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LEDeG (Ladakh Ecological Development Group) works on promoting ecological and sustainable development that harmonises with and builds upon local traditions and culture of Ladakh.

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Liveable Leh Project - The overall objective of the project is to strengthen capacities of the local government, the Ladakh Autonomous Hill Development Council (LAHDC) to make Leh, its prominent capital city and surrounding areas more environment friendly and a symbol of resilient and sustainable urban development.

The contract number is CSO-LA/2017/393-560



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A Sustainable Public Transport Plan for Leh Town



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Chapter 1 Introduction

Vision statement

To make Leh into a city that has a reliable, accessible, inclusive, smart and sustainable public transport system supported by a pedestrian and cycle friendly environment; with an effort to maintain public spaces and streets that include a level of convenience, safety and attractiveness to pedestrians, so as to encourage walking and cycling.

Liveable Leh Project

The overall objective of the project is to strengthen capacities of the local government, the Ladakh Autonomous Hill Development Council (LAHDC) to make Leh, its administrative headquarters and surrounding areas more environment friendly and a symbol of resilient and sustainable urban development.

The contract number is CSO-LA/2017/393-560

Specific objectives:

- To train its officials, strengthen institutions to conceptualize and develop Leh as a resilient and liveable mountain city;
- Prepare implementation plans to aggressively improve public services that have deep environmental impact (sewage treatment, waste management, green public spaces and transportation)
- Educate its 30,000 residents and 250,000+ tourists on issues around climate change.

Purpose of the plan

As per Work package 2.2.c: to create a detailed strategy and plans for public transport and traffic control.

The purpose of these plan is to adopt and enforce regulations that limit vehicles in certain areas in order to create peaceful and walkable spaces. A system for shared public electric bicycles that would get cars off the roads, and make commuting (by electric bicycle) much easier and safer for women, the elderly and even children.









ACCESSIBLE

PUBLIC TRANSPORT

WALKABLE TOWN

Leh Town

Leh town is one of the two urban centres in Ladakh and administrative headquarter of Union Territory of Ladakh. A Class 3 town, which comprises of 13 municipal wards with a total population of 30,870, (*as per Census 2011*). The municipal area measures 17.6 sq.km. It is an important tourism town and the educational, political and the economic centre.

Leh town is the nerve-centre of the Leh District, it is not only the administrative headquarter of the district but also remains the only urban centre in it. it provides various services including administrative, heathcare, education, commerce, transportation and communication and a host of other facilities necessary for survival and growth.

It has been experiencing rapid growth in its population since the 1990s. It also supports a floating population that comprises of labourers, defence personnel and tourists. The town is the most urbanised area in the Ladakh region, it attracts lots of migrants from all over the region for job opportunity.

Leh is a monocentric town and faces different urbanisation challenges. This includes traffic congestion as most trips converge towards city centre, high tourist influx, pollution, inefficient public transport, unsafe and unattractive streets and, most of all, inaccessible and limited pedestrian infrastructure. Due to its urban sprawl, land-use and satellite towns that have emerged around Leh's municipal boundary, th town attracts a lot of traffic and travellers who are directly dependent on the city centre for business, office, shopping and educational purposes.



Goals and Objectives



Chapter 2 Why Active transportation Matters?

Sustainable Urban Mobility

Sustainable urban mobility is an issue of increasing importance in towns and cities around the world. With a steadily growing population in Leh town and its surrounding areas, intra- and inter- urban mobility needs are on the rise, resulting in heavy dependence on private cars. This has resulted in a continuously growing number of cars, which leads to increased pollution. This car-oriented urban transport system has various negative environmental impact, health problems and scarcity of quality public space in Leh.

Leh town needs an effective and long-term solution for sustainable urban mobility by creating ideal conditions for the use and promotion of alternative environmentally-friendly modes of transport such as walking, cycling and efficient public transportation.

To achieve this, the focus of the plan is to improve the walkability of the town

Walking in an urban environment goes hand-in-hand with cycling and public transport, which act as pedestrian accelerators. Walking is the most basic, important and environment-friendly form of sustainable urban transport system.

Four main aspects of sustainable urban transport systems (Swartz, 2015).

- **Density and connectivity** to make active forms of transport such as walking and cycling an obvious and practical choice for city dwellers.
- Access to multiple methods of transportation transit interchange points should be developed at a variety of points where different modes intersect.
- Intelligent transport system that take advantage of advanced ICT solutions.
- **Transport networks and services** that are accessible everywhere and all the time by everyone.

TRANSPORTATION PLANNING IS CHANGING



Sustainable Urban Mobility

This definition clearly puts walking (together with cycling) in the number one position when it comes to sustainable urban mobility.

WALKABILITY

Walkability is quality or measure of how friendly an area is for walking. It is defined as the extent to which a town is suitable for walking as a mode of mobility for work and leisure, or the extend to which walking is available to the residents as a safe, accessible, connected and pleasant activity. Or simply, the general walking condition in an area.

Walkability is more than just properly maintained pedestrian infrastructure. There are other aspects of the city's fabric – the streets, neighbourhood and buildings, density, attitude, etc.

People will walk when walking is useful, safe, comfortable and interesting.

- Useful when functions and services are accessible within walking distance.
- Safe when people can reach various services easily through safe streets, walking is safe and pedestrians feel safe (from traffic, accidents, crime and violence).
- **Comfortable** when walking conditions are good (well-maintained footpath) with infrastructure to sit and space for standing and playing.
- Interesting when walking routes are lively, well-lit, facades of building and shops are interesting, outdoor cafes etc.

Walking is the most efficient, affordable and fundamental form of mobility, it makes an individual more physically active and socially engaged, brings life to streets and promotes human interaction, exchange of ideas and generates additional economic values and has a low environmental impact (K.Tashi, 2019).



WALKABLE TOWN



Problems and challenges in Leh Town

Walkability is not just an idealistic urban development concept, improving walkability is fairly simple and very practical solution to many bigger urban challenges that currently exist in Leh town.

Lacks pedestrian infrastructure – only 7.8% of roads have footpath coverage in the Leh municipal area. Existing footpaths are in bad shape, inaccessible and have no lighting facilities.

Narrow roads – most of the roads in Leh town have insifficient space for proper pedestrian infrastructure whic is further reduced by irregularly placed electric and telephone poles.

Car-oriented designs – the city is losing right of way spaces to parking bays instead of sidewalks. Furthermore, placing dividers and bollards on narrow carriageways for smooth flow of vehicular movement makes the streets unsafe for crossing and increases risks of pedestrian – vehicular conflict.

Public transport failure - only 13.5 percent of the municipal area is under public transport coverage, which remains reliable and overcrowded with no infrastructure or predictable schedule.

Urban mobility malfunction – with 86.5 percent of total municipal is transit desert and lacks transit facilities i.e. no public transport access, inconvenient walking infrastructure, people using car even for short trips. These reasons lead more traffic congestion in the city centre and other commercial areas thereby increasing parking demand.

Congestion and parking problem - Congestions and parking problems are closely interrelated. People drive around, looking for parking places (referred to as

cruising), which creates unnecessary additional traffic, contributing to congestion. Leh town is developing an increasing amount of parking space, and emphasising it even for public buildings or spaces. The problem is that ample (especially free) parking encourages people to use their cars, which in turn contributes to congestion. The need for additional parking in Leh will never end.

Ignorance of NMT - active forms of transport such as walking and cycling are given very little importance in Leh town, be it street space allocation, pathway maintenance, cycle-friendly streets, speed limits or cycle parking facilities.

Losing of public space and activities – Leh town has a mere 4.78 square metre per capita of open and public space. Urban streets have for centuries served as public spaces where people meet and socialise and were an important part of the community. However, increasing use of vehicles in Leh town has led to congested streets, increasingly narrow footpaths, which are systematically encroached by shops and businesses. All this leaves no space for social activity.

Increasing dependence on vehicles – Dependence on cars and ownership of vehicles are on the rise in Leh town, as it lacks other modes and facilities of transportation. Furthermore, it remains monocentric. All this encourages the use of vehicle. For instance, 27 of 33 staff members at LEDeG (a Leh-based NGO that works towards sustainable urbanism and ecology) uses private vehicle to travel to office.





















Importance of promoting walkability in Leh Town

Transport is an essential part of modern life, but it comes with a high cost in increased greenhouse gas emissions and air pollution. Leh being a part of a sensitive Himalayan region, have to work on meeting the mobility needs, more sustainably and effectively.

In Leh town there is an urgent need to reduce the use of motorised transport by developing environmentally-friendly and sustainable mobility solutions that provides a healthier and liveable environment for its residents.

The central challenge in Leh town is the strong dominance of automobiles. Cars have literally taken over the town. This has resulted in numerous problems including health impacts on residents, degradation of the town's environment, undermining of the local economy and increased strain on social cohesion. The way forward will require a change in philosophy. Instead of planning for traffic and moving cars as efficiently and quickly as possible, we need to concentrate on moving people as efficiently and quickly as possible.

To achieve environment-friendly mobility, Leh town needs to reduce travel demand and shift towards increasing acive forms of transport (walking and cycling) along with public transport while reducing the number of car trips.

Active forms of transport such as walking and cycling play a crucial role in making urban transport more sustainable. Leh needs to focus on creating an environment that encourage pedestrians to walk i.e. improve the walkability of the town.

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Benefits of walkable Leh

Walking and the walkable environment has many advantages and benefits including onces related to health, economy, social equity, environmental sustainability, sense of place, attractive build environmental, mobility, and public transport (K.Tashi, 2019).



Improves public health

Walking is the most common and the easiest physical activity. It is the most practical way to improve public fitness and health. It is the only realistic way to get one's daily half-hour of moderate exercise, which is the minimum level needed to stay fit (VTPI, 2017). The health benefits include prevention of chronic and cardiovascular diseases such as obesity, diabetes, certain types of cancer, hypertension, depression and osteoporosis and lower body mass index (BMI). Walking also promotes strength, endurance, bone density and flexibility resulting in individual well-being.



Boosts economy

Pedestrian movement increases economic transactions through different activities like eating and shopping. It enhances the economy by increasing street shopping, tourism, and supports local businesses, retailers, recreation activities and increases property value.



Walkable environment increases community cohesion (quality and quantity of interaction between people) in the area. It encourages and facilitates social interactions, exchange of ideas, social and cultural gatherings, cultural exchange, makes streets vibrant, and safer and enhances social life in the community.

Sense of place



Walkable environment increases the sense of belongingness and pride of residents. Making communities more walkable increases the sense of place i.e. the feeling of appreciation for the distinct character of the locality that includes various characteristics of the place, imageability or the quality of the place that makes it different, recognisable, and memorable (Cowan, 2005). Good permeability and legibility affects how people easily understand the area.



Attractive streets and environment

Walkable environment makes the street more vibrant and improves the quality of the public realm, it increases the interest of an area that can be visual and social, This is facilitated by improved design of streets (wider sidewalks and pedestrianised streets), transparency of fronting structures, visual activity, trees and natural features, views, places to socialise and most of all, the presence of other people and social activities. Improving walkability can support all these activities (Litman, 2013).



Walkable environment increases two types of safety : From traffic and from crime. Walking increases community safety for all, Research suggests that shifts to non-motorised transport results in an increase in road safety.

A walkable environment has vibrant and well-lit streets with a pedestrian presence that results in a low occurrence of crime. The presence of sidewalks, dedicated cycle lanes and pedestrian-friendly environment further increase safety from traffic. (Cowan, 2005)



Adopting walking as a mode of transport helps reduce transportation problems such as traffic, parking congestion, traffic accidents, noise, air pollution etc. It also makes the street greener and more interesting. Walking is a green mode of travel with no negative impacts on the environment and is one of the most sustainable forms of transportation.



Walking is the best way to promote social inclusion since nearly everyone can walk and share the same infrastructure. It is the most affordable mode of transportation. Lower income groups, and transportation disadvantaged communities rely heavily on non-motorised modes of transportation. People who are economically, socially and physically disadvantaged often rely on walking. Thus, making walkable environment can also help achieve social equity (Litman, 2013).



Walkability and walking as a mode of transport can also help achieve urban planning objectives such as land use planning objectives, urban redevelopment, and mixed-use community designs. It also supports other modes of transportation like public transit. All this results in an attractive and interesting built environment.

nsport

A walkable environment substitutes the need for cars and results in fewer cars trips. Thus, improving walkability also improves public transit and its usage. It also reduces peak-hour traffic and total traffic, improves physical access and reduces the need for car travel thereby increasing public transportation.

Mobility benefits

Walking is free. Therefore it is the most affordable mode of transport and the most convenient means of accessing local shops, services, recreation, community amenities, and public transit. Walking increases travel choice and mobility. People who are transport-disadvantaged often rely on walking to make daily trips and accessing public transit.

	BENE	FITS	
Improved active travel conditions	Increased active transport activity	Reduced dependence on car	More compact community
Improves accessibility, comfort for pedestrains	User enjoyment Improves public fitness & bealth	Reduces traffic congestion Reduces parking	Improves accessibility especially for pedes- trains
tourism	Increases social cohesion	problems Saves costs	Saves tranportation costs Reduces urban sprawl
Lower traffic speed	Increases local security	Increases traffic safety	Conserves open spaces
		Reduces pollution	Makes communities more liveable
		Boosts economic development	Increases property value
			Supports mixed-use development



"

Bicycling is now increasingly recognised as an important component of the transportation system. Not only it can reduce traffic, air pollution and energy consumption, it can also improve the health and quality of life of our residents and communities.

Leh town with the average trip length of less then 5 km with the climate (cold in winters and moderate in winters) cycling is the most suited mode of transport. But the terrain limits the cycle choice to multi gear cycles and electric cycles.

Leh town should recognize the contribution that bicycling can make to mobility, environment quality, community vitality and essential 'post Covid' transport choice.





More cycling trips in the town result in a more balanced transportation system that supports a healthy and liveable community. There are significant quality of life benefits associated with cycling, which are outlined below:

Equity

Providing infrastructure for cycling and improving cycling condition can strengthen equity by providing transportation options for all residents, including ones who do not have access to a motor vehicle. Having an established bicycle network can help reduce dependency on cars and increase the affordability of transportation for people and encourage them to walk and cycle.

Quality of life

Cycling can contribute to safer streets and trails with increased activity and improved social interactions, fostering liveable and bicycle-friendly communities with residents experiencing a stronger sense of place and freedom of mobility.

Health benefits

Cycling for transportation and recreation is an effective way to support mental and physical health to build a healthier and happier community.

Environmental benefits

Promoting cycling helps mitigate climate change while also supporting the protection of one's natural environment.

Economic benefits

Construction of cycling infrastructure is less expensive per km than the cost of widening a vehicular road. By installing bicycle facilities, residents receive a safe, enjoyable and convenient cycling option, reducing vehicle congestion. Fewer motor vehicles on the road reduces infrastructure wear and tear, and reduces the need for more roadways.

Safety

Bikeable environments contribute to a safer transportation system by making cycling a more visible and viable mode of travel. Increase in cycling leads to a decrease in incidents of collisions with motor vehicles. This is known as the "safety-in-numbers" principle. As a result, locations with the highest number of cyclists are also the safest places to cycle.

Cycling - A Green means to Covid recovery

The Covid-19 and the Lockdown in Leh town brings a dramatic change in the mobility sector, cycling emerges as a new form of personal transport mode in the town. Market roads where you could see few cyclists pre lockdown now flourishes with more then 18 cyclist per 5 minutes, cyclist of all age and gender are using bicycle for short and medium trips in the town. Walking and cycling in the town are increased, people enjoy their daily exercise or take essential journey they might otherwise made by personal car.

Countries all over the world is prioritising cycling as a key component of re-opening strategy, WHO has advised people to consider riding bicycles or walking to provide physical distancing while helping to meet the minimum requirement for daily physical activity.

Bicycle provides a mode to ensure that people carry on with their daily tasks albeit with social distancing strategies in place.

Encouraging and Promoting utility cycling will allow more people to safely travel without coming in contact with multiple people. When a significant number of people take to cycles, it will also help reduce crowds on public transport systems.

The 'new normal' in Leh needs promoting greener transport options especially walking and cycling.

Challenges for cycling in Leh

Lack of space allocation for cyclists - urban roads in Leh town are very unsafe for cyclists and most of the space and right of way remain in favour of motorists.

- Lacks cycling infrastructure The town has no infrastructure for cycling. It needs cycling lanes, parking facilities for cycles, cyclist sheds etc.
- The town terrain The sloppy terrain (3 to 10-degree slopes) of the town reduces the ease of cycling, One needs expensive cycles with multi-gears to navigate around Leh town.
- Narrow roads the town's arterial and major roads are narrow and lack space for cycling lanes. Cyclists are forced to share space with motorists.
- **Safety issues** the growing population of stray dogs poses a major safety issue followed by improper lighting and vehicular traffic. These safety issues discourage cycling in Leh town.





Chapter 3 An analysis of existing conditions



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GANGLES

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GONPA VILLAGE

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Demography

Population of the town

Leh's permanent resident population was estimated at around 35,807 in 2019 and the total population. including floating population is estimated at 65,927.

Туре	Population	Source		
Local population 2019	35,807	Primary and secondary surveys - ICDS - District statistical Department		
Tourist	11,460 (one-week footfall)	294710 (May to September 2019) - Tourism department Leh		
Migrant labourers	18,660	- Police stations - Labour registration department		
Total population	65,927	Peak Population in summers on a given day		

Table 1 Total population of the town

The population of the city varies seasonally. In summers, it shoots up to 65,927 with the arrival of tourists and migrants (labourers and villagers). In winters, it falls to 35,807 (local population).

The total population on account of the following special factors: **Besidents**

The current local Ladakhi population was 35,807 in the Leh municipal area. In 1921, there were 2,401 residents in Leh town and this number increased to 30,870 in 2011 (Census 2011). The current population is 35,807 but it is difficult to estimate the rural-urban migration within Leh district, particularly from nearby villages.

Residents of Leh Town

2027E	******	<u>†††††††</u>	,,,,,	*******			
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2001	******	******					
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1971	ŤŤŤ						
1961	†† i						
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1941	ŤŤ						
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1921	İ					- Porconc	
	10,000	20,000	30,000	40,000 Figure 3 Popu	50,000	wth of Leh	
				I IYUIC O FUDU		WUITOT LETT	10°

Note: The sharp jump in population from 1991 to 2001 is partly due to expansion of administrative boundaries of the town.

The above chart shows that in the 1990s, Ladakhis moved to Leh town seeking better schools, hospitals and livelihoods. By 2011, the population reached 30,870, representing 34% of the district population. Since 2008, tourism has driven the town's growth, and the population is likely to cross 41,000 in 2027.

This growth has also expanded the physical limits of Leh town, and residential colonies have emerged on the town's periphery. While India's urban population grew by about 2.1 times between 1991 and 2018 (217 million to 460 million), Leh's has grown 3.4 times. The resident population in Leh town drops by 15-20% from summer to winter by 15-20% as many escape to warmer places.

Net residential Density

The net residential density of the city is 135 hectare per person (pph). Ward 11 or Snemoling has the highest population density as it is located on a hill. This is followed by Ward 13 or Leh core area. Ward 1 or Upper Leh has the lowest lowest population density in the whole town.



Tourism

Ladakh was opened for tourism in 1974. Since then, many other areas in the region have also been opened up for tourism. In Ladakh, Leh town has emerged as an important tourist destination.

Despite the extreme cold in the winter months from September to April, when tourist traffic is at its minimum, Leh still has visitors, Most tourists prefer to use Leh as their base to explore other parts of Ladakh.. It is thus important to ensure that Leh has basic civic amenities.

If we are to use 2018 as a case study, then around 294,710 tourists visit Leh between May and September and stay in Leh for about seven days on average. This amounts to about 11,460 tourists on any given day. (This calculation is based on 294,710 visitors x 7 days per visitor / 150 days of the tourist season).

Almost 70% of the tourist population remains concentrated in four wards of Leh town. This includes Ward 3 (Changspa), Ward 4 (Tukcha), Ward 5 (Sheynam) and Ward 13 (Leh Main market). These wards have the highest concentration of hotels and guesthouses.



Map 3 Ward wise Tourist distribution

According to Tourism Department, Leh, a total of 277,255 tourists visited Leh in 2017 while 322,000 visited in 2018. In comparison, in 2007 only 54,346 tourists visited—this is six-fold growth in 11 years or an annualised growth of 18%.



Total tourists visiting Leh

Migrant population

There are two main categories of migrants in Leh town: Migrant labourers and local villagers.

Migrant labourers: These individuals who originate from distant places such as Nepal, Bihar, and Uttar Pradesh. These labourers are concentrated in areas with lower rents especially Ward 12 (Skampari). These areas have a high pedestrian footfall with almost no pedestrian infrastructure.

Local villagers: These are villagers who reside in the city for jobs and education or who have shifted from primary to tertiary activities. This group of migrants are distributed along the eastern and southern part of the town. Apart from these migrants, around 20,000 to 25,000 security personnel are stationed in and around Leh town or are in transit from other parts of Leh and Kargil districts. Even though MCL is not directly responsible for providing facilities or infrastructure to the armed forces, they are still using resources such as groundwater and contributing to traffic and pollution around Leh town.



Map 4 Ward wise migrant distribution

Spatial characteristics *Net density*

Walkability of an area depends on its urban form, which can be characterised in terms of proximity (distance between trip origin and destination) and connectivity (directness of travel route). The proximity is measured by density and land use. Density shapes pedestrian

activities by bringing numerous activities closer together and so increasing their accessibility from the trip origin and people's willingness to use slower modes of travel, such as walking for shorter distance.

The above map shows the net density in different areas of Leh town. Neighbourhoods such as Skalzangling, Ibex colony, Housing Colony,

Murtse, Snemoling and Old town have the densest concentration with more than 100 persons per kilometre. These areas also have the highest pedestrian footfall and activity as people prefer walking for short trips.

Built-up density

The map shows the built up density or settlement density of Leh town. The built up density influences land use and travel pattern for the whole town, Areas with higher density (Skalzangling, Ibex colony, Housing Colony and Leh market area) are the major activity and commercial centres of the town. They attract trips from other areas with lower density Almost all the internal trips in Leh town are to and from these areas.



Map 5 Net density



Land use

Land use also influences pedestrian activity and movement. Land use mix is a component of proximity i.e. the distance between or intermingling of different types of land uses. Land use mix increases accessibility as result of increased number of available destinations within walking range. The accessibility of destinations (offices, shops, restaurants, schools, etc) within walking distance from origins (homes, stations, Hostels, etc) increases the probability of walking.



Map 7 Land use

The current land use of the town has 54% under agricultural use, which includes residential facilities within fields. Around 21% of the town is used for residential facilities and is primarily located towards the south of the town. Only 3% of the town is under commercial use.

Ward 1 (Gangles), Ward 2 (Sankar), Ward 3 (Changspa), Ward 4 (Tukcha), Ward 5 (Sheynam) and Ward 6 (Skara) have predominantly agricultural land with residential and commercial (hotels and guesthouses). This part of the city is being urbanised but lacks infrastructural and commercial (shops and market) facilities.

Ward 7 (Skalzangling), Ward 8 (Ibex colony), Ward 9 (Murtsey colony), Ward 10 ((Housing Colony), Ward 11 (Snemoling) and Ward 12 (Skampari) are predominantly used for residential facilities.

Land use classification



Figure 5 land use classification

Settlement typology

The city has five different types of settlement patterns. Development has taken place based on availability of land in the mountainous terrain. The patterns of streets also emerged accordingly.

a) Areas with agriculture fields

As 53% of land use is under agricultural land, the northwestern part of the city is predominantly agricultural fields. This part of the city hosts the highest concentration of hotels and guest houses and serves as a major tourist area. Here built up structures or houses are scattered among the agricultural fields but the density is low as compared to other areas.

b) Planned area

The Housing Colony area is somewhat planned though it conforms to a gridiron structure. No other infrastructure and facilities exist in this area. It has narrow streets, dense population and lacks pedestrian infrastructure.

c) Hill settlements

Ward 11 (Snemoling) is settled on a western face of a hill, and accessibility to this area is limited and has no provisions for infrastructure, or basic facilities such as water. Though this area has the highest net residential area, the area is largely neglected by urban local body.

d) High-density Organic settlements

The core city or the old town area and areas around it are the oldest and organically developed neighbourhoods. It is connected by a maze of narrow, winding paths. Most of this area is only accessible on foot even now.

e) Areas settled around the highway

The southern part of the city is developed around the main road or highway and many major commercial areas and important facilities are located along the road with some residential areas around it.

Ward level characteristics

To capture the town's characteristics, it is divided into seven uses or functions

a) Urban centers

They are the major commercial centres with the densest neighborhoods. They act as the town centre with diverse land uses, employment opportunity and major economic transactions take place in these areas.reas.

b) Hub urban villages

These areas offer a balance of housing and employment but are generally less dense than urban centres. Hub Urban Villages provide a mix of goods, services, and employment for their residents and surrounding neighbourhoods.

c) Residential

These area are predominantly residential and about 70% of the town's residents live here.

d) Urban villages

These are the areas with predominantly agricultural activities. Ward 1 (Gonpa/ Gangles) is a good example of this.

e) Tourist areas

Hotels and guest houses are concentrated in these areas along with commercial places oriented towards the needs of tourists.

f) Institutional

These areas have major government or semi-government institutions.

g) Manufacturing/ servicing

These are the areas with major small-scale industrial units, workshops, car repair and service shops.



Map 8 Urban characteristics

Transportation scenario in Leh town Road network and classification

National Highway 1D and other important state highways provides basic cinnectivity to the town. Leh town has a total road length of 133 km within its municipal limits with a road density of 10.2 km/sq km

The road hierarchies in Leh can be classified as per their functions (not as per their width)

National highway	5.9 km
Arterial roads	20.8 km
Sub-arterial roads	17.3 km
Collector roads	78.2 km
District roads	10.9 km
Pathways	40.7 km
	Table 2 Road hierarchy

Leh has 40.7 km of pathways and a significant proportion of its road network is in the form of 'collector' road.

The pathways play a major role in the walking culture of the city and has a network of pathways that act as shortcuts or interconnections between the wards.



Road width

Roads in Leh town are narrow and their width is generally less than 15m. which restricts traffic speed to below 50 kmph and reduces the incidence of traffic-pedestrian conflict. There are many studies that show that narrower travel lanes are safer for everyone (Schmitt, 2016). Narrow streets feel more inviting for people on foot and are more comfortable. It also feels safe for cycling as narrow streets force cars to slow down.

Roads in Leh town lack proper infrastructure such as footpaths, lighting and a proper carriageway. There are electric poles on the narrower roads that further reduce their usable width.

Cycle tracks can be accommodated on roads wider then 15m i.e. Skalzangling road, SNM road, and Choglamsar road.

Map 10 Road width 11mi in 14.m Water body 0.5 ROAD WIDTH

Traffic volume/ vehicle flow intensity

A traffic volume count survey was conducted on the major roads of Leh town to estimate their vehicle flow intensity.

There are eight roads with high vehicle flow intensity with the highest being the SNM road where traffic from Choglamsar and Skalzangling merge. Five of the roads do not have public transport and there are no footpaths on three roads. Effective footpath width less then 1.8m on the roads with footpath. These roads have a high risk of pedestrian-vehicle conflict.



Daramatar	Road Stretch							
Parameter	GH Road	Skalzangling Rd	Choglamsar Rd	Skara Road	Old Road	SNM Road	Fort Road	Sankar Road
Type of road	Sub arterial	Arterial (NH)	Arterial (NH)	Arterial	Sub arterial	Arterial	Sub arterial	Sub arterial
ROW	12 m	18 m	20 m	10 m	7m	18m	7.5	8m
PT Route	No	Yes	Yes	No	No	Yes	No	No
Footpath	1.8	1.2	1.8 m	1.5	No	1.5 m	No	No
Effective width (min 1.8)	1.8	< 1	1.8 m	< 1	-	1.5 m	-	-
Lighting	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Pedestrian footfall (persons/5 mins)	4	125	42	43	32	38	47	36
Vehicular flow intensity (PCE/Hr)	436	977	1181	540	473	2804	382	341
Extend of conflicts	No conflict	Extremely high	Moderate	High	High	Extremely high	Moderate	Moderate
Road space distribution

The road space distribution of the above eight roads are illustrated below:

- **Choglamsar road** It is the widest road in Leh town but it is also one of the most unsafe roads with no lighting and crossing facilities, 12 to 15 inches high footpaths and fast-moving traffic.
- Sankar road It is a two-way road with no proper carriage way and obstructions such as improperly-placed electric poles on both shoulders.
- Old road It is a one-way road that is used by many pedestrians but lacks a footpath and has fast-moving traffic.
- Skalzangling road This road has commercial facilities on both side with no footpaths; existing ones are being used for parking. and has extremely high risk of accidents.
- SNM road This road have adequate pedestrian facilities.
- Fort road This road has a high pedestrian footfalls but lacks footpaths.



Pedestrian Movement pattern

For this study, pedestrian flow (5 minutes) in 35 streets (5 streets from each ward) were observed. Ward 3 (Changspa), Ward 4 (Tukcha) and ward 13 (CBD area) have the highest concentration of tourists. The streets of Ward 7 (Skalzangling) and Ward 13 (Leh CBD) have the highest concentration of pedestrian activities, though Ward 13 has more pedestrian infrastructure and Ward 7 lacks proper footpaths and lighting.



Map 12 Pedestrains flow

Roads with Footpath and Street Light

Only 10.5 km of road in Leh has a footpath This is a mere 7.8% of the total road length. The remaining 92.2% do not have any pedestrian infrastructure. Footpaths are the most important component for making any place walkable,. The biggest problem with Leh town is the lack of importance given to footpaths by town authorities.

Similarly, only 22 km of road have street lights. These are largely limited to main roads and highways. There are no street lights in any of the residential neighborhoods making them very unsafe to walk.

Travel characteristics Travel Origin and destination

The main destination in the town remains Leh market (the town centre). Almost every trip is made to Ward 13 or Leh main market as it is the major commercial area and is home to government offices.

Most people from Ward 6 and Ward 8 travel to Zone 7 as Ward 6 lacks a commercial area. Ward 7 (Skalzangling) also serves as a major market street in the southern part of the town. People from Ward 12 travel to almost every other ward as it has the highest concentration of daily wage labourers. Most of the trips are made without using cars except those travelling to and from from Ward 1.



Figure Travel origin and destination



Map 13 Roads with footpath and street light



Modal share of trips

According to our survey, around 57% of respondents are currently using a private car for travel which confirms the high dependence on personal cars, 7% of the respondents use motorised bikes, especially in the summer months, 12 % travel by public transport, 13% walk and only 10% use cycles to travel to their destination. Cycling as a form of transport increased in Leh from 0.9 % in 2018 to almost 10% in 2020. This rise indicates the shift to non-motorised and sustainable modes of transportation. The town needs to focus on providing infrastructure and facilities for walking and cycling, increasing the number of people who is public transport. These are vital for addressing traffic and transportation related issues. Leh town needs to open new public transport routes and improve services to reduce the need for private cars for intra-town mobility.

Share of newly registered and registered vehicles

Leh town is the district headquarter and nearly all registered vehicles end up in the town. Leh district has seen a drastic change in its economy and population since 2010. Though, tourism has brought prosperity to the region, the influx of people from outside has also increased. Additionally, the increase in population is also reflected in the number of cars on the road. The dependency on cars has increased as evident from the number of new cars registered at the RTO office. The number of cars registered in 2010 was 218, which increased gradually till 2017 (967) and then shot up to 1,439 in 2018. The overall count of private cars is 9,014 till 2019. Similarly, the number of two-wheelers in the region too has increased gradually.

The graph depicts the number of cars registered with RTO, Leh. There are about 10,000 cars that are registered from outside Leh. This includes Kargil, Srinagar, Jammu, Delhi and Chandigarh. Though, the count of taxis registered with the RTO is 4,454 till 2018, no new taxis were registered in 2019. There are around 5,000 taxis in which tourist visit Leh from outside regions. These taxis remain in Leh for the duration of the summer from May to October. A total of 16 buses were registered in 2010, which remained stagnant till 2017.

Mode of transport used to travel to various destinations



Figure 7 Mode of transportation to travel to the destinations

In 2018, the number of buses registered increased to 62. The rapid increase in the number of buses registered in 2018 was due to violations of route permits by taxi operators and various forms of nuisance created in different part of the region. In response, the administration in Leh revived buses as a form for public transportation.



Figure 8 Number of vehicles registered

Trip characteristics

Pedestrian survey

We surveyed a total of 400 pedestrians using Google Forms: (255 samples) and field interviews (145 samples). The questions focussed on travel, social characteristics and opinion on existing facilities and personal preferences.

Pedestrian travel characteristics

Frequency of walking

Most of them i.e. 61% of the respondents walk every day,. The town seems to use walking as the main mode of transport for short trips and people prefer walking over the use of the car.

The frequency of walking as per age group

All age groups are represented among those who walk every day. Most school-going children walk to school every day, and people in other age groups walk for short trips.

Most people in the age group of 20 to 24 and 25 to 44 walk every day, Most People in the age group 45 to 64 walk a few times each week. Thus suggests that people from all age group are active and prefer to walk

Trip purpose as per age group

Most trips are made for shopping followed by trips for work and recreation. People in the age group 14 to 19 walk to school, while those in the age group of 20 to 24 and 24 to 45 walk for employment wherein they walk to the bus stop and use public transport.





Figure 11 Trip purpos

Walking duration

The average time that people walk is 25 minutes as public transport is only limited to two roads. People living in the southern part of the city walk to the bus stop. People living in the central part of the city prefer to walk and then use other modes of transport.

Walking duration as per age group

Most people walk for almost 30 minutes. Few of them walk for more than 45 minutes. People in the age group of 45 to 64 generally walk almost 15 minutes. Most people in the age group of 20 to 24 walk for 16 to 30 minutes.

Our observations suggest that people in the age group of 45 to 64 walk less because most of them prefer to use cars over walking. Children generally walk more than 30 minutes as their school is located at a distance of about 30 minutes from their home. Some even walk for 46 to 60 minutes.





Figure 13 Walking duration as per age group

Safety

The streets of Leh city are fairly safe in terms of conflicts, accidents, and crime. In the survey, people rated the streets as three (fairly safe) though some of the females rated less than three (unsafe). The District Police's crime record for 2018 shows only one case of petty crime and 13 cases of pedestrian-vehicular conflict.





Major safety issues

Stray dogs –Leh has many stray dogs who behave more aggressive at night. This makes walking difficult at night. There have been three cases of dog-related fatalities in the last five years in the town.

Poorly lit- Only 17% of the road network have street lights and these are limited to highways and major roads. There are no street lights in any of the residential streets, which most people at night.

Conflict with cars- Streets have no footpath or pedestrian infrastructure, and the crossings are not safe and lack proper crossings. This leads to conflict with vehicles resulting in pedestrian fatalities.



Safety at night

A total of 83% of the streets in Leh don't have streetlights are are unsafe to walk at night. Around 57% of respondents said they feel the streets are unsafe at night. This is also because most shops shut and other activities cease after 8 pm and the environment becomes unsafe.

Figure 16 Major safety issues

Destinations within 10 minutes' walk.

Pedestrians were asked about the major facilities in their locality within 10-minute walk. They were also asked about the path conditions leading to these destinations and availability of footpaths.

In Leh town most services are limited to major markets but there is a grocery store in almost every neighbourhood.

A majority of the respondents have a grocery store near them but reported that there are no footpaths along the route.





Figure 17 Destinations within 10 minute wall

Number of vehicles per family

Most of the respondents own at least one vehicle in their family while some even own three vehicles. The total number of vehicles owned by an average family in Leh Is influenced by the number of family members who are employed.





Figure 19 Number of family members travelling on daily basis for job and education purposes

Why People Walk

Most people in Leh (62.3%) walk to go to specific places (shops, bank etc), about 27.4% walk for exercising, 17% walk to reach a bus stop, 21.7% walk to visit neighbours and relatives, 34% walk for work, 41.5% walk for regular household activities such as fetching water, milk, bread etc and 22.6 % walk for recreation including shopping.



Cycle trip characteristics

Unique opportunities for bicycling in Leh town

- Being a tourist destination and due to its distinctive urban fabric, Leh attracts different types of cyclists. This includes ones cycling for recreation, adventure and utility. Most cyclists in Leh town are recreational cyclists followed by adventure enthusiasts and utilitarian cyclists.
- According to our survey, cycling increased in Leh town form 0.9 % to almost 10% from 2018 to 2020. This rise indicates a shift to non-motorised and sustainable modes of transportation.
- An online survey was conducted in May 2020 to determine existing cycling patterns, issues and opportunities. We received 232 responses that gave us insights on current travel patterns, existing conditions and issues and opportunities for cycling in Leh town. Most respondent's (59%) started cycling after the COVID-19 pandemic. Very few (12%) respondents who are mostly adventure enthusiasts, have been cycling for the last two years. The rest (29%) use bicycles occasionally.
- Weather and season influence the use of bicycle as a mode of transport, In summer, 98% of survey respondents bike at least once a week while others cycle every day. In winters, only 29% of respondents bike at least once a week.
- The survey found that people who are new to cycling and had started cycling in 2020 tend to cycle in the morning or evening for (recreational purposes or to stay fit. These cyclists usually restrict themselves to safe roads with less traffic.
- Approximately 63% of the respondents reported that their cycling trips took between 20 minutes to one hour, while 37% reported taking shorter cycling trips along Leh's main market, Changspa street and GH road.

- Most respondents (54%) reported that they feel unsafe or very unsafe while cycling on the main roads of Leh.
- The biggest deterrents to cycling were identified as traffic safety (vehicle volume, speed, and intersection), lack of dedicated cycling facilities and terrain.



Chapter 4 Analysis of walking zones and Municipal wards

The walking culture of Leh

Old routes and towns

Leh's old town quarters is designed for pedestrians with a complex network of narrow alleys. This area is only accessible on foot along a maze of narrow winding pathways that meander past homes that are over 400-years-old. This was the first settlement of Leh town and remains only accessible only on foot even today.

This area has changed significantly over the years but is still predominantly a residential area. It has immense cultural and heritage value, The character of these narrow alleyways in many ways has influenced the structure of the CBD area. This area serves as the base for modern Leh town. The walking culture of this area still dominates and influences the main market area. Currently, old town lacks proper pathways and street lighting. It also faces numerous problems including the lack of drainage and waste disposal systems. This makes it challenging to walk on the streets and pathways in the winter as the stormwater drains freeze up and garbage is strewn on the street. In addition, the area also hosts a large number of stray dogs, which makes these streets unsafe along with issues of sanitation. Special focus is needed in this area to ensure that the area is clean, safe, and pedestrian-friendly and lively while also preserving its architectural and cultural characteristics.

Map 15 Old town

I eh old town

Pathways along agriculture fields

The town has a network of walkways connecting sparsely populated areas such as Ward 1, Ward 2, Ward 3, and Ward 4. The western part of the city is dominated by agricultural fields that are now being transformed to residential and commercial (hotels and guesthouses) use. Around 53% of the town's land use is still under agriculture fields with residential houses within and are only accessible by pathways. People from nearby areas also use these pathways as it acts as a shortcut to the main market and other areas. Tourists also use these narrow pathways instead of vehicular roads. These areas are now being connected through wider roads making them more accessible by vehicles. However, connectivity to most of the houses is only possible through these pathways. There are more than 40 km of pathway in Leh that need a major revamp to make them accessible for cyclists and pedestrians.







Circumambulations

Circumambulation is a form of pilgrimage or meditation by walking on a circumbulatory route around a religious shrine and other sacred places. It is believed that a person earns religious merit through this practice, which enables him/her to obtain enlightenment by purifying his/her negative karma. Leh town has a culture of circumambulation around Buddhist stupas and monasteries in the morning and evening. This has resulted in a walking trail that has become important in people's daily live. and encouraged developments along these routes . These pathways receive a high volume of pedestrians but lacks pedestrian infrastructure. They generally lead to stupas and other Buddhist structures, which can be improved to provide a safe and pedestrian-friendly environment.

Religious structures include -

Stupas, monasteries and Maneywalls

- SSB Gonpa
- Rtsemo
- Shanti stupa
- Sanker gonpa
- Housing colony Maneywall
- Buddha Purnima circuit a trial used by the residents of Leh to circumambulate every religious structure in the town during Buddha Purnima.



Existing Condition by pedestrian Zone

There are many places in Leh town that receive high pedestrian footfall. This includes markets, employment centres, schools, public places, transport hubs and religious places. Very few of these places are pedestrian-friendly despite being tourist hot-spots and cultural spaces of the town and having close links with pedestrian movement. The natural flow of pedestrians is determined by an adequate configuration of these spaces.

To make Leh town liveable, it needs to prioritise development of its pedestrian intensive zones.

Leh Main market

The historical Leh market is still the major market of Ladakh. It was an important market during the Silk Route trade between India and Central Asia. Since then it has undergone several transformations to emerge in its current form. Now it is the only pedestrian plaza in town with more pedestrian footfall throughout the year than any other area in Ladakh. Almost 90% of trips in Leh town is made to this area as it functions as the core of the town with the presence of all major commercial, economical, tourist and employment centres are in and around the area.

It also plays an important role in the town's urban structure along with other social, spatial and economic roles. It also plays an important role in shaping the quality of life of the town's inhabitants and the attractiveness of Leh. Leh market represents the town's identity and image.

Current status

Legibility, image and character

- It is legible with its unique buildings and locations.
- It emphasises local identity with its local architecture, structures, details and facades.
- It lacks proper signages to facilitate orientation

Comfort and convenience

- There are no facilities to provide shade and shelter from unfavourable conditions.
- There is a diversity of seats making it convenient for conversations and isolating oneself.
- It is not designed to meet the needs of elderly and differently-abled individuals.

Accessibility and ease of movement

- It is accessible by public transport as the nearest bus stop is located at a distance of 460m. However, the route between the bus stop and the plaza is not safe for pedestrian movement.
- Pedestrians movement is prioritised over all other transportation modes in this area.
- Bicycle permeability is less with no facilities for bicycle access and parking.
- Accessibility is limited for differently-abled individuals.
- There are multiple entry routes to the plaza.



Map 18 Land use map of Leh main market



Commercial and employment centres

There are four major commercial areas and few smaller markets in Leh town with a catchment area of more than 500m. Places such as Skalzangling market, Skara market, Housing Colony market and Skampari market are the major commercial area besides Leh main market. Each market attracts pedestrians from more than two wards and have a high pedestrian footfall. These markets lack any form of pedestrian infrastructure. There are government and private employment hubs around the main market and the southern part of town as found during a survey conducted in June 2018. Most people use private vehicles to commute from home and office. There are six major employment centres, inclduing Ibex Colony, Skampari, Council office, Leh main market, and Skara Yokma.

Parameter	Skalzangling Market	Skampari Market	Skara Market	HousingColony Market
Walking path modal conflict	Dangerous and inconvenient	Some conflict	Dangerous and inconvenient	Some conflict
Availability of Walking Paths	1.5-metre-wide footpath on both sides	No footpaths	Partially available	No footpaths
Availability of crossings	Not available	Not available	Not available	Doesn't need
Grade crossing safety	Risk of accident	Risk of being hurt	Risk of accident	Ascertain perceived safety
Motorist Behaviour	Rarely yield to pedestrians	Sometimes yield to pedestrians	Rarely yield to pedestrians	always yield to pedestrians
Amenities	Limited infrastructure	No infrastructure	Limited infrastructure	No infrastructure
Disability Infrastructure	No infrastructure	No infrastructure	No infrastructure	No infrastructure
Security from Crime	Some risk of crime	Some risk of crime	Ascertain perceived safety	Very secure
Maintenance & cleanliness	Very poorly maintained	Footpath not present	Very poorly maintained	Footpath not present

Table 4 Existing pedestrain environment condition in commercial areas



Map 19 Commercial & employment centres

Schools

There are 21 schools (government and private) in Leh town. Eight schools are near or along a major road and are town-level schools. The rest are neighbourhood-level schools. The roads leading to and from the schools are not safe and lack pedestrian infrastructure. Schools such as Lamdon School, Ladakh Public School, Sindh Public School, Government Girls Higher Secondary School, Government Boy's Higher Secondary School are along a heavy traffic road. So, these roads (identified on the map) need a revamp to provide walking path to reduce modal conflict, basic amenities, improve safety (perceived and actual), lighting and grade crossings with safer speed limit.



Access to parks, trails and open spaces

There are 4.78 sq. m per capita of public and recreational places for social interaction and active physical activities. Such spaces include playgrounds, stadiums, sports complexes, city parks, neighborhood parks, tot lots, zoological/botanical gardens, multi-use open spaces, market places, winter sport places, trails and public squares. Leh town needs a policy and design interventions to link major public places, spaces and important market places in the CBD area through safe and accessible pathways. Walking paths can be improved and conflict points can be solved with proper crossing, utilising small unused spaces for public by making it lively. Universal accessibility should be promoted to make the city accessible to everyone.



Transport Hubs

Public transport is the only form of mass transportation facility in Leh. Its services are limited to a certain point (Leh Gate) near the town centre. From this point, passengers have to walk to their respective destinations. Currently there are two major public transport hubs (Leh Gate and New Bus Stand) and two freight hubs. In future, the main bus station (national-level) will shift to the eastern part of Leh town. The existing site may then be used as a city bus hub. So, the most pedestrian-intensive transport hub will be at Leh Gate (transitional hub) in the future. It is important to improve crossing and footpaths to connect the hub to the markets and residential areas, There is also a need to shift the site to a dedicated hub from the road-side to improve accessibility, efficiency and safety.

Pedestrian Movement pattern

Pedestrian flow (five minutes) in 35 streets (five streets in each ward) were observed. Ward 3 (Changspa), Ward 4 (Tukcha) and Ward 13 (CBD area) have a high concentration of tourists. The streets of Ward 7 (Skalzanglig) and Ward 13 (Leh CBD) have high pedestrian activities. While Ward 13 has pedestrian infrastructure, Ward 7 lacks footpaths and street lighting.





Map 22 Pedestrain flow heat map

Measuring walkability

Global Walkability Index is used to measure walkability of a city. This includes infrastructure rating and public agency rating.

Five roads in each ward are selected and surveyed. Each parameter is then rated on a scale of 1-5 (1 being the lowest and 5 the highest). Pedestrian count for five minutes for each location and the length of the surveyed stretch is noted.

The average of this rating is then translated into a system from 100 - 0, Using this formula (Σ (LOS score) x 10x pedestrian count x road stretch)/no of road surveyed)/10

The walkability of each individual area is derived by taking an average of individual parameter. The final city walkability score is then calculated by averaging the walkability ratings of all the localities surveyed.

For example (ward 7)

Step 1 -

Selection of roads

Five important streets or road stretches are selected to ensure that they include all major streets and every road hierarchies. The selected road is then surveyed and rated according to the walkability scale.

Step 2-

Assigning LOS or rating for each parameter on a scale of 1-5. For example, 1 for high conflict on roads and 5 for no conflicts. All the parameters are then rated and finally the length of the stretch is noted.

Step 3-

The LOS score for each parameter is then multiplied with 10, total pedestrian count in 5 minutes and the road length and divided by number of roads surveyed and the resulting score is then divided by 10.

(Σ (LOS score) x 10 x pedestrian count x road stretch)/no of road surveyed)/10 LOS is multiplied by length of surveyed the road stretch and the pedestrian count in five minutes

Step 4-

Walkability of each ward is derived by averaging the individual parameter scores.

Step 5-

The final city walkability score is derived by averaging the walkability ratings of all localities surveyed



Road stretch							Road	stretch			Divided by	100		
1 2		2	3 4		5	Parameters	1	2	3	4	5	with the	no of road	Total
Walking Path Modal Conflict	2	2	2	4	4	Walking Path						mildi	-	score
Security from Crime	5	5	5	4	5	Modal Conflict	1388.8	140	143	320	72	2063	413	41.268
Crossing Safety	2	3	1	5	5	Security from								
Motorist Behavior	3	3	2	4	4	Crime	3472	350	357	320	90	4589	918	91,77
Amenities (benches,						Crossing Safety	-		-					
public toilets, street lights)	1	0	0	0	0	Motorist	1388.8	210	71.3	400	90	2160	432	43.202
Disability Infrastructure	1	1	1	1	1	Behavior Amenities	2083.2 694.4	210	143 0	320	0	2828	566 139	56.556 13.888
Maintenance and Cleanliness	2	1	2	1	1	Disability Infrastructure	694,4	70	71.3	80	18	934	187	18.674
Obstructions	2	2	2	3	2	Maintenance								
Availability of Crossings	1	1	1	1	1	and Cleanliness	1388.8	70	143	80	18	1699	340	33.988
Pedestrian Count	112	28	31	16	15	Obstructions	1388.8	140	214	240	36	2019	E 404	40.374
Length of Surveyed Stretch	0.62	0.25	0.23	0.5	12	Availability of Crossings	694.4	70	71.3	80	18	934	187	18.674
(km)	0.02	0.20	0.20	210		a successive		Walkab	lity sco	te				35,839

Pedestrian infrastructure rating

	Parameters														Normalia	zed LO	S Score											
	T di diffetero										(Σ	(LOS sc	ore)*10*ı	pedest	rian count	t*road :	stretch)/n	o of roa	ad surveye	d)/10								
	Point assessed	LOS	Ward 1		Ward 2		Ward 3		Ward 4		Ward 5		Ward 6		Ward 7		Ward 8		Ward 9		Ward 10		Ward 11		Ward 12		Ward 13	
	Makes walking impossible	1														ļ												
Walking Bath	Dangerous and inconvenient	2																										
Modal Conflict	Some conflict	3		27.1		35.4		84.8		67.2		26.6		38.3		41.2		40.7		23		15.3		32.1		15.1		59.8
woodar connicc	Minimal conflict	4																										
	No conflict	5																										
	Highly susceptible to crime	1																										
Security from	Some risk of crime	2																										
Crime	Ascertain perceived security	3		30.37		46.1		140		85.7		43.6		54.8		91.7		48.8		24.3		18.7		43.06		21.7		160
cinite	Minimal crime risk	4																										
	Very secure	5																										
	Risk of accident	1																										
	Risk of being hurt	2																										
Crossing Safety	Ascertain perceived safety	3		24.4		37.6		108		57.9		32.1		43.7		43.2		40		17		15.9		22.5		15.6		47.1
	Safe	4																										
	Very safe	5]
	Totally chaotic	1																										
	Rarely yield to pedestrians	2																										
Notorist Behavio	May yield to pedestrians	3		30.3		31.8		83.8		57.4	31.1	31.1	l.1	30		56.5		38		17		15.7		24.02		15.1		81.9
	Sometimes yield to pedestrians	4																										
	Always yield to pedestrians	5																										
Amenities	1 point for each present			8		14.1		38.1		31		7.7		22		13.8		16		12		0.42		6.3		2.24		47.1
	No infrastructure	1																										
Disability	Limited infrastructure	2		1		1		1)	19		1		1		1		1		1		1				1		1
Disability	In poor condition	3		6		11.1		27.9				8.7		12.6		18.6		12.2		6		4.02		8.8		4.86		31.9
Initastructure	But poorly placed	4		1		1		1		1		1		1		1		1		1		1		1				1
	Well placed	5		1		1		1		1		1		1		1		1		1		1				1		1
	Footpath is not present.	1																										
	Very poorly maintained	2		1		1		1		1		1		1		1		1		1		1				1		1
Maintenance	Smooth surface in some areas	3		6		14.7	14.7 58.6		19		10.4		12.6	33.9	33.9		19.4	15.1	5.28	5.28	30.2	30.2		4.86		62.8		
	Not very well maintained	4		1		1		1		1				-		1		1		1		1						1
	Very well maintained	5		1		1		1		1		1				1		1		1		1		1				1
	completely blocked	1																										
	Effective width <1m.	2		1		1		1		1		1		21.0		1		1		1		1		1		1		1
Obstructions	Effective width is < or = 1m	3		30.3		14.7		80.8		20		20.9		21.8		40.3		19.4		18.1	21.	21.9	9	75.8		10.1		80.7
	Effective width is > 1	4		1		1		1		1		1		1		1		1		1		1		1		1		1
	No permanent obstructions	5		1		1		1		1		1				1		1		1		1		1		1		1
	No marking	1																										
A	Zebra crossing	2		1		1				1		1		1		1		1		1		1				1		1
Availability of	Table top	3		6		11.1		27.9		19		8.7		12.6		18.6		12.2		6		40.2		8.8		4.86		32
Crossings	Signalized	4		1		1				1		1		1		1		1		1		1				1		1
	Foot over	5		1		1		1		1		1		1		1		1		1		1		1		1		1
		1																										<u> </u>
Roads surveyed			5	5	5		5			5	5		5		5		5		5		5		5		5		6	,
Average				18.72		24.07	1	72.2		41.8		21.09		22.7		39.76	i	27.41		15.39		15.27	1	27.95		10.5	i	67.03
Final average																												
score-															31	1.4/100								_				

The total walkability of Leh town is 31.4 out of 100, which is very low and indicates that the Leh is not walkable in terms of pedestrian infrastructure.

There is a serious need to improve its pedestrian infrastructure.

The major focus should be given to the crossings and disability infrastructure.

Also, the maintenance and quality of existing infrastructure should be prioritised.

The city performs well in terms of safety, as there are very less physical crime and conflicts.

Ward 12 scored the least as it doesn't have any pedestrian infrastructure.

Table 7 Ward wise Pedestrian rating

Policy and public agency indexing

Public agency survey or interview with the agency responsible for planning for pedestrian infrastructure and transportation, such as a Municipal Committee or Public Works Department is conducted to understand the funds devoted to transport planning, separate funding for pedestrian infrastructure and degree of municipal funding devoted to pedestrian planning. The priorities of officials towards pedestrian and parking is understood. In addition, any pedestrian-related fatalities and injuries are also recorded. The availability and enforcement of laws and regulations or urban design guidelines are also observed.

The Municipal Committee has insufficient funds and resources for pedestrian planning, as less importance is given to pedestrian infrastructure. There are no pedestrian-related urban design guidelines apart from the pavement type for which there are very few choices anyway.

In 2018, 56 vehicle-pedestrian conflict cases were registered and 13 resulted in pedestrian fatalities. There are frequent public outreach efforts on pedestrian safety.

The total policy and public agency score is 13.5, which is rather low.

Walkability score of the city

Total walkability score of the city is calculated by adding the field walkability score and public agency score. The field walkability score is 31.4 out of 100 and the public agency score is 13.5 out of 30. Total walkability score of the city is 44.6, According to the walkability scale, a score between 40 and 79 is considered fairly walkable. Thus, Leh town can be considered fairly walkable. However, a score of 44.6 is not very good as it barely makes it to the 'fairly walkable category'.

Question	Point Assign	Score Max 30				
Municipal resources for pedestrian	Can sustain long-term programme	5				
planning	Sufficient for short-term	2				
	Neutral	3				
	Insufficient	2				
	Non-existant	1				
Pedestrian-related	Pavement type	1				
urban design	Placement of amenities	1				
guidennes	Footpath widths	-				
	Design for disabled	1				
Proportion of traffic fatalities Involving pedestrians	IN PERCENTAGE divide by 10 (out of 56 cases in 2018,13 re fatality)source District police leh	2.1				
Public outreach efforts	Yes	5				
on pedestrian safety	No	1				
law or regulation for	Jaywalking	Usually enforced=3				
	Vendors on footpath		3 5			
	Parking on footpath		5.5			
	Riding on footpath	Rarely enforced = 1				
	Drunk driving	Divide by 2				
Total score			13.5 / 30			

Table 8 Public agency rating

Walkability scale								
0-39	Not walkable							
40-79	Fairly walkable							
80-100	Highly walkable							

Ward wise walkability score

Ward 3 and Ward 13 scored the highest as these two wards have many pedestrian infrastructures such as footpaths and pedestrianised streets. Also, footfall in these areas are the highest in Leh.

Ward 12 is the least walkable ward as there is no pedestrian infrastructure in this ward. More emphasis needs to be given on developing pedestrian infrastructure in this ward.

Ward	Walkability	Category	Description
	score		
Ward 1	18.8		
Ward 2	24		
Ward 3	72.2		Fairly walkable
Ward 4	41.8		
Ward 5	21.1		
Ward 6	22.7		
Ward 7	39.7		Not walkable
Ward 8	27.4		
Ward 9	15.4		
Ward 10	15.3		
Ward 11	28		
Ward 12	10.5		
Ward 13	67		Fairly walkable

Highly walkable	80 - 100	
Fairly walkable	41 - 79	
Not walkable	Less than 40	

Table 10 Ward wise walkability Rating

Only Ward 3 (Changspa), Ward 4 (Tukcha) and Ward 13 (Leh CBD area) scored more than 40 and are fairly walkable. The other wards are not walkable as they scored less than 40.

Way forward

- Reduce modal conflict in Ward 7, Ward 13 and Ward 11
- Make safer crossings in Ward 8, Ward 9, Ward 11 and Ward 12
- Provide pedestrian infrastructure and street amenities in all wards
- Develop disability infrastructure in Ward 7 and Ward 13 (major urban centres) to increase universal accessibility.
- Remove obstructions from existing footpaths

Road wise Walkability Index



Major issues and problems

After conducting extensive surveys on 64 streets, pathways and roads, we identified 11 major problems. If these are addressed, Leh town can drastically improve its walkability.





5) Lack of infrastructure makes the town inaccessible for the differently-abled













STREETS AND THEIR SIDEWALKS, THE MAIN PUBLIC SPACES OF A CITY, ARE ITS MOST VITAL ORGANS.



- Jane Jacobs, Patron Saint of Urbanism

Public transport

There is a limit of the distance that most people are willing to walk. Once the distance is deemed to be too long, people generally use other transport modes. Public transport is the most crucial part of urban transport system. It goes hand-in-hand with walking (for last mile connectivity), which is referred to as "pedestrian accelerator" in the walkability

literature. For a town like Leh, a sustainable public transport system is crucial to become a walkable town and reduce dependence on cars. Leh doesn't have an efficient and well-functioning public transport system. the current system only covers around 13.5% of the town area (assuming a 300m of catchment area). Current public transport system covers only the southern and south-eastern part of the town. Leh town needs to revamp its public transport system by introducing new routes, modern buses and intelligent transport system.

Existing public transport scenario

Mini-buses constitute the public transport system in Leh town. Currently, the Mazda Union with 120 mini-buses operates buses on fixed routes on a rotational basis. There were no bus services in Leh town before 2018 as paratransits or taxis were the only mode of public transportation. Rise of private vehicles and existing taxis created traffic issues. As a result, in 2018 public transport was once again revived in Leh.

The Mazda Union was granted circle-route permit to operate mini-buses on specific routes.

These routes are-

- Leh gate to Skalzangling
- Leh gate to Agling via Skalzangling
- Leh gate to Choglamsar
- Solar colony



Map 24 Existing bus routes



Urban Public Transport System functions in three stages.

Public transport system in Leh and fringe areas

Map 25 Public transport system in Leh and its fringe areas

Catchment area of the existing bus routes.

Current bus routes cover only 2.6 sq km or 13.5% of the town's area (19.2 sq km – including the southernmost part of the town, which is not under its municipal jurisdiction). There are almost 16.6 sq km of transit desert are in the town.

Public transport caters to the southern and south-eastern part of the town i.e Ward 7, Ward 10, Ward 8 and Agling.



Map 26 Existing Catchment Area

People's perception of existing public transportation system in Leh

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Figure 23 People perception about existing public transport

Figure 22 Major issues in public transport

Chapter 5 The Sustainable Urban Transport Plan

Human beings

The pedestrain Mobility System Streets for People

The Town

Polycentric Development of Leh town Recreational Walk Interconnection between Public Spaces Heritage Walk

Traffic & Movement

Public Transport Intelligent transport system Cycling Streetscaping

Human beings

The pedestrian mobility system - Access to one's town

- The planning of Leh's future urban environment and traffic system should strive to make the town an attractive environment to live in. The traffic system enables people to move and access different parts of the town, e.g. Urban centres, schools, work, culture, events and leisure activities. Access to high quality public transport and accessible cycle and walking lanes, set a framework for sustainable and healthy travelling.
- Travel characteristics of Leh town indicate more trips per day are carried out using private cars, Good accessibility for Leh's inhabitants is desirable and this can be done by focussing on strategies designed to target walking, cycling and public transport. These transport modes have lower thresholds in terms of costs for all individual, and they enable easy and efficient access to the town for all inhabitants, regardless of income. In addition, they also improve the aesthetics of streets and the town as a whole.
- The pedestrian mobility plan will be in three Levels

Level 1 -

Develop four existing urban centres (high pedestrian footfall and activity zone) as the major destinations of the town.

- Leh main market (Ward 13)
- Skalzangling (ward 7)
- Skara market (ward 6)
- Housing Colony (ward 10 and 11)

Major interventions -

- Rejuvenating existing markets as public space
- Interconnection of major public places
- Universal accessibility

- Pedestrian and cycle friendly environment
- High quality bus stops
- Pedestrianised zones

Level 2 -

Make urban centres accessible by walk from surrounding residential neighbourhoods.

Major intervention

- Improve pedestrian and cycle infrastructure on the roads leading to the urban centres
- 10 minute walk from surrounding neighbourhoods i.e. it should not take more than 10 minutes to walk from home to the nearest urban centre.
- Safe and vibrant streets

Level 3 -

Interconnectivity of urban centres

- A 20-minute town: It should not take more than 20 minutes to get from home to any part of the town.
- Frequent public bus service to and from urban centres.
- Cycle tracks providing interconnectivity for urban centres.

A 20 MINUTES TOWN A 10 MINUTES NEIGHBOURHOOD

Streets for people

A street is one the basic units of an urban space through which people experience the town. Streets are necessary public spaces in any city. They allow people to move, access services, and recreate. A town's streets are claimed and encroached by cars, electric poles, construction debris and stray dogs making it very unsafe and difficult to access.

In the future, Leh must reclaim the streets for people, have wide footpaths, cycle-friendly streets, lively, safe and accessible by people of all age groups and genders. Streets will be designed to balance the needs of diverse users to create an attractive environment that ensures access, safety, comfort, and enjoyment to everyone.

Strategies

- **Pedestrian access-** Develop an environment throughout the town that enables pedestrians to travel safely and freely. Every trip begins and ends with walking, and therefore every one is a pedestrian on a street at some point or the other. Develop continuous and unobstructed clear paths ensuring walkable neighborhoods for everyone. Each footpath should be complemented with active street edges and accessible facilities to make the journey comfortable and engaging.
- Inclusive transport network- Create space for pedestrians with universally-accessible designs
- **Safety-** Creating a street environment that strives to ensure pedestrian safety.

Safety

Pedestrain Access

Inclusive transport network Pedestrians need continuous and unobstructed moving paths, well-lit spaces, inviting building edges, shaded places to rest and walk, and wayfinding signs for a safe and comfortable street experience (NACTO, 2016).

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Pedestrian Access-

Developing an environment throughout the town that enables pedestrians to travel safely and freely.

Pedestrian access network must be safe, comfortable and enjoyable/ To achieve this, the design of the pedestrian footpath and network should be:

- Connected and Permeable
- Footpaths should be continuous, improving connectivity, and include different choices of routes, with spaces that allow groups of people to congregate without blocking the path for other pedestrians.
- Accessible and Comfortable
- Streets should be universally accessible, accommodate different walking speeds, and be legible for all users.
- Safe
- Pedestrian spaces must be safe for all users at different times of the day. They should be well-lit, provide accessible slopes and gradients, be free of obstructions, and offer visibility of the street for natural surveillance and crime prevention.
- Provide visible, clear, short, and direct crossings at intersections. Install curb extensions and refuge islands to shorten crossing distance and provide protected areas for pedestrians waiting to cross.

Relevant to Context

- Design facades and edges of buildings or spaces that define the pedestrian network should be engaging and interesting, support varied building heights, architectural details, signage, entrance spacing, transparency levels, and landscaping to break down the scale and make walking distances feel shorter.
- Strengthen the character of the town with unique street furniture. wayfinding, landscaping, paving, signage, and lighting.

Footpaths play a vital role in urban life. As a conduit for pedestrian movement and access, they enhance connectivity and promote walking. As public spaces, footpaths serve as the social space of the town. Just as improving and widening vehicular roads have historically enhanced travel for motorists, superior sidewalk design can encourage walking and improve the town's image.

65
Design elements and guidelines – Obstruction-free, safe, comfortable and continuous walking zone with accessibility ramps and tactile paving.

Elements.

Footpaths should have four zones. Leh's streets are narrow and it is difficult to accommodate all four zones but major streets, arterial roads and commercial centres must have all four zones.

- Frontage zone The frontage zone consists of both, the facade of buildings fronting the street and the space immediately adjacent to the building
- Clear path / Pedestrian zone The clear path ensures that pedestrians have safe and adequate space to walk. This should be around 1.8m to 2.4 m wide in residential settings and 2.4m to 4.5m wide in commercial areas with heavy pedestrian traffic.
- Street furniture zone Street furniture and amenities such as lighting. benches, newspaper kiosks, transit facilities, utility poles, tree pits, and cycle parking are provided in this zone.
- Buffer zone This zone includes curb extensions, park-lets, stormwater management features, parking, cycle racks, cycle share stations, and curb-side cvcle tracks.

Frontage Clear Path Furniture Buffer Zone Vehicular Zone Zone zone

Footpath design should go beyond the minimum in both width and

Guidelines

Dimensions

amenities. Pedestrians and businesses thrive where sidewalks are designed at an appropriate scale with sufficient lighting, shade, and street-level activity

Clear path / Pedestrian zone

- Provide sufficient width of about 1.8m to 2m so that two people using wheelchairs can comfortably pass each other (standards on footpath width given in table below).
- Must be free of fixed objects and gaps
- At driveways, clear paths should be continuous and step-free through the conflict zone.

Building edges and facades

- Facades and storefronts should be designed to respond to the pedestrian's eye-level
- Provide or encourage lighting, signage, canopies, and other elements that are scaled to the pedestrian's realm and add to the texture of the street
- Provide an open or glazed frontage that engages pedestrians, encourages pausing, provides passive surveillance, and links public and private spaces.



Utilities

- Provide space and plan for underground utility ducts and avoid overhead wires and poles on the street.
- Realign utilities such as lighting poles, service boxes, telephone poles, water pipes, and manholes so that there is a clear walking path free of obstructions
- Coordinate with relevant agencies and utility companies to ensure street designs accommodate space for new utilities without impeding accessibility.

Trees and landscaping

- Include trees and planting to provide shade and a sense of enclosure to the street
- Plant native species to enhance biodiversity. Preference should be given to tree species whose roots have a limited impact on the integrity of the sidewalk

Standards - The land use adjacent to road influences pedestrian flow. URDPFI has recommended width for footpaths alongwith various land uses, which are listed below.

Pedestrian zone - Obstruction-free pedestrian zone with Minimum Walking Zone of 1.8m x 2.4m and Maximum Kerb Height of 150mm.

Surface - Footpath and bus stop surfaces should have matt/anti-skid finish.

Continuous Pavement - The footpath should be continuous with minimal kerb cuts and even surface. Its elevation should be 150mm from the surrounding road-level with consistency of design elements, colour and texture..

S.no	Description	Width (m)
1	Minimum free walkway width and residential/ mixed use	1.8
	areas	
2	Commercial / mixed use areas	2.5
3	Shopping frontages	3.5 to 4.5
4	Bus stops	3
5	High intensity commercial areas	4

Table 11 Width of footpath as per adjacent land use. (Source:IRC 103-2012).

Street Type	Minimun width of clear pathway (m)	Minimun width of utilities zone (m)	Minimun total width of foothpath (m)
Street with ROW < 10m	1.5	0.5	2.0
Street with ROW >10m	1.8	0.5	2.3
Any street with retail commercial uses at ground level	2.3	1.0	3.3
Any arterial with retail commercial uses at ground level	2.8	1.0	3.8

Table 12 Width o the footpath as per width of the street. (source UTTIPEC)



Figure 25 Width of foothpath required by different users



Safety

Creating a street environment that strives to ensure pedestrian safety.

The threat of traffic violence makes movement around town a potentially dangerous activity. Street designs that prioritise automobiles over pedestrians and encourage high speeds fail to provide safe environments.

The major cause of conflict on Leh's streets are the lack of pedestrian infrastructure such as crossing facilities, speed-checks, lighting, missing sidewalks and stray dogs.

Leh town needs a new paradigm for safety built on human limits. The human body is fragile and can only survive certain forces. This means

Q Reducing the risk of modal conflict

Reducing crash numbers and the impact severity by checking vehicle speed

Opprading and shaping streets that are safe for vulnerable users.



More than 1.2 million people die on roads around the world every year. That is equivalent to roughly one person dying every 30 seconds, or over 3,400 people dying every single day of the year. Many of these deaths occur on urban roads and are preventable crashes caused by behaviour induced by street design (NACTO, 2016).



Speed Limits

It is important to reduce speed on major streets with high or medium pedestrian footfall to below 40 kmph. THis will ensure that potential conflicts will take place at lower speeds, which dramatically increasing the chances of survival in the case of a crash.

Speed is the single most important factor in the safety of a street, and is directly proportional to the risk of pedestrian fatality in cases of conflict (NACTO, 2016).



Figure 26 The relationship between impact speed and risk of pedestrian death

Several recent studies (Pasanen 1993, DETR 1998, Rosen and Sanders 2009, and Tefft 2011) show the existence of a clear relationship between vehicular speeds and pedestrian casualties, supporting the idea that **speeds over 40 km/h should not be permitted in urban streets**. However, most of these studies were conducted in high-income countries and there are reasons to believe this relationship might be even more extreme in low- and middle-income countries.

Crossing Safety

Safe and frequent pedestrian crossings support a walkable urban environment.

Pedestrians are at risk of being struck when accessible crossings are not provided or are inaccessible.

Improving pedestrian crossings in areas of high pedestrian activity and places where safety is an issue.

There are no functional crossings in the town, high vehicular flow roads need disabled-friendly crossings to improve pedestrian safety.

Design elements

- Pedestrian crossings should be located at all intersections in addition to mid-block points where pedestrian traffic is anticipated.
- Marked crossings with signals and stop controls, raised elements, refuge islands, narrow corner radii, and slow vehicular traffic approaching pedestrian crossings
- Use pedestrian refuge islands whenever speeds and vehicle volumes are high.
- Install pedestrian ramps at every pedestrian crossing and change of level. They should be built of non-slip material and have a maximum slope of 1:10 (10%), ideally 1:12 (8%). These ramps are critical for people pushing strollers or carts, or using wheelchairs. They should be aligned perpendicularly to the pedestrian crossing.
- Install pedestrian signals at intersections to allow pedestrians to cross the street safely

Guidelines

- Location Install crossings where there is significant pedestrian traffic.
- Marking Markings should be done at pedestrian crossings, regardless of the paving pattern or material.
- Signalization Provide signalised crossings, where vehicle speeds are below 30 kmph and pedestrian crossing demands are high and moderate.
- Uncontrolled crossings are generally safe on streets with low traffic volumes, and speeds are below 30 kmph.
- **Crossing Distance** Make crossing distance short, provide curb extensions, pedestrian refuge islands to make it safer and shorter.
- Width Crossings should not be Less then 3m wide.
- Additional safety measures Pedestrian crossing requires additional safety measures such as refuge islands, signals, or traffic calming strategies.
- Grade separation Always provide pedestrian crossing at same grade or level as footpaths, overpass or underpass should be discouraged as much as possible as it takes up footpath space, increases walking distance, and people prefer more direct crossings.

Standards

- Conventional crossing –
- It provides pedestrian to cross without deviating from the clear path, it is aligned as closely as possible with pedestrian clear path.
- It should be kept as compact as possible, facilitating eye contact by moving pedestrians directly into the driver's field of vision.



- Raised Crossings
- It is also known as table top crossing, it is a non-signalised crossings at intersections and the mid-block can be raised, extending the level of the footpath across the street.
- It also acts as a traffic calming measure, improves accessibility and increases visibility between motorist and pedestrians.
- Wide: No less than 3m in width, outfitted with kerb ramps and tactile warning strips.



Raised "Table-top" Crossing- Raised Crossings also increase visibility of pedestrians and physically slow down traffic allowing pedestrians to cross safely

- Location At all T junctions
- > Church junction
- Zangsti junction
- Moti market junction
- Skara market junction
- Degree college junction
- > All the T junctions at Skalzangling market

- Medians and Refuge Islands (Mid-Block Crossing) -
- Median Refuges allow pedestrians to wait safely for crossing wide streets.
- Medians or refuge create a two-stage crossing for pedestrians, making it easier and safer to cross.
- Pedestrian refuge islands should be at least 1.8m deep but have a preferred depth of 2.4m
- All pedestrian refuges at intersections should have a tip or nose that extends past the pedestrian crossing

Location –

- > At commercial areas, bus stops, schools and other tourist areas.
- > Dibetoo junction
- > Balkhang junction
- > Leh gate intersection
- > Bus stand
- > Boys High school
- > Post office
- > Petrol pump intersection
- > Jk bank skalzangling



For streets with more than one lane per direction or speeds above 30 kmph, crossings should be signalised or traffic calmed. If not signalised, the crossing should be raised or traffic calmed.



Map 29 Proposed pedestrian crossings

Street lighting

Streets in Leh need proper lighting to make them lively, safe and inviting.

Design Guidelines

- Leh needs evenly illuminated streets to give pedestrian, cyclists, and drivers better night-time vision and improved perception of safety and comfort.
- Streetlights are needed along all public rights of way, conflict areas, intersections, pedestrian crossings, cycle crossings, footpaths, plazas, bus stops, transport hubs, walkways and alleys.

Standards and Guidelines.

- A pedestrian-scale lighting if possible, or integrating streetlights on existing electric poles (low-cost solution).
- Street light should be clear of pedestrian zone, and should prevent any spillage of light or light pollution.
- Heights and spacing
 - Standard poles for sidewalks and bike facilities are 4.5 to 6 m.
 - Standard heights for narrow streets in residential, commercial, and historical contexts are between 8 to10 m.
 - The spacing between two light poles should be roughly 2.5 to 3 times the height of the pole
 - The density, speed of travel, and the type of light source along a corridor will also determine the ideal height and spacing.
- Low-mast or pedestrian scale lighting (3-5m tall) should be used to illuminate pedestrian-only walkways and provide supplemental light for footpaths should be installed in proposed public market spaces.



Map 30 Proposed Street light

Pedestrian-friendly building access, frontage, and street-level uses

Developments that front the streets with building entrances towards the street lead to natural monitoring and help enhance safety and even improve street aesthetics and beauty.

This will be achieved by:

- Ensuring access or pedestrian access from the primary street.
- Disallowing any type of wall towards the street and removing minimum requirements for front margins.
- On-street activities such as vending ctivities near important part of streets in clusters not smaller than five vending spaces.
- Mixed land use and active frontages will ensure natural surveillance and good lighting for vehicles and pedestrians to reduce street accidents and crime. Also, use of CCTV can help keep a check on crime and other anti-social activities help enforce traffic rules and regulation.



Urban streets must be designed for slower traffic speeds and include sidewalks, lighting, furniture, and shade to support a safe experience. Streets provide links to critical services such as health care and education and require safe, secure, and accessible routes. Street design should provide spaces that enhance urban safety and support crime prevention (NACTO, 2016)

Inclusive Transport Network

Creating space for pedestrians with universally accessible designs

It is an approach that increases the usability by all types of users including people on wheelchairs, differently-abled pedestrians, children and senior citizens.



Location - Universal accessibility should be prioritised In the following high footfall areas in Leh town.

- Leh Main market
- Skara Market
- Skalzangling Market
- Housing Colony

Design elements-

Differently-abled people

- The footpath must be wide enough to allow two people in wheelchairs to pass one another with clear paths on low-volume streets being wider than 2m and never less than 1.8m.
- Clear paths should be unobstructed, level, and with a smooth surface. Design accessible ramps with shallow slopes at all crossings preferably 8%, and provide cut-through paths in medians, pedestrian refuge islands, and corner islands.

Children's

Children are less capable of judging speed than adults, placing the responsibility of providing safe movement options.

- Pedestrian-crossing design and signal timings should account for shorter height and slow speed with high visibility pedestrian crossings.
- Reduce traffic speeds at intersections to ensure safer crossings.
- Designs should indicate to drivers that children are present on neighbourhood streets.
- The design of all streets must account for children by limiting the speed of vehicles and introducing efficient pedestrian infrastructure, especially signals

Adults and seniors

- Design safe streets for seniors by providing refuge islands for every two to three traffic lanes.
- Provide curb extensions to reduce crossing distances and improve visibility at pedestrian crossings.
- Prevent parking within 6m of pedestrian crossings to increase visibility.



Kerb Ramps/ Pedestrian Ramps -

It is an approach that increases usability by all types of users including those who are differently-abled and users of wheel-chairs, children and senior citizens.

Slope - It is cut back into the footpath at a gradient of 1:12, with flared sides (1:10) providing transition in three directions.

Width - The ramp width should be as wide as the clear path: a minimum of 1.8m wide but recommended to be 2.4m.

Top landing - The landing should be as wide as the clear path or a minimum of 1.8m wide.

Side Flares - Side flares are intended to prevent tripping hazards. Side flare slopes cannot exceed 1:10. Grade breaks at the top and the bottom must be perpendicular to the direction of the ramp.



Detectable surfaces / Tactile Paving"

Install tactile paving or detectable warning strips at curb ramps and other transitions between pedestrian, vehicular, or shared areas

A different texture than the rest of the surface will help provide guidance. A distance of 600mm to 800mm should be maintained from the edge of the footpath and raised part should be about 5mm above the surface.







The Town

To make the town more pedestrian and tourist friendly, Leh needs to develop ways to access major destinations and tourist spots on foot or by cycle. In this regard, Leh must develop its urban environment and traffic system, and also regulate land use to make the town more attractive.

This section explore how Leh can regulate its land use to make the town more pedestrian-friendly.

1- Polycentric development of Leh town.

Decongestion of CBD through Integrated market spaces and markets as public spaces, partial or fully pedestrianised local markets that will serve as public spaces in the neighbourhood.

2- Recreational walk

Create walking and cycling trails along agricultural fields, hills and mountains, urban villages, and religious places for recreational walk to serve as alternatives to vehicular roads and as shortcuts between wards. This will attract locals and tourist alike.

3- Interconnection between public spaces.

Link major public spaces and important market places in the CBD area through safe and accessible pathways.

4- Heritage walk routes.

Create comfortable and interesting trails in the old town area to connect important historical places.

Polycentric Development of Market Spaces

Major activities in the city takes place in Leh Main Market. This creates a lot of pressure on existing infrastructure. There is thus an urgent need to decongest the CBD area by improving other market streets. Integrated market spaces should be developed in other neighbourhoods, which will reduce the number of trips people make to the CBD area and provide new destinations and public spaces for the surrounding neighbourhoods.

Market streets of four wards can be improved and developed to serve as plazas and public spaces for surrounding neighbourhoods. These include:

- The local market of Skalzangling
- Skara market
- Housing Colony transit area and market street.
- Skampari market.

Major interventions -

- Rejuvenating existing markets as public space
- Create interconnectivity between major public places
- Ensure universal accessibility
- Develop a pedestrian and cycle-friendly environment
- Install high quality bus stops
- Create more pedestrianised zones



Map 31 Proposed zone for polycentric development of market spaces

Revitalization of markets – Development markets as pedestrian-friendly public spaces

Partial or fully pedestrianised local markets will act as public spaces in the immediate neighbourhood. E.g. – Skalzangling market, Ward 7 (existing scenario)



Proposal and recommendation

1. Offer social and public activities opportunities by integrating seating areas and promoting mixed use, improve safety by curb extension spaces or bulb-outs and parklets.

Roads in Leh town are narrow. It will be difficult to follow a standardised constraint design for every street in the town. However bulb outs can be accommodated at regular internal along with on-street parking to accommodate both utilitarian and leisure activities. These will expand pedestrian spaces and offer space and opportunities for stepping aside, sitting, standing, and chatting.

Accommodate other street infrastructural elements such as benches, lights, dustbins, and trees. Small spaces along the streets can be used as seating areas with proper lighting and trees.

2. Improve street legibility by improving views along and across the street and by providing landmark features.

Streets in Leh have unpleasant and unattractive visual clutters such as overhead wires, electric poles, and unregulated street parking. In addition, views along and across the street are often blocked by existing building elements and obstructions on street.

Legibility should be addressed by clearing this visual clutter. Leh has fewer parking spaces and narrow streets and them completely will be difficult/ One option is to reduce this clutter by providing curb extensions such as bulb outs and distributing parking in an alternative manner only on one side of the road.

3. Improve aesthetic quality of streets by supporting public art works

Public art is important to create a common cultural identity in the community that can engage various users of these spaces while also conveying a message to the mases. Various spaces such as manhole covers, signages, and street surfacing are ideal for art.

4. Increase pedestrian route network by encouraging more shortcuts along neighbourhoods and revitalisation of internal courtyards.

There are many internal footpaths and shopping courtyards along streets in Leh's market places. These can be revitalised for better opportunity for social interaction and place-making.

5. Improving safety due to traffic and crime by rerouting traffic pedestrian prioritisation

Protection from traffic by measures such as lower speed limits (i.e. 15-30 kmph), prioritisation of pedestrians, and separation of pedestrians from traffic using tree plantation, bollards (which can be used for sitting) and parking lanes (wherever possible).

Protection from crime or violence by providing a sense of transparency along streets (eyes on the street) with the presence of windows, well-lit shopfronts and doors and good lighting along the street. CCTVs along potentially problematic streets.

6. Provide protection from unpleasant environmental aspect

Climate-related factors such as air, temperature, wind, solar, and heat influence one's feeling of comfort. Thus, mitigation of these problems will also have an impact on the micro-climate along the street. This can be done through several measures such as increased sun exposure by ensuring that buildings are low. Similarly, reduced wind exposure can be achieved by compact building blocks, and clumping of trees along the street. Air mass can be broken while also providing shelter from the sun and wind by installing landscaped features (such as hedges, fences, or trees), canopy covers, or simply good positioning of elements (such as benches).

7. Provide cycle facilities

Cycling facilities such as cycle lanes, parking facilities and cycle-sharing and hiring options should be present in these areas.

Recreational Walk

Leh town has a excellent potential for recreational walks around the town. Around 50% of the land cover is under green cover, be it trees or agricultural fields. It also has a large number of tourist who visit the town each year and has untapped potential to even more. There is thus a need to develop a recreational walking system. One can walk from the top-most area in Leh along the stream till one reaches the lower areas. This path meanders through agricultural fields along the stream and through narrow streets.



Within this walking track, there is scope to develop cycling tracks to enable people to explore the city on a cycle. Most of the pathways do not coincide with the town's vehicular traffic. Also, the town is surrounded by mountains on three sides. It has great scope to develop trekking routes in these moutnains. Currently, only one trek route has been identified in his area. Based on the success of this route, other routes can also be developed.

Routes identified in the town:

Longer routes: Upper Leh hiking trails

Route – 1: Starting from Gyamtsa valley one must walk along the wetland till one reaches the stream.

Route – 2: Recreational walk along agricultural fields, urban villages and walkways.

Starting from the Gangles locality, which is an urban-rural area with agricultural fields, wetlands, fresh water streams, and trees. This path follows a route along the stream and is peppered with ponds and agricultural fields.

Shorter routes: Religious trial

Route – 1: Leh Palace to Shanti Stupa via Namgyal Tsemo and Sankar gompa. This is a prefect route for the elderly .

Hiking route:

Route – 1: People from all over the world visit Leh district for trekking, rafting, and hiking. The town can't offer a long route for trekkers but it has the potential for develop several short trekking rotes, especially in upper Leh.

Walking trails:

The northwestern part of the town is dominated by agricultural fields. These areas also host a large number of hotels and guest houses while also serving as a major tourist area. Many houses have been built along the agricultural fields and population density in this area is relatively lower than other areas.

By creating walking trails along these agricultural fields, one can encourage recreational walking, provide an alternative path to vehicular roads and serve as a shortcut between wards

Design elements: Pedestrian-scale street light and development of tracks will ensure that these paths can be used for walking and cycling.

Design elements

Route maps – Proper legible maps showing the routes should be placed at regular intervals along the routes.

Route maps should have all major destinations, shelters and resting points and public conveniences

Signages – Signages should be placed at intersections along the route to help navigate the pathways along with some form markings along the way.

Lights - Low mast lights should be placed along the routes.

Walkways – Develop a series of accessible, well-maintained and properly-paved walkways that can be used for both cycling and walking. Walkways of north western Leh town are along irrigation canals. Any development on such walkways should preserve the natural and traditional canals by not concretizing and covering them.



Shelter and resting facilities should be installed at periodic intervals to provide space for resting, and shelter from rain, snow and sun. These facilities should also have drinking water facilities (a water refill point).

Public conveniences: At least two public toilets should be provided along the major routes.



Interconnected Public Spaces

There is a need to make Leh CBD a walkable public space by linking major public places, religious spaces and important market places in the CBD area through safe and accessible pathways and by introducing new public spaces

There are many public spaces in Leh town. In the new public space plan, every public open space should be inter-linked with each other forming a network of interlinked public spaces starting from Chutey Rantak through the Leh main market all the way to Leh Gate

The ice hockey rink, the baker's street, the main market, Moti Market and the bus station. Walking paths can be improved while conflict points can be resolved with proper crossing. Universal accessibility can be promoted in this area.

The interlinkage should start from Ladakh Haat (Jumma bagh), Karzu pond and Changspa road. From there it is connected to the main market via the Chutey Rantak street. From the main market there are a network of public spaces running along Nowshera street and Chandu market. This eventually links with Pologround. The public space then continues along the main road till Moti Market (which is a great public space but needs some proper lighting) and then continues till Leh Gate.



Connection 1 - Karzu pond to church street

This is one of the most important roads in the town as it connects Leh main market and the Karzu pond, which is a major destination in winters too

It host major administrative offices.

Issues-

Lacks footpath

Pedestrian-vehicular conflict

Pollution of stream

High intensity traffic

Proposals-

Improve footpath along one side of the road

Remove the electric poles and provide an underground utility duct

Provide space for two-way traffic and provide a median/bollard for smoother flow of traffic.

Provide streetlights for better visibility and safety.









Connection 2 – Changspa to Leh market

Changspa is a major tourist destination in the town but needs revitalisation, The road connecting Changspa and Leh market is narrow with no pedestrian pathways despite connecting two major markets.



Proposal-

- Widen the road to incorporate a footpath.
- Develop two spaces Zangsti and Chemrey labrang as public space

Changspa street was taken as the pilot project for this research and proposed ideas were implemented in 2019.



Connection 3 – Ladakh haat to Leh market via Chutey rantak and Baker street.

Chutey Rantak street mainly has shops that sell tandoori rotis. This street has a unique identity. Development of this street is to be done with this in mind to preserve the unique identity of the area. The street should be provided with proper lighting and street furniture (all of this should be done using local material and design to complement the aesthetics of the existing street). The pond in Chutey Rantak should be rejuvenated

The natural wetland to the north of Chutey Rantak also has great potential to be developed as a public space or a park. The Central Asian Museum is located along this stretch. All these sites complement each other and give Chutey Rantak a unique identity. This unique identity must be maintained at all costs.



Connection 4 - Esplanade along the eco cultural park

The site is located adjacent to the Main Market and currently hosts a parking lot for taxis . This area is bound by a two-way street to the east. This street should be made a one-way street and the additional right of way can be used to create a 24-foot wide pedestrian promenade. The promenade will join two important parcels of land: the park, the taxi parking lot and the small space adjacent to the Government Girl's Higher Secondary School. The latter space can be converted to a joint-use facility where the school and the general public will have access to a modern multi-use facility for sports.

A 24-foot wide promenade is proposed to connect the two parts of the Eco-cultural park. Here many activities will be planned on a weekly or daily basis. This includes art fairs, book fairs, food festivals with food trucks, children's day events, ecology-oriented events etc.



Connection no 5 – Leh market to Moti market via Balkhang

• This will connect two main public spaces through a safe and lively walkable street using place-making techniques

On this route, the 160m stretch from the northern end of Moti Market till Main Market receives the highest number of pedestrian footfall in the whole town. Our survey reveals the footfall to be 639 persons per 10 minutes in peak hours. It is the shortest and most-used route for people coming to the main market.

Major Issues

- Most important pedestrian routes
- Highest pedestrian footfall 639 persons / 10 minutes
- Lack of proper footpath
- Pedestrian-vehicular conflict
- Breaks the continuity of public space

Potential intervention:

Interconnectivity of public spaces: Connecting main market and Moti market through an adequate walkway will connect the two major public spaces.

Public spaces: Seating near tea shops, prayer wheels and chortens with adequate space for gatherings will help create smaller public spaces.

Planters: Planters can be installed along the walkway to improve the aesthetics of the area.

Safety: Railings and bollards can be designed to be used for halting and resting will also protecting pedestrians from conflicts with vehicles. Lowering speed of vehicular traffic speed and providing good pedestrian=scale lighting will also help improve perceived safety.

Vending zones: Providing space for vendors (near Balkhang chowk) will improve the quality of the space as the place will become livelier.

Crossing: A table top crossing is proposed to connect the Eco-park with the main pedestrian way. This will increase the footfall in the park, which is rarely used by the public otherwise.



Figure 27 Proposed cross-section for interconnection of public spaces

Heritage walk routes.

Create comfortable and interesting trails in the old town area to connect important historical places.

The old town area is ideal for pedestrians with complex narrow alleys and remains accessible only on foot. it is connected by a maze of narrow, winding pathways that wander past homes that are over 400-years-old. it was the first settlement of Leh town.

Currently old town lacks proper pathways, street lighting and sanitation. Other problems include the lack of drainage and inefficient waste disposal system, which makes the streets and pathways very inconvenient to walk in winters when stormwater drains freeze over and garbage is strewn around the street. In addition, it is also home to a large population of stray dogs who remain a major safety and sanitation challenge.

Special focus is needed in this area for making this area clean, safe, pedestrian friendly and lively while preserving the architectural and cultural characteristics of this area.



Major streets and Nodes are identified on the map

Nodes - Nodes are all the social spaces and intersections in old town that need revitalisation through provision of benches, lights and other activities while also preserving the traditional look of the area.

Links – These are the major streets that connect all the major destinations. All these streets need pedestrian-scale lightings, proper pathways, dustbins at regular intervals and development of all utilities.





Figure 28 Leh current heritage walk, Leh old town initiative

Traffic and movement

Leh town needs an effective and lasting solution for sustainable urban mobility by creating ideal conditions to promote the use of alternative, environmentally=friendly modes of transport such as walking, cycling and public transport.

Transport is an essential part of modern life but it comes with a major cost in increased greenhouse gas emissions and air pollution. Leh is located in a sensitive Himalayan region and so needs to invest efforts to meet its mobility need more sustainably and efficiently.

To move towards a more sustainable transport system in Leh town, the first step requires a major change in the philosophy and approach to planning. This means, instead of planning for traffic management where one focuses on moving cars as efficiently and quickly as possible, we need to concentrate on moving people as efficiently and quickly as possible.

Street scaping - Streets in Leh town needs major upgradation from their dull and unsafe appearance to an attractive, multi-modal and lively space. Leh's vision should focus on converting its roads into streets.

Cycling - Bicycling is increasingly being recognised as an important component of the transportation system. Leh town, where the average trip length of less than 5 km with extreme climate (cold in winters and moderate in summers), is ideal for cycling as form of transportation. Leh should focus on becoming a bicycle-friendly town.

Public transport - Walking in an urban environment goes hand-in-hand with cycling and public transport, which acts as pedestrian accelerators. Leh needs to increase public transport coverage, introduce new bus routes and high quality bus stops and transit interchanges.

Intelligent transport system – To make Leh's public transport system accessible, people-friendly and efficient. Leh should introduce Intelligent transport system.

Streetscaping-

Leh should encourage the inclusion of street furniture, street frontages, signages, pedestrian-scale lighting, and art in pedestrian improvement projects to make the streets pedestrian-friendly, lively and accessible. Street design must meet the needs of the people who are walking, cycling, transiting, doing business, providing city services, and driving. All of this happens in a constrained space.



The following principles are key to shaping great streets (NACTO, 2016).

Streets for Everyone -

Streets must put people first (moving or stationary). Street design should be equitable and inclusive and serve the needs and functions of a diversity of users with particular attention to people with disabilities, the elderly, and children.



Safety -

Safe streets have lower speeds to reduce conflicts, provide natural surveillance, and ensure spaces are safely lit and free of hazards.

Multidimensional spaces -

Building street as multidimensional space, dynamic spaces, foothpaths, facades, building edges that people experience with all their senses.

Streets for health -

Street designs that support active transportation and integrate green infrastructure strategies improve air and water quality/ They can also reduce stress levels and improve mental health.

Streets are public spaces -

Streets must be designed as places for cultural expression, social interaction, celebration, and public demonstration.

Streets are multimodal -

Safe, efficient, and comfortable experiences for pedestrians, cyclists, and transit riders while also facilitating access to critical services and destinations and increasing the capacity of the street

Great streets create value -

Well-designed streets create environments that entice people to stay and spend time, generating higher revenues for businesses and higher value for homeowners.

Streetscaping and street shaping should follow the following process:

Street design is an iterative process, which vary in each context. They follow typical steps outlined in the diagram below to define and guide the process for each project before it begins.

Analyse the site - It is important to analyse the physical, social, and environmental context of the project site to identify how it functions as a part of its immediate surroundings and within larger networks of connections.

Observe who uses the street, at what time, and note the various activities they perform. Analyde who lives and works in the area, while also observing local customs, cultures, and political influences.

Engage all stakeholder - Identify and invite all stakeholders to engage in the process of shaping their streets to ensure long-term success and stewardship. Nobody knows a local street better than the people who use it every day. Welcome inputs from local constituents to make a project more applicable to its specific context.

Develop a Project Vision - Develop a vision for the street's look, feel, and function in the future. Identify best-practice street design strategies and innovative examples that are most applicable to the local context.

Planning and Design - Design facilities and elements to align with functional priorities and local place-making goals. Identify quick and easy wins, consider testing designs on site through interim solutions, and source professional design reviews for further refinement. Ensure that local conditions, climate, ongoing maintenance, and implementation processes inform decisions about materials, design, long-term durability, and user behaviour.

Build the Street - Implement great street projects by ensuring each part of the process is well-coordinated and that selected materials and resources are available, Consider adopting suitable local skills and materials for economic, environmental, and social benefits.

Process Step	Project Planning	Post Completion
Analyze the Site	H	
Engage All Stakeholders		$ \longrightarrow $
Develop a Project Vision		
Planning and Design		Ē
Build the Project	H	Ê - 1
Maintain and Manage the Project		
Evaluate the Impacts	<u>ا ا ا</u>	£→
Update Policy		\rightarrow



Cycling-friendly environment

Description

Leh should recognise and consider the needs of different cycling trips and provide complementary facilities for cyclists to make Leh a cycling-friendly town. Leh's cycling network should have cycling sharing system, shared cycling routes, recreational routes and based on the principle of "every street is a bicycle street". Encouraging cycling as a transport mode in the town requires provision of safe and continuous facilities.

Leh has two different types of cycle users:

- Leisure or recreation: This includes cycling for sightseeing, sports, recreation riders, and cycle tourists. Also, includes children playing on their cycles near their home.
- Utility: This includes cyclists engaging in a journey to perform an activity at the destination e.g. cycling to work, shop, education or shopping.

Cycle network

A comprehensive network of cycling facilities is planned for Leh town, which incorporates needs of all cyclists along with a hierarchy of routes, street networks and key destinations. This network will further act as a feeder service to the public transport system and provide scope for recreational and utility cycling. Leh will have "every street is a bicycle street" approach as it is not feasible to provide bicycle lanes on every street as they have a narrow width. Cycling trip origins and destinations are as complex and they use all streets to access various activities. So, cycling needs must be considered on every street. All streets and intersections should be provided with necessary infrastructure for cycling.

Recreational cycling

Leh town offers numerous sites, wetlands, villages and trekking and adventure sites. A route is proposed to enjoy the scenic beauty of Leh town. There are other options for recreational cycling e.g. to the Indus river bank south of the town, Khardung-la top and other adventure and sightseeing areas. This route will not have separate cycling lane.

This route will have following facilities

Signages- Sign boards and maps for orientation and formalising the route Rest facilities – Facilities to halt and shelter from rain, sun or snow Public toilets – At regular intervals

Drinking water spots – Water drinking facilities along the route at regular intervals

Cycle parking facilities – Cycle parking facilities with above facilities at major destinations.

Interconnection of urban centres

Cycling routes connecting proposed urban centres (Skalzangling market, Housing Colony, Skara market and Leh market) with bicycle lanes will improve the interconnectivity of these major urban centres for cyclists. Cycle tracks on roads wider than 15m.

A dedicated cycle track or a temporary track (as shown in reference image) on wider roads.

- Choglamsar road
- Skalzangling road
- Skara road
- SNM road

Bicycle tracks along walkways

Leh town must develop an intricate network of pathways and walkways along agricultural land, water streams and old town area. Incorporating cycling facilities with the existing pathway will further improve the cycling potential and accessibility of each area.



Bicycle sharing system

For Leh, a cycle-sharing programme will offer new transportation choices for people of all incomes while also extending the reach of current transit systems. Such a system will make one-way cycling trips possible and eliminate some of the barriers to riding such as cycle ownership, access to storage space, maintenance costs, and concerns about theft.

Coverage area

Such cycling facilities should be provided in upper and lower Leh, especially around

Leh market and Skalzangling market areas. It will connect all the major tourist

and public destinations, neighbourhoods, employment centres, cultural and recreational destinations in and around Leh town.

Density and station spacing

It should ensure that stations are spaced no more than 300m apart across the entire area. This translates to an overall density of 11 stations per square kilometre.

Station placement

The cycle stations in Leh market should be placed near major points such as the two ends of Leh plaza, near Eco cultural park, Leh Palace, Shanti Stupa, government office hubs and other major destinations.

The cycle

The landscape around Leh town is undulating and hilly. Thus, only geared and electric cycles will be useful for riders

E-bike sharing systems provide bicycles wherein pedalling is assisted by a small electric motor. These types of bicycles are particularly helpful for the elderly and can encourage people to cycle in hilly areas. Pedelecs (pedal electric cycles) reduce effort, decrease the time to reach a destination, and increase the range of accessible destinations . In some cases, digital wayfinding screens are included on the bicycle. (NACTO, 2016)



Complementary facilities

To create a cycling friendly town, supporting facilities and complementary facilities are needed to support the cycling network. This includes:

Cycle parking and corrals

Cycle parking structures are high-quality cycle parking facilities for numerous cycles along with protection from other street elements. They are installed at transit stations or major destinations such as shopping centres. Such parking facilities are needed at major bus stops and transit station such as Leh Gate and Bus Stand. These structures should be easily accessible by nearby cycle routes and should have wayfinding and signages to help cyclists navigate..



A cycle corral is a row of cycle racks placed on the street that occupies space in the parking lane. Existing parking spaces can be used efficiently as cycle parking, which helps free space on the footpaths. The cycle racks in the corral should be protected from parked cars by a plastic delineator or parking stops.

Cycle signals

Cycle signals are traffic signals designed specifically for cyclists. As of 2020, Leh doesn't not have a single traffic signal. However, in the future, Leh should install cycle signals at major intersections, especially on high volume streets and cycle streets. Cycle signals improve safety and confidence for cyclists at places with a large volume of vehicular traffic or conflict. Cycle signals—particularly those associated with protected facilities—should be a part of normal signalling systems.



Wayfinding, Signages and Markings

Wayfinding, signages and markings are elements that identify cycling routes to reach major destinations or connecting cycle facilities. These include signs with directions, specially-designed street signs, and markings on the road. They increase confidence and alert drivers that they are on a cycling route and should exercise caution.



Reference Image: 1 cycle signages - Danish bicycle signages,

Kerbside cycling lanes-

An exclusive clear path of at least 1.8m provides a dedicated path with pavement markings and signage adjacent to the curb. An additional buffer space of a minimum of 1m is marked between the cycle lane and the roadway. It is most applicable when speeds are below 40 kmph. As speeds and volumes increase, vertical separation increases safety and comfort. Cyclists remain visible to adjacent motorists and flexible bollards may be added in some cases.



Cycle lanes next to parking -

The cycle lane is located adjacent to vehicular traffic and flows in the same direction next to the parking lane. A minimum width of 1.8m should be provided, with a total minimum width of 4.3m between the curb and the outer edge of the cycle lane. It is most applicable when speeds are below 40 kmph. The conventional cycle lane is preferable to no facility at all but it would be greatly improved by the provision of marked or physical buffers



Safety •0000 Space •0000 Comfort •0000 Cost •0000

Mixed traffic -

Most of the roads in the town are narrow and it can be challenging and impractical to provide separate spaces for cycles. Thus, mixed traffic is more practical with speed limits of less than 40 kmph along with cyclists being given priority.

Cycling lane along walkways -

Leh town has an intricate network of pathways and walkways along agricultural land, water streams and old town area. It is important to incorporate cycling facilities with existing pathways to enhance the reach of cycles and improve accessibility of the town.





Accessible public transport

Increase the coverage of public transport to 14 sq km from the current 2.6 sg km catchment area. Leh is spread over 19.2 sg. km. Integration of public transport with different land uses such as schools, employment centres, residential and commercial areas is important to make the whole town accessible through public transport.

Low emission buses or electric buses will drastically reduce the negative impact on the fragile ecosystem of Ladakh (such as faster melting of glaciers due to diesel fumes).

Universal accessibility, low floor buses with reserved space and seats for the differently-abled and wheel chairs.

New routes

New bus routes as per above study for city wide coverage

- Leh gate to Gonpa
- Leh gate to Murtse and Dambuchan
- Leh to Choglamsar via Choglamsar village
- Frequent bus to solar colony and Mahabodhi road
- Leh gate to Skara yokma via skalzangling
- Ring route Sankar- Yurtung- upper Changspa Gh Skara
- Leh Gate to skampari
- Old road Fort road

Upgraded routes

Existing routes needs to be upgraded for proper functioning and accessibility for users.

Leh gate to Skalzangling

Leh gate to Agling via Skalzangling

- Leh to Choglamsar via Housing Colony
- Solar colony



New interventions

To ensure proper functioning of recommended routes, certain areas need to be redeveloped. This includes development of a new transit exchange at Old Bus Stand as the bus drop and pickup point at Leh Gate causes traffic jams and accidents.

Low emission buses or electric buses will drastically reduce the negative impacts on Ladakh's fragile ecosystem (such as melting of glaciers due to diesel fumes).

Universal accessibility, low floor buses with reserved space and seats for physically challenged and wheel chairs.

Increase city-wide coverage of public transport, from the current 2.6 sq km of catchment area to more than 14 sq. km.

Integration of public transport with different land uses such as schools, employment centres, residential and commercial areas is important to make the whole town accessible through public transport.



Figure 30 New transit exchange at Leh gate



Map 35- Proposed public transport catchment area



Public transport facilities Bus stops

Leh can develop two types of bus stops: shelter on wider roads and stops on narrow roads.

Stops - These are clearly marked spaces that indicate where a bus stops for passengers. It should have signs, route numbers and names, wayfinding information with destinations, schedules, and maps. It should have seating for waiting passengers, and maintain clear paths for walking and universal access. Leh should introduce electronic bus stops to enhance the functioning of its public bus system through Intelligent transport system.



Reference Image: 1 Electronic bus stops

Shelters – These are spaces with overhead protection and vertical partitions that provide shelter from the weather. They should include seating for waiting passengers along with space for people with pushchairs and in wheelchairs. Vertical partitions should be transparent to provide safety and visibility to waiting passengers. Space for cycle parking should also be provided

A total of 108 points are identified through primary surveys and GIS analysis at distances of 350m to 400m near major residential, commercial, public and semi-public destinations.




Bus route Details

The bus routes are classified into three sections

- > Route A Lower Leh
- ≻ Route B Upper leh
- ≻ Route C Choglamsar

Route A - Lower Leh

Route No	Route description	Origin	Destination	Number of bus stops	Name of proposed bus stops	Lanes	ROW	Carriage width	Length	No of buses needed
					New Bus stand					
					Govt boys school					
					SNM hospital					
					Petrol pump					
					Skyatsags					
A1	Skalzangling	Leh gate	Skalzangling	12	Post office	2 - 4	18 m	7 - 14	3 km	8
					JK bank					
					Skalzangling					
					Bambu Chowk	1				
					Airport Road	1				
					Industrial area					
					Agling Chowk					
					Ibex colony 1					
			TCV Agling Leh gate	6	Ibex colony 2	1				
		Leh gate			Truck Union	1-2				
	Agling via Skalzangling				HF Chowk		15- 20m			
A2					Agling Road			3.5 - 7	5.3 km	7
					Indian oil		20111		2.5km or	
					MES Colony					
					Tibetan Camp /					
<u> </u>					I CV Agiing			<u> </u>		
					Skara Vokma	1		5		
43	Skara via	Skara via Skalzangling			Skitchanling	1	Avg			1
	Skalzangling				Skara	1 '	6m		6.7km	- T
					Public School	1				
					Noravaslina					
					Islamia School	1				
					Jamyang School	1				
					Murtse colony	1				
					Targyasling					
A4	Murtse	l eh aste	War hero	13	upper Ibex colony	1_2	Avg	5-7 m	4.6km	1
A4	IVIUI LSC	Len yale	colony	10	Ibex committee hall	1-2	6m		+.UNIII	4
					Ibex colony 3					
					Nari niketan hostel					
					RTO					
					Dambuchan					
					war hero colony					

Table 13 Proposed bus route-A details





Table 14 Proposed bus route-B details

0.5 1

Choglamear

CHOGLAMSAR



Table 15 Proposed bus route-C details

2

10

ibex colo

0.5

Map Proposed bus routes - Route C

Public Bus Mazda buses

Leh's public transport plan should incorporate existing service providers, the Mazda buses, which are privately-owned and regulated by the Mazda Bus Union Leh. A significant number of local families earn their livelihood from these buses. The induction of new private buses should be discouraged and existing ones should be integrated in future transport networks. The operation and schedule of the buses should be formalised and regulated by one city public transport agency. According to our surveys, analysis and calculations, the transport network needs 51 Mazda buses to operate according to the schedule (given in next chapter).



Bus schedule for Mazda buses

This schedule is prepared after taking into account existing and future residential, commercial and other destinations. The table includes cycle time, headway, fleet size, number of buses needed and route length.

BUS no.		Destination	Distance (KM)	Time taken (mins)	Circle time taken	Interval (mins)	NO. of buses on this route	Start	time								
۸1		okolzonalina	2 km	20	40	6	0	Summers	07:00								
AI		Skaizariyiiriy	3 KIII	20	40	5	0	Winters	07:30								
B1		Choglamsar	9 K M	25	50	5	14	Summers	07:00								
51		onogiamoai	3100	20		, ,		Winters	07:30								
A4		Murtsey	4 km	30	60	10	4	morning	7:55 - 10:30								
								evening	3:30 - 5:30								
Δ2		Aalina	5 km	25	50	20	7	Summers	07:00								
712	< <	Aging	0 Km	20		20		Winters	07:30								
B3	Q	Solar Colonv	12	12 25 50	30	4	Summers	07:00									
		,						Winters	07:30								
D1	N	Spituk	8 km	25	50	60	4	Summers	07:30								
			~	~	~	~	-		-							Summere	07:00
A3		Skara Via Skalzanling	8 km	30	60	10	4	Winters	07:30								
50		771.11	001	05	70		0	Summers	07:30								
DZ		Thiksey	ZZ KM	35	70	30	2	Winters	07:30								
D3		Chuchot	20 km	35	25 90 60	90	60	2	Summers	07:30							
55		Chuchot	20 KIII	55	80	60	2	Winters	07:30								
D4		Saboo	12km	30	70	60	2	Summers	07:30								
- '							-	Winters	07:30								
D5		Stok	17km	35	80	60	2	Summers	07:30								
								winters	07:30								



Table 16 Proposed bus Schedule for Mazda buses

City bus

A new eco-friendly, energy efficient and accessible (as per public bus standards) fleet of buses should be introduced in the future public transport system, especially electric buses.

Electric buses are running in many cities worldwide, Electric buses have higher torque than other vehicles and are ideal for places like Leh tha have a hilly terrain.

Leh needs 11 electric buses to operate on route B.



Reference Image: 4 Electric bus from TATA for indian cities

Propose route schedule for city bus



Reference Image: 3 Electric bus from Ashok Leyland

	ROUTE	Distance (KM)	time taken (mins)	circle time taken	interval (mins)	day time interval (mins)		NO. of buses on this route	start ti	me	no. of stops						
	Ring road	8.43	25	25	10	15	Peak Vehicles	6	Summe rs	07:00	23						
							Base vehicles	4	Winters	07:30							
CITY BUS	Skampari	3.9	3.9	3.9	3.9	3.9	3.9	3.9	15	15	20	30	Peak Vehicles	2	Summe rs	07:00	13
							Base vehicles	1	Winters	; 07:30							
	Quarter	4.60	15	40	20	60	Peak Vehicles	1	morning	7:55 - 10:30	4						
	Gangles	4.63	15	40	30	60	Base vehicles	1	evening	g 3:30 - 5:30	4						
	Old - Fort	4.43	20	20	10	10	Peak Vehicles	2	Summe rs	07:00	10						
	noau						Base vehicles	2	Winters	07:30							

Table 17 Proposed bus Schedule for new city buses

Intelligent transport system

Leh should introduce intelligent transport systems in its public transport system along with a cycle-sharing system to shift the current dependence on cars to a more sustainable mode. ITS systems will drastically improve the operation, maintenance and sustainability of the public transport system. ITS is a combination of information and communication technologies to improve the safety, efficiency, and sustainability of transportation networks,to reduce traffic congestion and to enhance driver and passenger experiences.

Major benefits

- Reduce waiting time and uncertainty
- Increase the accessibility of the system
- Increase the safety of users
- Reduces fuel consumption and emissions
- Reducs operational costs
- Improve traffic efficiency
- Reduces traffic congestion
- Improve environmental quality and energy efficiency
- Improve economic productivity.



The core components of this Systems are

- Vehicle Tracking System
- Real Time Passenger Information System
- Central Control Station
- Geographical Positioning System (GPS)
- Electronic Display Systems
- Information & Communication Technologies

Travelers at the bus stops / stations will get following facilities under ITS system

- Information on bus routes (Bus numbers: starting point, destination and stops enroute)
- Schedule of the buses
- Seat availability
- Point to point bus fares
- Approximate travel time
- Information will visual and audio enabled.
- The information should be in two languages English and Ladakhi



Reference Image: 5 Public information system at bus stops

Information and services available in the buses

- In-vehicle announcements through visual displays and audio system regarding next bus stop arrival and other related information should be in Ladakhi and English
- Special seat allocation for the elderly, differently-challenged while also prioritising their entry and exit from the bus.
- CCTV real-time relay that should be linked to the command centres
- Ticketing machine
- Vehicle Drivers
- Two-way communication system between the driver and central control station for emergency /incident management.
- Passenger announcement system inside the bus.

Operational Managers

- Facilitate operation managers to manage the entire fleet operations more efficiently through on-line remote access to vehicle positions, speed, breakdown, accident/ incident, etc
- Two-way communication facility for instant contact with drivers in case of emergency incident /accident management/ diversions / traffic jams and warning of any traffic violations in real-time.
- Instant access to information such as: missed trips, delays on different routes, break downs and their duration, vehicles offline, accidents (types, impact, losses etc,)
- Route-wise stop times for different trips at bus stops, average speed point to point, travel time analysis, improper stops at bus stops, driver behaviour, deviation in routes and speed violations.

Cost of providing intelligent transport systems including electric buses for Leh town

This costing table provides insight on the scale of this project and serves as a reference for further planning and calculation of bus and ITS – the actual coasts may vary

ITS SYSTEM COSTING					
PRODUCT	COST	UNIT	TOTAL COST		
Total Central Control Station Cost	4,94,65,000	1	49465000		
Vehicle Mounted Unit and Associated Software	13,700	66	904200		
GPS Software	2,00,000	1	200000		
Bus, Bus stop and Bus terminal Display Units	6,00,000	185	111000000		
GIS Software and Components	15,00,000	1	1500000		
Depot Infrastructure	4,30,000	1	430000		
Electric Bus	70,00,000	12	84000000		
Bus Depot	4,00,00,000	1	40000000		
Bus terminal	50,00,000	1	5000000		
Bus charging station					
OPERATION COST					
Data Communication Costs for Central Station	35,01,667	1	3501667		
Communication Costs of Data Links at the Central Station	30,00,000	1	3000000		
Facilities Management Costs and AMC	29,50,300	1	29,50,300		
Maintenance of Depot Infrastructure Costs	25,25,000	1	2525000		
Total Cost			30,15,25,867		

ITS system costing for Leh.

Source : CIRT.(2008) . DPR- intelligent transport system, KSRTC, Mysore

Integration of different modes of transport

Effort needs to be made to make journeys using cycles and public buses more convenient and efficient through integration of these modes. This will further facilitate inter-modality (the completion of a single trip using two or more different modes of transport) and multi-modality (the use of different transport modes for different trips).

This will promote a shift towards sustainable transport modes and contribute to achieving the overall objectives of Leh's sustainable urban transport plan.

Cycling is limited to a certain distance but is flexible and can reach any destination. Similarly, public transport reaches distant distances but runs on fixed routes. Thus, there is a lot to gain from a synergy and convergence of different transportation modes.

Cycling allows public transport users to access more distant public transport stops and stations as compared to walking

People who make greater use of cycling to access public transport may also use more public transport overall, suggesting an overall reduction in car use, road congestion and negative environmental impact (Perkins, 2017).

• The basic building block for integration of cycling and public transport is a bicycle rental scheme. Leh should introduce bicycle sharing systems (electric cycles) in the four proposed urban centres near bus stops. This will further improve the cycling environment in the town.



Reference Image: 6 cycling sharing system

• Bike-on-board facilities and regulations, which describe the extent to which bicycles are accommodated on-board public buses, It should be mandatory for buses in Leh to have spaces or facilities to carry bicycles on-board. This will drastically improve the ridership of the both modes.



Reference Image: 7 Bike on board facilities

 Bicycle parking facilities at public transport stations – these can range from simple bike racks to secure parking spots, such facilities should be provided near major destinations like schools, urban centres and employment centres etc, Leh market and Skalzangling market should be prioritised in initial phases.



Reference Image: 8 cycle parking at bus stops

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Town-level recommendations

The following list of recommendations will help improve walkability in Leh town -

- Provide pedestrian infrastructure in the wards with high tourist footfall (Changspa, Tukcha, and Sheynam) to reduce tourist dependency on taxis to travel to the core area.
- Improve unattractive streets by restricting overhead wires and providing underground utility space below footpaths for electric and other communication lines, especially in market areas.
- Walkability score of the city can be improved significantly by focusing and rejuvenating the 40.7 km of walkways, alleyways, and pathways.
- More development is needed in the southern wards (Ibex colony, Murtsey colony, and Skalzangling) as most of the city's population reside in these areas.
- Promote mixed use in residential neighbourhoods which lacks retail or market (Murtsey colony, Skampari, Skara yokma, and Sankar).
- Provide wider footpaths and control encroachments and obstructions.
- Provide footpath with a minimum width of 1.8 m (both sides) on Sanker road, and footpath (both sides) with a minimum width of 2m (1.5 m clear pathway and .5m utility zone) on Fort road and Old road.
- Improve footpaths on Skalzangling road and Skara road with a width of 3.5 m (2.3m minimum clear pathway and 1 m for utilities). 2.3m width footpath (1.8 clear pathway and .5 m for utilities) on SNM road.

- Providing Street lights on Choglamsar Road and Skara road should be given high Priority.
- Develop commercial areas in Skara yokma, Ibex colony, and Murtsey colony.
- Improve streets that connects Skara yokma, Murtsey to Skalzangling Market with proper Lighting and walking facilities.
- Roads leading to and from Bus stops and schools should be improved and developed with Pedestrian friendly infrastructures and made safe by speed restriction on the vehicular traffic.
- Market areas should be given more focus as almost 70 percent of the trips are made for shopping/Markets.
- As public transport is only limited to the southern wards, central and Northern wards of the city should be prioritized for developing pedestrian infrastructure.



Chapter 6 Supporting programme

Overview

Planning for the needs of pedestrians and cyclists requires more than physical facilities and infrastructure such as footpaths, crossings, street-lighting, cycling tracks and trails. While infrastructure is important and critical, support programmes and activities that promote and encourage people to walk and cycle are also very important. The shift from cars to cycling or walking for short trips is only possible when people change their mindset. This chapter outlines a variety of programmes and activities that can be implemented as part of this plan.

Sustainable commuting

Commuting in Leh can become more sustainable, efficient and reliable through different actions and measures. The goal of sustainable commuting, efficient transport modes like bicycle and public transport, should become more attractive attractive in relation to cars.

We need to increase commuting trips using public transport and bicycles.

The focus points below describe actions that should be taken to develop more sustainable commuting

Make car a modal choice not a necessity

It is important to connect peri-urban areas and nearby villages such as Shey, Thiksey, Stakna, Spituk, Saboo, Choglamsar, and Phyang with frequent public transport services. This will lead to a significant reduction in the use of private cars and encourage sustainable commuting.

The parking

Enact a parking maximums ordinance in Leh town to create multiple formula for different use categories. The parking norm should be used to move towards reducing the use of cars.

Green travel plans for Leh's different workplaces

Develop green travel points for workplaces using strategies such as facilities such as parking, shelters and lockers for bicycles. In addition one can also launch subsidised public transport passes and reduce the availability of free and subsidised parking.

The goal of using a green travel plan is to make sustainable transport modes more attractive for work and business trips. If more employees choose to walk, cycle or use public transport, it will lower costs for travelling, fuel and parking. It will also encourage more efficient use of urban spaces and improve the liveability of the town.

Eco-friendly modes

Introduce eco-friendly modes of transport such as electric buses for public transport, electric cycles through bicycle sharing systems etc will improve the overall town environment and make it more attractive to make longer commutes on bicycle, This will improve the competitive advantage of bicycles and public transport systems in relation to cars.

Transit interchange

Introduce new inter-modal transfer points at Leh Gate, Skalzangling and Housing Colony with cycle parking, taxi services and high-quality bus stops to facilitate the use of public transport by local residents, general commuters and visitors.

Parking policy and norms

Leh will have a parking policy and norms to support the development of green travel plan along with an efficient strategy to regulate access to free parking on the streets.

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Pedestrian first Movement

This programme focuses on changing the current vehicle-first approach on the streets of Leh through poster campaigns. This will make it mandatory to put Pedestrian First signs on every billboard advertisement in Leh town,

- TV shows A small video clip running every day on Local tv show.
- **Signboards** Signboards with "pedestrian first" written all over the Town.
- School Teaching ethics on "pedestrian first" to students.

Safety and education

This programme focuses on teaching people of all ages the rules of the road, including how to safely walk and drive in the town. This programme may consist of events, fliers, classes and social media campaigns.

- Encouraging students to walk or bike to school
- A walk or bike to work once in a month or a public transport day
- Traffic safety oriented curriculum for schools on walking and biking
- Workshops for govt or private employees on pedestrian, cycling general traffic safety.
- Campaigns targeting unsafe driver behaviour through billboards, public announcement and social media.
- Training programs for city planners and engineers on the planning and design of pedestrian facilities.

Bicycle/pedestrian advisory committee

Form a committee comprising of municipal ward members and local cycling clubs to promote local, commuter and recreational cycling along with walking in Leh town while also improving safety of cyclists on roads. This committee will provide feedback and suggestions to implementing agencies on cycling and pedestrian infrastructure. They will also undertake various cycling education and awareness activities.

Enforcement and promotion

These programmes aim to incentivise people to walk and cycle and provide catalysts to increase walking trips.

Promotion

- Plan, design, and install wayfinding signages to direct pedestrians to parks, leisure trails and other key destinations specially in tourist areas and major residential areas in Leh.
- Put the walking map of Leh along major roads, markets (Leh main market) and tourist destination (Leh palace, Shanti stupa etc).
- Promote self-guided walking Leh old town, especially heritage sites and historical homes.
- Organise activities for senior citizens such as walking clubs, organise walks, and other similar activities in each ward to encourage the elderly to walk for health, recreation and transportation.

Enforcement

Ensure that all road users and commuters adhere to the law.

- Enforcement programmes focus on enforcing speed limits and driver yielding to pedestrians at crossings.
- Conducting operations and enforcement campaigns aimed at regulating speed, failure to yield to pedestrian and distracted driving
- Develop online forum to report traffic problems
- Initiate speed reader boards and radar gun programmes
- Train police officers on the rights and responsibilities of pedestrians and on enforcement principles related to pedestrian safety.

Actionable recommendation

The Potential Projects listed below are preliminary recommendations and will be finalised after detailed discussions amongst relevant Government authorities and departments, consultants and experts.

The projects are divided into two phases

	Phase 1 – 2021 - 2023							
S.no	Project	Time line	Department responsible					
	Footpaths and streetlights							
1	Footpath and pedestrian scale streetlights from Leh main market to Karzu pond	2021	MCL					
2	Extension of Changspa road footpath till GH road and provide streetlights along the Changspa road.	2022	MCL					
3	Reconstruction of old road incorporating footpaths and street lights	2021 - 23	Urban development authority					
4	Partial pedestrianisation of eco park road – from Girls school chowk to Malpak Bridge.	2021	Leh development authority					
5	Upgradation of the footpaths in Skalzangling market.	2022 - 23	Urban development department					
6	Partial pedestrianisation of street connecting Skalzangling market to Murtsey road.	2022 - 23	MCL					
7	Street lights along Shanti stupa road from Yurtung road to Shanti stupa	2021	MCL					
8	Streetlight along Yurtung road (Karzu pond to Yurtung) and Chubi road via Jummabagh.	2022	MCL					
9	Streetlights along Upper Tukcha, lower Tukcha and Tukcha road.	2021- 23	MCL					
10	Streetlights along the major streets of Ibex colony and Housing colony.	2021- 22	MCL					
11	Streetlights along Skara roads – Shenam hall to Leh valley school, Skara market to airport, Streets of Skara Yokma.	2021 - 23	MCL					
12	Street lights along the highway – from Skyatsags to Choglamsar.	2021- 22	PDD/BRO					

	Pedestrian crossings						
1	Construction of Table top pedestrian crossings at Church junction, Zangsti Junction, Moti market Junction, Skara market Junction, Degree college Junction and in Skalzangling market.	2022 - 23	MCL/ Traffic Police Department				
2	Designation of pedestrian crossing points and construction of refuge islands at the median at Dibetoo, Balkhang, Leh gate intersection, Leh bus stand, Boys high school, Post office, Skyatsags intersection, JK bank Skalzangling and at all the commercial areas, bus stops, schools and other tourist areas	2022 - 23	MCL/ Traffic Police Department				
	Develop	ment of M	larket places				
1	Rejuvenation of Skalzangling Market as a pedestrian and cycle friendly space with, proper footpath, high quality bus stops.	2022- 23	MCL/Urban Development Department				
2	Making Leh main market Universally accessible	2021- 23	MCL/Urban Development Department				
	R	ecreationa	l walk				
1	Hiking trail in upper Leh - along agricultural fields, urban villages and walkways	2021- 22	Leh Development Authority/Tourist Department				
2	Connection of major public spaces around Leh main market area – from Karzu pond to church street by providing footpaths, streetlights other street furniture.	2021 - 22	MCL				
3	Connection of major public spaces around Leh main market area – from Changspa to Leh market by providing footpaths, streetlights other street furniture.	2021 - 22	MCL				
4	Construction of an esplanade along the eco cultural park starting from JK bank to Girls school.	2021	Leh Development authority				
5	Connection of major public spaces around Leh main market area – Leh market to Moti market via Balkhang by improving walkways and installing streetlights and street furniture.	2022- 23	MCL				

WALKABLE

6	Heritage Walk						
7	Development of a comfortable and interesting trail in the old town area connecting important historical places	2021- 23	MCL / Leh Development Authority				
	Public Transport						
1	New transit exchange for the public transport at old bus stand.	2021- 22	Transport Department/ MCL/ Urban Development				
2	New bus route from Skalzangling – Industrial area – Skara yokma – Skara market and Leh Gate	2021	Transport Department/ MCL/ Urban Development				
3	New bus route from Sanker – Yurtung – upper Changspa – army general hospital – Skara market and Leh Gate.	2021	Transport Department/ MCL/ Urban Development				
4	New bus route to Gompa and Gangles village from Leh Gate.	2021 - 22	Transport Department/ MCL/ Urban Development				
5	New bus route from Martyrs Chowk – Murtse – Ibex colony and Dambuchan.	2021 - 22	Transport Department/ MCL/ Urban Development				
6	New bus route to Skampari as illustrated in the map on page 97.	2021 - 22	Transport Department/ MCL/ Urban Development				
7	New bus route from Martyrs Chowk – Murtse – Ibex colony and Dambuchan.	2021- 22	Transport Department/ MCL/ Urban Development				
		Cycline	g				
1	Planning a comprehensive network of cycling facilities with hierarchy of routes that connects all the major destinations (as illustrated in the map on page 96).	2021 - 22	Urban development/ MCL				
2	A dedicated cycle tracks on the major arterial roads such as Choglamsar road, Skalzangling airport road, Skara road and SNM road.	2021 - 22	Urban development/ MCL				
3	A bicycle sharing System in Leh town, and introduce electric cycles or E bike share system.	2022 - 24	MCL, Urban Development department.				

	Phase 2 – 2024 – 2030					
Sno	Project	Time line	Department responsible			
	Footpaths and streetligh	nts				
1	Construction of footpath till Yurtung via Chubi and Sankar	2024	MCL			
2	Reconstruction of Fort road incorporating footpaths and streetlights	2024	Urban Development			
3	Pedestrian friendly street connecting Leh bus stand and Market	2024- 25	MCL			
4	Upgrading the existing Streets to pedestrian friendly street in old town Leh connecting Skampari market to Leh market.	2024 - 25	MCL			
5	Footpath and streetlight from Leh Gate to Skampari via DC office, Skampari market till Nubra road.	2024	MCL			
6	Upgradation of footpaths from Leh gate to Skyatsags.	2025- 26	Urban Development/ MCL			
7	Complete street project from Bus stand till Housing Colony Market.	2025	MCL			
8	Footpaths and street lights from Shenam community hall till Skyatsags Chowk.	2026- 27	MCL / Urban Development			
9	Footpaths and street lights in Skara Yokma from GH road via councillors quarters, Indus valley school, Reach Ladakh office – till airport.	2026 - 27	MCL			
10	Footpath and streetlights along Murtse road till ibex colony road.	2025	MCL			
11	Footpaths and street lights along Ibex colony road	2025- 26	MCL			
12	Footpaths and street lights along RTO road.	2025	MCL			
13	Reconstructing Agling road from Skalzangling to Leh fire station as Complete street.	2025- 27	Urban development/MCL			
14	Streetlight in streets of Skampari, Nubra road (Skampari to Leh Gate).	2025	MCL			

	Development of Market places					
1	Rejuvenation of Skara Market as a pedestrian and cycle friendly space with, proper footpath, high quality bus stops.	2025- 27	MCL			
2	Rejuvenation of Skampari Market as a pedestrian and cycle friendly space with, proper footpath, high quality bus stops.	2026- 27	MCL			
3	Rejuvenation of Housing colony Market as a pedestrian and cycle friendly space with, proper footpath, high quality bus stops.	2027 - 30	MCL			
	Recreational walk					
1	A religious trial from Leh place to Shanti Stupa via Namgyal Tsemo, Sankar gompa	2026- 27	Tourism Department			
2	A hiking trail in upper Leh - Starting from the Gyamtsa valley walking along the wet land and reaching the river.	2025	Tourism Department/ MCL			
	Public Transport					
1	New bus route to Choglamsar village; Choglamsar to Skalzangling via Agling; and Solar colony via Mahabodhi.	2025	RTO, Transport department			
2	Introduction of low emission buses or electric buses for city public transport.	2025- 27	Urban development department.			
3	Introduction of winter friendly bus stops with Public information system and heating systems.	2025	MCL			
4	Intelligent Transport systems in Leh's Public transport.	2025- 26	MCL, Traffic Department, MCL			
5	Integration of different modes of transport in Leh town through- bicycle rental scheme at bus stations and Bike on board facilities.	2025 - 30	MCL, LDA, Urban Development Department.			
	Cycling					
1	Upgradation of the existing walkways in western Leh to accommodate cycling.	2025 - 30	MCL			

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