

Ladakh

Unleashing potential



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Knowledge Partner



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Message



Vineet Agarwal

President ASSOCHAM
and Managing Director,
Transport Corporation
of India Ltd.

Multisectoral growth is the key to the prosperity of any region. A stable economy must have multiple strong pillars to provide strength. The union government's vision 2050 for the Union territory of Ladakh is a multi-dimensional and multisectoral strategy towards the regional economic revival.

At this stage, it is imperative for governments, private sector enterprises, and the local population to map opportunities and diversify in other sectors. This will be a saviour to the region's environment and will also safeguard locals from over-dependence on a seasonal industry like tourism.

The sudden rise in this sector has created a threat for the region's economy and its people, who are currently dependent on tourism. Further, Ladakh, an ecologically sensitive area, is seeing a growth spurt that its ecosystem is having difficulty withstanding. While the development initiatives are critical for the region's economic and cultural prosperity, they need to be executed in tandem with nature to protect the region's fragile ecosystem.

This report presented highlights the holistic regional strengths that could be leveraged while overcoming its weaknesses. It has identified specific areas across multiple sectors, along with focused interventions for them, to give adequate growth opportunities to the people of Ladakh. The public and private sector players can explore the immense potential of these less-explored sectors to create a more stable, robust, and prosperous economy of Ladakh.

ASSOCHAM is helping the region to create its differentiated positioning across various sectors, which we believe will open new avenues of growth. This report is an attempt to unleash the potential of Ladakh for its regional economic and cultural prosperity that leverages the natural advantages of the region while overcoming its limitations.

I thank the teams at Primus Partners and ASSOCHAM for their efforts in bringing forth this in-depth analysis for the region.

Message



Deepak Sood

Secretary General,
ASSOCHAM

For populations living in the world's high alpine zones, climate change is leading to an unpredictable environment. Climate change is altering ecological functioning as well as the human activities that rely on them. As a result of rising air temperatures, melting glaciers, and extreme weather events, many people living in the mountains are experiencing enormous problems.

Preserving the environment is essential for the region and the country. As explained in this report, tourism-led growth models pose a significant threat to the environment. Therefore, there is a need to explore new growth streams that are environmentally friendly. "Sustainable Development" is the new mantra, and Ladakh has the potential to emerge as a leader in adopting this development model by harnessing the power of the available natural resources.

Ladakh is nature's gift to us. We all know Ladakh as a tourism destination, but the region has much more to offer to the world. This study reveals that there are undiscovered and untapped economic opportunities in the sectors such as agriculture and allied activities, handlooms, energy and power, and the tourism sector.

ASSOCHAM, along with Primus Partners, is delighted to share this report which presents our endeavour towards Ladakh's growth.

The union government is all set to develop the union territory of Ladakh into an economically and socially prosperous region by realising its true potential. The government's vision 2050 for the union territory of Ladakh is a comprehensive plan that will revolutionise regional growth.

Through this report, we aim to assist in the government's vision for the growth of the Union Territory. I hope that this will open new avenues of sustainable growth in the region.

Message



A S Mittal

Chairman, ASSOCHAM
North Region
Development Council &
Vice Chairman,
International Tractors Ltd.
(Sonalika)

“He who climbs upon the highest mountains laughs at all tragedies, real or imaginary.” – Friedrich Nietzsche

This is the beauty of Ladakh, where the region is characterised by harsh terrain, limited accessibility and extreme climatic conditions but also by its untouched beauty and magical landscape making this cold desert an extremely awe-inspiring place.

Scrapping of Article 370 and Ladakh being declared as a Union Territory have opened multiple opportunities for trade and investment in the region. The region, which was earlier side lined by region’s political environment, is now at the focus of development. For FY21, a budget of INR 5,958 Cr. has been allotted to the UT for carrying out major projects and activities in the areas of Rural Development, power, Civil aviation and Tourism, among others.

The move to make Ladakh a Union Territory has brought it back in the center stage of policy and development. Region’s ecological and cultural uniqueness and sensitivity calls for highly focused decision-making approach. This Though Leadership covers various aspects of the new UT of Ladakh, including increased access to finances.

While tourism has been the most talked about sector of Ladakh, the region has the capability to be converted into an economic powerhouse, with the use of sustainable local techniques. This Though Leadership features an analysis alongside the growth potential and opportunities available for the below sector.

I’m thrilled to see the work ASSOCHAM is doing to help create awareness on the potential that Ladakh has to offer. We hope to see significant interest in the region, driven by the Chamber’s efforts.

Message



Tashi Gyaltsen

Chairman,
ASSOCHAM Ladakh
UT

Ladakh is located between the Karakoram Range in the North and the Himalayas in the South. Its difficult terrains challenge the very concept of socio-economic development, but also highlights the never-dying spirit of its people, its eco-system and its magical beauty.

The geographical location of Ladakh makes it strategically very important for India because first, it connects India to Central Asia, South Asia, China, Pakistan and the Middle East, and second, it hosts the mighty Siachen glacier.

Beyond its natural beauty, Ladakh has a lot of offers to its citizens and visitors, in terms of Tourism, Agriculture, Energy, etc. A structured and climate friendly approach to these sectors can unleash the potential of Ladakh region and usher its citizen into the new era of growth and prosperity, while retaining its nature beauty.

This report throws some light on the region's importance in India's history and geography, including, Geographical importance, Demographics and Settlement pattern, Security perception, Major challenges - Harsh climate, Energy, Connectivity.

While tourism has been the most talked about sector of Ladakh, the region has the capability to be converted into an economic powerhouse, with the use of sustainable local techniques. This report features recommendations and opportunities available in, Agriculture and allied industry, Travel and tourism, Handlooms and handicraft, clean energy (Solar and Hydro).

Welcome to the beautiful world of Ladakh!

Message



Nilaya Varma

Co-Founder & CEO,
Primus Partners



Sameer Jain

Managing Director,
Primus Partners

Since the days of caravan commerce along the Silk Route, Ladakh has had a history of business acumen and capabilities. Different reasons, including political instability, ecologically sensitive zones, and several other reasons, led to a slowdown in the region's growth. The Jammu and Kashmir Reorganization Act, 2019, passed by the Parliament of India, contained provisions to reconstitute Ladakh as a Union Territory, separate from the rest of Jammu and Kashmir, has opened a gateway of development and prosperity for the region.

The UT administration is operating with tremendous energy to fulfil the development mandate in the region. They have ensured the availability of funds and laid a vision for the development of the UT (Vision 2050). The message is clear to establish UT's presence on the global map and restore its glory of the silk route era.

When talking about development in Ladakh, one has to keep in mind its ecosystem which still poses a challenge to its growth. The fragile ecology coupled with the now visible impact of climate change calls for a growth model which is environmentally sustainable for the region.

The problem with the mainstream development models is their repercussions on the environment. There is a need to shift the focus on growth models that are in tandem with nature. With increasing concerns over deteriorating climatic conditions, sustainable development has become a necessity in the modern era. The study done for this report suggests that Ladakh can become a pioneer in achieving sustainable development and become a role model for the world.

Through this report, we attempt to list economic opportunities after carrying out a detailed sectoral analysis of the region's key sectors. Apart from tourism, there are regional strengths in sectors like Agriculture and allied activities, Energy and Power, and handloom, which is waiting for the right policy interventions and private sector collaborations to yield positive results.

It is now time for Ladakh to realize its true economic and socio-cultural potential!

Ladakh: The land of high passes

Ladakh, hidden amid a wide and breathtaking terrain, is a destination rich in awe-inspiring natural characteristics. It is surrounded by two of the world's most formidable mountain ranges, the Karakoram in the north and the Great Himalaya in the south, and is bridged by two parallel chains, the Ladakh Range and the Zaskar Range. Ladakh, like the rest of the Himalayan cordilleras, is located in an ecologically sensitive zone. The region is seeing rapid expansion with which its delicate environment is struggling to cope with.

For these ecologically sensitive zones, climate change is also an added burden, creating an unpredictable, and at times dangerous environment. Many people residing in the mountains are facing major challenges as a result of rising air temperatures, melting glaciers, and extreme weather occurrences and threat to Ladakh is no different from these. Ladakh, though in recent years has seen growth due to extensive tourism, the region is home to several indigenous products and needs collaborative interventions to unleash its economic potential.

So, the question is, can the region grow and unleash its potential without compromising its ecological sensitivities? As this report discusses, it can!

Introduction to Ladakh

Ladakh, commonly known as "the Land of Passes" (La-passes, dakh-land), is one of the world's highest areas, covering an area of 95,876 sq. km. and famous for its alpine beauty and distinct culture. It is governed by India as a Union Territory (UT). According to

Census 2011, the UT of Ladakh consists of two districts: Leh and Kargil, with a combined population of 2.74 lakhs.

Area: 86,904 sq. km.
Population: 274289 (2011 Census)
Altitude: From 9000 Ft. to 25,170 Ft.
Language: Ladakhi, Purik, Balti, English, Tibetan

Kargil, a part of the western Ladakh Union Territory, is located in the Himalayan Zaskar Range and abuts the line of control that divides India and Pakistan's Kashmir regions. The town of Kargil, which is about halfway between Srinagar (west) and Leh (east), is considered as gateway to Ladakh.

Leh, with a total size of 45,100 sq. km. is one of the country's largest districts. The district is bordered on the west by Pakistan-controlled Kashmir, on the north and east by China, and on the south by Himachal Pradesh's Lahaul and Spiti. It is 434 kilometres from Jammu and Kashmir's summer capital of Srinagar and 474 kilometres from Manali (Himachal Pradesh).¹

Region's significance

Geopolitical importance: Ladakh has the distinction of being situated along the historic Silk Route, which travelled through the region and so had a significant influence in the development of culture, religion, philosophy, trade, and commerce in the past.

Geostrategic location and security

perception: The Zaskar and Karakoram mountains are located in the newly formed Ladakh Union Territory's south and north, respectively. Pakistan and China are also on its borders. Its strategic significance for India's national security is due to its advantageous location. Because it provides access to the frozen battlefield while also connecting the rest of the country to it, Ladakh is critical for maintaining Indian presence on the Siachen Glacier. Gilgit and Baltistan, governed by Pakistan, are located west of the Siachen glacier, across the

Saltoro Ridge. To the east, China controls Aksai Chin. The Saltoro Ridge of the



Siachen glacier serves as a divide that prevents direct linking of PoK with China, preventing development of unfavourable geopolitical linkages for India. Ladakh also helps India connect to Central Asia, South Asia, China, Pakistan and the Middle East. The south Asian countries can reach Central Asian markets through this region. Further, it is also a connecting route for countries like Uzbekistan, Turkmenistan and Kazakhstan that are rich in uranium, cotton, oil and gas resources.

Rich in mineral source: The Union Territory of Ladakh is rich in mineral resources, including borax in the Puga valley, high-quality marble in both Leh and Kargil, cement-grade limestone, and good-quality granite. There also are minerals from the Archean to Post-Cretaceous era, these, however, are yet to be extracted.

Energy potential: Solar radiation is one of Ladakh's most abundant natural resources, with yearly solar radiation surpassing the average for comparable high-insolation locations in India. There's also the possibility of finding geothermal energy resources at depths appropriate for research and development. In the region, a proposal to build the country's first geothermal energy power plant has already been approved.

Region's Characteristics

Climate: Ladakh has a severe climate and is one of the world's highest and driest inhabited areas. Because of its combination of arctic and desert temperatures, Ladakh's climate is described to as a "cold desert" environment. Geologically complex and topographically immense, the Great Himalayas contain ranges with numerous peaks reaching elevations of 20,000 feet (6,100 metres) or higher, between which lie deeply entrenched remote valleys.

The radiation level is among the highest in the world due to the high altitude and little humidity. The soil is permeable, thin, and sandy. With the exception of valleys and irrigated regions, these reasons explain why the whole area is almost barren of flora.

Socio-Economic Setup: Ladakh is a peaceful community with a self-sustaining economy. Agriculture for subsistence has always been a significant element of both society and the economy. Pastoralists sell the region's major occupational outputs of dairy, wool, and pashmina goat fibre. 90% of Ladakh's population rely on agriculture, which is reliant on the Indus River for survival. There was a major social and economic change during Indian integration and border restrictions that favoured a more cash-based economy. The importance of the Leh and Kargil districts has increased as a result of these advancements, since they provide access to regional and national markets. The economy of Ladakh is also highly dependent on cattle. Sheep, yak, goats, and cows are among the animals used in pastoral farming. The tourism sector has played an essential part in Ladakh's economic growth, and it is currently one of the most important components of the economy today. It currently employs tens of thousands of people and is the community's second-largest source of revenue behind the government.

Road connectivity: Ladakh is accessible by roadways only during the summer season as the National Highway 1 and ZojiLa remain



closed during the winter because of heavy snowfall in the region.

The Manali-Leh route is still considered long, and it is blocked for many months each year due to five high-altitude mountain passes. The third axis to Ladakh, connecting Leh and Manali, is now anticipated to be completed by 2025, providing year-round connectivity to the newly created Union Territory.

Connectivity to National grid: The first component (Leh-Khalste) of the Srinagar-Alusteng-Drass-Kargil-Leh power transmission system was commissioned in 2017, connecting part of Ladakh to the National grid. Local micro-hydropower installations with a total capacity of 14 megawatts and diesel generators with a capacity of 12 megawatts provided electricity

to the Ladakh region. The energy shortage in the Ladakh region until 2017 was as high as 95 per cent. There are plans of connecting more areas of the region to the grid.

Development as a Union territory: A very important characteristic of this region is that after revocation of Article 370 of the Indian constitution in 2019, Ladakh is a Union Territory and is governed by the Union Government of India. Ever since then, there have been several developmental changes in the region which are mentioned in the next section.

Among other things, the UT status has brought a significant change in the administrative structure with the functioning of the UT administration, directorates, two hill councils and the Panchayati raj system.

Ladakh's UT Status: On road to development

Although the region holds great geostrategic importance, its socio-economic development has seen restricted growth in the past. Due to complexities of Jammu and Kashmir regions, distribution of resources has been a major barrier in the development of Ladakh. Several factors, such as, relative inaccessibility and primitiveness, presence of nomadic tribes, slow transfer of funds etc. have delayed development of the region.

The Jammu and Kashmir Reorganisation Act, 2019, passed by the Parliament of India which contained provisions to reconstitute Ladakh as a Union Territory, separate from the rest of Jammu and Kashmir, has opened gateway of development and prosperity for the region.

To address the problem of availability of funds for the region, a budget allocation of almost Rs 6,000 crore (\$ 821 Mn), the highest ever, has been given to Ladakh during 2021-22. This will be used across different sectors to fulfil long-pending demands, particularly in healthcare, infrastructure connectivity and more.

The Government has also laid Vision 2050 for the UT which is focussed towards:

- Sustainable agriculture development and thrust on SMEs and promotion of investments
- Promotion of 'Clean Energy' and 'Waste to energy'
- Focus on SMART Infrastructure
- Integrated Development- Integrated common service centres and community care centres across the UT and digital platforms for easy access for citizens.
- Development & promotion of tourism
- Creation of surplus employment opportunities
- Assured 24X7 quality water supply

Apart from the normal flow of funding under various central ministries' programmes, all of the Centre's flagship initiatives, including numerous government-sponsored schemes and individual beneficiary-oriented schemes, are being implemented proactively in Ladakh.

It is proposed that a multi-purpose integrated company be formed to handle a variety of activities adapted to the needs of the Ladakh area. The fact that the UT administration and the national government lay such high emphasis on localised governance is laudable. It will offer a much-needed boost to grassroots and participatory government.

Tourism is one of the main areas in Ladakh that contributes significantly to income generation, employment creation, and general regional growth. The total number of tourists that visited Ladakh's Union Territory (UT) in 2019 was 279,937. Total tourist arrivals in Ladakh till June 2020 were 6,079, with 5,019 domestic and 1,060 international visitors.²

Ladakh implemented its first tourist incentive programme in November 2020, with the goal of promoting fair and sustainable growth across the Union Territory.³

Various development projects that aim to build a clean, green, healthy, and wealthy UT have been initiated in the UT, such as:

- In February 2019, Hon'ble PM Narendra Modi has inaugurated the Dah hydroelectric project and had dedicated

the 220 KV transmission for overall electrification.

- The Ministry of New and Renewable Energy in India has devised a strategy to scale up the 23,000 MW infrastructure that connects the huge solar project in Ladakh with a 7,500 MW package that is the first stage of a larger project.
- An MoU with the Solar Energy Corporation of India (SECI) for setting up a 50 MW solar energy plant has also been signed
- A Rs 50,000 crore grid connecting solar photo-voltaic project spread across Leh and Kargil districts has been approved by the government.
- A 255 km all-weather Darbuk-Shayok-Daulat Beg Oldie Road has been constructed in order to allow connectivity between Karakoram Pass and Leh.
- Ladakh produces around 50% excess milk, which has the potential to be processed/exported and generate money for local farmers. The National Dairy Development Board (NDDB) and the UT Administration of Ladakh signed a Memorandum of Understanding in October 2020 to undertake a benchmark survey with the goal of promoting dairying and rural livelihoods in Ladakh.
- In February 2021, an MoU was signed between Oil and Natural Gas Corporation (ONGC) and the UT administration of Ladakh to develop a geothermal field development project with a power potential of 200 MW
- Handloom, handicraft, and metal-based goods dominate the sector in Ladakh, with 95 percent of MSMEs working at the household level. To improve craftsmen's abilities and conserve age-old traditions, the state government has created 34 handicraft training centres around the state.

Thus, the infrastructure and other projects are set to open doors for enhanced economic activity, leading to employment and development in Ladakh, which can be significantly benefit the UT.



While the above development initiatives are critical for region's economic and cultural prosperity, they need to be executed in tandem with nature and with a goal of protecting the region's fragile ecosystem.

Ladakh and its fragile ecosystem

Ladakh, hidden amid a wide and breathtaking terrain, is a destination rich in awe-inspiring natural characteristics. It is surrounded by two of the world's most formidable mountain ranges, the Karakoram in the north and the Great Himalaya in the south, and is bridged by two parallel chains, the Ladakh Range and the Zaskar Range. Like the rest of the Himalayan cordilleras, Ladakh also is a part of an ecologically sensitive zone.

This is a young land in geological terms, having developed only a few million years ago. Its fundamental outlines, raised by tectonic processes, have been changed over millennia by wind and water erosion, sculpting it into the shape we see today.⁴

Being young fold mountains, the Himalayan cordilleras, including the Ladakh region are classified as ecologically sensitive zones.

Ladakh and Climate Change

For populations living in the world's high alpine zones, climate change is producing an unpredictable, and at times deadly environment. Climate change is altering ecological functioning as well as the human activities that rely on them. As a result of rising air temperatures, melting glaciers, and extreme weather events, many people living in the mountains are experiencing enormous problems.

Even in the United Nation's Intergovernmental Panel on Climate Change (IPCC)'s 6th Assessment Report, two of the findings and implications are very relevant to the region of Ladakh. These include, first, that there is now unequivocal evidence that global warming is being caused by human activities, resulting in melting of glaciers, which is an irreversible process. The second, is a warning of more extreme weather incidents such as cloud

*bursts, landslide and flooding in the Himalayan region.*⁵

Ladakh, an ecologically sensitive region, is seeing a growth spurt that its fragile ecosystem is having difficulty withstanding. Some very visible changes happening due to climate change and some anthropogenic factors include:

- **Changing seasonal patterns are causing water scarcity in the region:**
The south-west monsoon brings minimal rain to the region, which is located on the leeward side of the trans-Himalayan range. It is not only seeing less precipitation, but it is also experiencing unforeseen schedule adjustments. In an ordinary year, Ladakh receives the greatest snowfall between November and January, allowing the snow to settle and freeze. Late January and February, however, have brought a lot of snow to the area. Due to the fact that spring arrives in March, any recent snowfall raises the risk of avalanches, floods, and drought in the years to come. When a glacier doesn't have enough ice before spring, it begins to melt considerably more quickly. The region's glaciers are rapidly vanishing; the International Centre for Integrated Mountain Development (ICIMOD) estimates that 35% of Ladakh's glaciers will be gone in the next two decades.
- **High summer Precipitation:** Rainfall is beneficial in every location because the water is absorbed by the soil, making it rich and fertile while also increasing the water table. The rocky terrain of Ladakh, on the other hand, has no natural mechanism for absorbing precipitation, which causes it to flow down in the form of a flood. According to World Weather Online, average summer rainfall in Ladakh has increased from 30 mm in 2009 to over 140 mm in 2019, with an increase in

the average number of wet days from 8 to 20 in just a decade. (this however, has happened in the summer season)

- *Low winter precipitation:* Despite the rain, the region is experiencing water shortages. Ladakh is a Himalayan region with peaks reaching over 25,000 feet and a base height of around 8,000 feet. For water, the Ladakhis rely nearly exclusively on glacier and permafrost melt. Glaciers have receded in the last 35 years due to lower snowfall. Between 2013 and 2017, Ladakh had a four-year drought with yearly precipitation deficits ranging from 50% to 80%, with 2017 marking the end of the drought. This has led to water scarcity in the villages. The impacts of climate change may also be seen on the world's highest battleground, the Siachen glacier.⁶ The snout of Siachen the starting point of the glacier at the Base Camp has receded by about a kilometre since 2005.⁷
- ***Increase in average temperatures of the region:*** Increased temperatures are one of the primary effects of climate change throughout the planet, and Ladakh has not been immune to the phenomena. Minimum temperatures have risen by 1 degree Celsius in the winter and 0.5 degrees in the summer in the last 35 years, according to one estimate. According to some recent research, the temperature in Ladakh has risen by 3 degrees Celsius during the last four decades. This has had a severe influence on the region's snow and rain cycles and may result in glaciers melting sooner than expected.
- ***Low agricultural yield and changed cropping pattern:*** Water from glacier melt has been the sole source of irrigation for 80 percent of Ladakh farmers. Only 20% of farmers cultivate near the banks of the Indus River and irrigate using river water. However, snowfall has decreased in recent years and has arrived late for the

season. The region's agricultural community is especially susceptible due to the unpredictable weather. Water shortage has shortened their planting season, lowering agricultural yields as a result. Farmers have also resorted to using chemical fertilisers to boost crop production in the now-reduced sowing season, resulting in increased contamination of the region's most valuable water bodies.

- ***Increase in extreme weather events:*** Several severe weather occurrences, such as cloud bursts and flooding, have been linked to fast changes induced by climate change and retreating glaciers, according to studies. As previously noted, the temperature in Ladakh has risen by about 3 degrees Celsius in the last four decades, whereas it has risen by 1 degree Celsius in the rest of India, making the region warmer. The increase in temperature causes more evaporation and, as a result, cloud development in the hills, increasing the risk of cloudbursts. Between August of 2010 and August 2018, there are close to 6 instances of flash floods and cloud bursts in Ladakh⁸, that have not only caused severe damaged to properties but have also claimed human lives.

Further, among other anthropogenic factors responsible for above, increase in the influx of tourists has also led to overexploitation of natural resources and pollution which, coupled with climate change impacts, is threatening the ecological integrity of the fragile ecosystems in the region.

Shortcomings of current tourism led growth model

The UT of Ladakh has seen a manifold increase in the number of tourists visiting it each year, Leh particularly has emerged as one of the favourite destinations of not only Indian tourist but also of foreign tourists. The tourism industry accounts for nearly 70% of Ladakh's total revenue. More than half of Ladakh's population, mainly in the Leh district, relies on the sector for a living.⁹

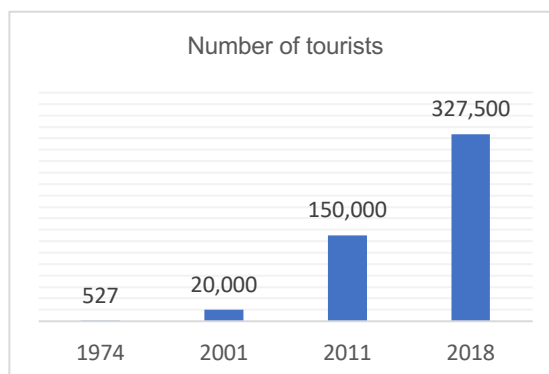
Though tourism in Ladakh has brought a lot of prosperity to the region and contributed in reducing the vulnerability of Ladakhis, it has also led to overexploitation of natural resources and pollution, which, combined with the effects of climate change, is threatening the ecological integrity of the region's fragile ecosystems. The fast adaptation of the tourist sector to the changing demands of visitors has resulted from the growth in demand for tourism in the Himalayas.

- **Excessive use of water is threatening the region's existence:** Most of India receives rainfall from the South West monsoons for a period of about 3-4 months, with an annual average precipitation being in the range of 850 - 900 mm. Being on the leeward side of the trans-Himalayan range, Ladakh receives just about 100 mm of precipitation in a year, making the region a cold desert. Due to above, for Ladakhis, water is an extremely precious commodity. They've grown accustomed to a life in which water is both limited and precious. According to studies, the ordinary Ladakhi consumes approximately 20 litres of water per day, but visitors use at least 75 litres.¹⁰ With growing water demand and drying up of common taps, locals have long resorted to digging borewells, using and exhausting ground water of the region. It is predicted that the glacier on which Leh depends is estimated to melt completely in the next five to six years.

- **Contamination of groundwater:** Traditional Ladakhi water management and sanitation systems were more in tune with nature. A compost pit was utilised for excretory functions, as it is a structure that does not require the use of water and thus eliminates the need for sewers or drains. Until recently, water from streams fed by glaciers was used for drinking purposes. However, with the flush toilets used by approximately 450+ guest houses and hotels only in Leh, water consumption has increased manifold. Also, due to a lack of drainage system, sewage water is being let into once pristine streams, thereby

polluting the source of drinking water for local inhabitants.

- **Absolute economic dependence on one sector:** The sudden rise in this sector has created a threat of the region's economy and its people being totally dependent on tourism. The tourism sector in the region has come to a full halt this year owing of the COVID-19 epidemic. Everything is closed, including hotels, guest homes, stores, cafés, taxi services, restaurants, and other auxiliary industries, and the individuals who work for them have been unemployed for over eight months.
- **Demand for more energy:** Tourists demand energy services above what local residents require. Cooling, heating, lighting, and transportation needs have been provided primarily by fossil fuels trucked over the Himalayas, adding diesel fumes, coal smoke, and spent oil to the list of Ladakh's environmental woes.



- **Uneven distribution of benefits:** As the tourism economy is centred around Leh, more than 90% of Ladakhis who reside outside of this area receive relatively little of the economic advantage of tourism. While now off beat tourism has also become popular in the region, it still benefits those having spare infrastructure to host tourists. There is therefore a danger of those not participating becoming economically worse off simply by continuing to live as they always have.

As can be seen, though tourism has led to rapid development of the region resulting in economic prosperity of the locals, there is need to tap into other potential areas and stop any further damage to the region's ecology and its people.

At this stage, it is imperative for governments, private sector enterprises and local population to come together, map opportunities and diversify in other sectors. This will not only be a saviour for the region's environment but will also safeguard locals from over dependence on a seasonal sector like, tourism.

The next section covers in detail on how Ladakh can unleash its economic potential.

As for any sector to give positive results, collaboration among key stakeholders, including Government and private sector players, is of critical importance, an attempt has been made to highlight key interventions required from both parties. No discussion about the region is complete without discussing the impact of interventions on climate, the section will also highlight the role which proposed interventions can play in mitigating the impact of climate change in the region.



Unleashing Ladakh's economic potential

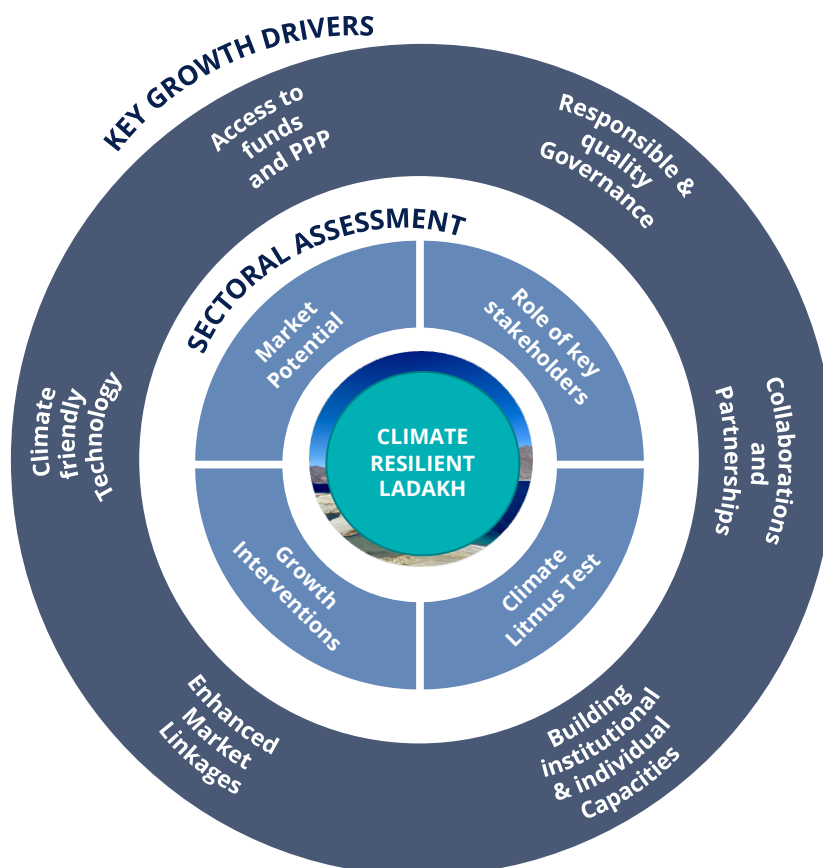
The diverse topology makes this high-altitude cold desert located in the Great Himalayas, a favoured destination among domestic and foreign tourists. While tourism has contributed immensely to unleashing the region's economic potential, but it has still not tapped it fully. The region has lots to offer to rest of the world in different sectors.

Ladakh has around 320 clear sunny days per year and receives an average daily global solar radiation of 2022 kWh/m²/year, making it an ideal location for solar power generation in India. In addition, due to the abundance of wind resources created by the valley terrain landform, it has the ability to harvest wind energy.

Ladakh produces some of India's most exquisite agricultural goods due to its lengthy fruiting season, bright skies, and significant diurnal temperature fluctuation. The region is also famed for the world-famous pashmina wool type, which was once solely found in Ladakh. In spite of such significant characteristics, the region has not been able to realise its true economic and socio-cultural potential.

To assess the region's potential, the below framework for sustainable development has been devised. The framework analyses the region's unique characteristics across sectors, namely, Agriculture and Allied, Travel and Tourism, Power and Energy, and Handloom.

To assess the region's potential, the below framework for sustainable development has been devised. The framework analyses the region's unique characteristics across sectors, namely, Agriculture and Allied, Travel and Tourism, Power and Energy, and Handloom.



Sector 1: Agriculture and allied services

a) Sector Overview

Ladakh is largely an agrarian community, with roughly 70% of the people directly or indirectly dependent on agriculture. Due to the region's long, harsh winters, the cropping season has been shortened to only four to five months every year. Single cropping is the norm in the region due to the short cropping season, and agriculture is entirely dependent on irrigation. Only below an altitude of roughly 3000 metres is double-cropping possible. The majority of families have small land holdings, with 49.4 percent having less than 0.5 hectares. Only 0.2 percent of the entire geographical area of Leh district is under agriculture, with a total cultivated area of 10,223 ha.¹¹

Low cropping intensity leading to lack of self-sufficiency in food is a major challenge for this region. Approximately 73 per cent of Ladakh's food grains are procured from outside the region. About 67 per cent of vegetables consumed by the region and 85 per cent of fruits are also procured from outside of it. This problem is further aggravated in winters, as both the National Highways leading to the region get closed due to excessive snowfall, rendering the region inaccessible via road in winters. In such a scenario, airways are the only option available for transportation of necessary commodities to Ladakh. This option, however, is very expensive for the local population. As a result, consumption of fresh fruits and vegetables by locals reduces drastically in the winter season.¹²

- **Apricot and Apple-** Apricot and Apple – The region's two most important fruit crops are apricot and apple, both of which are renowned for their high quality. The climatic conditions are favourable for the development of high-quality apricot and apple due to the longer fruiting season, bright sky, and significant diurnal temperature fluctuation during the growing

season. In 2016-17, Ladakh produced 5,644 metric tonnes of apples, with a CAGR of 2.05 percent over the previous decade. Apricot production in Ladakh reached 5,698MT in 2016-17, with a CAGR of -2.77 percent.

- **Seabuckthorn-** It is a valuable native plant both environmentally and commercially. It grows wild in Ladakh, with little human intervention. Despite being utilised as components in traditional medicine, the recent discovery of the health advantages commands a premium price even at the harvesting locations. Large-scale seabuckthorn cultivation has the potential to be a critical instrument for Ladakh's cold desert's long-term development. Cultivation of Seabuckthorn on 2500 ha in Ladakh is projected to result in net income of Rs 491 crore per annum in 2030 from raw material harvesting and its primary processing. It is estimated that the area under pure seabuckthorn is 7184 ha while the area under mixed seabuckthorn is 2083 ha in Ladakh that accounts for 70.9% of the country's area used for its cultivation. This accounts for less than 5% of the region total potential.¹³
- **Cultivation of Vegetables –** Only four varieties of vegetables were cultivated in the region in the late 1960s. The feasibility of growing 101 different types of vegetables has been proven in Ladakh.¹⁴ The climate is ideal for growing exotic vegetables, such as broccoli, bell pepper etc. which are mostly imported by India. Given that India imported fruits and vegetables worth about USD 1,189 million in 2019,¹⁵ and the fact that only 629 ha area of Ladakh is currently in use for cultivation of vegetables, there is immense potential for expanding vegetable cultivation.

Although Ladakh, has varieties of fruits and vegetables which are unique to the region and also has an environment which is favourable for production of exotic vegetables, coarse grains etc., due to poor market linkages, water scarcity and improper

branding, their production remains low at this stage.

b) Gaps identified

This region's agriculture differs from that of other rural parts of India as cultivation is only possible for four months per year. The soil in the region is loose and under tremendous water stress. Added to this are other socio-economic factors such as small farm holdings, low productivity, labour shortages, inadequate post-harvest management and poor marketing of produce.

Some of the major gaps identified in the sector include the following:

- In Ladakh, the land-based food production is reducing and a supply-oriented food system is emerging.
- Adverse climatic conditions leading to limited vegetable cultivation particularly in winter months resulting in high dependency on imported food grains.
- Occupational shift among the new generations of locals to tourism industry as agriculture sector is giving low return due to lack of adequate technology or crop diversification and given poor market linkages.
- Low impetus on value chain development for major produce like apricots, apple, seabuckthorn etc. This includes limited capacity building of locals, limited provision of necessary infrastructural inputs, and limited branding, packaging and marketing abilities of the region.
- Inefficient harvest and post-harvest technologies causing high wastage of food
- Farmers hesitant in adopting new techniques, technologies and high value crops due to lack of knowledge and access to infrastructures
- Due to lack of distribution network, the region also loses its competitive advantage to J&K, just as in case of apples and berries.

c) Government interventions which will contribute immensely in unleashing the sector's economic potential:

As previously stated, Ladakhis used to grow and consume their own grains, cereals, and vegetables, make their own manure, seeds, and other agricultural inputs, rear their own animals, and prepare their own farms in an integrated and balanced manner in response to Ladakh's agro-climatic circumstances. Poor cropping intensity, low yield, and a short agriculture season, on the other hand, have resulted in an increased reliance on imported food grains and vegetables by the growing population. To add to this, the agriculture sector of the region is also seeing shift in occupation from the next generation of locals. This results from the fact that at the same time as farm incomes are decreasing due to low yields, tourism is turning out to be the most promising sector in the region. With certain interventions from the government and private sector with a focus on increasing agricultural yield, using low-cost technology for producing different types of vegetables, ensuring food supply in winters and adequate value addition and marketing of horticultural products, the region has the potential of sustaining itself again.

- **Commercial Greenhouse:** Ladakh has a harsh environment and a short agricultural season since it is a cold, dry, high-altitude area of India. Commercial Greenhouses will not only help the Ladakhis' economic condition, but they would also enhance health of locals, as they only get fresh vegetables for eight months of the year, which are a rich source of vitamins and minerals. The polyhouse gathers sunlight and creates an excellent atmosphere for growing vegetables. It also traps carbon dioxide, which plants emit at night and is necessary for photosynthesis. By keeping water from evaporating from the soil, the

polyhouse lowers irrigation expenses. Since the Tibetan region has similar climatic conditions, and farmers there have adapted to greenhouses, the agriculture department there, however, is a need and opportunity to do this at a larger scale with there being a need to have at least one or two greenhouses in each village of Ladakh.

Commercial cultivation of Indian/exotic vegetables/flowers in large greenhouses for first meeting local demand, then supplying on contractual basis to local hotels and army bases, post which the produce can be supplied to rest of the country at a premium, as most of the vegetables (broccoli, bell pepper etc.) are imported by India.¹⁶

- **Cold storage facilities:** Lack of temperature controlled facilities to store fruits and vegetables, often results in wastage of this precious organic produce of the region. To address this issue keeping in mind the power shortage in the region, it is recommended to set up solar-powered cold storages in the region. Entrepreneurs and investors throughout the country are increasingly focusing on using solar energy to generate greater value for farmers through creative solutions.

Solar energy can be harnessed to help farmers in Ladakh to store and sell their produce for a longer duration. This will also help them to reduce post-harvest losses and increase their incomes from farming. Just like commercial greenhouses, cold storage facilities powered by solar energy can be taken up for implementation at a large scale.

- **Trench Farming:** Because greenhouses are expensive and not all farmers can afford them, farmers in the region may be taught and encouraged to consider alternative choices for producing

vegetables, such as low tunnel technology, until the administration takes up the installation of commercial greenhouses. This technology is not just low-cost, but also portable. The farmers have the ability to relocate the tunnel to whatever location they want. In high mountain locations like Changthang, they may also be utilised to cultivate herbs and vegetables.

Some farmers who have adopted this technique are now growing up to 28 different varieties of vegetables, up from the previous ten.¹⁷ This has not only allowed people to make more money from their agricultural products, but it has also ensured that the community has access to a variety of healthful veggies. Therefore, there is a need to carry out capacity building activities to build acceptance of this technology. The administration in collaboration with DRDO, can look at popularising this technology in the region.

- **Increased focus on horticulture products and also adding value to local produce:** Food processing may cover a profitable need gap for farmers, entrepreneurs, and the local economy, as well as kickstart the entrepreneurial process by displaying immediate and obvious advantages to all parties involved. Processing fruits (seabuckthorn, apricot) and vegetables (particularly peas, tomatoes, and potatoes) into value-added forms with extended shelf-lives that increase spatial and time-based availability in and out of Ladakh. Jams, juices, oils, dehydrated preserved canned forms, purees, and other items are available.
- **Seabuckthorn-** Currently for seabuckthorn, primary processing of the berry is done in Ladakh and various components such as the pulp, seed and hull are sold to firms located outside the region for further value addition. There is an opportunity for

development of value-added products in this area. Hence, government needs to create a favourable environment for the investors through partial support in the form of subsidies, training and skill development on value added product. Pulp extraction facilities can be the part of the below proposed food parks. Various value-added products that may be created from this raw material include beverages including flavoured tea, health drinks and juices, wine, oil, creams, vitamin capsules etc.

- *Apricots and apples-* The main fruit trees of Ladakh are apricots and apples, which are abundantly produced in the warmer and lower portions of the state, particularly in Sham, Nubra, and Kargil. The apricots are traditionally sun-dried on the roofs of houses or on huge stones before being sold in markets in Leh and Kargil. Apricots and apples that grow in Ladakh are highly perishable within the short summer season. Therefore, the fresh fruits need to be transported to the markets soon after the harvesting in July and August. Poor market linkages in the region lead to high wastage of these fruits. Fruit processing units may be constructed in the below mentioned food parks adhering to Food Processing Order (FPO) standards. The local women may also be organised into Self-help groups at a large scale and then be trained to not only extract pulp to produce jams, jellies, oil etc but also identify potential buyers from the market.
- *Natural dyes-* There are many naturally occurring dyes that may be processed into natural dye powders and then exported or utilised internally in the textile, including Pashmina and handloom industries.
- *Native herbs and flowers-* Native herbs and flowers including exotic species like Geranium can be used to produce aromatic and medicinal oils, herbal tea, extracts for soaps and perfumes, scented candles etc.
- *High quality seed production-* The weather conditions in Ladakh are ideal for seed development of various vegetable crops. Long photoperiods, high light intensity, low rainfall and humidity, and low disease and

pest incidence are all available in the region. However, even with the aforesaid favourable climatic conditions, crop-specific agro-techniques are important for any crop's successful seed production. The Defence Institute of High Altitude Research (DIHAR) in Leh has developed seed production systems for a variety of temperate vegetable crops. Cabbage, onion, leek, beetroot, temperate radish, temperate carrot, turnip, swede, celery, and parsley are vegetable seed crops that can be produced on sandy to heavy soils with enough water and nutrients. If given right impetus, these have the potential of being exported and grown throughout the world.

At the village, block, and zone levels, small-scale food parks (spread in 10-20 acres of land) based on the cluster idea of industries may be established, with start-up units and facilities being leased out to entrepreneurs and cooperatives.

At the food parks, in collaboration with cooperatives and private sector, the administration may ensure capacity building of locals in the region to extract maximum from their produce. The food parks will provide common infrastructure, technical guidance, access to procurement and logistics facility and therefore will ensure maximizing value addition, minimizing wastage, increasing farmers income and creating employment opportunities particularly in rural sector.

Through its Farmer Producer Organisation policy, Odisha is successfully dealing with challenges and constraints that confront farmers by leveraging collective strength and bargaining power to access financial and non-financial inputs, services and appropriate technologies, reducing transaction costs, tapping high value markets and entering into partnerships with private entities on more equitable terms

- **Support in marketing and packaging:** There is a need to launch a 'Ladakh Organic Mission' with a sight of next 5 years. All marketing and branding of these



products, including on e-commerce portals may then happen under this umbrella. Adequate marketing strategies will make rest of the world aware of Ladakh's high quality produce and create organic demand for its products.

Launch of a 'Ladakh Organic Mission' with a focus of making Ladakh an organic certified region like Sikkim. Under this mission, an important component will be marketing and branding of local products.

With a large-scale centralised branding mission, the locals who are not skilled in this area, will get exposure to a world-wide market. Another component of this mission can also focus on eco-friendly packaging for the product, creating a unique brand image for its products.

d) Envisaged role of private sector

- **Conducting research and development activities:** Supply, production, processing, transportation, trading, marketing, and export are all steps of the agricultural value chain. The majority of them are

connected, with the output of one flowing into the input of the other. As can be seen from above, R&D activities carried out in any stage of the value chain has benefitted the overall sector in the region. Some key areas for research can be high yielding seed varieties, development of less water intensive crops, pest resistant crops, genetically modified crops, biofortification, improved storage, processing & logistics and labour-saving technologies

- **Additional investment in infrastructure:** Private sector players can come forward and invest in essential infrastructure for agriculture in the region, which will have the capacity to transform the sector. Solar powered cold storage, Mini food parks, commercial greenhouses etc. are all parts of essential infrastructure that are need of the hour for the sector. Setting up of small units for with food processing facilities will also create more jobs for local.
- **Better market linkages:** Private sector can emerge as a key player in providing market linkages to the farmers.

Establishing farm-firm linkage could help provide credit, assured market, remunerative prices, quality check and extension services, particularly to small landholders.

e) Positive impact on climate

Agriculture is one of the few sectors that can contribute to both carbon reduction and sequestration. Reduced tillage, increased crop rotations, cover crops, and animal reintegration into agricultural production systems have all been demonstrated to lower agriculture's own carbon footprint while

simultaneously absorbing carbon from other industries. Development of the region's agricultural and associated sectors, among other things, would lessen the region's need on tourists for survival.

Sector 2: Travel and Tourism sector

a) Sector Overview:

The Himalayan region has become one of India's most popular tourist destinations, offering a diverse range of activities such as religious, recreational, adventure, and nature-based tourism. As stated elsewhere in the document, the increase in demand for tourism in the Himalayas has led to rapid adaptation of the tourism industry to the needs and wants of the tourists

A total of 3,27,366 tourists, including 49,477 foreigners, visited Leh in 2018, marking an increase of over 50,000 compared to 2017.¹⁸

This development has resulted in overexploitation of natural resources and pollution, which, when combined with the effects of climate change, is jeopardising the ecological integrity of the region's delicate and fragile ecosystem.

According to studies, the ordinary Ladakhi consumes approximately 20 litres of water per day, but visitors use at least 75 litres.

With growing water demand and drying up of common taps, locals have long resorted to digging borewells, using and exhausting ground water of the region.

Ladakh officially opened for tourism in 1974 with 527 tourists visiting the region (J&K Tourism Department, 2010). Since then the number of tourists have grown consistently. The UT of Ladakh has seen a manifold increase in the number of tourists visiting it each year, Leh particularly has emerged as one of the favourite destinations of not only Indian tourist but also of foreign tourists. The tourism industry accounts for nearly 60% of Ladakh's total revenue. More than half the population of Ladakh, particularly the

Leh district, is dependent on the industry as a source of income.

Ladakh's tourism industry has mostly grown on a reactive basis. Further, the large influx of tourists has caused significant changes in the region's economy and environment. In most situations, the local community has had to adapt on a regular basis to accommodate an ever-increasing influx of tourists.

b) Gaps identified

- With every passing day, the impact of climate change is getting more visible, world over. The effects of climate change are changing ecosystem functions and the human activities that rely on them. Many people residing in the mountains are facing major challenges as a result of rising air temperatures, melting glaciers, and extreme weather occurrences. Tourism as an industry is most susceptible to the impact of climate change in the region of the Ladakh.
- The increase in demand for tourism in the Himalayas has led to rapid adaptation of tourism industry to the changing needs of visitors. Therefore, a lot of these adaptation have been in unplanned manner which has led to the region operating under tremendous stress which is now visible in the form of, water scarcity, ground water contamination, demand for more energy among other things.
- As the tourism economy is centred around Leh, more than 90% of Ladakhis who reside outside of this area receive relatively little of the economic advantage of tourism. While now off beat tourism has also become popular in the region, it still benefits those having spare infrastructure to host tourists. There is therefore a danger of those not participating becoming economically worse off simply by continuing to live as they always have.
- Focus on only summer tourism has resulted in 3-4 months of very active tourist season in the region.

c) Government interventions which will contribute immensely in unleashing the sector's economic potential:

- **UT of Ladakh's tourism policy:** There is a need for the region to have a very focused tourism policy. The tourism policy will reflect the overall development policy and focus areas of the region and will ensure that tourism as a sector is very well integrated with the region's priorities.

After thorough stakeholder consultation, Ladakh administration should roll out a comprehensive tourism policy, focusing on:

- Tourism attraction and activities
- Various types of accommodation facilities in the region
- Tourist facilities and services including, setting up tourist information centres, last mile connectivity, inter-intra city transport etc.
- Essential urban and rural Infrastructure facilities including, water supply, power supply, sewerage systems, internet connectivity etc.
- Focus should be laid on human resource planning and educational programs for those operating in this sector. Training and development of local youth should be an important area of focus for the policy.
- Tourism investment promotion will also form a very important part of this policy. Though, through the UT of Ladakh's Tourism incentive policy launched in 2020, the administration has announced Capital Outright Investment subsidy which aims at promoting a concept of small and beautiful fixed assets in Ladakh based on local tradition and architecture, there is scope for attracting more investments through tourism summits and conclave and other business promotion activities.
- Important plans on connectivity, communication and transport should also be covered in the policy.
- **Development of new tourism products:** Tourism has been the most adversely affected sector due to the outbreak of COVID-19 pandemic across the globe. Those engaged in this sector in Ladakh have also severely felt the impact of this

adversary. This however has also given an opportunity to the administration to develop several other types of tourism circuits and products in the region.

The administration can play a very important role in getting Ladakh onto the Tourism map of the country and shifting its nature of seasonal tourism to a perennial one.

Some of the different tourism products which can help unleash the region's economic potential, without deteriorating the ecological balance, include:

- *Night-sky tourism:* According to a report, nearly seven million people travelled across the US in 2017 to witness the total solar eclipse¹⁹, giving birth to a new concept of Tourism called as night-sky or Astro tourism. Due to having 300 plus clear days in an year, Ladakh is home to many observatories focusing on different celestial bodies in the villages of Hanle, Merak etc. Tapping into this potential, the administration in Ladakh has a unique opportunity to start night-sky tourism without much infrastructure investment.
- *Winter tourism:* Because of the extreme climatic condition, Ladakh has become a tourist destination in winters for the adventure seeker. And along with Chadar trek, Snow leopard spotting is also very famous in the region starting from December end till early March. There is however scope of developing winter tourism in the region. Winter sports like Snow ski specially in Zaskar region can be developed. With the opening of Chilling-Padum Road, Ski can also be promoted in future to sports enthusiasts.
- *Adventure and sports tourism:* Ladakh's rugged topography in the Himalayan foothills offers a variety of adventure sports activities that are guaranteed to please any adventure lover. To explore the potential of this segment, there is need for the administration to develop adventure

tourism specific guidelines. Just as Indian Institute of Mountaineering in Gulmarg, a specialized institute for high altitude skill training may be developed in Ladakh. There could also be specific trekking programmes organised for trekkers to places like, Zinchen, Rumbak, Stok la base etc.

- *Cultural, spiritual and wellness tourism:* With the Ministry of Tourism aiming to market Ladakh as a spiritual and wellness destination, it may be prudent for the administration to create a number of such circuits to assist tourists in having a genuine spiritual experience while focusing on Ladakhi hospitality and heritage. As mentioned earlier, Ladakh is home to several medicinal and aromatic plants and herbs which can be used to produce oils with those benefits. As there is growing interest in wellness and rejuvenation, this is the right time to tap into this market. Organising yoga retreats, forming tourism circuits and developing homestays near monasteries, organising Tibetan wellness spas could just be the right start to this segment of tourism.

- *Wildlife tourism:* Ladakh is a one-of-a-kind wildlife attraction, with a variety of rare animals and bird species roaming freely in their natural habitat. It also boasts a number of rare and endangered animal species, including the beautiful snow leopard, Tibetan sheep, yak, marmot, blue sheep, lynx, and others. There is a need to promote this aspect of Ladakh to catch attention of nature and wildlife enthusiasts and bring them to the region. Wildlife tourism will also promote influx of tourist all year round to see different aspects of flora and fauna, giving some respite from the current over-crowded tourist seasons.

- **Promotional/ branding initiatives similar to Incredible India:** Ladakh is in need of its very own 'Incredible India' campaign. In 2002, the Indian government started the "Incredible India" campaign as part of an integrated marketing

communication effort to promote India as a tourist destination by highlighting various aspects of Indian culture and tradition, such as yoga and spirituality. In the paradigm of amazing India campaign, international visitor arrivals grew at a CAGR of 13.19 percent, while foreign exchange profits in Rupees and US Dollars increased at CAGRs of 15.87 and 17.49 percent, respectively.²⁰.

An integrated marketing campaign maybe launched either as part of the Tourism development policy or separately, with a focus on various facets of tourism in Ladakh will successfully add the missing piece to its current state of tourism.

- **Focused training programs:** Given the shift towards tourism for income generation, households that have so far been left out of the fray because of lack of initiative or resources can be targeted for inclusion through trainings, workshop and skill-building. There needs to be a tie up with institutions of national and international repute to train the youth of the region in hospitality and many other avenues of tourism.

d) Envisaged role of private sector

- **Adoption of eco-friendly products:** Hotels, as part of the tourism industry, exert a significant impact on the environment. The hotels operating in the region should be encouraged through their hotel associations to follow green practices in hospitality. These green practices include sustainable management of water, energy conservation, solid waste management, ensuring air quality, environmental purchasing, community awareness and maintenance of permits.
- **Sourcing locally:** Procurement in the hospitality industry accounts for 30% of the expenses and hence plays a very important role in controlling cost. The industry should therefore focus on increasing its local sourcing of ingredients/components in key areas of food and beverages, infrastructure and engineering equipment. This will not just

help hotels to reduce their costs, it will also boost the local economy and culture. Sourcing locally will also give tourists the real flavour of Ladakh.

- **Skill development of locals:** As the tourism industry in Ladakh has grown on reactive basis, it has not given local youth an opportunity to be adequately trained for the hospitality industry. Further because the tourist season in Ladakh is concentrated within a few months, many hotels/ agencies prefer to hire migrant and contractual employees because they can expand and contract their staff as demand changes. Due to all of the above, very employers make concentrated effort to train the youth. It is therefore recommended for hotels to invest in developing competencies required to professionally carry out the duties associated with the great variety of jobs in the tourism industry.

e) Positive impact on climate

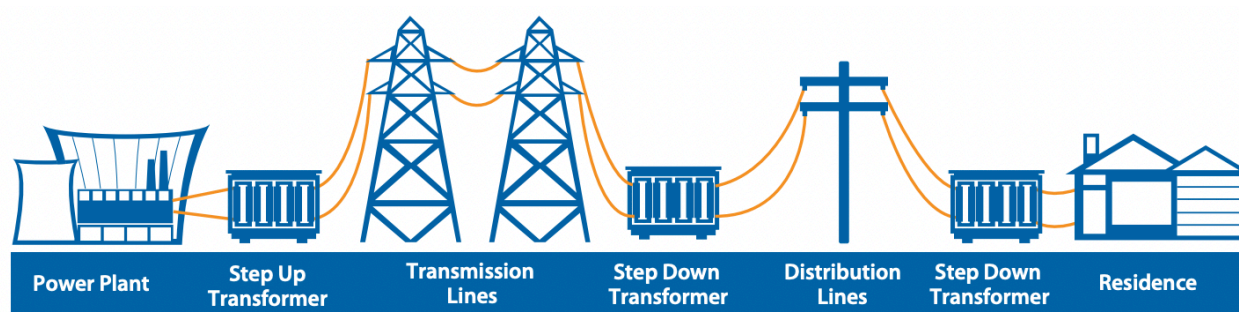
In addition to the cold desert, Ladakh's landscape is also characterised by pastures/grasslands, which are home to ethnic groups that make a living through agriculture and animal husbandry. As a result, the natural, social, and cultural contexts on these grazing fields are different. However, without a full understanding of the intricate linkages between many landscape components, tourism's rapid expansion might harm Ladakh's unique grassland ecosystems. In comparable situations in the Tibetan Plateau of China, tourism in grasslands has been found to have a detrimental impact on the ecology of the plant-soil system (species diversity, litter biomass, nutrients, and enzyme activity in soil). Other impact which the rapid growth of this particular industry is having on the ecosystem of Ladakh, have been discussed in detail in earlier sections.

Further, as mentioned earlier, tourism in Ladakh is concentrated in a few months, i.e., between April to September. As a result of this, there is over exposure of natural elements to tourists in some months. The mass tourist arrivals during the peak season have already caused a huge challenge for adequate availability of

civic services. Endless traffic jams, lack of regular water supply, poor waste management, and increasing pollution are causing enormous difficulties to the tourists as well. The suggested new tourism products will ensure all round tourism in the region resulting in tourist influx, which is evenly spread out throughout the year, giving nature time to recover.



Sector 3: Energy and Power



a) Sector Overview

The hon'ble Prime Minister of India announce in his Independence Day speech on 15th August 2019, that Ladakh will endeavour to become nation's first Carbon neutral region. While the notion of carbon-neutral villages has been discussed in India before, with certain villages in Kerala and Manipur adopting it, this will be the first significant region to make an attempt at above. Carbon neutrality means annual zero net anthropogenic (human caused or influenced) CO₂ emissions by a certain date.

It is this sector which has the potential to lay the foundation for this aspirational thought.

Connecting Ladakh to the main national grid is difficult because to the Himalayan mountains. Despite the fact that certain regions have been connected to the national grid, connecting the entire region remains a tough undertaking at this time. In the past, the region's power shortage has hampered the expansion of other businesses. Because Ladakh lacks such reserves, any electricity generated is largely derived from fossil fuels imported from outside the region. The majority of power has always been generated by diesel generators.

Renewable energy sources are definitely the way forward for Ladakh in terms of its power and energy needs. In Ladakh, there is a significant potential for solar and

micro-hydel-generated energy, and there are also

90% Household Electrification in Ladakh

64% Energy Deficit in Winter

- Demand: ~50 MW
- Supply: ~18 MW

15 hours of power supply/ day

25% Transmission and distribution losses*

geothermal and wind energy prospects in certain places. These should be tapped into to the fullest extent feasible.

Solar energy potential in Ladakh: In India, Ladakh has the greatest sun radiation intensity in the country. Leh itself has about 320 bright sunshine days each year, and the low climatic temperatures help solar panels function more efficiently. India's Union Territory of Ladakh—which has a peak electricity demand of 50 MW—has massive solar potential of around 60 GW (including 35 GW in Leh and 25 GW in Kargil district).²¹ In Leh and Kargil, the government plans to build India's largest solar project, with a capacity of 7.5 GW (4.5 GW in Leh and 2.5 GW in Kargil) and two solar plants, each with a capacity of 7 MW and a 21 MWh battery energy storage system. Aside from that, Leh is set to get a 50 MW solar plant.²²

Wind energy potential in Ladakh: Ladakh has a wind power potential of 1 Lakh megawatt (Mw) and preliminary studies have indicated the region holds tremendous promise for setting up commercial scale wind energy projects.²³ The region has wind resource due to its valley terrain and temporal variation with an estimated potential of 5,311 Megawatt at a hub height of 50 meter. The potential goes up to 100,000 Mw at a height of 120 Meter.

Geothermal energy potential: Geothermal power is energy generated from heat sources beneath the earth's crust, such as steam, hot water, magma, and hot dry rock. As per some experts, Ladakh is probably the best place in India for generating geothermal power because subsurface temperatures are very high. The Puga hot spring region, located in the Indus Suture Zone at the confluence of the Indian and Tibetan plates, offers the highest potential for the development of geothermal energy in the Indian subcontinent in the near future. More than 5,000 MWh of geothermal energy is expected to be accessible in Puga, which may be utilised for heating, greenhouse horticulture, and, eventually, power generation. Exploration work for finding more such fields is currently on.

Green Hydrogen energy potential: green hydrogen is created by splitting water using renewable energy and electrolysis. Grey hydrogen, which is made from methane and emits greenhouse gases, and brown hydrogen, which is made from coal, are two different types of hydrogen. One of the greatest choices for making Ladakh carbon neutral is to use green hydrogen. For power, heating, and transportation, diesel, a widely utilised fossil fuel in the region, may be substituted by green hydrogen energy. At the Sonam Norboo Memorial Hospital in Leh, Ladakh now boasts a 200 KW green hydrogen pilot project.

b) Gaps identified

- Without proper storage devices, renewable energy has its limitations in being a reliable source of energy.
 - The region is bound by hills on all sides, creating a need for conducting shadow analysis before shortlisting any plan for renewable energy.
 - High exploration cost and unknown environmental impact of Geothermal energy is a very big deterrent for its extensive use right now. The key challenge is to bring down costs, where it will be economical to develop small geothermal fields in areas like Puga Valley, because a small project of 5 KW can electrify rural areas in Ladakh.
 - While power can be generated using renewable sources of energy, especially in areas like Ladakh which have great potential for these, transmission and storage of power generated still remains an area of concern for many. Being an extremely rocky terrain, the cost of constructing transmission lines increases further in the region.
- c) Government interventions which will contribute immensely in unleashing the sector's economic potential:**
- The use of vast renewable energy resources would make Ladakh the only place in the country with 100 percent clean electricity. It will also turn out to be a major source of revenue for the newly formed Union Territory.**
- There however are certain interventions needed from the government to make this sector more attractive for investments. Some of those include:
- **Decentralized availability of solar electricity:** Decentralised availability refers to energy being generated close to where it will be used by a variety of small-scale power consumption units. This implies that instead of linking all rural areas through a single grid, power production units should be located in and around villages in Ladakh. Microgrids provide power to isolated regions that aren't linked to the main grid. This will also contribute in reducing losses on account of transmission and distribution, which currently are as high as 25%. At this stage, the government must invest in forming an Ease of doing business framework. It is required to sign Power Purchase Agreements (PPA) with private entities and encourage them to invest in this region using the PPP route. More clarity needs to be established on transfer of land ownership rights of the region. If transfer of land ownership is a concern among locals, the government should give land on lease until the life of the project

and increase the PPA by a fraction to offset the risks.

- **Environment impact policy for Geothermal energy.** Environmental studies for geothermal power should be similar to those in place for oil and gas development because the stress and pressure on the soil must be understood. The high levels of seismicity of the region adds to the need for detailed studies of the associated risks. As the exploration of geothermal activity is in a nascent stage, it is a right time to formulate an environment impact assessment policy for this type of energy and also do some more exploratory research to understand the potential risk which tapping of geothermal energy may have on the flora and fauna of the region.
- **No one size fits all approach:** The goal should be to make each village energy-secure using the right mix of renewable energy options. There is no one size fit all approach that can be adopted. The right source of energy for each village should be determined only after carrying out on-ground assessment of the village's energy potential. The local community must be involved for the installation, commissioning and maintenance of such systems.
- **Procuring affordable batteries for storing energy:** One of the biggest obstacles to renewable energy is its cycling between oversupply when the sun shines or the wind blows, and shortage when the sun sets or the wind drops. While the battery costs for storage have fallen by over 80% since 2010, there is still a need to carry out price discovery activities for this. Further, more dedicated research needs to be undertaken for exploring ways to store energy. Private entities may also be called to the region to set up power storage projects. India's first Ever Large Scale 50MWh Battery Energy Storage System co-located with 50MW Solar PV plant is being set up by Tata Power Solar in Ladakh's Leh.
- **Setting up of SMART electricity grids:** Increased rooftop solar penetration in the distribution grid will have a substantial influence on the system's reliability. The grid must be flexible and smart in order to accommodate rooftop solar. Energy storage devices will play a critical role in achieving this flexibility by serving as a load when there is excess generation and a producing source when there is a supply deficit. As a result, the grid will be stabilised, and the output of the solar rooftop will be smoothed. The UT administration may devise a strategy for turning current grids and metres into SMART devices.
- **Carrying out assessment activities to understand environment impact of using green Hydrogen in the region:** Hydrogen is now firmly on the table in India's quest for energy. Finance Minister Nirmala Sitharaman also indicated this when she inaugurated the National Hydrogen Energy Mission. According to the Centre, hydrogen fuel is essential for a low-carbon transition in industrial sectors. However, because water is a scarce resource, additional research is needed to determine the hydrological impact of hydrogen generation in a high altitude location during the winter. If achieved, Green Hydrogen might become a viable alternative to the fossil fuels now utilised in Ladakh.
- **Reduction of subsidies on Diesel:** To promote adoption of clean energy among the people in the region, the UT administration may also look at reducing the subsidy on diesel which it currently offers. The subsidy can then be eventually phased out.
- d) Envisaged role of private sector:** The renewables industry reacted to the government's demand for climate-compatible growth by quickly ramping up capacity, raising the percentage of renewables in India's overall energy mix from 6% to 10%, with an annual growth rate of 17.5 percent between 2014 and 2019. India is among the top five clean-energy producers in the world.²⁴ All of this has been made possible by the Government's and private sector's excellent partnership. There are a few additional things

the private sector can do to aid the energy transition. Some of them are:

- **Contribution in decentralized availability of solar energy:** Once the government has put together an Ease of doing business framework for the region, it is required from the private sector to sign Power Purchase Agreements (PPA) with the UT administration/ Government and invest in this region using the PPP route and create micro grids for areas not connected by the National grid. There is also a need for private sector to invest adequately in energy storage options.
- **Research and development:** Discovery of breakthrough new energy solutions like improved battery technology and green hydrogen are results of extensive time, effort and energy which has gone into research by several countries and companies. Private sector, is therefore encourage to collaborate with academia, regulators and governing boards to develop new methods and assist in energy transition.
- **Foreign Institutional Investment (FII) and Foreign Direct investment (FDI) in Renewable energy sector:** To promote the smooth flow of cash and knowledge, India permits 100 percent FDI in Renewable Energy projects. Tax incentives are also available for mega-manufacturing plants for solar cells, lithium-ion batteries, electric cars, and charging infrastructure. The Indian renewable energy market has matured, and it now boasts of big scale, fewer risks, predictable yields, and medium to high returns, all of which are exactly what FIIs need for investments.

e) Positive impact on climate:

The Intergovernmental Panel on Climate Change (IPCC) has determined that fossil fuel emissions are the primary contributor to global warming. Fossil fuels and industry accounted for 89 percent of worldwide CO₂ emissions in 2018.²⁵ Electricity production generates the second largest share of greenhouse gas

emissions (25 percent of 2019 greenhouse gas emissions)²⁶.

Approximately 62 percent of our electricity comes from burning fossil fuels, mostly coal and natural gas. The IPCC warns that fossil fuel emissions must be halved within 11 years if global warming is to be limited to 1.5°C above pre-industrial levels. The energy transition to clean fuels will contribute in abating the climate change process in the ecologically sensitive region of Ladakh.

Sector 4: Handloom- Pashmina

a) Sector Overview

Ladakh is a place known for its unique and exquisite craftsmanship. The handicraft and handloom of the region projects the unique art and cultural heritage.

Pashmina: The Chang pa tribe has been shepherding their Changra goats for decades in the remote Trans-Himalayan Changthang region of Ladakh, at around 16,000 feet above sea level. Changra goats with world-class Pashmina wool are raised right here. The Changpa tribe travels from high pass to high pass in search of appropriate pastures for their goats, sheep, and horses, establishing encampment in five to seven different sites each year.

The Ladakh pashmina sector, worth \$100 million, has applied for a GI designation for pashmina from Changthang goats. Though Ladakh contributes just 0.95 percent of world pashmina supply (annual output is approximately 55 tonnes), the wool is only 12 microns wide.²⁷

b) Gaps identified

- The younger generations of the Changpa tribe are no longer interested in living a difficult nomadic life like their elders. Some of them have descended to Leh in search of better paying opportunities in the tourism sector while some have even left the hilly region of Ladakh and relocated to metro cities for education and jobs. It is also in Leh, where their phones get network and a working internet connection, making them realise how fast the world is progressing, and they are not.
- Pashmina is also getting stiff competition from cheap synthetic wool made in China. The markets in and around Leh are flooded with this inferior quality of self-claimed Pashmina.
- Many Changpas families are now preferring to be an agrarian community rather than a nomadic tribe. To earn their livelihood and rear their goats, the families live in small huts with tin covered roofs,

and brace harsh winters with temperatures going down to minus 40 degree Celsius. Definitely not adequately prepared for the season, their huts are equipped only with basic necessities. The weather is getting harsher, and unpredictable too given the impacts of climate change, and fodder for the goats is declining, forcing the tribe to leave the nomadic lifestyle.

- Though Pashmina wool originates from the region of Ladakh, the marketing and branding done for Cashmere (from Kashmir) Pashmina wool has made people to believe that Pashmina belongs to Kashmir. There is a significant difference between the varieties of both the wool, with Ladakhi Pashmina being 8 times finer than human hair.
 - Ladakhis do not have the expertise to carry value addition activities on raw Pashmina.
- c) Government interventions which will contribute immensely in unleashing the sector's economic potential:**
- **Development of Changthang region:** In terms of fundamental development indicators like sanitation, safe drinking water, and electricity, the Changpa tribes have a poor quality of life. Due to the severe climate circumstances, personal hygiene and nutrition are frequently ignored. It is needed for the UT administration to provide critical infrastructure in the region on an urgent this part has to be implemented on priority. It is extremely important to develop housing, health and sanitation and education in the region.



- **Capacity building on spinning, weaving, dyeing and customising pashmina products:** The UT administration may collaborate with institute of national repute and carry dedicated courses to train the locals in adding value to the Pashmina wool. The emphasis should be on improving internal processing and weaving capabilities so that value is added in Ladakh and so advantages flow to the people of Ladakh. In 2020, Paley's (a middle aged Changpa tribe member) annual income was a meagre ₹45,000, though he sold 15kg of pashmina wool. A kilogram of raw wool fetches ₹3,000; the same price jumps to ₹11,000 for a de-haired and cleaned version. The same amount of pashmina fibre makes two shawls, each fetching ₹20,000 or more.²⁸
- **Product diversification for Pashmina:** Today, shawls are the only widely known

Pashmina Product popular worldwide. There is a large scope to expand the Pashmina offerings and cater to many different segments of people.

- **Quality assurance and other Research and development activities:** As Ladakhi Pashmina is pure with zero blending, it is recommended to set up a certifying agency which will serve as an authority in certifying and branding pure Pashmina.
 - **Marketing and branding:** As mentioned elsewhere in the document, the UT department needs to invest in branding of Ladakh only products. It is important for rest of the world to know what all does this region can offer.
 - **Strengthening of existing fodder banks and Pashmina (Changra) goats breeding centers:** Financial assistance must be increased to existing goat breeding farms and fodder banks. This will augment the capacity of the farms to raise more numbers of better quality bucks for distribution amongst Pashmina goat rearers. Fodder banks will help rearers resolve the problem of fodder shortages in winters.
- d) **Envisaged role of private sector:**
- **Marketing and branding of handloom products:** Private sector players can assist the UT government in launching a dedicated marketing and branding program for local products of the region. This program with a focus on branding initiatives, may also include aspects of making market linkages better for these products.



- **Research and development:** The sector can undertake the activity of setting up research institutes in the country to strengthen the activities of rearing, shearing, washing and processing of Pashmina wool. This will also give the Pashmina sector of the region exposure to best practices followed throughout the world in specialised rearing.
- **Skill development of youth:** Some large private sector players in the Pashmina market may also collaborate with the UT administration and design a training program dedicated to youth trying to make a career in the Pashmina industry.

e) Positive impact on climate:

Rearing of Pashmina (Changra) goats has been an integral activity for Changpa tribes.

The region of Changthang has also witnessed the rearing of Pashmina goats for many centuries. As all of these activities form the ecosystem of Ladakh, their survival is very important for the ecological balance of the region. The above interventions will from Government and private sector will also reduce the migration of youth from this region and sector. This will also prevent the towns of Leh and Kargil from being over populous.

Way Forward for Ladakh

Despite its enormous geo-strategic importance, Ladakh's socioeconomic development has been limited in the past. The allocation of resources has been a key impediment to Ladakh's growth due to the complexity of the Jammu and Kashmir areas. Several challenges have slowed the region's growth, including its relative inaccessibility and primitiveness, the existence of nomadic tribes, and the sluggish flow of finances. The Jammu and Kashmir Reorganisation Act, 2019, passed by the Parliament of India which contained provisions to reconstitute Ladakh as a Union Territory, separate from the rest of Jammu and Kashmir, has opened gateway of development and prosperity for the region.

While tourism has played a significant role in unlocking the region's economic potential, it has still not tapped it fully. Furthermore, climate change is creating an unpredictable, and at times dangerous, environment for communities living in the world's high alpine zones. Climate change is changing the way the environment works, as well as the human activities that rely on it. Many people living in the mountains are facing huge challenges as a result of rising air temperatures, melting glaciers, and extreme weather occurrences.

The region has many things to offer to rest of the world in different sectors.

Ladakh has around 320 clear sunny days per year and receives an average daily global solar radiation of 2022 kWh/m²/year, making it an ideal location for solar power generation

in India. In addition, due to the abundance of wind resources created by the valley terrain landform, it has the ability to harvest wind energy. Ladakh produces some of India's most exquisite agricultural goods due to its lengthy fruiting season, bright skies, and significant diurnal temperature fluctuation. The

region is also famed for the world-famous pashmina wool type, which was once solely found in Ladakh.

The document has made an attempt to analyse region's unique characteristics across the sectors, Agriculture and Allied, Travel and Tourism, Power and Energy and lastly, Handloom. As for any sector to give positive results, collaboration among key stakeholders, including Government and private sector players, is of critical importance, an attempt has been made to highlight key interventions required from both parties. No discussion about the region is complete without discussing the impact of interventions on climate, therefore, the role which proposed interventions can play in mitigating the impact of climate change in the region has also been highlighted.

Since the days of caravan commerce along the Silk Route, Ladakh has had a history of business acumen and capabilities. A large number of young people are involved in a variety of commercial activities. However, via company growth, Ladakh is yet to achieve a breakthrough in terms of creating jobs for its comparatively better educated young.

It's time the region realises its true economic and socio-cultural potential.

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- 1 Ladakh Autonomous Hill Development Council, Leh. (n.d.). About.
- 2 India Brand Equity Foundation. (2021). Ladakh Presentation and Economy Growth Report.
- 3 Directorate of Tourism. (2012). Incentive Rules for Tourism Industry in UT-Ladakh. *The Union Territory of Ladakh*.
- 4 Welcome to Ladakh. (n.d.). Ladakh.
- 5 The Intergovernmental Panel on Climate Change. (n.d.). AR6 Climate Change 2021: The Physical Science Basis
- 6 Goswami, S. (2018). Problem in paradise: Water crisis deepens in Ladakh amid surge in tourists. *Down To Earth*.
- 7 Peri, D. (2015). Climate change is changing landscape of Ladakh. *The Hindu*.
- 8 Sharma, A. (2018). Climate change poses danger to Ladakh. *Tribune India*
- 9 Bhatia, V. (2020). Ladakh's long, hot summer. *Indian Express*.
- 10 Karthikeyan, H. (2018). Ladakh's soaring popularity as a tourist paradise has left the arid region water-starved. *Scroll India*.
- 11 Ladakh Autonomous Hill Development Council, Leh. (2019). Mission Organic Development.
- 12 Ladakh Autonomous Hill Development Council, Leh. (2019). Mission Organic Development.
- 13 T. Stobdan and T. Phunchok (2017), Value Chain Analysis of Seabuckthorn (*Hippophae rhamnoides* L.) in Leh Ladakh.
- 14 News On Air. (2021). 101 types of vegetables grown in one farming season in Ladakh.
- 15 Ladakh Autonomous Hill Development Council, Leh. (2019). Mission Organic Development.
- 16 Defence Institute of High Altitude Research. (2011). Vegetables Scenario in Cold Desert Ladakh.
- 17 Business Standard. (2014). Modern farming techniques changing lives in Ladakh (Agriculture Feature).
- 18 Press Trust of India. (2019). Tourism in Leh facing tough time; hotels' occupancy 50 pc down. *Business Standard*.
- 19 Dundoo, S. D. (2019). All you need to know about astro tourism. *The Hindu*.
- 20 Singh, S. & Turan, M.S. (n.d.). Indian Tourism In The Paradigm Of Incredible India Campaign. *Journal of Hospitality Application & Research, BIT Mesra, Ranchi*.
- 21 Gupta, U. (2020). Ladakh could generate 60 GW from solar plants. *PV Magazine [Website]*.
- 22 Gupta, U. (2020). Ladakh could generate 60 GW from solar plants. *PV Magazine [Website]*.
- 23 Reve. (2019). Ladakh has wind energy potential of 100,000 MW.
- 24 Sinha, S. (2020). Why India is the new hotspot for renewable energy investors. *World Economic Forum*.
- 25 Client Earth. (2020). Fossil fuels and climate change: the facts.
- 26 United States Environmental Protection Agency. (n.d.). Sources of Greenhouse Gas Emissions.
- 27 Singh, P. (2021). Ladakhis want to reclaim pashmina. But can they? *Mint*.
- 28 Singh, P. (2021). Ladakhis want to reclaim pashmina. But can they? *Mint*.

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