Leh heritage trail:

A journey through Kharyog, the historic Old Town of Leh

By

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I met a traveller from an antique land
Who said: "Two vast and trunkless legs of stone
Stand in the desert. Near them, on the sand,
Half sunk, a shattered visage lies, whose frown,
And wrinkled lip, and sneer of cold command,
Tell that its sculptor well those passions read
Which yet survive, stamped on these lifeless things,
The hand that mocked them and the heart that fed:
And on the pedestal these words appear:
My Name is Ozymandias, king of kings;
Look on my works, ye Mighty, and despair!
Nothing beside remains. Round the decay
Of that colossal wreck, boundless and bare
The lone and level sands stretch far away."

-Percy Shelley's "Ozymandias"

Abstract

The city of Leh was the capital of the Kingdom of Ladakh from the fifteenth to nineteenth centuries. Over time, due to wars, politics, and isolation, the capital city fell into a state of disrepair soon after the royal family was exiled. An explosion in tourism over the last few decades has seen a revival in the local community but most of the benefits including generated tourism revenue have been directed towards development outside the historical boundary of Leh. The residents of what is now known as Leh Old Town suffer from poverty, lack of basic infrastructures such as drainage, and limited access to water. Additionally, Leh Old Town was also placed under World's Monument Watch in 2008 due to issues related to low-scale modern construction and urgent need of repair for 55% of the historic buildings. Climate change has also been cited as a cause of concern due to issues related to faster melting glaciers and flash floods due to the lack of a drainage system.

The main aim of this practicum is to study and demonstrate the role that landscape architects can play in the rehabilitation of historical alpine settlements that have been adversely affected by anthropological factors such as politics, climate change, and over-tourism. It does so by highlighting the cultural and architectural heritage of the Old Town of Leh, known as *Kharyog* in Ladakhi, and demonstrating the use of indigenous construction materials and methods that have been superseded by modern materials imported from other parts of the country. It also aims to study how the positive effects of tourism can be distributed equally throughout a community to improve the quality of life for the residents of Leh Old Town.

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Figure 1: This image taken in the Old Town of Leh shows the contrast between the traditional materials used for construction on the right (mud bricks) and the new materials used for construction on the left (concrete). It also shows the state of disrepair and neglect that the old buildings have fallen to over the years.


UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
AFGHANISTAN
Srinagar
LEH
CHINA
Lahore
PAKISTAN
Delhi
NEPAL
BHUTAN
INDIA
MYANMAR
(BURMA)
LAOS
Gulf of
Tonkin
Arabian Sea
THAILAND
Bay of Bengal
VIETNAM
CAMBODIA
Bay of Bengal
Andaman Sea
Gulf of
Thailand
SRI LANKA
Indian Ocean
MALDIVES
MALAYSIA

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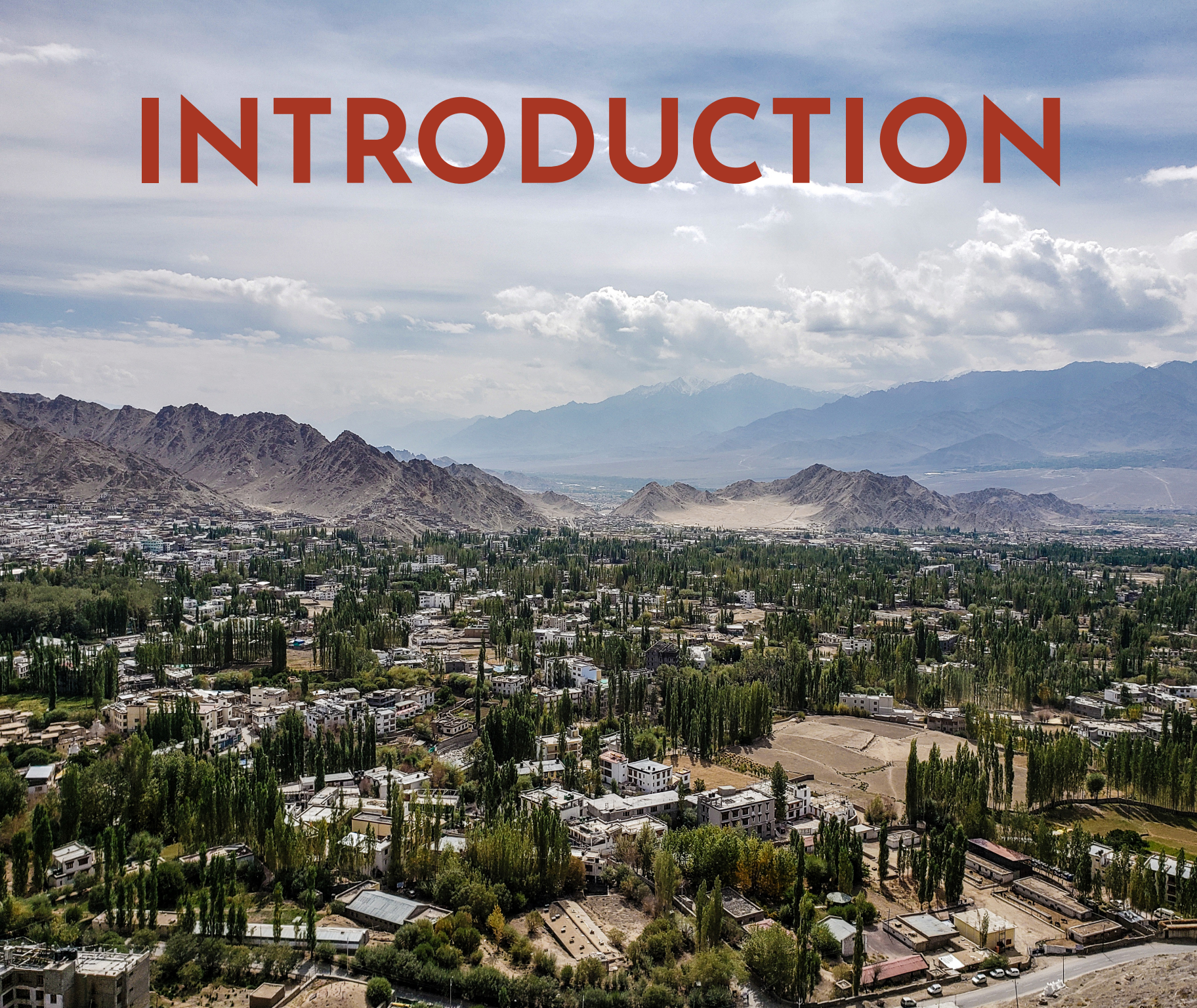


My first experience of Ladakh mimics the experience of many travelers before me. It was an experience of serenity, beauty, and feeling of isolation, except when I visited the city of Leh. In Leh, I felt as if I had landed in the center of any other major tourist city of the world. There were people from different countries, many unfamiliar faces, tourists taking photographs, restaurants that served hamburgers and pizzas, and tour guide shops that promise you an experience of serenity and beauty at popular tourist destinations such as the Pangong and Tsomoriri lakes. This impression of the city of Leh, and more specifically Leh Bazaar, is not too different from the experience of Edward Knight, a tourist in 1905, who wrote:

"*There is such a motley collection of types and various costumes, and such a babble of different languages, as it would not be easy to find elsewhere. Savage Tartars in sheepskins, and other outlandish men, jostle with the elegant Hindoo merchant from the cities of Central India, and the turbulent Mussulman Pathan scowls at the imperturbable idolaters from the Celestial Empire. Leh in September is, indeed, one of the busiest and most crowded of cities, and the storekeepers and farmers who have to supply this multitude must make a very good profit for this time. Leh is therefore a very cosmopolitan city, even in the dead season; for there are resident merchants and others of various races and creeds. Small as is the permanent population, at least four languages are in common use here– Hindostani, Tibetan, Turki, and Kashmiri – while several others are spoken.*" (Fewkes, 2008, p. 52)

However, due to the recent renovation of Leh Bazaar (completed in 2018) into an outdoor mall, the historical importance of the Bazaar has been lost, replaced by buildings and infrastructure renovated using modern construction techniques. The integrity and authenticity has been lost but tourists still flock to Leh driven by ideas of Ladakh as "Little Tibet" (one of the few remaining places in the world that still displays traditional Tibetan architecture and practices), "the last Shangri-La" (the idea of Ladakh as the last isolated, utopian society), and "the lunar landscape" (unique terrain and landscape).

Fewkes disputes the aforementioned ideas of Ladakh, indicating that even though Buddhism played a huge role in shaping the architecture and culture of Ladakh, a huge part of its population is Muslim and their presence in Ladakh has also shaped the city of Leh (p. 26) . Not much of the authentic Tibetan architecture remains as most of the new buildings either completely ignore its heritage (or plaster over concrete blocks to mimic traditional architectural facades). It can be argued that the only remnants of true Tibetan culture and architecture are confined within the walls of Leh Old Town, formerly the boundary of the residential area of Leh, that sits adjacent to the Leh Bazaar.

Kharyog is a Ladakhi word that describes the Old Town of Leh as the area that lies below the Leh Palace (Morup et al, 2018, para 1). From the 17th century to the mid-nineteenth century, *Kharyog* was the residence of all the ministers and influential people of the court. Its gates were surrounded by farmland owned by the king and adjacent to it was the Leh Bazaar where all the merchants and traders rested and sold their goods (Fewkes, p. 55). After the Dogra invasion of Ladakh in 1834 and resulting exile of the reigning king, the Leh palace and many of the residences of *Kharyog* were abandoned up until the 2000s when the site's inclusion in World's Monument Watch and efforts by local non profit organizations such as the Leh Old Town Initiative allowed some of the residences and buildings to be restored and rehabilitated . Despite these efforts, many residences in *Kharyog* are still in need of repair and the infrastructure for water management is lacking (THF, Leh Old Town, para 10) . While the rest of Leh, outside the gates of *Kharyog*, has expanded well past its ancient boundaries to take over former farmland for hotels and guest-houses that have their own water supply, the residents of *Kharyog* still rely on hand water pumps to access water for their daily needs(Ibid). The area's heritage value and potential to attract tourists by rehabilitating buildings and increasing accessibility has largely been undermined by the local and national governments whose efforts have been directed towards engineering projects such as the "Atal tunnel" that will make it easier for tourists to access Leh via road. (Kumar, 2020) This practicum proposes reconnecting the historical area of *Kharyog* to its surrounding areas and making it more accessible not only for tourists but also the residents of Leh using indigenous materials and creating a storm-water drainage system. This goal will be achieved with a new trail that connects the Leh bazaar (tourist attraction) to *Kharyog* (Leh Old Town). The trail will draw in tourists and generate more revenue but will also serve as a catalyst for future development within *Kharyog* that would eventually raise the standard of living for its residents.

The experience and journey of the trail will allow a user to explore the history, culture, and traditions of Ladakh and highlight the importance of water in the region. By appreciating its historical importance, the Leh Old Town can regain some of its importance in the future.

Figure 3: View of Leh from the Leh Palace.

Background

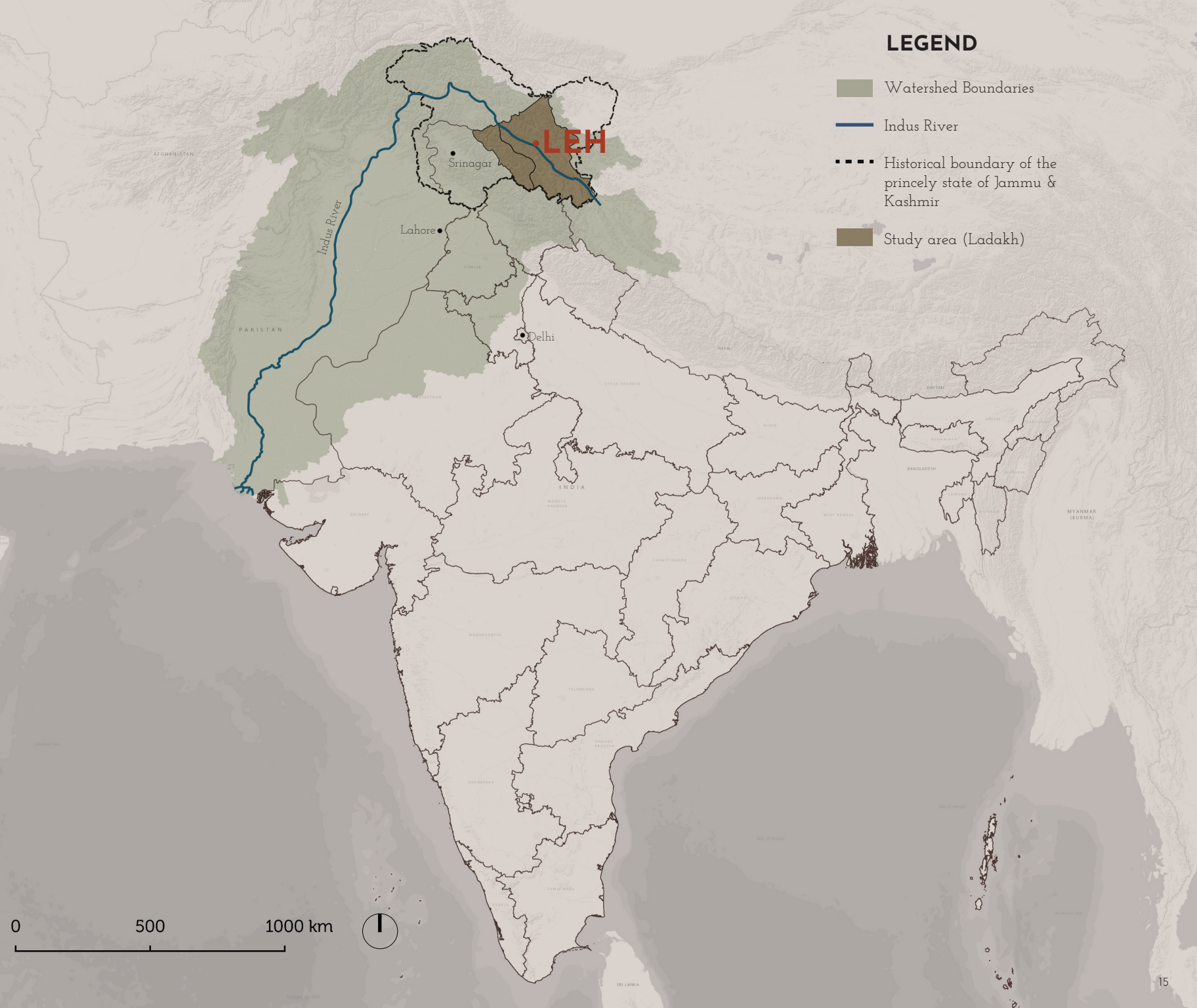
Leh is the largest city in Ladakh, with a population of 30,870 (LAHDC, 2019, p.16). It is also the highest plateau in India, with the majority of it lying at an elevation of 3000 meters above sea level(Nüsser, Schmidt and Dame, 2012, p. 51). The Upper Indus Basin at Leh is bounded by the Ladakh Range to the north and the Stok Range to the south(Ibid, p. 52).

The main source of water for the Indus River and other streams in the region is the winter snowfall on the mountains(Joshi, 2018, para 6). Climate change has led to an alarming decrease in precipitation in the region. For instance, there was a 50% to 80% decrease in annual precipitation in Ladakh between the years 2013 and 2017, with 2016 being a year of record-low rain (Ibid, para 5). An increase in the average temperatures of 3 degree Celsius in Ladakh over the last four decades has also been recorded that has resulted in less snowfall and faster snow-melt in the higher regions. In the western Himalayas, the glacier cover has reduced by almost 20% and some of the glaciers are now facing an existential threat (Ibid, para 10).

Ladakh is a beautiful scenic attraction that attracts thousands of tourists every year, both from within and outside India. As the only major airport in the region, Leh's Kushok Bakula Rimpochee Airport receives all the incoming tourists who choose to fly to Ladakh. The tourism industry is now an important socio-economic factor for the Union Territory (Pelliciardi, 2010, p. 14) as it generates revenue and creates employment opportunities and jobs on a large scale in related sectors such as hotels, home-stays, restaurants, catering services, transport, guides and mule porters, shops, retailers, handicrafts, etc. According to some sources, tourism now is a major contributor to the local economy (around 50% of the local GDP) but the benefits of the tourism industry are still concentrated mostly in and around Leh town. However, all infrastructural systems throughout the region (water, sanitation, disposal, power, etc.) are under increasing pressures (Ibid, p. 14).

Excessive tourism has also created many issues for the city of Leh. While water used to be plenty for the sparse population in Ladakh, climate change and booming tourism, coupled with modern practices such as the use of water to flush toilets instead of traditional dry toilets, have led to an increase in pressure on natural resources such as water in this high-altitude desert (Parvaiz, 2018, para 3). To cater to its visitors, Leh has over 450 hotels and guest houses and almost every household and guest house in Leh now has a bore well that extracts groundwater continuously. In a survey conducted in 2014, Ladakh Ecological Development and Environmental Group found that 375 hotels in the town were extracting 852,000 liters of water a day, with some wells dug anywhere between 150-200 feet (45-60 meters) to hit the water (Ibid, para 19).

Figure 4: Location of the study area, Ladakh, within the Indus River watershed.


LEGEND
Watershed Boundaries
Indus River
Historical boundary of the princely state of Jammu & Kashmir
Study area (Ladakh)
LEH
Srinagar
Lahore
Delhi
Indus River
AFGHANISTAN
PAKISTAN
INDIA
CHINA
NEPAL
BHUTAN
BANGLADESH
MYANMAR (BURMA)
SRI LANKA
0
500
1000 km

Little Tibet

The interest in Ladakh as a site of Tibetan Buddhism is a decades-long view. The Ladakhi people are primarily of Tibetan origin, and the area welcomed refugees following China's 1950 invasion of Tibet. Also referred to as "Little Tibet", the site has become known as one of the last remaining enclaves of Mahayana Buddhism and is the primary religion in Leh district (Fewkes, p. 25). While Buddhism has played an important role in the Ladakhi landscape (in the form of prayer walls, monasteries on higher elevations, and stupas/shrines/prayer wheels), about half of its population is Muslim and hence its culture is distinct from Tibet due to Islamic influences (Ibid).

The first Tibetan Buddhism monastery was built in Spituk in the early fifteenth century. Up until the seventeenth century, Tibet's trade in Ladakh was often an exchange of tributes between the Buddhist powers and thus affected by the waxing and waning of Tibetan power in the region (Ibid, p. 42). Towards the end of the seventeenth century, King Delek Namgyal, who was the ruler of Ladakh at the time, converted to Islam in exchange for help from the Mughal Emperor Aurangzeb in fighting off the Tibetan empire (Ibid, p. 56). He also constructed the original Jama Masjid of Leh, which has seen many repairs and expansions throughout the years(Ibid, p. 56). The current Muslim population of Ladakh can trace its roots to trading communities that included families from Central Asia who would visit or stay in Ladakh on their pilgrimage to Mecca (Ibid, p. 64). In the census of 2011, the majority of the population of Leh district (closer to Tibet) was Buddhist, and the majority in Kargil (Closer to Pakistan and Kashmir) was Muslim(LAHDC, p. 10-11).

The following timeline highlights important events in the history of Ladakh that indicated a cultural shift.

900- A Tibetan Prince, Skidley Nimagon conquers Ladakh.
930-60 Lhachen Spalgygon, Nimagon's son becomes the first king of Ladakh and commissions the royal residence and many public works in Shey, 15km south of Leh.
1684- Treaty of Timisgong concedes Kashmiri traders the right to free access to large parts of Ladakh for the trade of wool and pashmina.
1820- Gulab Singh becomes the ruler of Jammu, beginning the Dogra regime. Demographic shifts occurred as Muslim settlers came into Ladakh with the momentum of increased international trade.
1834- Invasion of Ladakh by General Zarowar Singh of the Dogra regime. End of Ladakhi monarch rule. (Fewkes, 2008)

Figure 5: View of nearby hills from Shanti Stupa, a religious site located at an elevation of approximate 3,600 meters above sea level.

Figure 6: Approximate boundary of the Tibetan empire at its peak in the year 790 and location of present day Leh within it.


LEGEND
Tibetan Empire at its peak (year 790)
KAZAKHSTAN
MONGOLIA
UZBEKISTAN
KYRGYZSTAN
TAJIKISTAN
AFGHANISTAN
Srinagar
LEH
CHINA
Lahore
Delhi
PAKISTAN
NEPAL
BHUTAN
INDIA
MYANMAR (BURMA)
LAOS
THAILAND
VIETNAM
Gulf of Tonkin
Bay of Bengal
0
500
1000 km

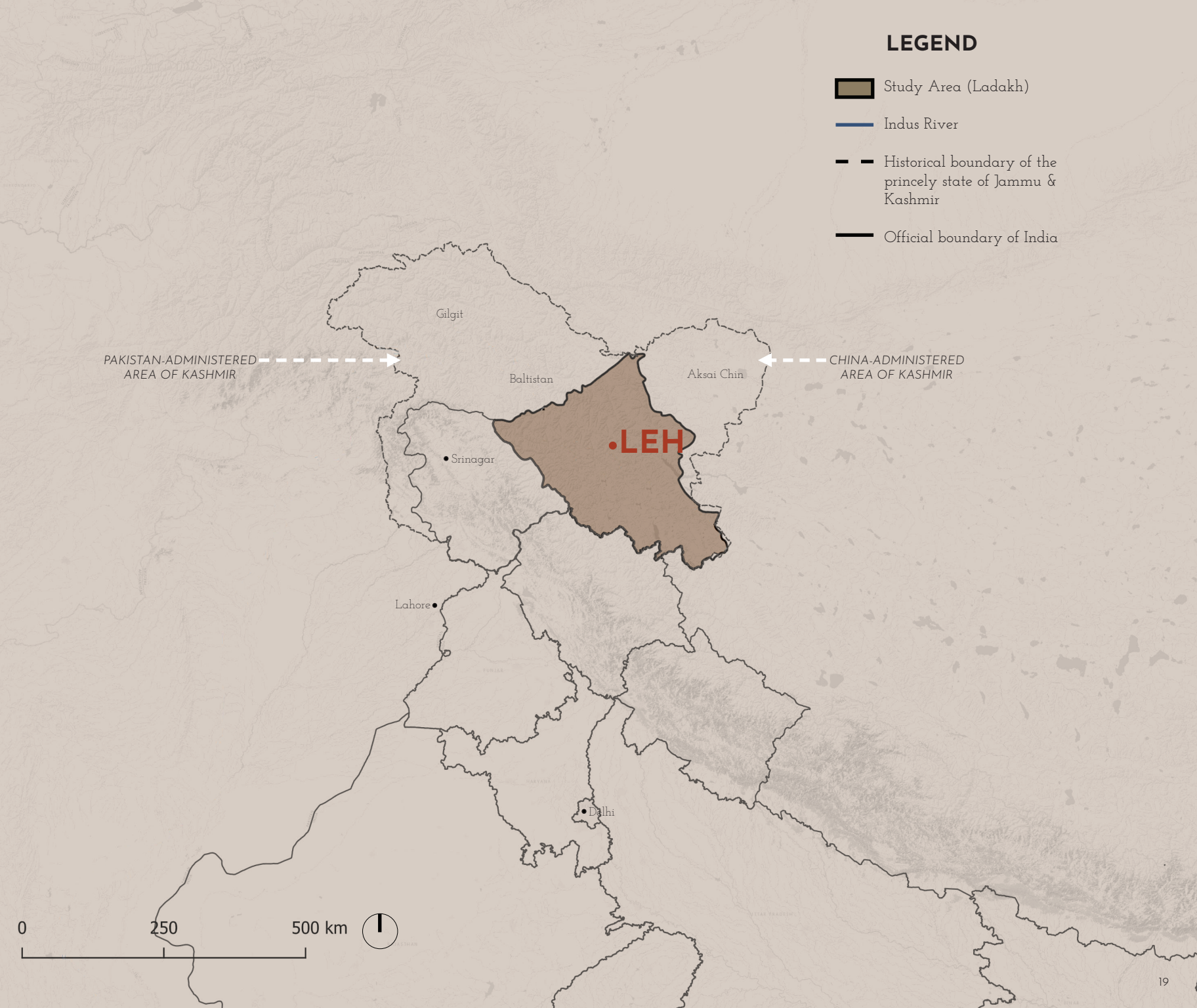
The last Shangri-La

Shangri-la was first mentioned in English literature by James Hilton in his 1933 novel *Lost Horizon*, where it defined Shangri-la as a utopian society in the Himalayas (Fewkes, p. 29). It was distinguished as a remote, mysterious, isolated, and peaceful location. Since the 1970s, much of the travel literature on Ladakh has invoked this sense of place when referring to it as the last Shangri-la.

This view of Ladakh is perhaps aided by the fact that its culture shares many similarities to that of Tibet and the region was isolated from the rest of the world from the late 1940s to early 1970s due to political conflicts with neighbouring countries. However, such conflicts have also played a huge role in making Ladakh accessible to the outside world after the region was opened to tourism. Military presence in the area has allowed for the construction of all-weather roads and airports that now make the region more easily accessible, contradicting the view of Ladakh as an isolated Shangri-la lying remotely in the mountains. Much like in the past when the region was the center of many trade routes, it is no longer isolated from the rest of the world. The major difference today is that most of the visitors come for leisure and tend to have much larger carbon footprints (in the form of air travel, newly constructed hotels, and various motorcycle and car rental services) exacerbated by their high water demands. In 2018 for example, approximately 327,000 tourists visited the Leh district alone (LAHDC, 2020).

Figure 7: This image was taken just outside Leh and along with the serene landscape, one can see a millitary truck in the background as well. Reminders of millitaty presence are littered all over Ladakh, making it hard to ignore the border disputes that erupt regulary nearby.

Figure 8: This map shows the disputed areas around the study area, Ladakh. The border disputes are a major reason for Ladakh's isolation up until the 1970s and still affect the amount of tourists that the region attracts yearly.


LEGEND
Study Area (Ladakh)
Indus River
Historical boundary of the princely state of Jammu & Kashmir
Official boundary of India
Gilgit
Baltistan
PAKISTAN-ADMINISTERED AREA OF KASHMIR
Aksai Chin
CHINA-ADMINISTERED AREA OF KASHMIR
LEH
Srinagar
Lahore
Delhi
0
250
500 km

The land of high passes

According to Fewkes, the idea of Ladakh as the land of high passes is most appropriate as not only does the word *la-dakh* directly translate to land-pass but the idea suggests Ladakh's history as a busy conduit for movement between several regions of Central and South Asia (p. 21). The regions' high mountain passes (well over 3,000m above sea level) allowed for the exchange of ideas, goods and cultures. Leh town in Ladakh acted as a network trading hub due to its proximity to key mountain passes. (Fewkes, p. 40) Travelers passing through the town often rested in building structures known as *Serais*. (Ibid, p. 88). *Serais* were not merely hotels but also functioned as a trading areas, transport centers and taxing posts.

The three major routes that passed through Leh were the Tibetan route, the Central Asian route and the South Asian route. The major towns mapped on these routes were not end points but rather access points for trade that spread throughout the respective regions. (Ibid, p. 40) All three routes were open for a brief period during summer months when snow had melted and the mountain passes were accessible to travelers.

While these trade routes did not disappear overnight, the partition of India and its subsequent wars with both Pakistan and China led to tightened borders and redirected the flow of people that previously took these routes(Ibid, p. 17). Transformation of Leh into a military base also allowed for a different type of migration, a migration of military personnel, seasonal workers and seasonal shopkeepers from all over India. (Ibid) The construction of roads and airports to aid the military has also allowed thousands of international and domestic tourists to flood the Leh town, especially during summer months.

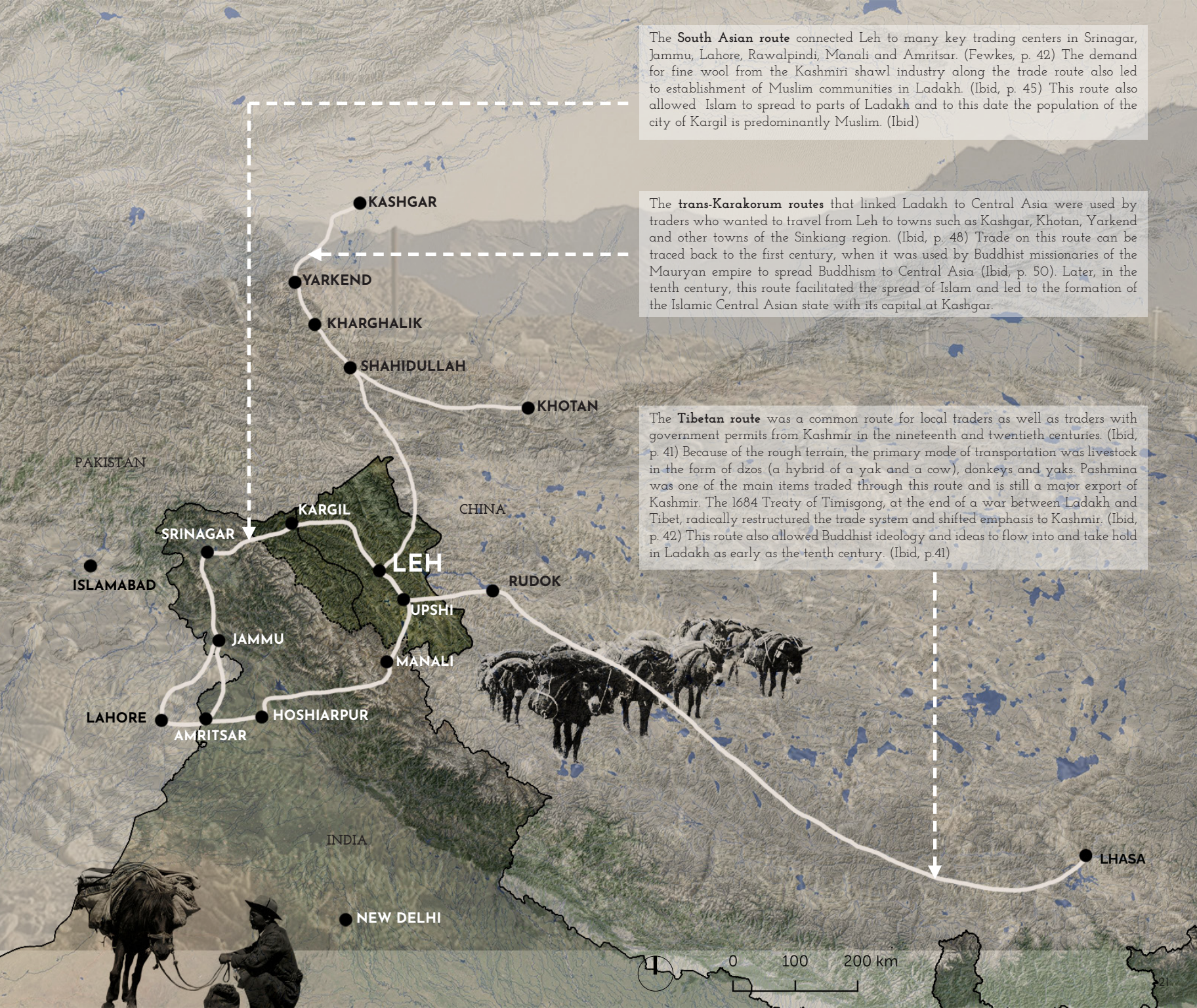
Figure 9: A collage invoking the history of Leh as a major trade route stop.

Figure 10: Major historical trade routes passing through Leh.

The **South Asian route** connected Leh to many key trading centers in Srinagar, Jammu, Lahore, Rawalpindi, Manali and Amritsar. (Fewkes, p. 42) The demand for fine wool from the Kashmiri shawl industry along the trade route also led to establishment of Muslim communities in Ladakh. (Ibid, p. 45) This route also allowed Islam to spread to parts of Ladakh and to this date the population of the city of Kargil is predominantly Muslim. (Ibid)

The **trans-Karakorum routes** that linked Ladakh to Central Asia were used by traders who wanted to travel from Leh to towns such as Kashgar, Khotan, Yarkend and other towns of the Sinkiang region. (Ibid, p. 48) Trade on this route can be traced back to the first century, when it was used by Buddhist missionaries of the Mauryan empire to spread Buddhism to Central Asia (Ibid, p. 50). Later, in the tenth century, this route facilitated the spread of Islam and led to the formation of the Islamic Central Asian state with its capital at Kashgar.

The **Tibetan route** was a common route for local traders as well as traders with government permits from Kashmir in the nineteenth and twentieth centuries. (Ibid, p. 41) Because of the rough terrain, the primary mode of transportation was livestock in the form of dzos (a hybrid of a yak and a cow), donkeys and yaks. Pashmina was one of the main items traded through this route and is still a major export of Kashmir. The 1684 Treaty of Timisgong, at the end of a war between Ladakh and Tibet, radically restructured the trade system and shifted emphasis to Kashmir. (Ibid, p. 42) This route also allowed Buddhist ideology and ideas to flow into and take hold in Ladakh as early as the tenth century. (Ibid, p.41)



CONTEXT

Figure 11: Taken from Thiksey Monastery approximately 30km from Leh, this image shows the Indus River on the right and its importance in sustaining agriculture and life.

Water is life

Leh lies in the rain shadow region of the Himalayas, and cannot be reached by monsoon rains, leading to a dry, arid and cold environment. As a result, many resources such as food, water and construction materials are limited The population of Ladakh has adopted a lifestyle that conserves these important natural resources. Several practices such as fraternal polyandry, primogeniture, monastic life for at least one family member, and labor sharing during the farming season have been a part of careful, communal management of scarce environmental resources for many generations (Pelliciardi, 2012, p. 16)

Foraging has allowed the local population to utilize almost all plants and trees growing in the wild as fuel, animal fodder, construction, medicine and colour dyes (Norberg-Hodge, 2009, p. 21). The main building material used until a few decades ago was mud, with stone usually forming the first floor of a house to add stability (Ibid, p. 25). Wood from willow and poplar trees is generally used for constructing roofs and decorating the balconies. The houses are also equipped with dry toilets that limit the use of water and also allow the waste product to be used eventually as manure. Tibetan Buddhism also makes use of landscape to ground its spirituality as multiple deities are believed to live in the mountains and the water (Ibid, p. 16) In the past, this view towards water has compelled the residents of Ladakh to respect natural resources such as water by keeping it clean. Additionally, all traditional Ladakhi houses have an indoor dry toilet in which soil is thrown after every use. The pit where all the waste is collected is accessible only from the outside and in spring the decomposed sand and excreta mixture, along with manure from animals, is dumped in heaps on the fields for further decomposition and eventually mixed with the topsoil by ploughing (Pelliciardi, 2012, p. 97).

With an average of 225 sunny days, weather during the summer months is mild while fall, winter, and spring weather is very cold (Ibid, p. 58). Precipitation is also very low, with most of it falling as snow. Other climatic conditions in Ladakh are low relative humidity(20-40%), high wind velocity(5-10km/hr), low atmospheric pressure (493 mm Hg), low partial pressure of oxygen, intense sunlight and UV radiation, and fluctuating temperatures(as high as 30C in summer and -30C in winter). January, February, and December are the coldest months, with daytime temperatures averaging -2C.(Ahmad et al, 2019, p. 245) During these months, the highways connecting Leh to rest of India are closed due to ice and snow buildup and usually open up in the last week of April or the first week of May. Day temperatures in June average 21C with July being the warmest month of the year (average day temperature of 25C). The annual precipitation is usually less than 100mm. In general, August receives the most rainfall (16mm) and the month of January receives the most snowfall(11mm) (Ibid, p. 246).

The Himalayan range contains over 50% of all permanent snow and ice fields outside the polar regions and these glaciers are an important source of water supply for Northern India (Pelliciardi, 2012, p. 44). Glaciers cover 9810km^2 in Ladakh and are a major source of water (Thayyen, 2019, p. 404). Mountain regions are more vulnerable to adverse effects of climate change due to their fragile environments (Ahmed, p. 247). Over the last 50 years, the average temperature increase per decade on the Tibetan Plateau has been in the range of 0.2-0.6C (Pelliciardi, 2012, p. 25). Climate models project an increase in the maximum and minimum temperature of Ladakh, precipitation increase with an uneven distribution and an increase in extreme climatic events such as droughts, cloudbursts and floods (Ahmed, p. 248).The nomads, Changpas, of Changthang have already been affected by climate change as loss of pasture land has led to loss of livelihood and change in their migration patterns (Ibid, p. 249). Water shortage due to faster snow-melt and increase in the occurrence of pest attacks and weeds will also directly affect agriculture.

Precipitation and terrain has also directly affected agriculture in Ladakh as most of the farmland can be found alongside major rivers such as the Indus. As the soil has low fertility, irrigation

Figure 12: Despite being primarily an agrarian society, arable area is quite low, as shown in the map. This is primarily due to the rough terrain and lack of precipitation. Many major settlements such as Leh were established in river valleys that allowed farming to exist.


LEGEND
Glaciers
Farmland
Ladakh Boundary Line
Major rivers in Ladakh
Shyok River
Nubra River
DEPSANG PLAINS
ASKAI CHIN
KARGIL
Dras River
Suru River
LEH
Zanskar River
PANGONG TSO
TSO KAR
TSO MORIRI
Indus River
0
100
200 km

Figure 13: This image shows a stream that passes through Leh and with a background of a lush vegetation of willows and poplars. The image also shows two issues arising from over-tourism in the city: plastic pollution and new hotel and guesthouse development.

and manure are used to grow the staple crops of barley, wheat, buckwheat, peas, potatoes, mustard, vegetables, and in some valleys fruits such as apricots and apples (Pelliciardi, 2012, p. 51). Since the last decade, sea-buckthorn (*Hippophae rhamnoides*) berries have become increasingly popular due to demand from outside the region. Usually a thorny shrub growing on riversides, sea-buckthorn berries, which are rich in nutrients, are processed to make juice and marketed nationally and internationally (Ibid, p. 66).

In 2013, the Public Health and Engineering department (PHE) of Leh district provided 3.1-4.1 million liters of water during summer months, of which 1-2 million liters was extracted via four tube wells from the Indus River aquifer, 1.3 million liters was extracted from the various tube and bore wells inside Leh and 0.8 million liters was channeled from various springs in the upper catchment area of Leh (Gondhalekar et al., 2015, p. 302). Water extracted from the Indus River aquifer often needs to be lifted 300 meters to be distributed in Leh, thus very energy-intensive.

Leh guest-houses and hotels use private bore-wells as a decentralized water supply source because they cannot rely on PHE to provide a regular water supply for their guests. The two to three hour water availability in the mornings is not enough for a hotel with 18 rooms that needs up to 8,000 liters of water in twenty-four hours (Ibid). Moreover, groundwater extraction in Leh is not regulated, leading to exploitation by bigger hotels and home-stays. According to the Ladakh Ecological Development Group, an average Ladakhi uses 21 liters of water per day while a tourist uses upwards of 75 liters (Goswami, 2018, para 4).

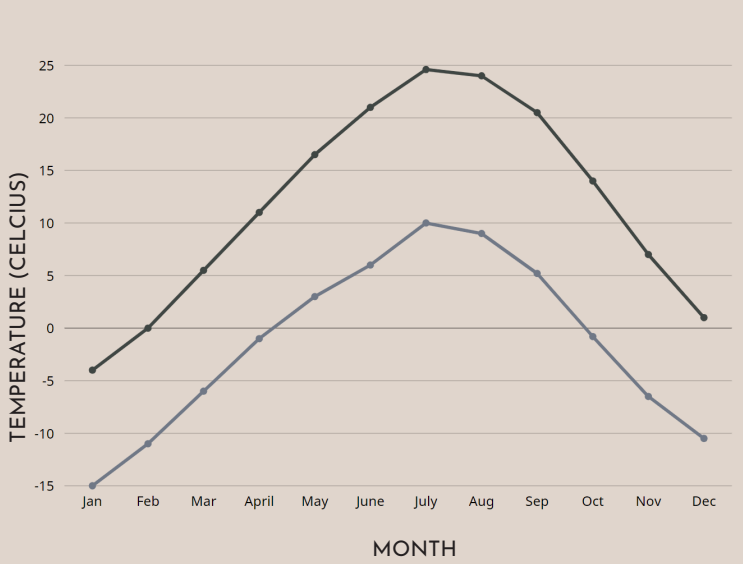


Figure 14: Average high and low temperatures in Ladakh show that the months of June, July, August and September have average low temperatures above 5 degrees. These months also coincide with the most tourist footfall and the agriculture season (Ahmad, p. 245).

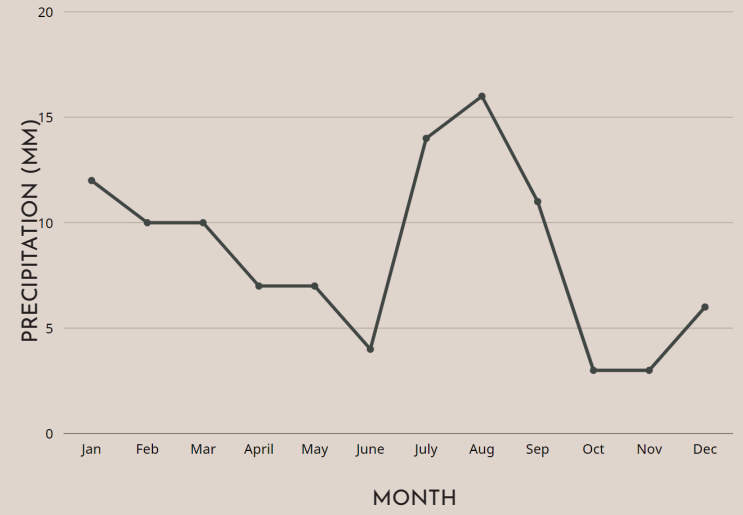


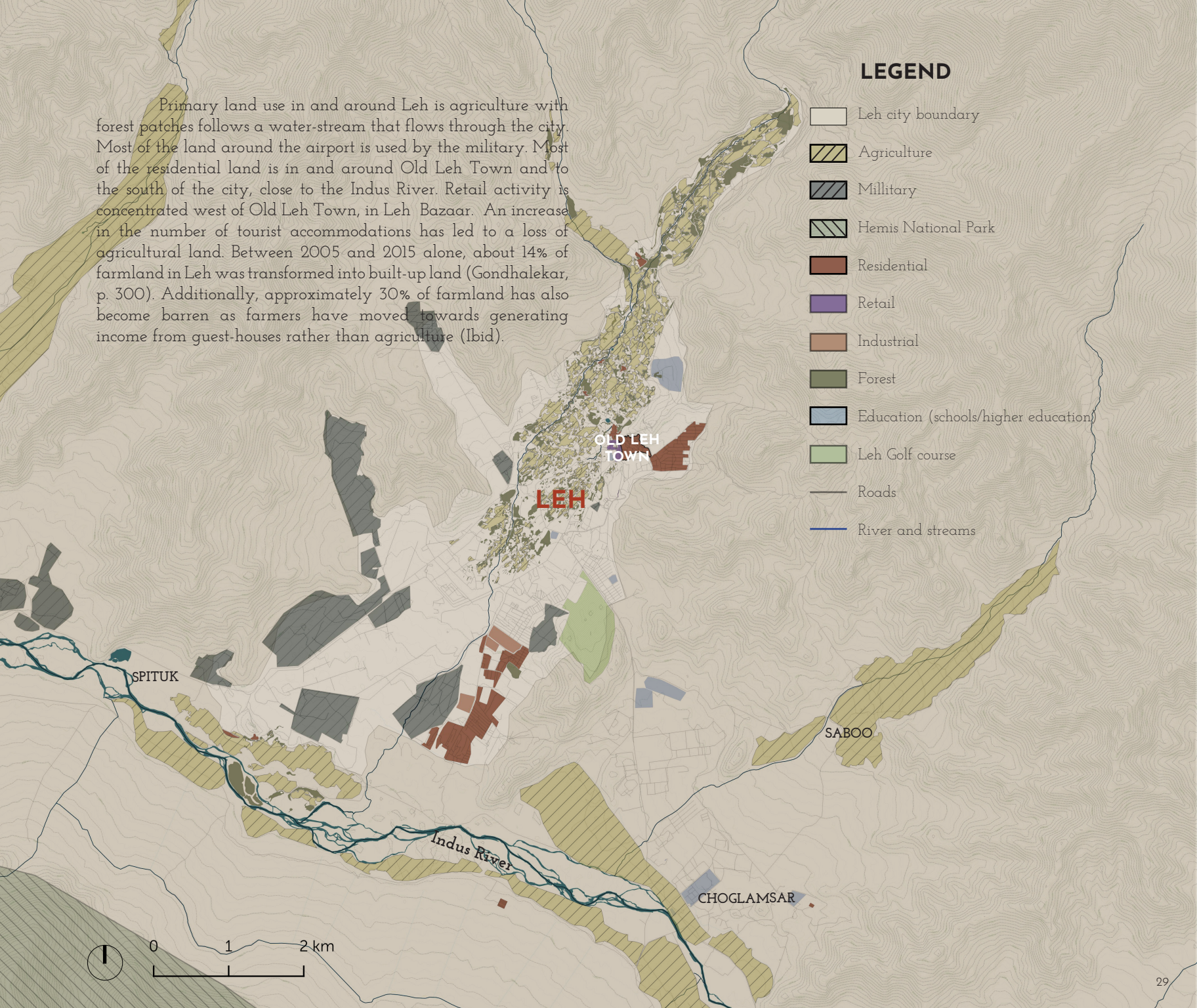
Figure 15: On average, Ladakh receives a rainfall of less than 100mm every year, with months of January, July, August and September receiving rainfall on an average of above 10mm (Ahmad, p. 245).

Figure 16: Farmland in the outskirts of Leh

Figure 18: Land Use map of Leh.

Figure 17: Farmland that has been conversted into a restaurant. Remnants of the old farm can be still be seen in the form of terraces and sections divided by boulders.

Primary land use in and around Leh is agriculture with forest patches follows a water-stream that flows through the city. Most of the land around the airport is used by the military. Most of the residential land is in and around Old Leh Town and to the south of the city, close to the Indus River. Retail activity is concentrated west of Old Leh Town, in Leh Bazaar. An increase in the number of tourist accommodations has led to a loss of agricultural land. Between 2005 and 2015 alone, about 14% of farmland in Leh was transformed into built-up land (Gondhalekar, p. 300). Additionally, approximately 30% of farmland has also become barren as farmers have moved towards generating income from guest-houses rather than agriculture (Ibid).



An oasis in a dry, cold desert

Plants in Ladakh are generally subjected to multiple stresses such as low precipitation, extreme temperature fluctuation, strong winds and salination at lower elevations. (Dolezal et. al, 2018, p. 3) The region is large enough to be tentatively divided into four neighbouring phytogeographical provinces (Ibid, p. 4). The northern area, extending above the Ladakh Range to the north and reaching the upper Indus Valley to the east is the Karakoram Province that contains very sparse Central Asian flora and a few native species at higher elevations. The second comprises the southern and western parts of Ladakh, including the lower Indus Valley and the Zanskar Range. Named the Inner Northwest Himalayan or Western Transhimalayan Province, it has a relatively large share of Himalayan herbs and shrubs. The third province is the Southwest Tibetan Province that includes southeastern parts of Ladakh with their high elevation, rolling hills and basins next to the Tibetan Plateau. The flora in this area contains Tibetan plant species and is very different from the high elevation flora of Karakoram. The fourth North Tibetan Province or Changthang province accommodates relatively small or disputed areas on the Eastern border of Ladakh, north of the Indus, including Pangong, Aksai Chin, Upper Shyok valley and Depsang plains. It contains a few species of North-Tibetan flora (Ibid, p. 4).

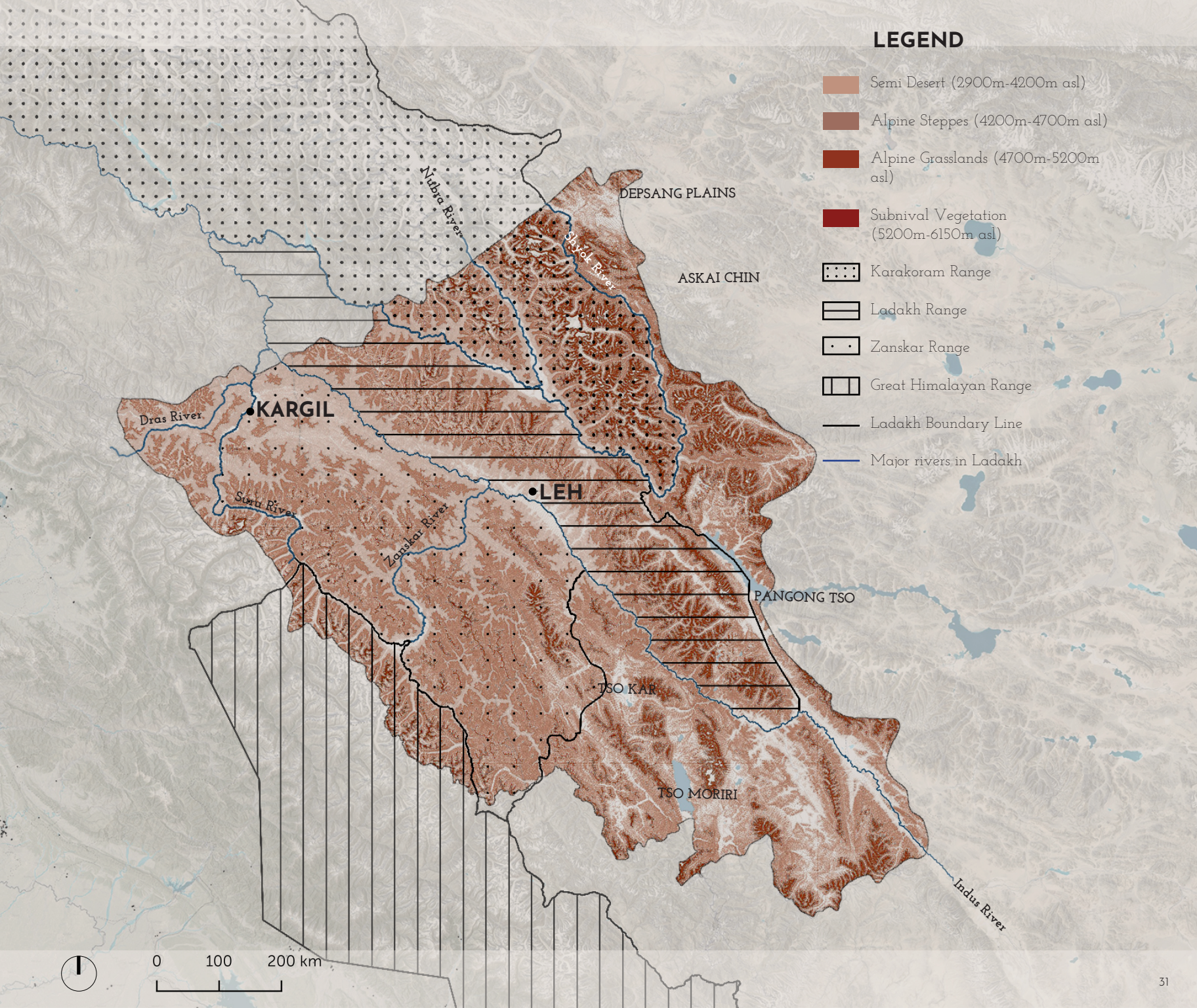
Overall, species richness in Ladakh depends heavily on elevation as most species are found between elevations of 4500m and 5000m with a decrease towards both ends of the elevation gradient. (Ibid, p. 5) Vegetation is sparse and even absent over wide tracts of land due to climatic constraints, especially at lower elevations where vegetation may only be found around water sources. Natural forests are absent in Ladakh with the exception of some small juniper groves (*Juniperus semiglobosa*) in a few favorable mid-elevation areas and scarce birch strands (*Betula jacquemontii*) at a potential upper tree line near the Himalayan southwest border. Overall, the vegetation in Ladakh can be categorized into 4 biomes:

1. Semi- Desert: Much of the main Indus valley to beyond Leh, and reaching far into the tributary valleys including Dras, Suru, Zanskar, and the Shyok valley system up to Nubra hosts this type of vegetation, extending up to 4200m.
2. Alpine Steppe: This type of vegetation prevails widely and represents vegetation completely influenced by the climate (zonal vegetation). It can be found up to the elevations of 4700m.
3. Alpine grassland: A narrow belt of alpine grassland occurs higher up to the elevation of 5200m, including the characteristic moist alpine turf of Kobresia pygmaea.
4. Subnival vegetation: This type of vegetation generally lies above the elevations of 5200m and can be found near the snow line and on slopes with surface water. The upper vegetation limit lies at 6150m.

Azonal vegetation includes wetlands found in large areas of flat and broad valley bottoms, they are often saline. Large woody species can be found along river banks and river beds of major rivers and streams. Synanthropic vegetation includes collections of plants growing on eutrophied ground by stables of domestic animals and near villages up to elevations of 5400m. Weeds growing in arable fields up to elevations of 4700m also fall under this category (Ibid, p. 5).

Much like the rest of Indus valley, Leh falls under the Semi-Desert biome and most of the city is over 3000m asl. Leh also lies in a narrow valley that allows some species of trees to grow well at lower elevations. A few of the most popular species of trees and shrubs that grow in the city are *Salix sericocarpa*, *Salix alba*, *Hippophae rhamnoides subsp. turkestanica*, *Juniperus semiglobosa* and *Polygonum aviculare* (Ibid). Some of the species, such *Salix sericocarpa* and *Hippophae rhamnoides subsp. turkestanica* are native to the region and grow well in the Semi-Desert ecosystem (Ibid).

Figure 19: Elevation and vegetation map of Ladakh.


LEGEND
Semi Desert (2900m-4200m asl)
Alpine Steppes (4200m-4700m asl)
Alpine Grasslands (4700m-5200m asl)
Subnival Vegetation (5200m-6150m asl)
Karakoram Range
Ladakh Range
Zanskar Range
Great Himalayan Range
Ladakh Boundary Line
Major rivers in Ladakh
DEPSANG PLAINS
ASKAI CHIN
Nubra River
Shyok River
KARGIL
Dras River
Suru River
LEH
Zanskar River
PANGONG TSO
TSO KAR
TSO MORIRI
Indus River
0
100
200 km


LEGEND
Leh city boundary
Water sources
D (4207M)
(3721M)
D (4299M)
C (3689M)
Shanti Stupa
(3515M)
B (3484M)
Namgyal Stupa
(3418M)
C (3820M)
LEH
A (3234M)
B (3784M)
(3229M)
A (3234M)
Indus River
Igoo-Phey Canal
0
1
2 km

Agriculture and vegetation in the form of forests is located mostly along a stream that passes through Leh into the Indus River. The boundary limits of Leh are dictated mostly by its form, with most of the settlement built on relatively flat valleys of the Indus and its tributaries. Places of worship such as Shanti Stupa and Namgyal Stupa are built at higher elevations on top of hills. The Indus River at this location also has many channels and the Igoo-Phey canal runs parallel to it.

The elevation sections of Leh show that while the Leh valley is relatively flat, it slopes drastically towards the Indus River. Elevation also represents hierarchy as places of worship and former home of the royal family, Leh Palace, are situated at higher elevations.

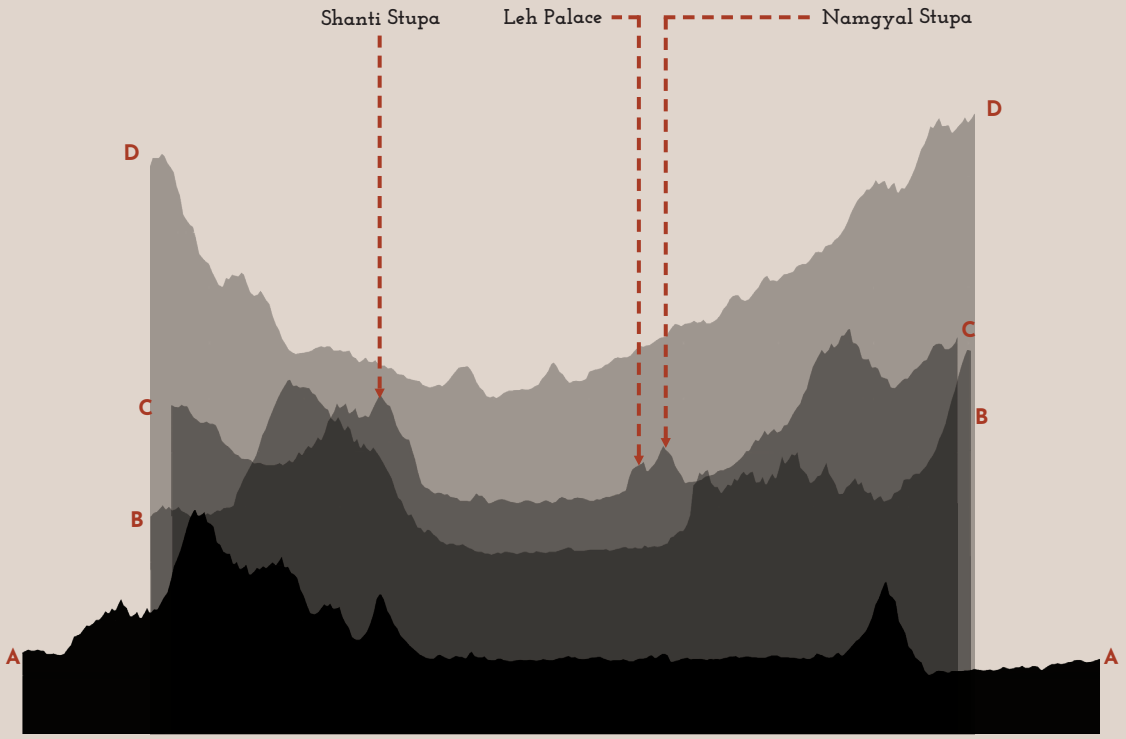


Figure 20: Elevation map of Leh

Figure 21: Elevation sections throughout Leh along with major landmarks.

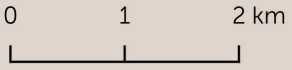


Figure 22: *Salix alba* grows well in Leh, especially along rivers and streams. Its wood is used widely for construction.

Figure 23: *Salix denticulata* is a species of willow native to Ladakh. These shrubs can often be seen growing in crevices of hills and along water streams.

Figure 24: *Populus ciliata* is another tree species found abundantly in Leh. In the above example, the trees have been planted as shelterbelts on farmland now converted to guesthouses.

Figure 25: Semi-desert vegetation in the form of *Pygmy caragana* and *Corydalis flabellata* also grows abundantly in dry, arid parts of Leh.

Tourism and its downsides

International tourism in Ladakh existed before Indian independence (Fewkes, p. 30). The cool Kashmiri climate was popular with British and other European travelers, with some adventurous enough to venture out into Ladakhi territory. The post-independence Ladakh was closed to foreigners due to security concerns, but the 1960s border war with China made construction of the Leh-Srinagar highway possible which later made it possible for tourists to access the region by road (Ibid, p. 31). While there were no recorded international tourists in 1974, the number shot up to 15,000 by 1982. The popularity of Ladakh increased in the late 1980s and early 1990s when conflicts in the Kashmir valley redirected Kashmiri merchants and tourists to Leh (Ibid).

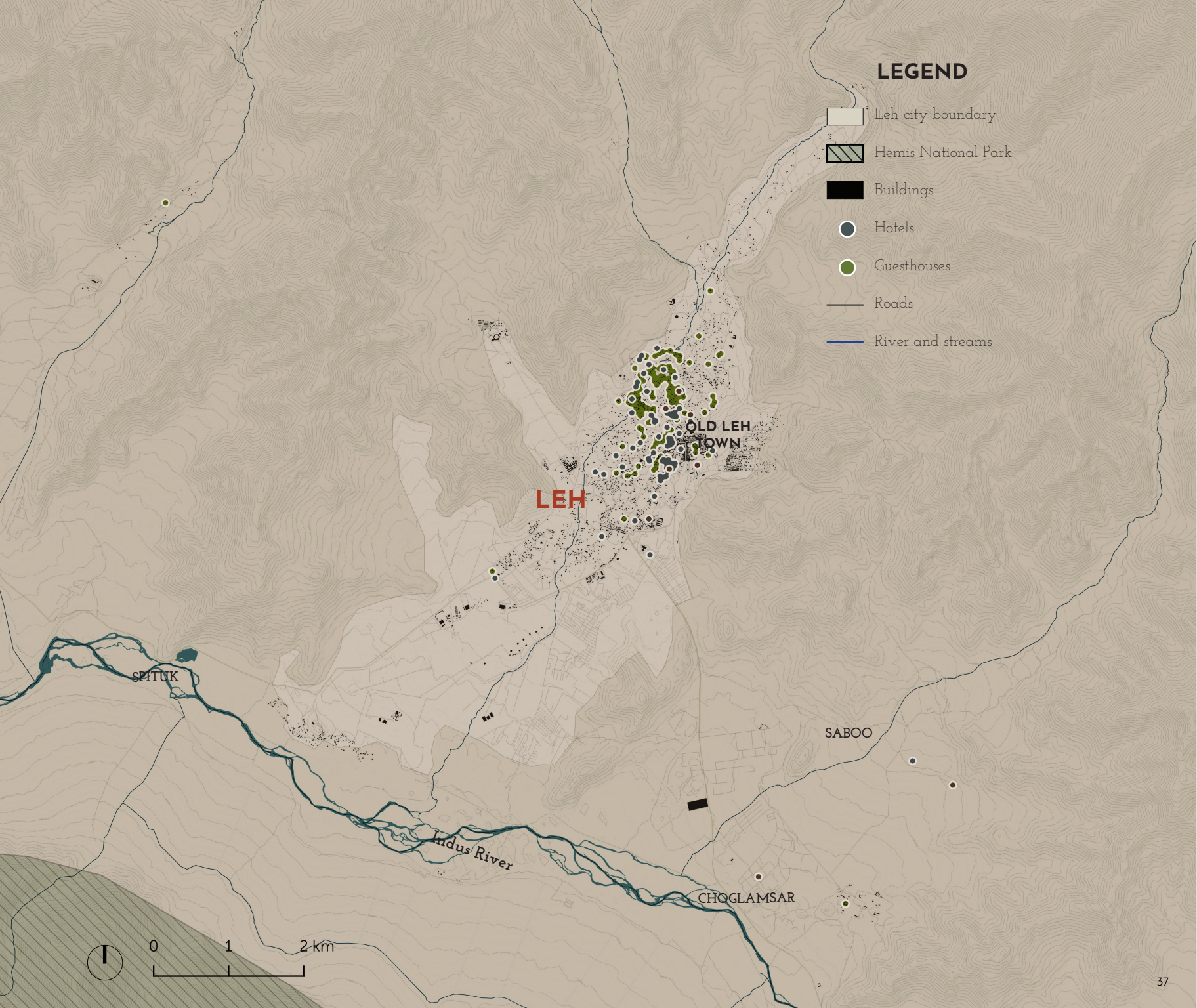
The booming tourism industry has become a major contributor to the local GDP and increased the purchasing power of many families (Pellicardi, 2012, p. 16) These benefits, however, are mostly concentrated in and around Leh while socioeconomic inequalities and pressures on infrastructure (for eg. water, sanitation, waste disposal, power) are increasing all over Ladakh. The long transition from ancient barter and trade system to modernization, globalization and a monetary economy has had positive effects such as economic growth and increased life expectancy and literacy rates but side effects include environmental degradation, pollution, food insecurity, loss of indigenous knowledge and rapid urbanization (Ibid, p. 17).

Due to border issues, many parts of Ladakh require an Inner Line Permit(ILP) to visit places such as Nubra valley, Khardung La, Pangong Tso, Tso Moriri and other places bordering Pakistan and China (Leh Ladakh India, para 4) and due to their popularity, many travel agencies in Leh offer tours to these locations. These travel agencies have grown in number over the years and often provide package deals that make obtaining the ILP and transportation to these locations easier.

The number of tourist accommodations has also increased steadily for the last few years. In the 1980s, there were only 24 guest-houses and hotels in Leh, increasing to 360 in 2012 (Gondhalekar, p. 299). These accommodations usually build en-suite bathrooms with flush toilets and showers to enhance their attractiveness and revenue (Ibid p. 296). As Leh does not have a sewage system, guest-houses and hotels generally dispose of wastewater through septic tanks and soak pits that are not managed well and run a huge risk for groundwater contamination.

As of 2019, there are 155 hotels and 216 guest-houses in Leh, with most of them concentrated in the city center (Changspa, Karzu and Yurtung neighbourhoods) (LAHDC, p. 188). All around Leh, new construction indicates heavy investment into newer, higher-end tourist accommodations. These accommodations are resource-intensive and need more power and water for operating. Guest-houses often need to be upgraded to provide more facilities as en-suite bathrooms to cater the tourists.

Figure 26: Map displaying the locations of all hotels and guesthouses in Ladakh. There are currently many more hotels under construction in Leh at the moment.


LEGEND
Leh city boundary
Hemis National Park
Buildings
Hotels
Guesthouses
Roads
River and streams
OLD LEH TOWN
LEH
SPITUK
SABOO
Indus River
CHOGLAMSAR
0
1
2 km

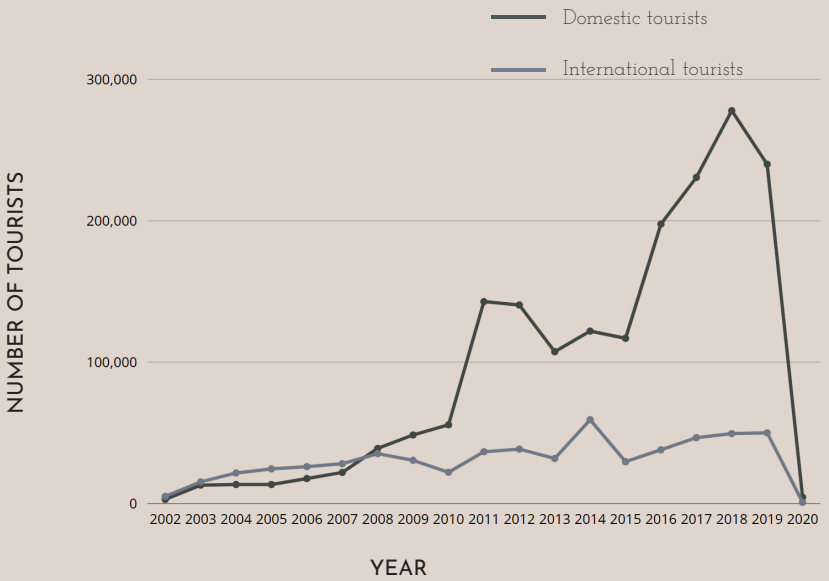


Figure 27: The number of tourists visiting Ladakh was evenly divided between domestic and international arrivals until the year 2007. Since then, the number of domestic tourists has increased manifold while the number of international tourists has stayed almost the same, with slight fluctuation (LAHDC, p. 185). In 2020, an estimated 800 international and 4400 domestic visitors visted Ladakh, a drastic decrease due to COVID travel restrictions and conflicts with China near Pangong Lake. (Pelliclardi, 2020, p. 740)

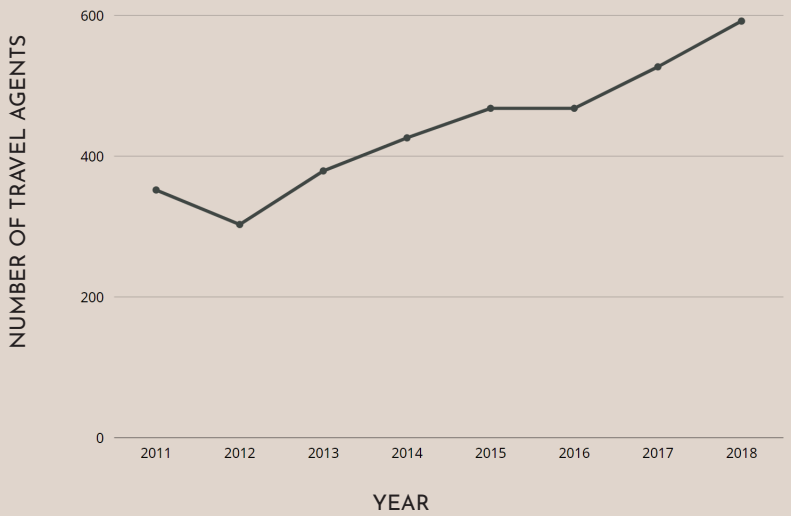


Figure 28: This graph shows the number of travel agents and agencies operating in Ladakh. Two or three night treks are common in Ladakh and travel agents are often required to get permits to visit protected wildlife areas (LAHDC, p. 188).

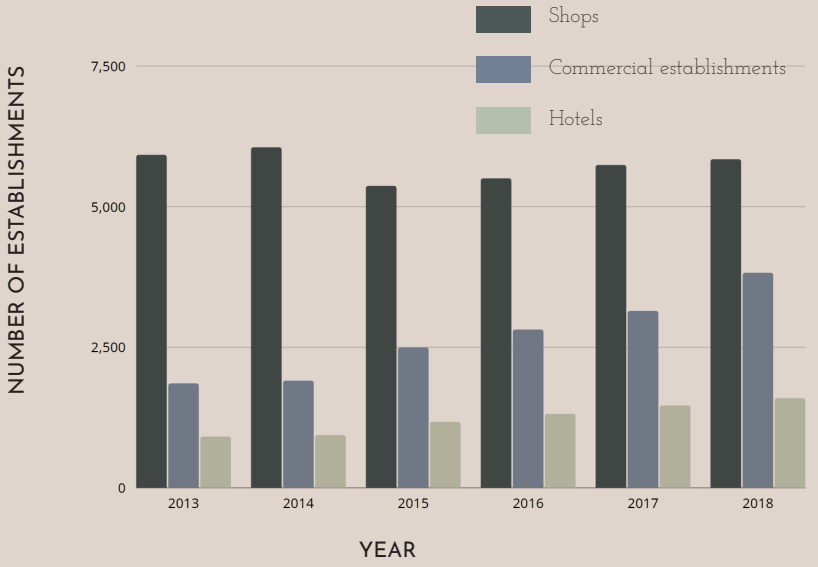


Figure 29: A steady increase in the number of hotels and other commercial establishments(travel agencies, bike rentals, cafes, shops etc.) in the Leh district can be seen even over a five year period (LAHDC, p. 116).

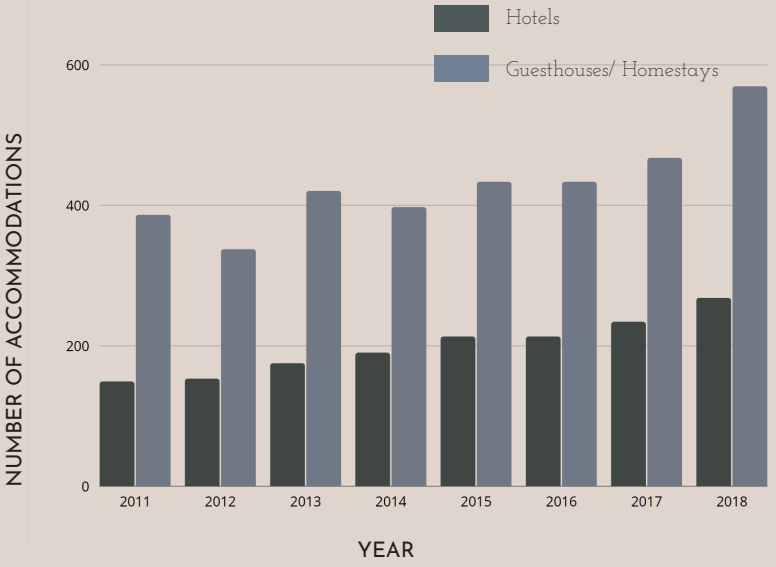


Figure 30: This graph shows an increase in the number of tourist accommodations in the form of hotels and homestays in the Leh district. Not only has the number of accommodations gone up but quality of accommodations and hence their use of resources has also increased. For example, in 2011 there were zero 3 star and A+ class hotels in Ladakh but in 2018 there were two 3 star and twenty three A+ class hotels (Ibid, p. 188).

Figure 31: This photo was taken in Leh, close the Leh market. Shops such as these that advertise tours and treks all over Ladakh reflect the increasing number of tourism related businesses in Leh

When sustained and limited, tourism can help a region economically, and in some cases, lift people out of poverty. However, as in the case of Ladakh, remote alpine communities with limited natural resources such as water, suffer in the long run when the number of tourists grows exponentially. Rapidly increasing tourism has led Ladakh on a road to rapid modernization accompanied by a loss of traditional cultural practices and adoption of western values. Monetary value placed on goods and labour has decreased community bonds and caused rapid migration of the young from rural Ladakh to urban areas all over India (Norberg-Hodge, p. 63). Cement has replaced mud as the main building material as it is cheaper and more efficient to produce but needs to be imported from other parts of the country (Ibid, p. 76).

New lifestyles, technologies and infrastructure have permeated the local communities and affected indigenous traditions, culture and land use. Traditional agricultural practices have also been affected. Population increase over the last few decades with crop production remaining almost the same has meant that a large amount of food grain needs to be imported by traders, cooperatives and the central government to ensure food security (Pelliciardi, 2012, p. 54) Food is often distributed to the residents at a subsidy or, in some cases, free of charge, making the community more dependent on the outside world (Ibid). This model of subsidized food has led to a change in diet from traditional grains such as barley to rice which cannot be grown locally (Ibid, p. 68). The population and local administration wishes to regain self sufficiency through extensive land reclamation, irrigation projects and increase in agricultural yields but lack of funding and decreasing manpower due to urban migration has increased the need for alternative solutions (Ibid , p. 54) In recent years, Ladakh has earned the nickname "mini Dubai" for its population of immigrant construction and farm workers during the tourist and agricultural seasons. The construction workers often end up staying in the Leh Old Town, where the owners have moved out due to a lack of infrastructure and deteriorating buildings (Ibid).

Tourism in Ladakh is also heavily affected by local political and global events. Political conflicts between India and its neighbouring countries can drastically reduce the amount of yearly tourist footfall. Recently, the tourism driven economy also took a huge hit from restrictions resulting from covid-19 pandemic. As these factors are unpredictable, it makes more sense to divert funds generated from tourism to increase the quality of life of Ladakhis, rather than constructing hotels or new infrastructure projects that make it even easier for tourists to visit the region.

Figure 32: Some of the hotels advertised in Leh.


HOTEL SANGTO VILLA & JORCHUNG HOTEL
ASHOKA GUEST HOUSE & SNOW LAND HOTEL
KUSHU GUEST HOUSE & KANIKA HOTEL
JOR GUEST HOUSE & NANGSO HOTEL
HOTEL CITY PALACE & DAWA GUEST HOUSE
YARTSA GUEST HOUSE & YAROL GUEST HOUSE
OASIS GUEST HOUSE & HOTEL LHALINGKHA
NIRWANA PALACE & HOTEL LUNG SE JUNG
HOTEL RAFICA & TONGSPON GUEST HOUSE

Figure 33: A view of Leh showing the Leh Bazaar and farmland beyond in 1983. Image copyrighted by Ed Fulton.

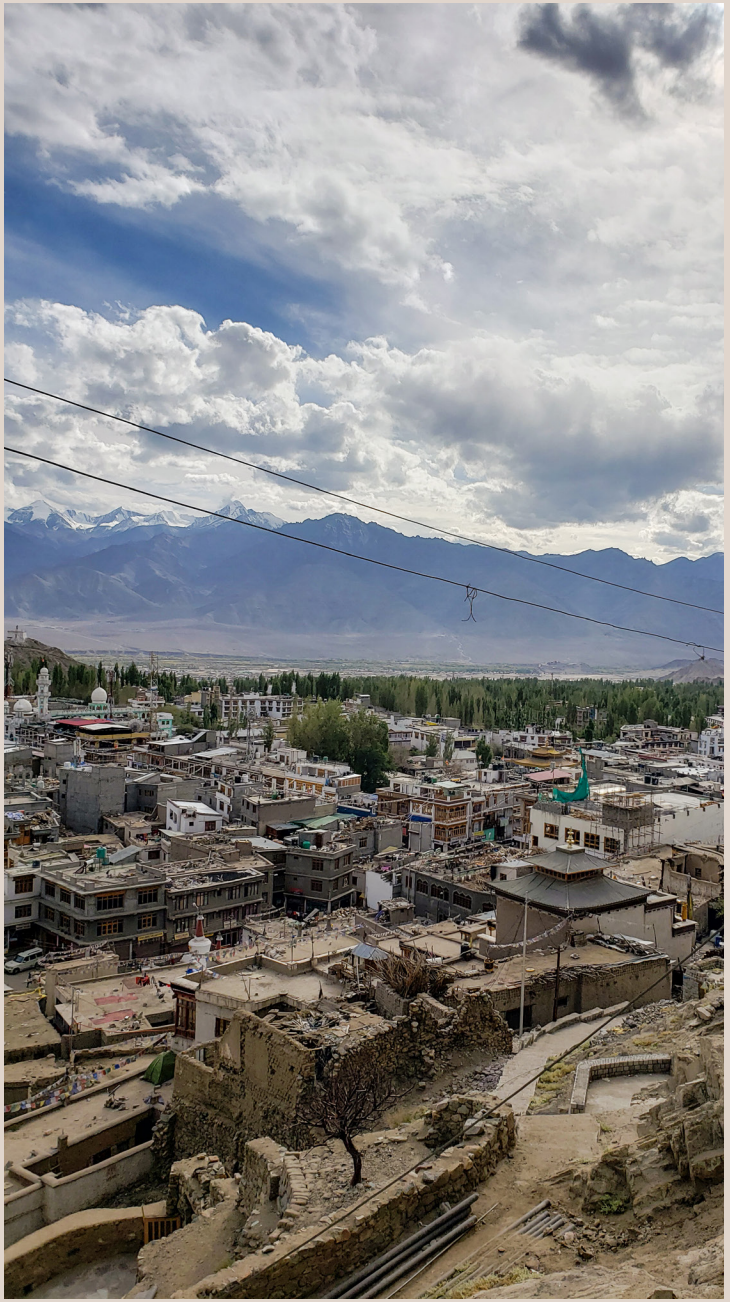


Figure 34: Taken in 2019, this image shows a change in character of the Old Town, especially around Leh Bazaar.

Figure 35: Another image taken in 1983 looks towards the North of Leh valley and shows that most of the land use was agriculture. Image copyrighted by Ed Fulton.

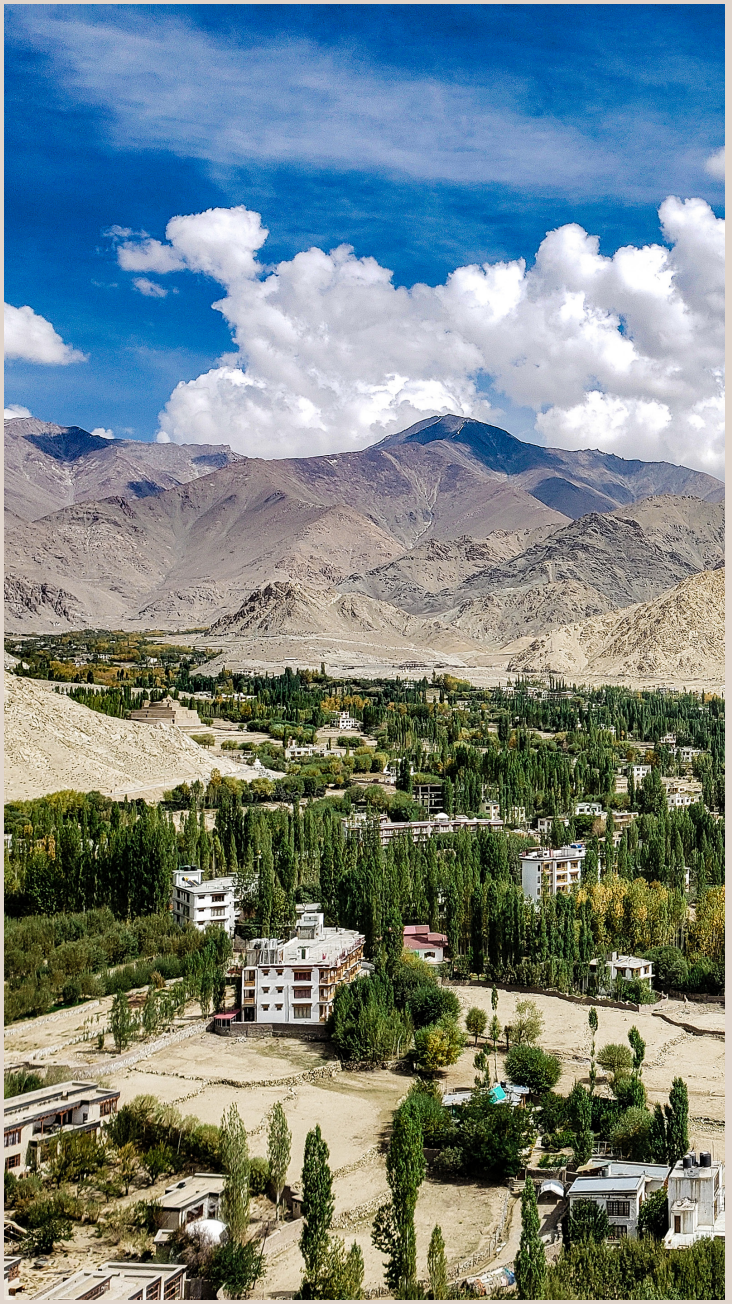


Figure 36: This image, taken in 2019 shows a similar view towards the northern Leh valley and shows newly constructed buildings and an increase in the number of trees, especially *Populus ciliata*.

Kharyog- the Old Town of Leh

In the 17th century, Leh was the site of the palace of Ladakhi King Sengge Namgyal. The Leh palace was also constructed around this time for the Ladakhi royal family along with many monasteries such as the Hemis, Chemre and Tashi Gong (Fewkes, p. 55). The Old Town of Leh, also called *Kharyog*, refers to residential houses and community spaces directly before the Leh Palace (Morup, para 1) . This area used to be fortified with walls and five gates oriented in different directions. The houses were located according to the rank of the court officials or status of people (jewelers, tailors, horsemen etc) residing in them. For example, the Lonpo's (Prime Minister) house stood right at the foot of the palace (Ibid). On top of the highest hill in Old Town is the Namgyal Tsemo Complex that consists of a tower and chapel, Tsemo Goenkhang (protector temple), and Tsemo Maitreya temple. These were built between the years 1400 and 1540 by Kings Tashi Namgyal and Tragspa Bumde (Leh Monasteries, para 2).

There are three main entrances into the Old Town from Leh Bazaar. Most of the Old Town is connected by a network of narrow, sloping, pedestrian-only streets. Leh Bazaar is a major hub filled with shops, restaurants and tourists. Drinking water is obtained from mountain aquifers but is distributed unequally through public water taps and hand pumps, resulting in the residents receiving less than 10% of the water amount recommended by the Indian government. (Alexander, 2007, p. 33) As a result of the lack of infrastructure and insufficient water supply, many of the wealthy families formerly residing in the Old Leh Town moved out and today the houses are mostly occupied by seasonal migrant workers who are unable to maintain them (Morup, para 34). This, combined with modern construction, tourism, seismic activity and heavy rainfall, has led to further deterioration of the structures. In 2008, the site was added to world's monument watch that has resulted in several renovations but the town is still in need of basic infrastructure such as electricity and a sewage system.(Alexander, p. 46)

Very few hotels, guest-houses and cafes reside inside the Old Town. The existing ones are situated mostly at its periphery and have been reconstructed using modern construction techniques that makes them stand apart from the architecture of the rest of Old Town. (Ibid, p.39) There are, however, a few exceptions where old, heritage structures have been rehabilitated for different uses. For example, Lala's Cafe, also known as Lala's Gallery, was formerly known as the Sankar Labrang (THF, Leh Heritage House, para 1). It was the home of a monk who served as caretaker of a temple nearby. The house was set to be demolished to make way for a modern, concrete-frame shop by the Sankar Monastery but persistent lobbying by the Leh Old Town Initiative allowed it to be used as showcase of the old town conservation project (Ibid, para 2). The house now hosts a permanent exhibition room dedicated to the history of Leh, the architecture of old town and the on-going conservation projects. It also serves as an entry point for visitors to the Old Town. A nine-foot statue of Avalokiteshvara (Boddhisatva) found buried near the cafe was recently installed outside the building (Morup, para 12).

The Old Town is still important to the residents of Leh as it has many religious structures in the form of temples and stupas that serve as venues for many religious festivals throughout the year (Ibid, para 9). However, despite the efforts by non profit organizations such as LOTI and THF, the progress towards rehabilitation of Old Town has been slow and there is not much information that highlights the importance and heritage of this area for tourists (Ibid, para 34). In its present state, the Old Town portrays a sense of disconnect from the rest of the city that has expanded well beyond its historical gates. Old Town needs an intervention that highlights the importance of its architectural and cultural heritage, and reconnects it to the modern Leh that has benefited most from tourism.

Figure 37: View of Leh Old Town from Leh Palace.


Namgyal Tsemo Complex
Namgyal Tsemo Road
Namgyal Tsemo Trail
Leh Palace
Leh Palace Road
Taxi stand
Central Asian Museum
Chutey Runtak Street
Jama Masjid
Main Bazaar Road
Leh Bazaar
OLD LEH TOWN
Polo ground
A
B
C
D
LEGEND
Old Leh Town boundary
Streams
Pedestrian only streets
Shared streets
Forest/wooded areas
Farmland
Water hand pumps
Image locations
0
100
200 m

Figure 38: Map of Leh Old Town and adjacent areas showing major roads, streets and water hand pumps.

(A) Figure 39: Chutey Runtak street is adjacent to Kharyog and Leh Bazaar. The streets are narrow with shops and residences on each side. The elevation and slope gradients are also low enough for planting trees, as shown by the white willow in the background.

(B) Figure 40: Some parts of Kharyog still display the heritage of Leh and are relatively untouched by modern construction techniques. The street above lies in such an area and shows the narrow streets without any drainage infrastructure.

(C) Figure 41: Some parts of Kharyog are being upgraded at the moment to include drainage pipes or channels. This is an example of one such part. The renovation work has been slow, however, as most of the funds from tourism are directed to newer developments outside the Old Town

(D) Figure 42: This image taken in the Maney Khang area of Kharyog shows one of the public water taps in use. Image copyrighted by Kevin Standage.

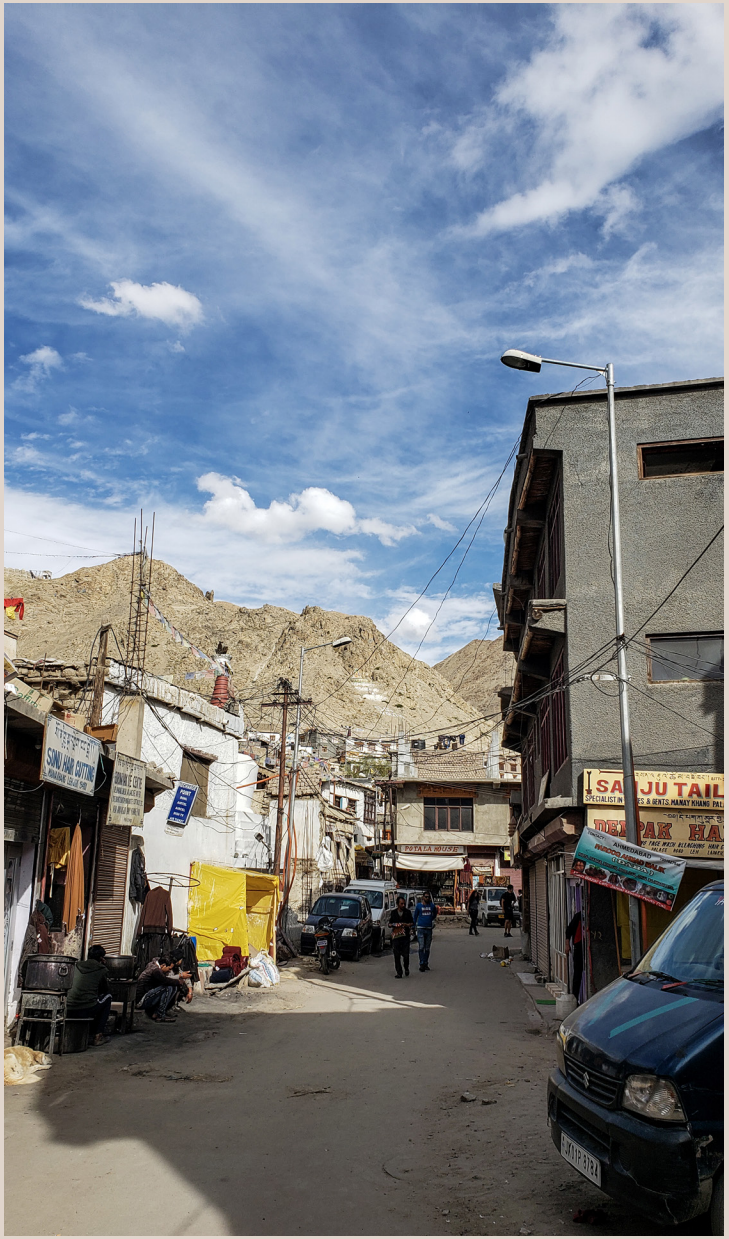


Figure 43: Entrance to Leh Old Town Market from Leh Bazaar. This area is also known as Maney Khang and despite being marked as a pedestrian-only street, it is paved with asphalt and shares space with automobiles. There is no surface water drainage system.

Figure 44: Stupa gates identical to these not only mark entrances to monasteries and temples but also the entrances to Kharyog.

Figure 45: Taken in 1983, this image shows Leh Bazaar before it was renovated in 2018. Low number of automobiles, presence of street vendors and trees give the bazaar a distinct and inviting look. The buildings in the picture have also not been torn down and rebuilt. Image copyrighted by Ed Fulton.

Figure 46: Taken in 2019, this image shows Leh Bazaar after renovation. Prohibiting vehicular traffic has made it safer and walkable but the bazaar's character has diminished as the old trees have been taken down and the construction materials used are not indigenous to Ladakh. Street vendors have also been removed.


1
2
3
4
5
6
7
8
9
10
11
12
13
14
3650m
3600m
3550m
3500m
Maney Khang
Stalam
Lobding
Stago Philoq
Chutey Runtak Street
Main Bazaar Road
Leh Bazaar
LEGEND
Old Leh Town boundary
Forest/wooded areas
Farmland
Water hand pumps
Image Locations
1. NAMGYAL TSEMO
2. LEH PALACE
3. NAMGYAL STUPA
4. GONPA SOMA
5. CHENREZI LHAKHANG
6. LONPO HOUSE
7. MUNSHI HOUSE
8. RED MAITREYA TEMPLE
9. GURU LHAKHANG
10. KALMAK HOUSE
11. JAMA MASJID
12. QADIR SHEIKH HOUSE
13. SHANGARA HOUSE
14. STUPA GATE
0
100
200 m

Figure 47: Map of Leh Old Town and adjacent areas showing some of the identified heritage buildings.

Figure 48: Lala's Cafe, also known as Lala's Gallery is an example of an heritage building repurposed for a different use. Image copyrighted by Kevin Standage.

Figure 49: The Roke Bano house is another building restored by THF/LOTI and currently serves as the HQ and living quarters for those who are working on restoring Old Town, mostly voluntary interns (Standage, 2015). Image copyrighted by Kevin Standage.

At the height of its prominence, the Old Town consisted of around 120 houses; most of these are gone today, along with the protective wall (Morup, para 1). Historically, these houses acted mostly as winter residences for families, with summer residences built outside the city walls, constituting large tracts of land ideal for farming (Ibid, para 2). The architecture of Old Town displays indigenous aesthetics with use of indigenous materials such as mud/clay and wood for construction as well influences from other parts of Central Asia, Tibet and Kashmir (Ibid, para 3). The roughly 24 acres area consists of five wards (Kharyok, Maney Khang, Stalam, Lobding and Stago philoq) that are connected by narrow, winding pathways that are accessible only by pedestrians. The residences were built from locally available materials such as stone, wood (juniper, poplar and willow) and sun-dried mud bricks (Johnson, 2014, p.49). Leh's Old Town and monasteries are a huge draw for tourists and have been renovated over the last 10 years but the rest of the Old Town has seen neglect and has deteriorated with time, despite its historical and cultural significance (Morup, para 34).

Figure 53: The **Lonpo House** lies below the Leh Palace, indicating the power that the Lonpo family held in court (Morup, para 30). It has a spacious room on terrace and a kitchen and a guest room on the floor below. It was restored between the years 2000 and 2003 by a conservation architect named John Harrison and is currently being used by monks of Chemday monastery. A room has also been lent out to the Himalayan Cultural and Heritage Foundation (Ibid, para 32).

Figure 54: The **Munshi House** stands on the upper part of the town, below the eastern end of the royal palace and was once the residence of Togoche family that served as secretaries to the King. (Morup, para 28) After the invasion of Ladakh by the Dogras, the term Munshi was used as an official title for the secretary in the Ladakh court and was a hereditary position. The building was renovated to add new rooms in the 19th century by Munshi Spalgyas. As common with many houses in Old Town, most of the rooms have decorated balconies as well as two kitchens - a smaller one used in summer and a larger one for winter when the whole family gathered around a wood stove to stay warm and live in one room. The family moved out in 1984 and the house is now used as a community arts and media space. (Ibid, para 29)

Figure 55: The **Red Maitreya Temple** was built by King Tragspa Bumde in the early 15th century (Tibetan Heritage Fund, para 1). The temple has been renovated multiple times in the past, most notably after the Dogra invasion in 1840s and after water damage in the 1950s. The temple has two complexes, a white assembly hall and a red tower of the Maiterya Temple which gives it its name (Ibid, para 2). In late 2005, some wall paintings were discovered under a white wash and then restored with the help of a Romanian restorer and the staff and students of the Technical University of Erfurt, Germany (Ibid, para 3).

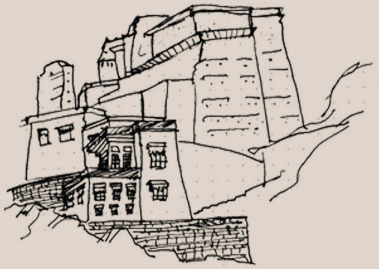


Figure 50: The **Namgyal Tsemo complex** sits atop a high mountain to the east of the Leh Palace and consists of a tower and chapel, Tsemo Goenkhang (protector temple), and Tsemo Maitreya temple. These were built between the years 1400 and 1540 by Kings Tashi Namgyal and Tragspa Bumde (Leh Monasteries, para 2).

Figure 51: The **Royal Palace of Leh** was built by King Sengge Namgyal in the 17th century. It is a massive nine-story stone structure designed in the Tibetan style that was later made famous by Potala Palace in Lhasa (World Monuments Fund, para 1). The palace was abandoned in the mid nineteenth century following the Dogra invasion. During this time the palace decayed and started to fall apart but has been undergoing renovation with several renovated parts now open to tourists (Ibid).

Figure 52: The **Namgyal Stupa** is one of eight different types of stupa in the Indo-Tibetan Buddhist tradition that represent eight events in the life of Buddha. (Berchenling, para 1). Also known as the stupa of complete victory, it commemorates Buddha extending his life for three months. Several types of stupa can be found in Old Town, with many functioning as gateways into the town (Morup, para 13).

Figure 56: The **Kalmak House** is located behind the Jama Masjid and was recently renovated. The family's descendants were from central Asia and the house was at one time called 'China-Pa' ('man from China') (Morup, para 35). The family used to host travelers and traders from Kargil for a long time. The exterior of the house stands out in Old Town due to a curved exterior wall that contrasts the straight lines and rectangles of most of the other houses (Ibid).

Figure 57: Also located right behind the Jama Masjid, the **Qadir Sheikh House** has an exquisitely carved wooden balcony. (Morup, para 34) The winter kitchen in the house is very large and can hold roughly 100 people. Qadir Sheikh used to host many guests during festivals such as the Dosmoche festival, an annual Ladakhi prayer festival that is still celebrated on the 28th and 29th day of the 12th Tibetan month which normally falls in the second half of February (ibid).

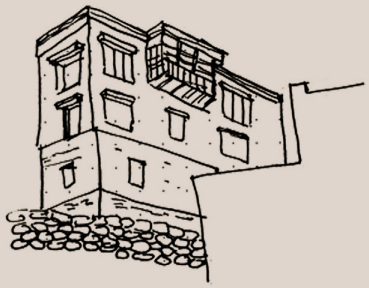


Figure 58: One of the bigger houses in Old Town, the **Shangara House** is known for its large prayer room (Morup, para 33). Apart from that it has a kitchen and a beautiful balcony with intricate woodwork that faces Leh Bazaar. The descendants of this family were key members of the Lopchak Mission, a biannual trade mission that went to Lhasa on behalf of the Ladakhi king bearing items of trade as well as gifts for the Dalai Lama (ibid).

PRECEDENTS

Figure 59: Central Asian Museum

Case study: Central Asian Museum

PROJECT: Central Asian Museum
LOCATION: Tsas Soma, Chutey Runtak, Leh.
YEAR: 2008-2020

The main purpose of this case study is to consider traditional construction methods and materials used for construction on the Tibetan Plateau, of which Ladakh is a part. Amongst the construction projects in Leh over the last decade, the Central Asian Museum stands out due to its use of local materials and construction techniques in a modern context.

The Central Asian Museum was conceived in 2007 to commemorate Ladakh's historic role in the ancient trade routes that connected the region to other Central Asian cities and regions such as Yarkand, Kashmir, Tibet, Afghanistan, Samarkand and Bukhara. (Architect's empire, 2020, para 1). Built on the location of a former *serai*, the museum is designed in the shape of a Tibetan-Ladakhi fortress tower overlooking a large garden.

The construction materials used are traditional Ladakhi materials of stone, timber and mud. The granite stones are also sourced locally from Shey village, the old capital of Ladakh. The mortar is a mixture of soil, water and *markalak* (local clay from river beds)(Ibid, para 10).

The garden outside the museum building itself also displays the use of other traditional Tibetan materials such as slate to pave pathways, and stone and wood to construct benches and sun shades. There is also a canal that carries water through the garden.

In conclusion, the use of construction materials and construction techniques at the Central Asian Museum provide an example of how local resources and traditional knowledge can be implemented in the design process to reduce a project's carbon footprint. A project such as this can act as a precedent for future construction in Leh.

Figure 60: Furniture such as benches and sun shades are constructed using locally sourced stone and wood.

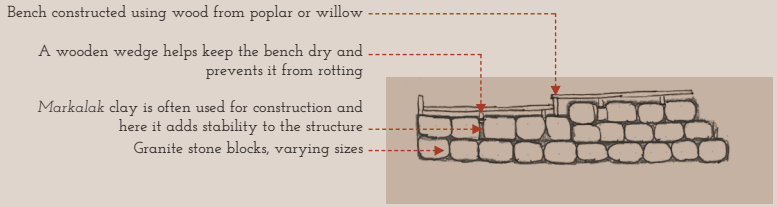


Figure 61: Section of a bench on site drawn from observation.

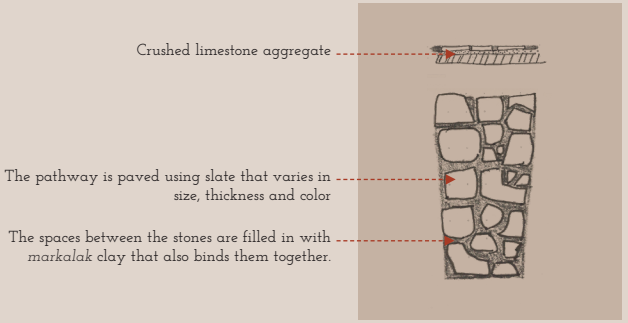


Figure 62: Section of paving on site drawn from observation.

Figure 63: The garden is also planted with willow trees that would grow well next to the water canal.

Figure 64: Map of Leh Old Town showing location of the conservation model street.

Case study: Conservation Model Street

PROJECT: Conservation model street
LOCATION: Stago philoq, Kharyog, Leh.
YEAR: 2005

The Tibetan Heritage Fund's (THF) conservation model street serves as one of the very few examples of infrastructure development within the Old Leh Town that utilizes local materials and applied local knowledge and conditions during the design and construction process.

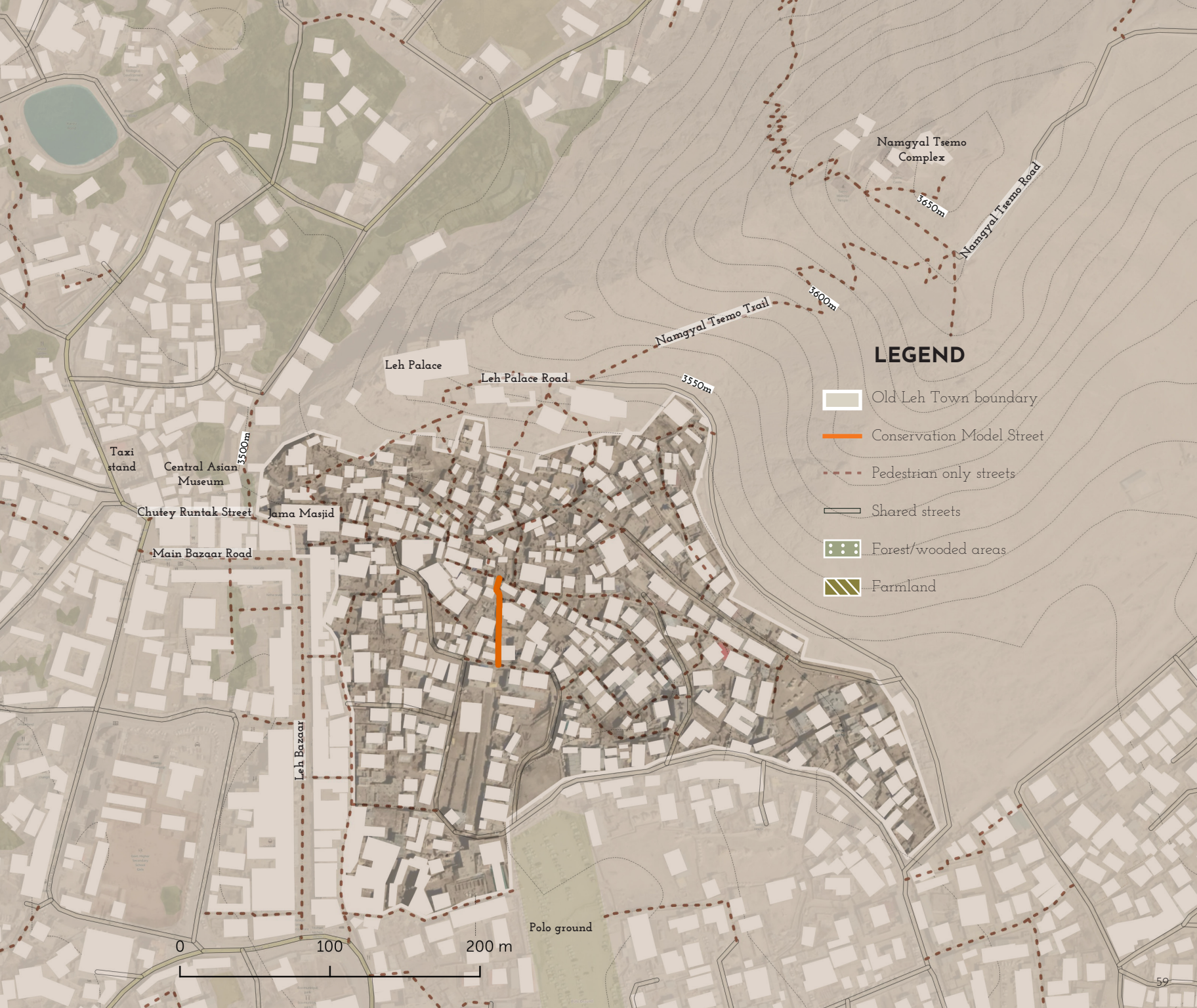
The project was built to demonstrate THF's vision for the Old Town of Leh. Several social surveys conducted previously cited poor infrastructure in the area as the most urgent problem. The alley picked for the project was not only in need of infrastructure improvement but also adjacent to many important historic buildings (Conservation Model Street, para 1).

Several technical experts were contracted by THF and together with volunteers that were mostly residents of the area, the street was finally upgraded. The drains dug were at least 70cm deep to allow water to keep flowing throughout the winter and paving comprised slate as opposed to concrete tiles that were favoured by the Indian government (Ibid, para 3).

This project was considered successful as it led to enhancement in community spirit and also a significant clean-up of the area. This project was initiated by THF and community members after waiting 10 years for the government to take action (Ibid, para 13).

Much like the Central Asian Museum, this project helps in identifying local materials and context specific techniques, especially within the Old Town of Leh that is in need of basic infrastructure development such as water drainage.

Figure 65: This image taken in 2015 shows that the conservation model street is still in good shape and functioning. It also shows one of the stupa gates that mark the entrance to Kharyog. Image copyrighted by Kevin Standage.


Namgyal Tsemo Complex
Namgyal Tsemo Road
3650m
3600m
Namgyal Tsemo Trail
Leh Palace
Leh Palace Road
3550m
3500m
Taxi stand
Central Asian Museum
Chutey Runtak Street
Jama Masjid
Main Bazaar Road
Leh Bazaar
Polo ground
0
100
200 m
LEGEND
Old Leh Town boundary
Conservation Model Street
Pedestrian only streets
Shared streets
Forest/wooded areas
Farmland

Case study: Artificial Glaciers

PROJECT: Artificial glaciers
LOCATION: multiple in Ladakh
YEAR: 2005-present

Artificial glaciers are credited to Chewang Norphel, an engineer from Ladakh, whose observations of rising tree lines, retreating glaciers and farmers expressing worries about water scarcity inspired him to devise a low-tech form of geoengineered structures that could tackle the effects of climate change. (Regad, 2016, p. 7) The artificial glaciers are part of a large watershed system that works in combination with other infrastructure such as diversion canals, various irrigation schemes and water reservoirs known as *zings*. It is also very site specific, often requiring shade and temperatures below -15 to -20 Celsius (Ibid).

They can cost anywhere between 17500 to 26000 CAD to build and are supposed to provide water during the summer months of April and May as they are the sowing seasons when water requirements are relatively high. (Regad, p.51) They do so by using a constant freeze-thaw cycle and slowing the flow of water, allowing it to melt during peak summer months . (Clouse, 2014, p. 12)

Within the context of Leh, such artificial glaciers may allow opportunity to retain surface run off water for use by its residents. They are relatively low-tech, can be constructed using local materials, and can be implemented at a smaller scale, especially on areas with relatively steep slopes. They can also provide unique landscapes that display the importance of water in the region to tourists.

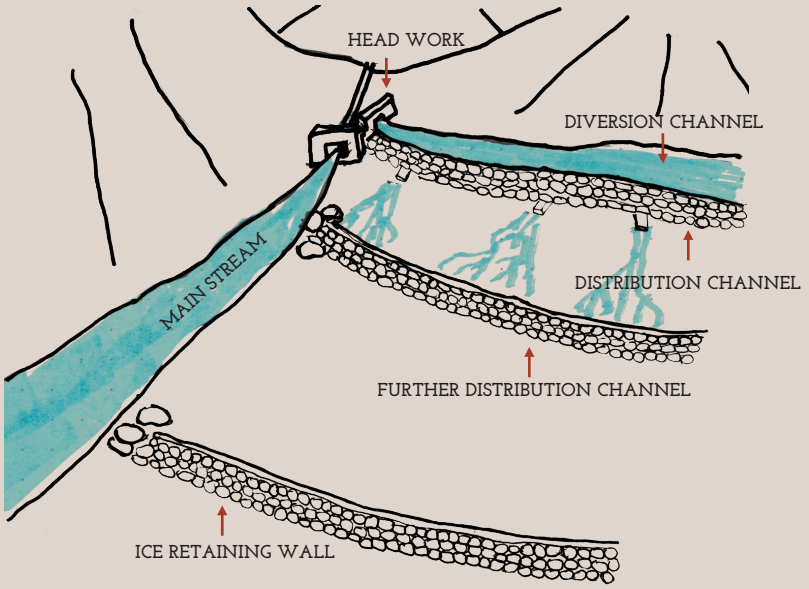


Figure 66: This diagram shows the functioning of an artificial glacier. The water from a river or stream is diverted into different channels before finally reaching either water storage structures (*zings*) for use later by farmers or going directly into fields.

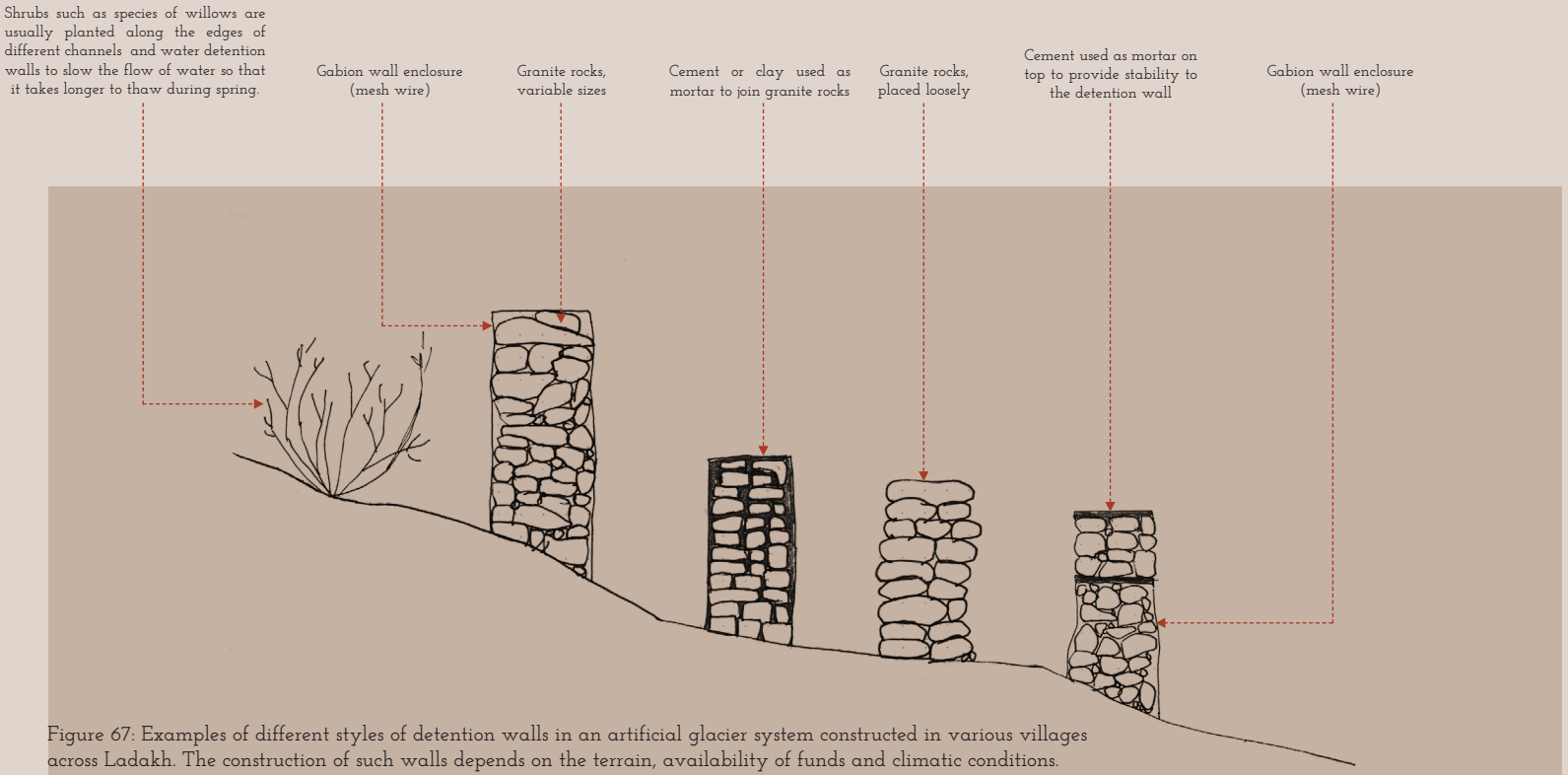
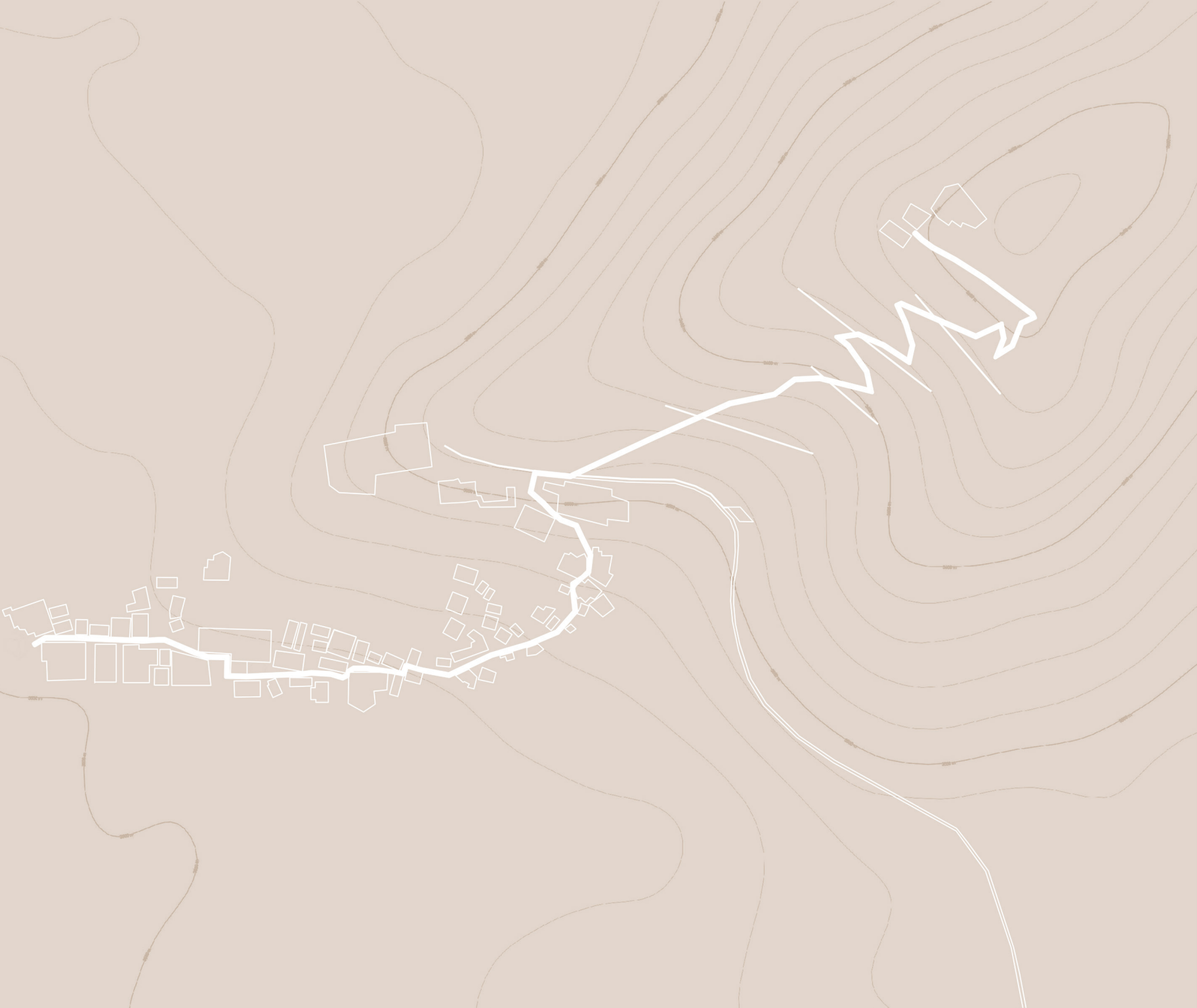


Figure 67: Examples of different styles of detention walls in an artificial glacier system constructed in various villages across Ladakh. The construction of such walls depends on the terrain, availability of funds and climatic conditions. (Gladfelter, 2018).

PROPOSAL

Figure 68: Map of the proposal, NTS



Leh Heritage Trail

Tourism has played a huge role in development and re-development of Ladakh. It has led to urban sprawl in the form of hotels, segregated the Old Town from the rest of the city and resulted in re-development of historical sites such as the Leh Bazaar into tourist spots without regard for its heritage. The former power and heart of the kingdom of Ladakh, *Kharyog*, now lies partly in ruins and neglect. Conservation efforts have been made by NGOs such as THF (Tibetan Heritage Fund) but the progress has been slow, often resulting in residents taking matters into their own hands as seen in the case of the Conservation Model Street where the residents and THF cooperated to pave a small part of the Old Town. There is a disconnect between the old and the continuously growing new as more attention is paid to the newer developments.

Another major issue that the Old Town faces, apart from a lack of infrastructure, is water access. There is only one communal water source within Old Town at the moment, situated at the entrance to Maney Khang. While it is difficult and expensive to connect all the residences to the existing water pipe system, there is a possibility to add more communal water sources so that the residents make shorter trips for water.

To highlight the unique heritage of *Kharyog*, a trail is proposed that connects the Old Town to its surrounding areas, namely Leh Bazaar and Namgyal Tsemo Complex. This trail is named the Leh Heritage Trail as it offers visitors and residents of Leh a journey along major historical landmarks and heritage buildings. The trail will also act as an example of rehabilitation for the areas of the Old Town still in need of infrastructure development. Rehabilitation has been defined by the US Department of Interior as "the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values." Due to the cosmetic changes already made to the parts of the Old Town (demolition of historical buildings and reconstruction using non indigenous materials), rehabilitation is the best strategy for the area. So far, the residents have not benefited much from the increasing revenue generated from tourism. Reuse of buildings abandoned by their owners, as seen in the case of Lala's Cafe, allows an opportunity not only to attract tourism but also allow visitors to appreciate and experience Ladakh's heritage. The revenue generated from tourism can also be used directly to rehabilitate the rest of the Old Town and improve its infrastructure.

Leh Heritage Trail takes the first step towards rehabilitation of the Old Town. It draws the tourists in, sets up guidelines for reconstruction of the infrastructure of Old Town and also make the religious areas of the Old Town more accessible to the residents. It defines the pathway with interpretive signage that directs tourists from the busy Leh Bazaar to the Namgyal Tsemo complex, one of the oldest and highest points in Leh. The materials used for reconstruction are stone and wood found locally in Ladakh and used traditionally all over the Tibetan Plateau. By paving the pathways and allowing water to drain away from the houses, Old Town becomes more accessible, especially during the winter.

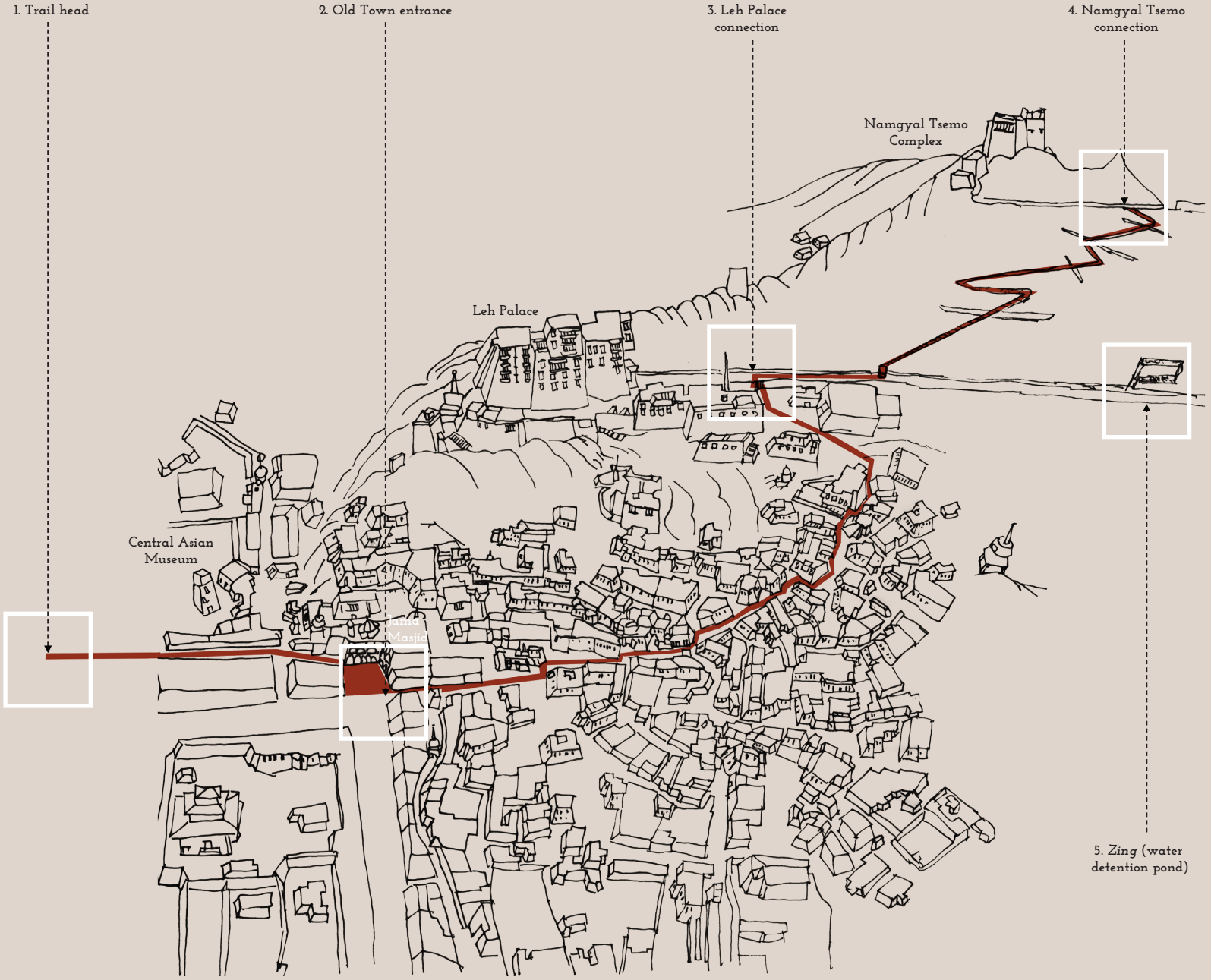
Figure 69: The map shows the location of the proposed Leh Heritage Trail and water structures.


Namgyal Tsemo Complex
3650m
Namgyal Tsemo Road
Namgyal Tsemo Trail
3600m
Leh Palace
Leh Palace Road
3550m
3500m
Taxi stand
Central Asian Museum
Jama Masjid
Maney Khang
Stalam
Chutey Runtak Street
Main Bazaar Road
Old Fort Road
Leh Bazaar
Lobding
Stago Philoq
Polo ground
0
100
200 m
LEGEND
Old Leh Town boundary
Existing pedesrtrian-only streets
Existing water hand pumps
Proposed heritage trail
Proposed water infrastructure
Proposed hand water pump

The Leh Heritage Trail begins at the junction of Old Fort Road and Chutey Rantak street, a historical street that runs adjacent to the boundary of Old Town and known historically for its Balti(stani) bakeries. The trail head also lies next to a communal water source and a heritage *Populus ciliata* tree. On the Chutey Runtak street it connects to two major landmarks in Leh, the Central Asian Museum and the Jama Masjid. It connects to the Old Town through a historical entrance from the Leh Bazaar that used to be marked with a wooden arch. Passing through the mostly unpaved parts of Maney Khang and areas below the Palace, the trail connects to the Leh Palace Road. Here it continues to the existing Namgyal Tsemo trail which, in its current form, is a narrow, unpaved trail that acts as a shortcut to the Namgyal Tsemo Complex. The elevation level of the complex means that there is a 150m elevation change throughout the trail. It mirrors the journey to other places of worship and monasteries throughout Ladakh as the journey becomes harder due to the incline as one gets closer to the end. It can be understood as a form of a pilgrimage with important incidents along the route.

Water also plays an important role on the trail. The trail head is located adjacent to a water hand pump, highlighting the need for a steady water supply for the residents of Old Town and how precious of a source water is. Water drains throughout the trail, highlighting the presence and movement of groundwater and makes it somewhat visible to visitors. Lastly, the water detention structures reveal the effects of climate change on water sources throughout Ladakh and the need for preservation of water. Interpretive and wayfinding signage will also be incorporated throughout the trail to enhance user experience and make it easier to find existing landmarks. The trail will also complement the restored and rehabilitated heritage buildings by using interpretive signage to highlight their history and importance.

Figure 70: This drawing shows the location of important sections and intersections on the Leh Heritage Trail


1. Trail head
2. Old Town entrance
3. Leh Palace connection
4. Namgyal Tsemo connection
Namgyal Tsemo Complex
Leh Palace
Central Asian Museum
Jamia Masjid
5. *Zing* (water detention pond)

1. Trail head

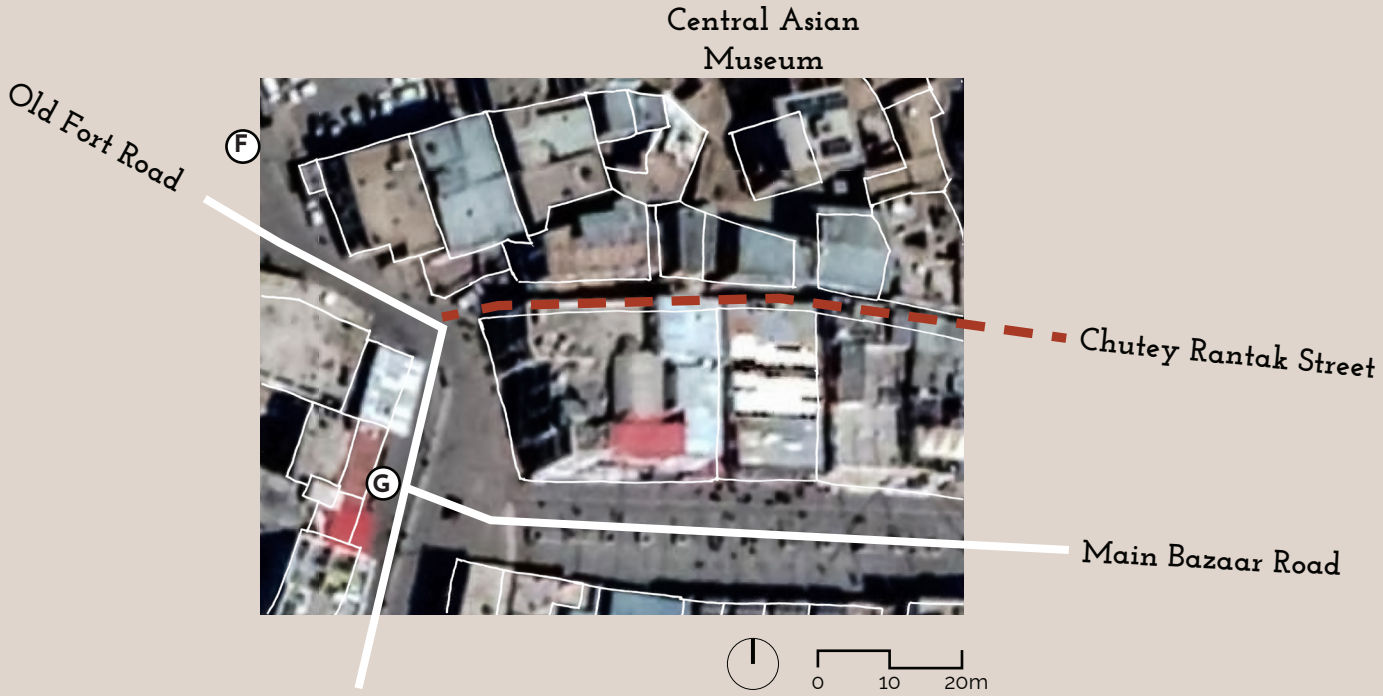
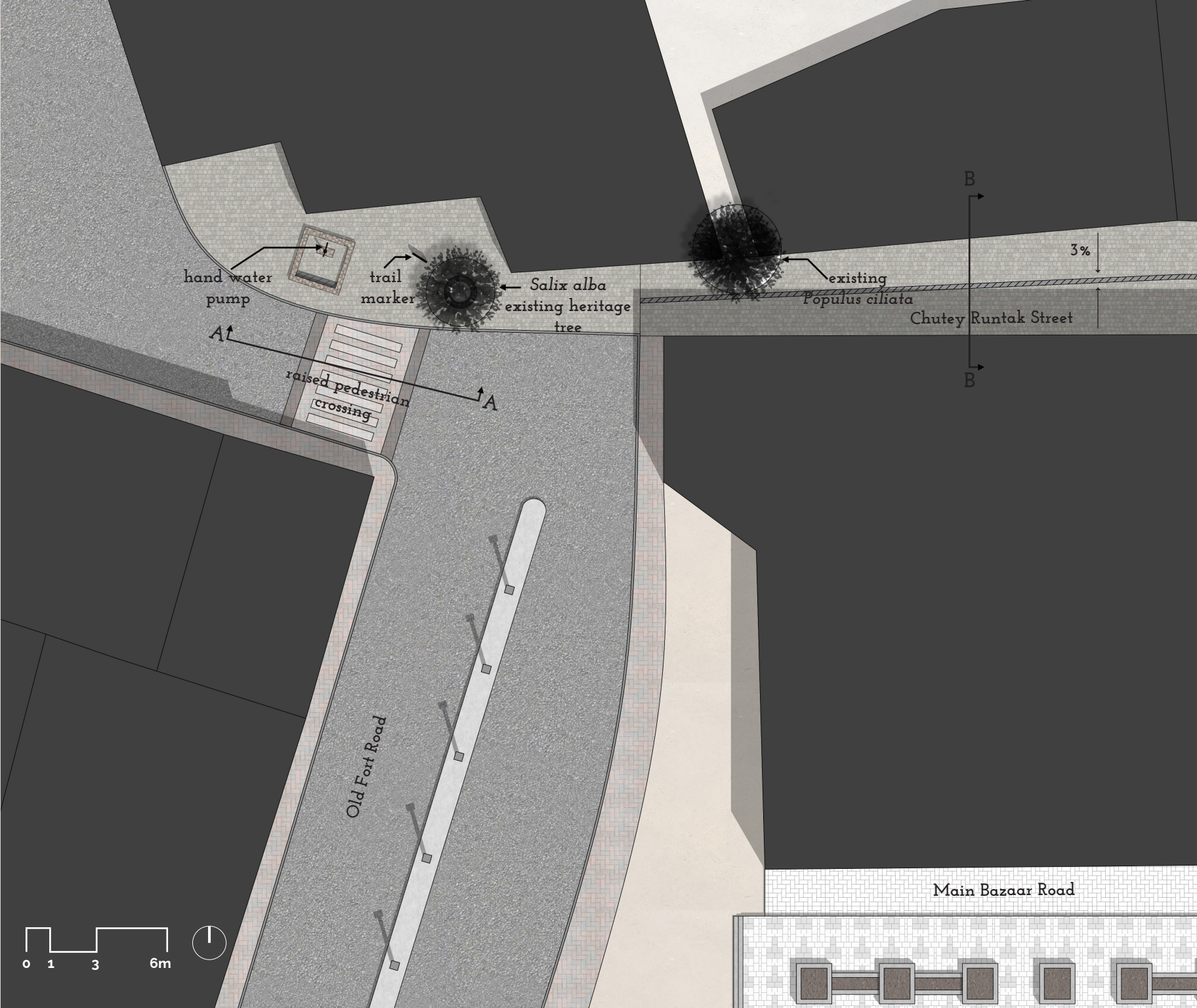

Central Asian
Museum
Old Fort Road
F
G
Chutey Rantak Street
Main Bazaar Road
0
10
20m

Figure 71: Existing conditions at Trail head.

Ⓕ Figure 72: The Old Fort Road is a four-lane road with a small sidewalk. There are no official crossings to either Chutey Rantak Street or Leh Bazaar Road.

Ⓖ Figure 73: The east side of Old Fort Road is missing a sidewalk. Adjacent to its intersection with Chutey Rantak street is a car park.


hand water pump
trail marker
Salix alba
existing heritage tree
existing
Populus ciliata
B
3%
Chutey Runtak Street
B
A
raised pedestrian crossing
A
Old Fort Road
Main Bazaar Road
0 1 3 6m

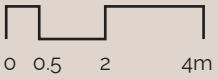
LEGEND

- Asphalt
- Granite paving
- Packed gravel
- Existing concrete brick paving
- Existing concrete brick paving
- Existing concrete sidewalk paving
- Stainless steel grates
- Dried mud bricks coated with markalak (waterproofing clay)
- Concrete

The Trail Head is marked by an existing heritage *Salix alba*. The Trail Head is also adjacent to a hand water pump relocated and redesigned to the paved sidewalk for easier and safer access. The water from the water hand pump is drained into the existing water drainage system that runs along the sidewalks. Chutey Rantak Street is also paved using granite that is found abundantly in Ladakh. The entrance to the trail is also made safer with the help of a raised pedestrian crossing that is paved with the same concrete pavers as the existing sidewalks. Other existing trees along Chutey Runtak Street are preserved and protected.

Figure 74: Proposal for trail head.

Figure 75: Section AA



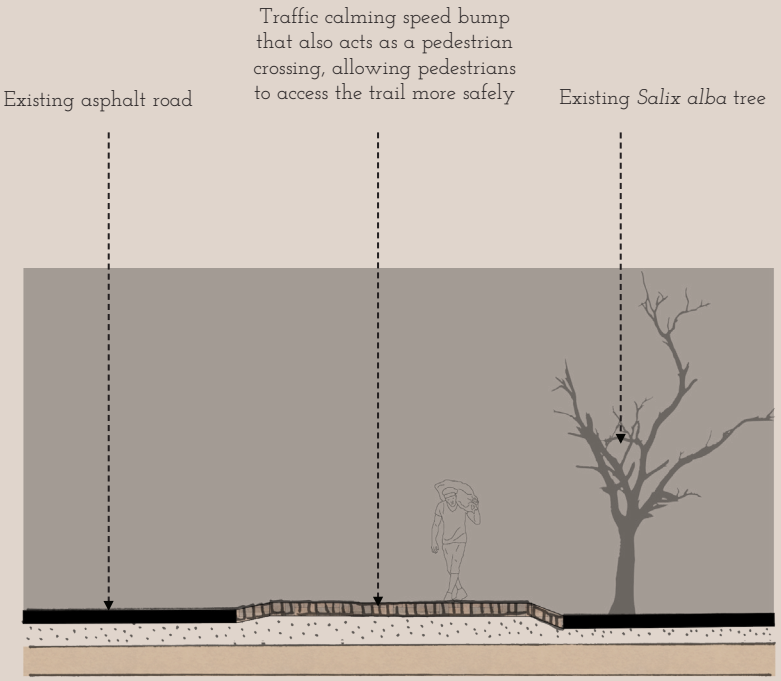
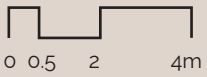


Figure 76: Section BB



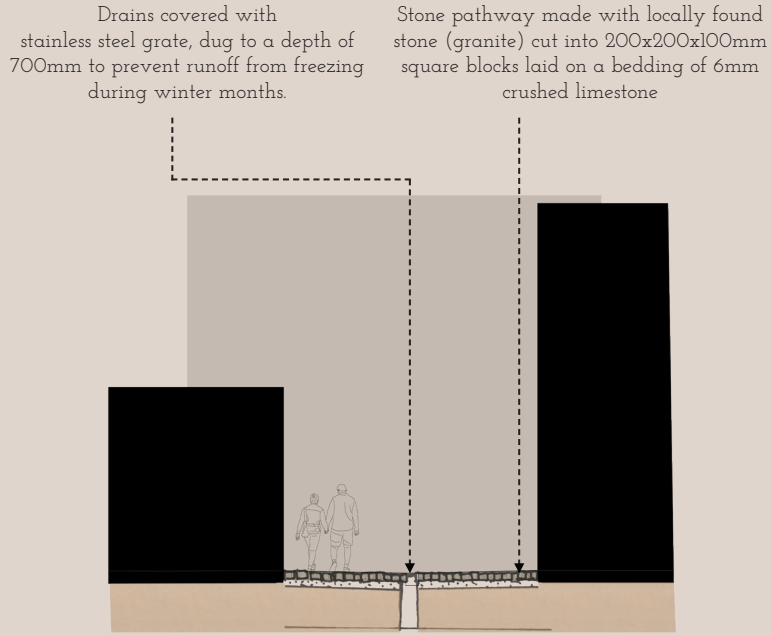
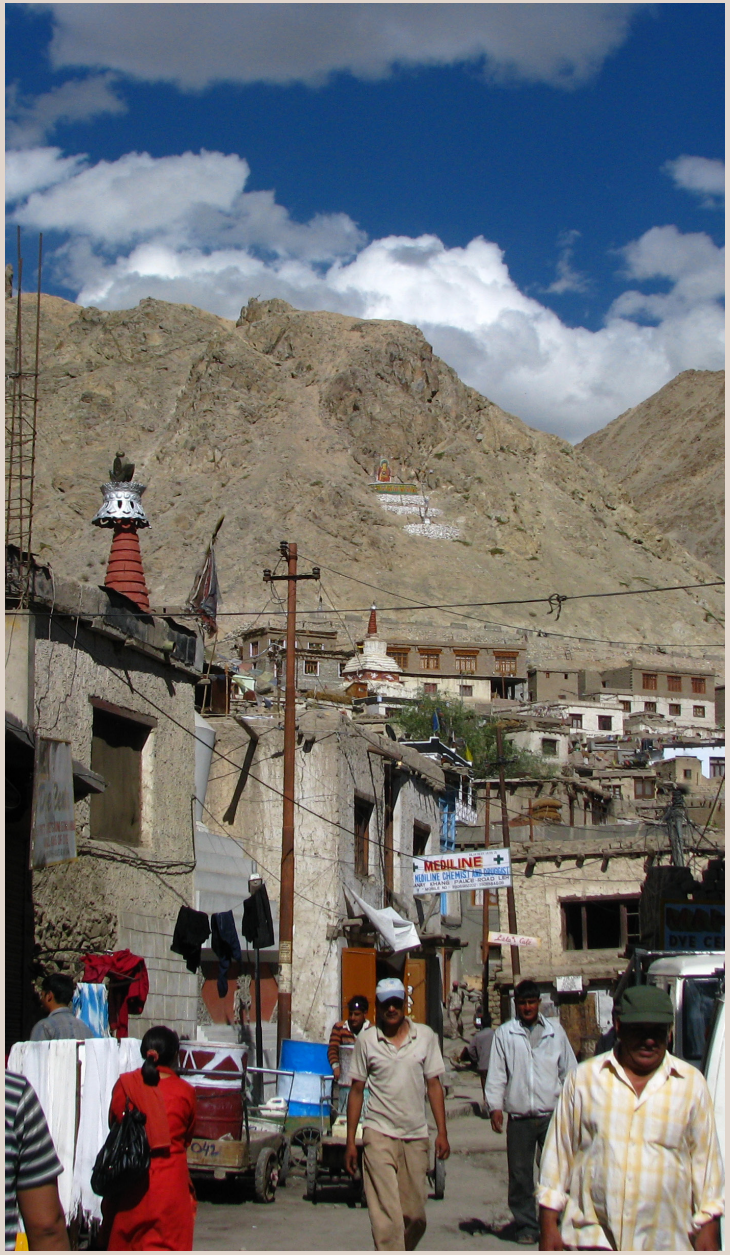


Figure 77: Perspective at the Trail Head.

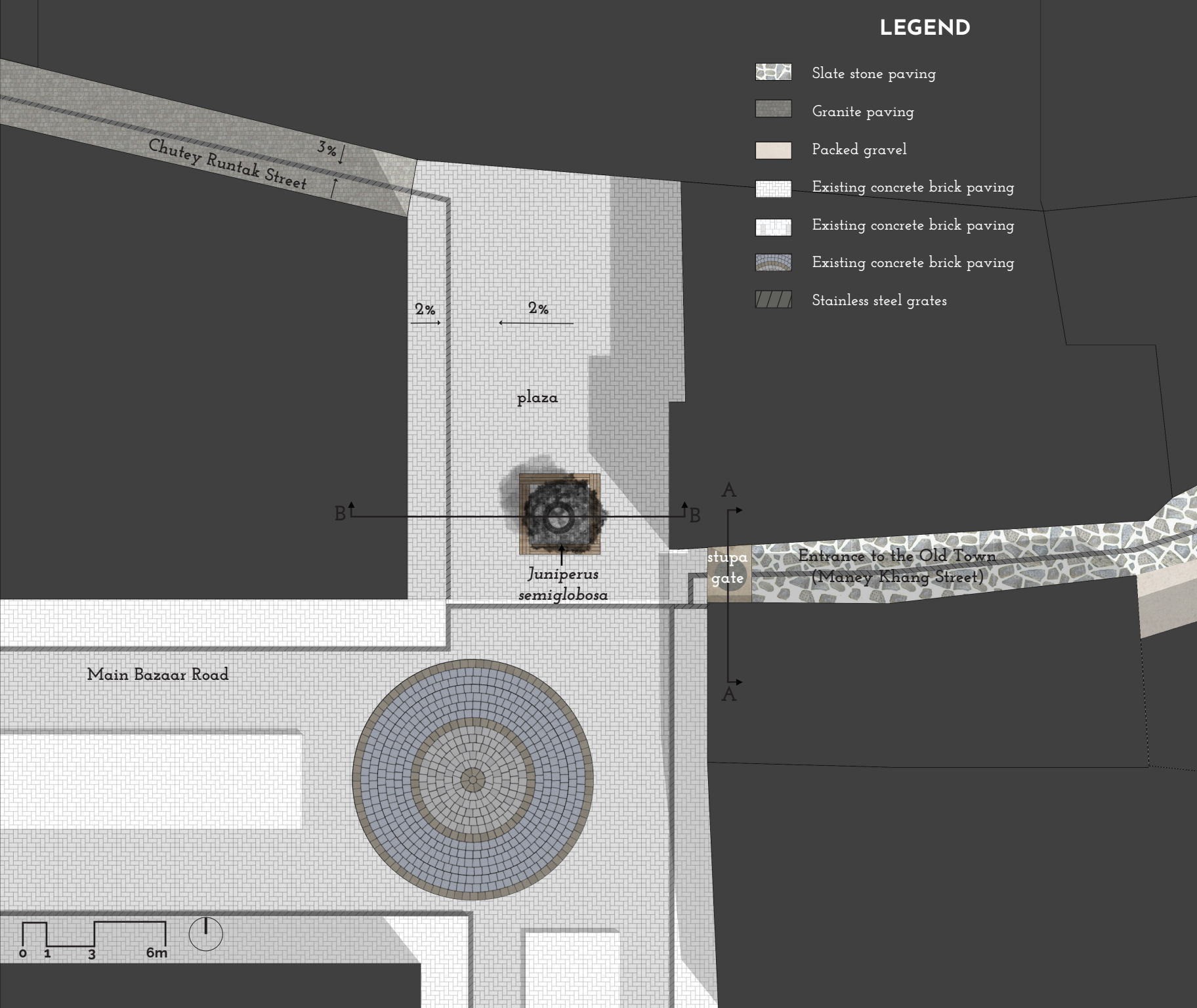
2. Old Town entrance

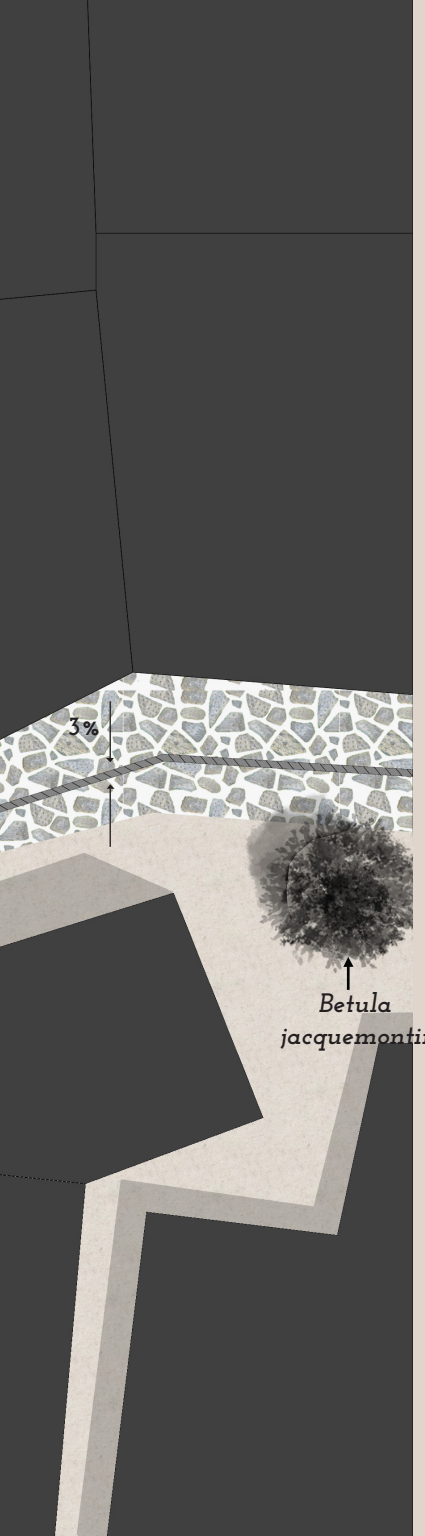
Figure 78: Existing conditions at the Old Town entrance into the Maney Khang area of Old Town.



(H) Figure 79: View into Old Town from the Maney Khang entrance

(I) Figure 80: The square outside Jama Masjid being used for a gathering, possibly a festival.


LEGEND
Slate stone paving
Granite paving
Packed gravel
Existing concrete brick paving
Existing concrete brick paving
Existing concrete brick paving
Stainless steel grates
Chutey Runtak Street
3%
2%
2%
plaza
B
B
A
A
Juniperus semiglobosa
stupa gate
Entrance to the Old Town (Maney Khang Street)
Main Bazaar Road
0 1 3 6m



The trail continues through Chutey Runtak Street until it reaches the plaza in front of the recently renovated Jama Masjid. A few alterations to the plaza are improved drainage and paving that extends the plaza all the way through to the entrance of Old Town, where the trail connects to the Maney Khang neighborhood. The entrance is also defined by a new stupa gate modeled after existing stupa gates in the Old Town.

To provide shade to users of the plaza, a *Juniperus semiglobosa* tree has also been added. A native species, the tree holds a sacred value for Tibetan Buddhists. Benches around the tree provide comfortable seating in the shade. *Betula jacquemontii* is another species of birch native to Leh and as the Maney Khang area adjacent to the Old Town entrance is relatively flat, there is an opportunity to plant it as an ornamental tree contrasting the willows and poplars planted throughout Leh.

Figure 81: Proposal for Old Town entrance into Maney Khang.

A new stupa gate that marks the entrance to the Old Town. The gate dimensions are based on similar gates in the old town and their narrowness indicates the feeling of scale in the old town, where streets are narrow, often only a meter and a half wide.

Locally found slate stone is used here for paving. They are laid out on a bedding of 6mm limestone aggregate using *markalak* (waterproofing clay) to fill the gaps. The surface dimensions of the stones vary but the thickness of each is approximately 100mm.

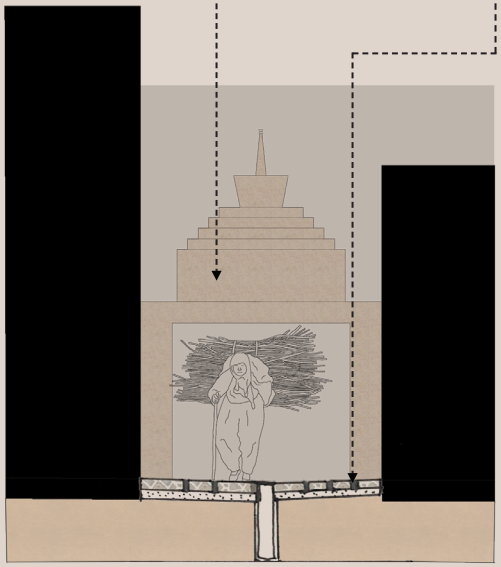


Figure 82: Section AA

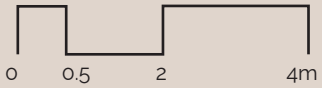
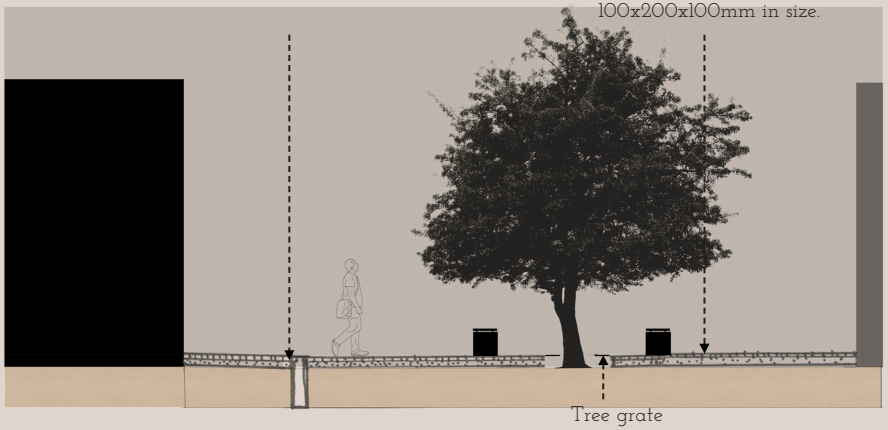


Figure 83: Section BB

Drains covered with a stainless steel grate connect with other drains on the main bazaar road

Existing pavers laid out during the renovation of Jama Masjid concluded in 2020. These concrete pavers are 100x200x100mm in size.



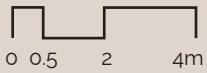
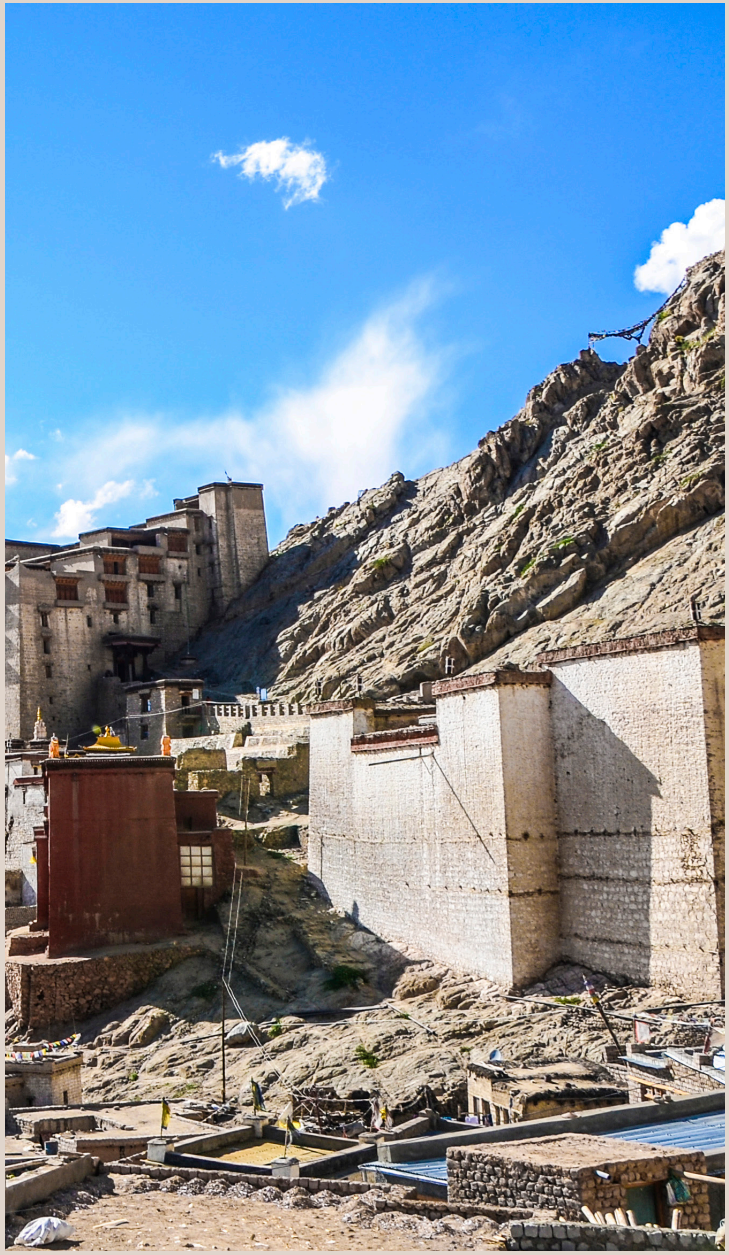


Figure 84: Perspective at the plaza adjacent to the entrance into Old Town.

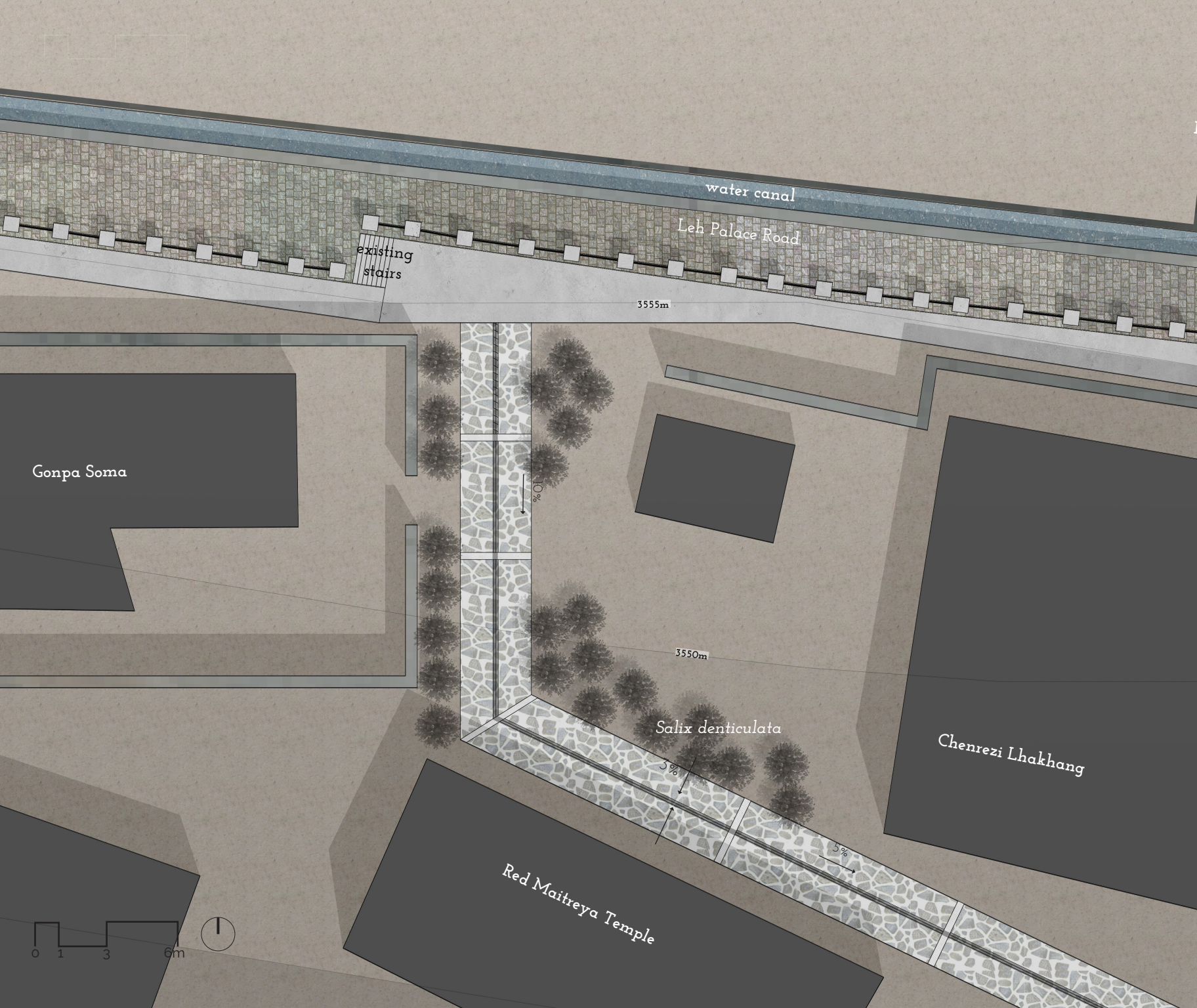
3. Leh Palace connection

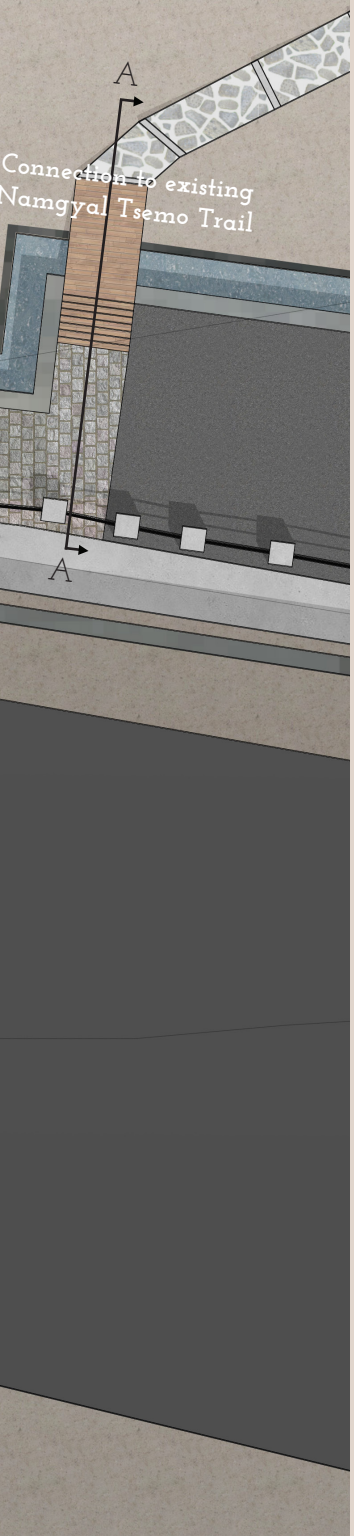
Figure 85: Existing conditions at the Leh Palace connection where the Leh Heritage Trail continues on to the Namgyal Tsemo Trail



(J) Figure 86: View of the current, informal pathway that runs between Chenrezi Lhakhang and Red Maitreya Temple.

(K) Figure 87: View of the Leh Palace Road in front of the Leh Palace.


water canal
Leh Palace Road
existing stairs
3555m
Gonpa Soma
10%
3550m
Salix denticulata
Chenrezi Lhakhang
5%
5%
Red Maitreya Temple
0 1 3 6m



LEGEND

- Slate stone paving
- Granite paving
- Packed gravel/unpaved surface
- Brushed Concrete
- Timber from *Populus ciliata*
- Water contained in the canal
- Stainless steel grates
- Asphalt

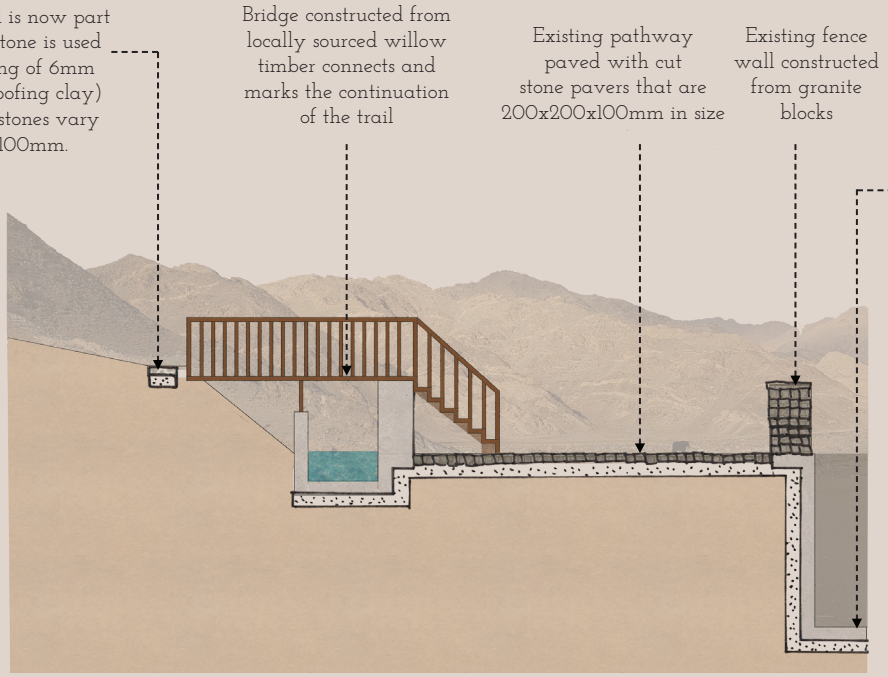
After passing through Old Town, the Leh Heritage Trail intersects the Leh Palace Road via a set of existing stairs constructed from brushed concrete. The road is already paved with granite stones, but to connect to Namgyal Tsemo Trail, paving is extended further down towards a proposed wooden bridge that will allow residents to walk over the proposed water canal that carries surface water to a *zing*, a traditional water storage structure in Ladakh that collects surface runoff from channels and other water diversions.

Taking inspiration from existing willow shrubs growing on slopes, *Salix denticulata* shrubs are planted along the trail to stabilize slopes and also increase the number of native tree species. The slope of the trail varies to match the existing terrain and water connects to drains that are dug over 700mm deep into the ground. Water drains are also covered using steel grates to reduce garbage build-up within the drains and hence reduce the need for maintenance.

Figure 88: Proposal for Leh Palace connection where the Leh Heritage Trail continues on to the Namgyal Tsemo Trail

The previously unpaved Namgyal Tsemo Trail is now part of the Leh Heritage Trail. Locally found slate stone is used here for paving. They are laid out on a bedding of 6mm limestone aggregate using *markalak* (waterproofing clay) to fill the gaps. The surface dimensions of the stones vary but the thickness of each is approximately 100mm.

Figure 89: Section AA



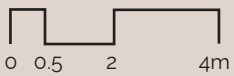


Figure 90: Perspective at the pathway as it passes through Old Town.

4. Namgyal Tsemo connection

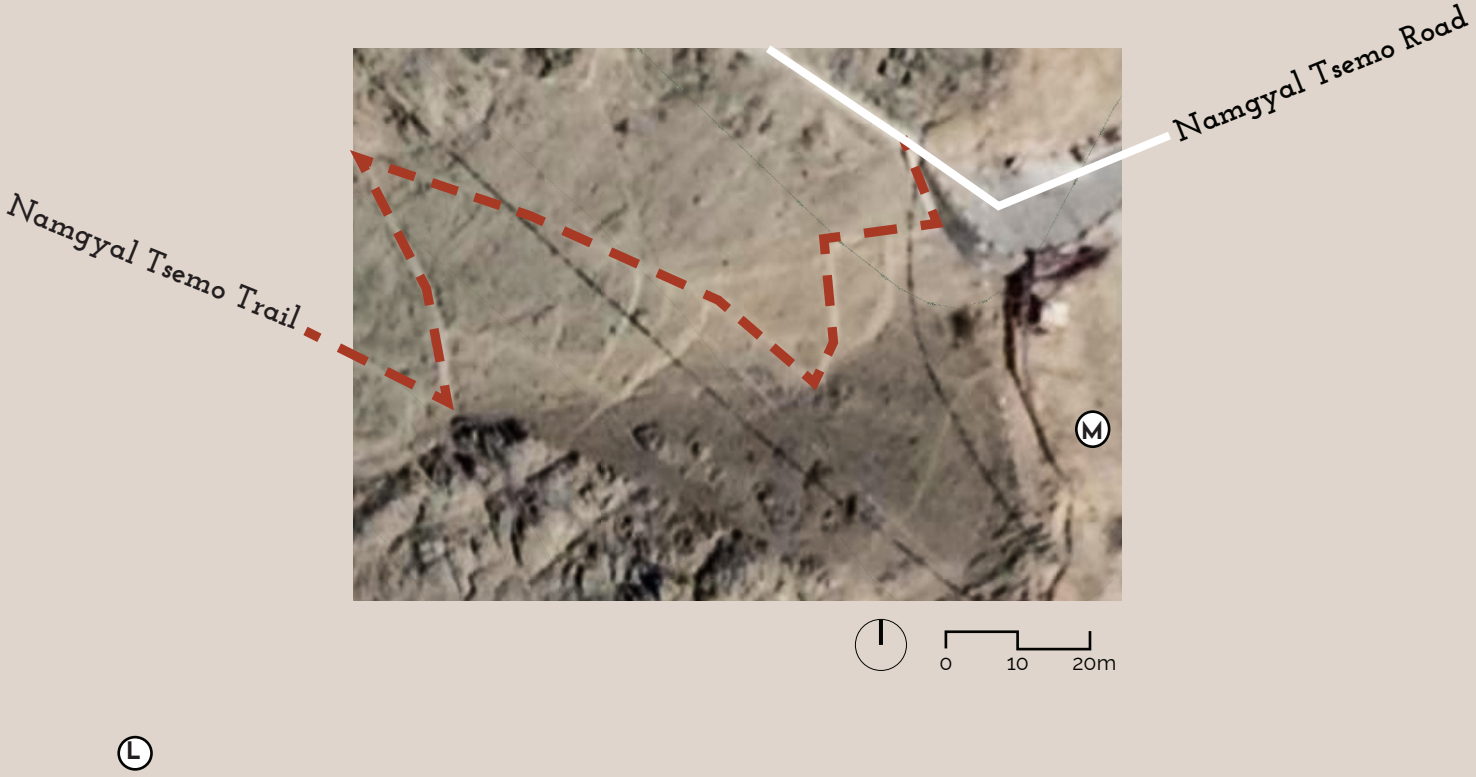
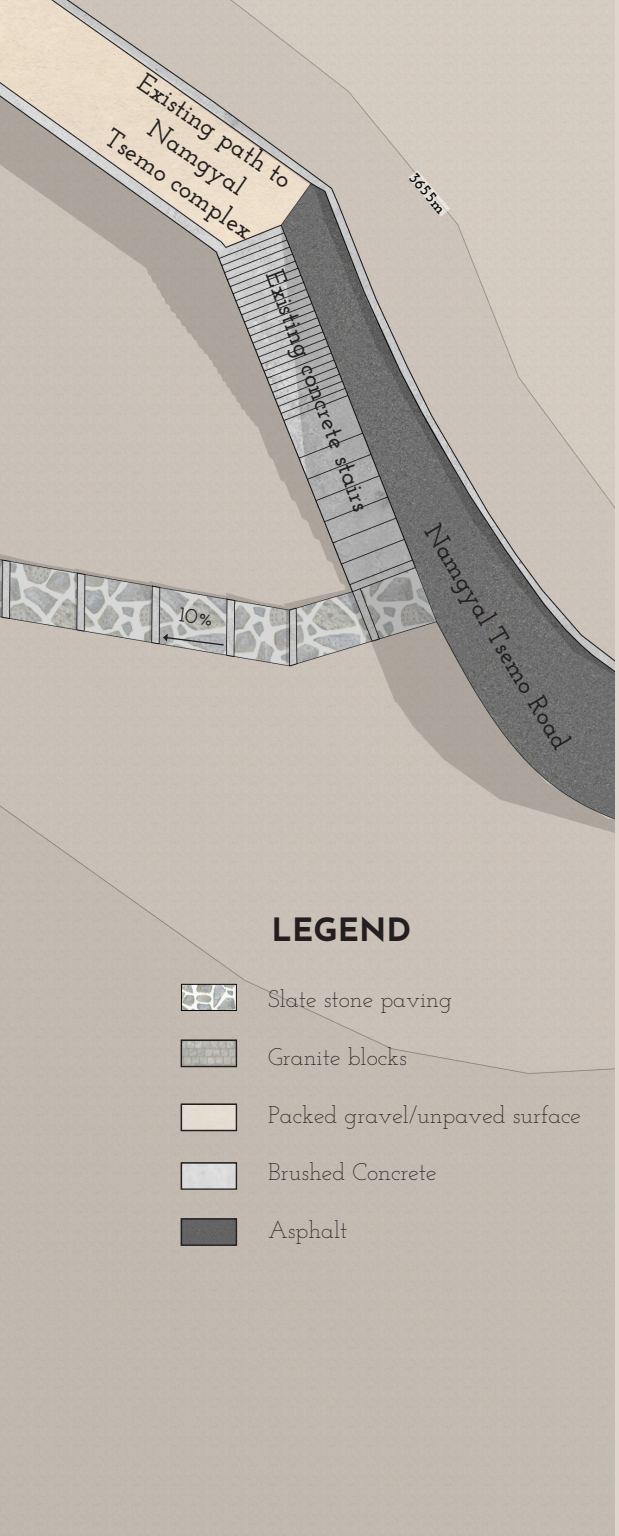


Figure 91: Existing conditions at the Namgyal Tsemo Trail.

(L) Figure 92: Currently, the tracks on Namgyal Tsemo Trail appear to have been etched into the landscape over many years of human activity. The trail is unpaved but offers a pathway that meanders to follow the line of least resistance, following the slope angles.

(M) Figure 93: A set of stairs has been constructed out of concrete at the end of the trail, allowing users to access the Namgyal Tsemo complex.

hippophae rhamnoides
3640m
15%
A
A
3645m
12%
3650m
water detention
structures
Hippophae rhamnoides
B
B
0
1
3
6m



Namgyal Tsemo trail is surrounded by a rugged and hilly terrain that has weathered over time to expose a layer of granite underneath. As a result, water flows readily across the surface towards the Leh Palace Road. The water detention dams are inspired by artificial glaciers that have been created around any villages in Ladakh, where a stream of water is split and diverted to another channel with 1-2 meter tall detention walls at regular intervals that slow down the flow of water, allowing it to stay frozen for longer in spring and thus provide a steady flow of water later into summer months. The wall is constructed using loose granite stones enclosed in a steel wire mesh and reinforced using *markalak* clay that also helps retain the water. As the stream here is replaced by surface run-off, the detention dams are only a meter tall, with the edges being even shorter 1/2 a meter, allowing water to spill over to the next detention dam once it fills up.

Another inspiration for planting on slopes, close to the detention dams, is the jessour system in Tunisia where dams such as the ones used in artificial glaciers are used as terraces that retain sediments, nutrients and water before each dam to allow for crop and tree planting (Piras et al, 2021, p. 2).

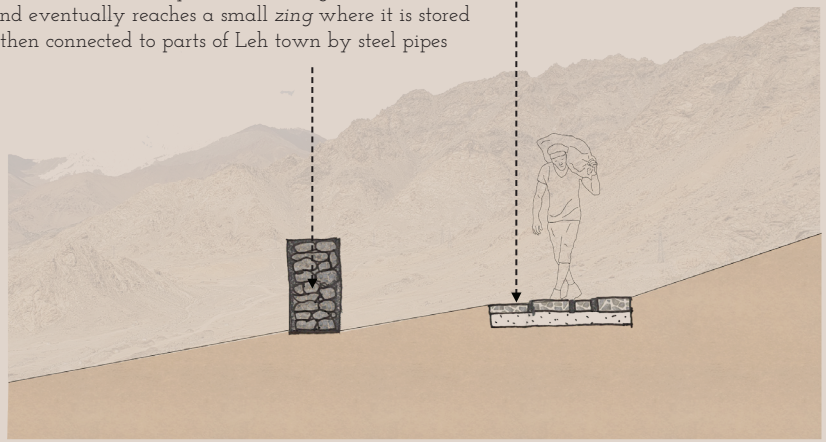
On the Leh Heritage Trail, both of these strategies are implemented at a smaller, experimental scale particularly because the slopes are much steeper and also due to bedrock that would contain plant roots. Plants such as *Hippophae rhamnoides* are planted due to their ability to grow in dry, arid evironments with poor soil. The harvesting area is dug, levelled and filled with soil (enriched with manure) upto a depth of 0.5m to give them a chance to establish themselves.

Figure 94: Proposal for Namgyal Tsemo Trail.

Figure 95: Section AA

The water detention structures are constructed with stone walls up to a meter in height, reinforced with clay and mesh wire. Their water detention capacity is not very high as they only retain surface water from rain or snowfall but they can slow the velocity of water enough for it to thaw at a later time in the summer, providing a more steady flow of water throughout the summer and fall months. The water is channelled directly to canals along the Leh Palace Road and eventually reaches a small *zing* where it is stored and then connected to parts of Leh town by steel pipes

The trail is paved using locally sourced granite slate that is placed on a bedding of 6mm limestone aggregate. The surface dimensions of the stones vary but the thickness of each is approximately 100mm.



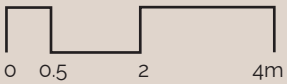
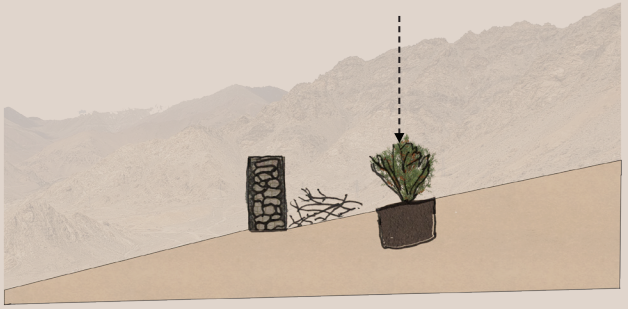


Figure 96: Section BB

Hippophae rhamnoides grow abundantly in Ladakh. In addition to harvesting its stem and berries, the plant has also been used for soil erosion control. Dead and trimmed branches collected from the plants are placed in front of the walls to slow down the flow of water and help it freeze faster and delay melting in spring so that there is water supply during the drier summer months.



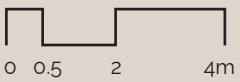
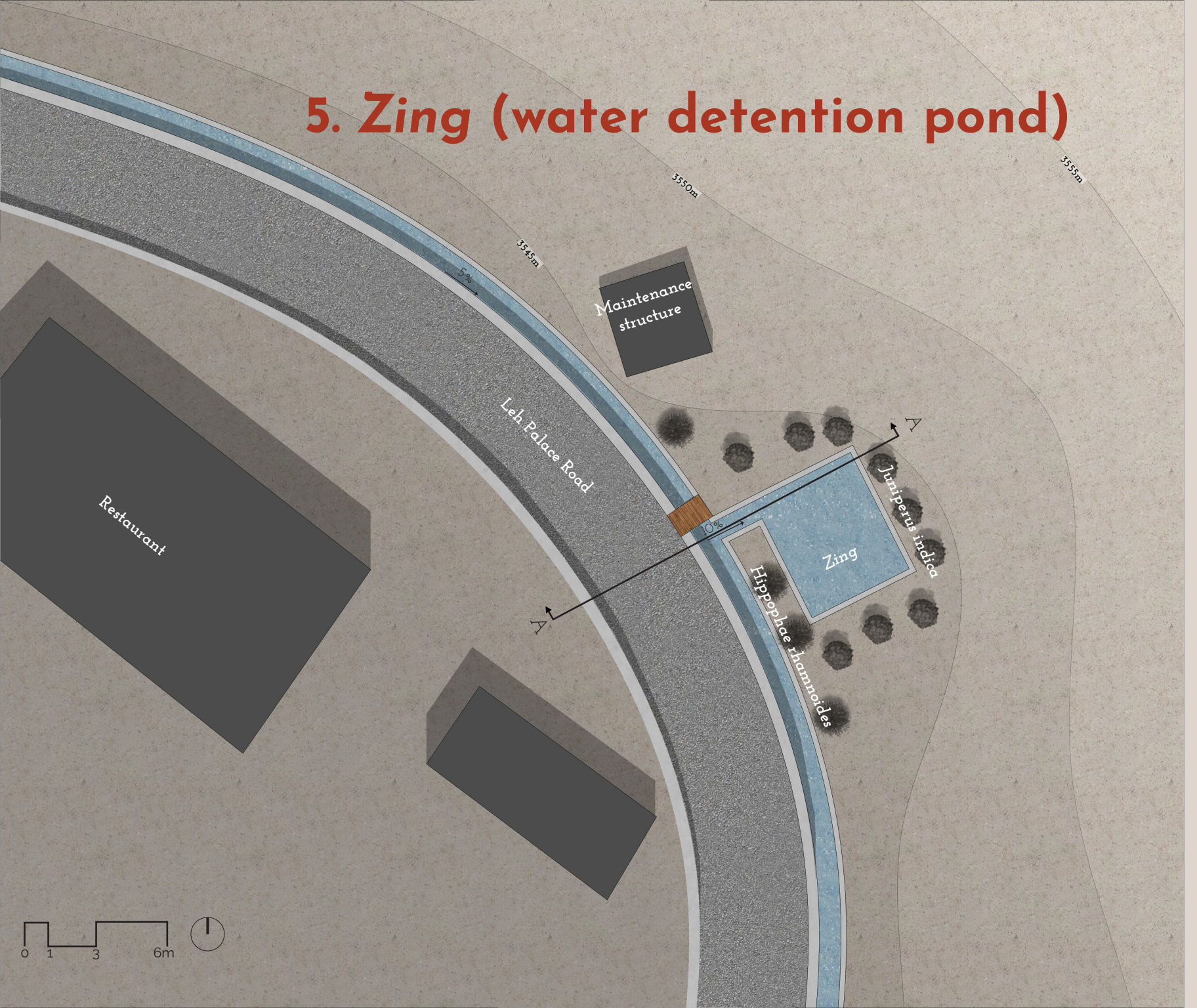


Figure 97: Perspective at the pathway as it passes through the Namgyal Tsemo trail.

5. *Zing* (water detention pond)



LEGEND

- Existing unpaved surface
- Concrete
- Timber from *Populus ciliata*
- Water bodies
- Asphalt

Traditionally, water stored in a *zing* is used for agricultural purposes. Here, the *zing* acts as a water detention structure. Water stored in it is slowly discharged through a pipe that connects to a hand water pump constructed in the Old Town. This pipe can be expanded to include a network of hand water pumps or water taps that provide water at various locations throughout the Old Town. However, as digging into the hard granite that lies beneath the area's surface expends more energy and resources, one water hand pump located close to the Leh Palace is recommended. For maintenance,the *zing* is accessed via a small wooden bridge next to the Leh Palace Road.

The walls of the *zing* are constructed using reinforced concrete, just like the walls of water canal connected to it to ensure a strong connection between the two structures. It is also 1.5 meters deep to ensure enough depth for water to not freeze during the winter months.

Additionally, several *Juniperus indica*, a native shrub, are planted around the *zing* along with some *Hippophae rhamnoides* to stabilize the surrounding area. The juniper shrubs surrounding the water also give the structure a symbolic purpose. As junipers are considered sacred in Tibetan Buddhism, this site and the water it collects retain some of that sacredness and gives importance and prominence to water and the role it plays in the lives of people of Old Town.

Figure 98: Proposal for *Zing*, the water collection structure.

Figure 99: Section AA

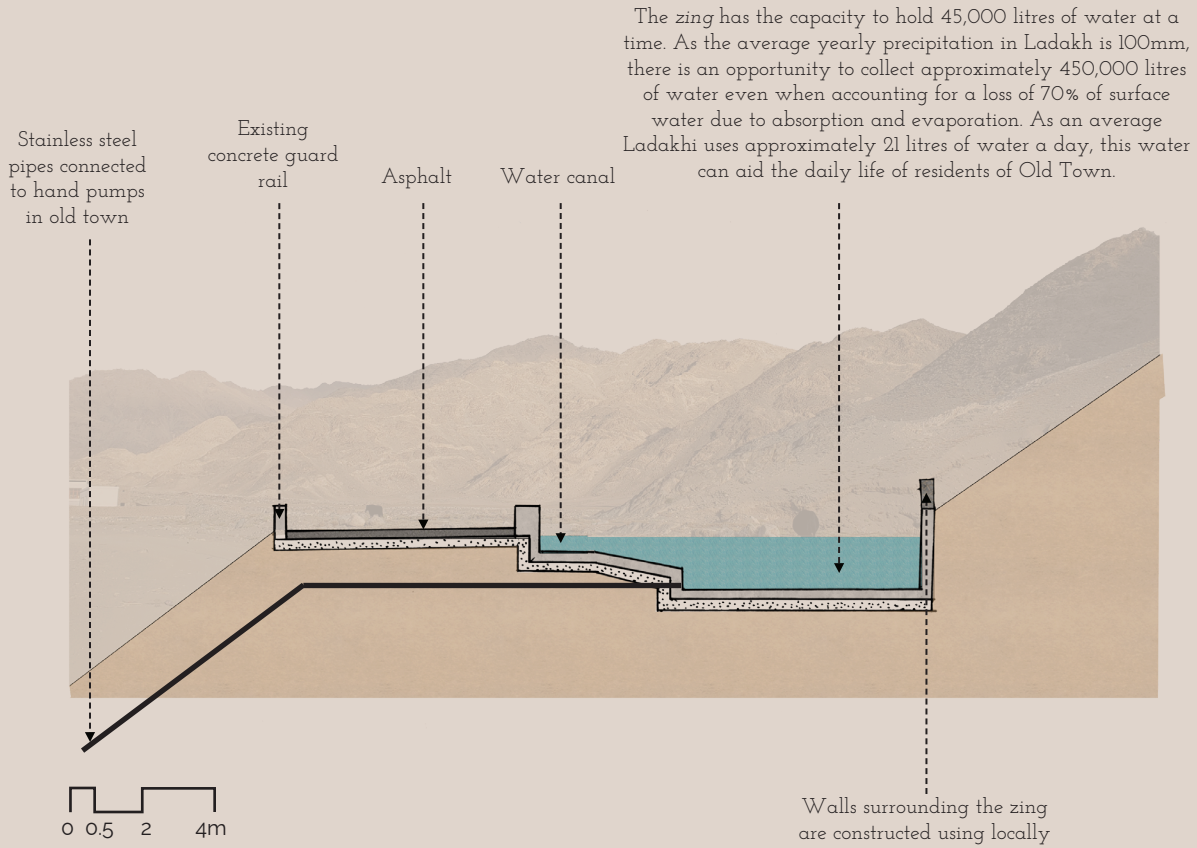


Figure 100: Perspective at the water collection structure.

Wayfinding signage

Consistent wayfinding and interpretive signage can aid navigation along the Leh Heritage Trail and enhance the user experience by providing information about various landmarks such as heritage buildings, religious structures and landmarks such as the Central Asian Museum, along the route. Wayfinding signage along the Leh Heritage trail is kept simple by limiting the number of colors and materials used. Proposed colors and text provide a high contrast so that signage can stand out from their background.
The signs are made from a single sheet of wood with a white background and lettering painted on top. The smaller signs are easy to install as they can be simply hung either around tree branches or fixed to other structures using screws.

Figure 101: Examples of wayfinding signage.

Conclusion

The city of Leh has been part of many interconnected systems throughout its existence. In the past, it was connected to the world through trade routes that allowed different cultures to mix and helped Leh form its own unique identity. Today, it is connected to the rest of the world through its promise of a unique getaway with a window to unique landscapes and cultural heritage. While the interchange of cultures still occurs, Fewkes points out that the dominant western ideology has been a huge pull for the youth of Ladakh, leading to a steady decline in Ladakhi culture and identity. This is especially true in case of *Kharyog*, as this once seat of power is hardly talked about in tourist pamphlets and websites, and was largely ignored and left to decay until the efforts of a few non profit organizations brought its issues to light. Modernization has brought prosperity to Leh but most of that prosperity is experienced by landowners and businesses outside the walls of Old Town.

This practicum demonstrates a way in which the historic Old Town of Leh might regain its authenticity while taking the ever changing culture into account. Cutlural shift in Leh conveys a sense of sudden rush towards adopting the western culture and ideology, especially since the 1970s, that has resulted in a drastic change in landscape within the span of just one generation. The cultural and architectural heritage of Leh is unique and its preservation is more important than ever as climate change and over-tourism further threaten its existence. The already diminishing water sources, occasional flash floods and seismic activity has cast a shadow over the city's future (World Monuments Fund, para 3). The tourism industry is a volatile and unreliable source of income generation as tourist footfalls are impacted drastically by factors such as fears of threat to life and change in living standards affected by national or global economical situations. This has been evident during recent conflicts between India and China, and travel restrictions resulting from COVID-19, when many tourism-dependent businesses struggled to make any revenue due to lack of tourist arrivals in Ladakh.

By reconnecting the historical part of Leh to its surrounding areas and improving infrastructure, it is possible to attract a larger number of tourists within the *Kharyog*, giving them a chance to experience the landscape and architectural heritage of Leh. It also allows them to view the sensitive nature of water availability and could potentially encourage them to reconsider their daily water usage by making them more mindful of how much water they consume. Increased tourist footfalls in the Old Town will also coincide with LHF/LOTI's efforts to rehabilitate vacant, abandoned or rented buildings into offices, cafes, restaurants and guest-houses that would generate more revenue to aid further rehabilitation work.

During winter months and times of instability, when the number of tourists visiting Leh decreases drastically, the residents of Old Town can still benefit from improved infrastructure on the Leh Heritage Trail as it allows them easier access to places of worship, especially during annual festivals such as the *Dosmoche*. The water detention dams and *zing* also benefit the residents directly as the water collected is relatively accessible for them. Ideally, the *zing* would connect to every household in the Old Town but due to its small size and difficulties digging into the hard bedrock, the project can only be undertaken in phases.

Most of the rehabilitation work undertaken in Leh at the moment is by architects and engineers. As landscape architecture is still a growing profession, especially in countries like India where the profession began only in the 1980s and urban development still has little regard for the natural environment (Shaheer, 2001-15), the role of landscape architects becomes even more important as their work can set guidelines and act as precedents for future development where major issues such as climate change and environmental pollution are addressed. Through practice examples, landscape architects can also demonstrate the importance of their profession and get involved in more projects. With their ability to view a site as a complex web of social, political and cultural conditions, they can bring a unique perspective to planning and design proposals.

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Figure 1: Singh, A., 2019. *Dichotomy within Old Town.*

Figure 2: Singh, A., 2021. *Location of Leh within Asia.* Data layer: ESRI (ArcGIS/World_Imagery.) [raster] 2021. In: https://qms.nextgis.com/geoservices/519/ [Accessed January 10, 2022]. Using QGIS Development Team (2016). QGIS Geographic Information System. Open Geospatial Project, [computer software] http://qgis.osgeo.org.
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