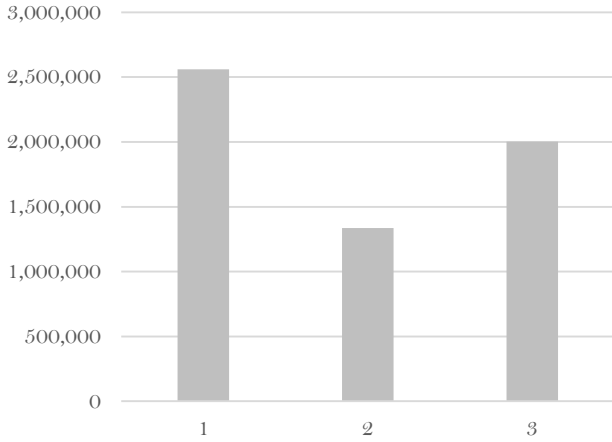


Source: Primary Survey, October 2020

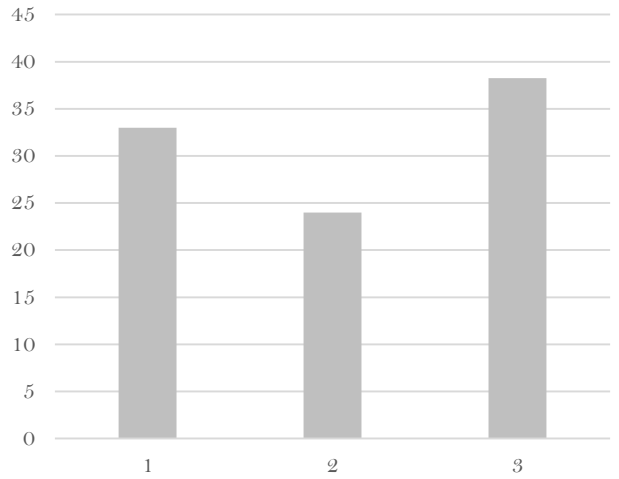
“Considering the narrow streets of Udaipur, pedestrianization with traffic circulation mechanisms like One-way Streets would be the best fit for the historic core.” –FGD Participant (Expert)



Annual Motorized Vehicle Kilometers Travelled (VKT)



CO2 (million)



Scenario-wise SDG Assessment	BAU Scenario						LCMP Scenario						SDG Scenario						
	SDG 1	SDG 3	SDG 5	SDG 8	SDG 11	SDG 13	SDG 1	SDG 3	SDG 5	SDG 8	SDG 11	SDG 13	SDG 1	SDG 3	SDG 5	SDG 8	SDG 11	SDG 13	
Land Use & Density	Trade-off	Mixed Impact	Mixed Impact	Synergy	Synergy	Trade-off	Mixed Impact	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy
Motorization & Road Infrastructure	Trade-off	Trade-off	Trade-off	Mixed Impact	Trade-off	Mixed Impact	Mixed Impact	Synergy	Mixed Impact	Mixed Impact	Mixed Impact	Mixed Impact	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy
NMT Network & Infrastructure	Trade-off	Trade-off	Trade-off	Trade-off	Trade-off	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy
PT Network & Infrastructure	Trade-off	Trade-off	Trade-off	Trade-off	Trade-off	Trade-off	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy	Synergy

■ Synergy
 ■ Mixed Impact
 ■ Trade-off



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