

## Leh - An Endangered City ?

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**ABSTRACT** The solution to environmental problems in the broad sense is very complex because choices have to be made between the consequence in the short and in the long run between the protection of the ecosystems and standard of living of the inhabitants, as well as the economic growth and equity. The concept of ecological footprints offers an explanatory bridge between consumption patterns and population resource development-environment relations, which lie at the heart of economic, social and environmental futures.

In 1950, 30 per cent of the world's population lived in cities and towns. The proportion rose to 45 per cent in 1955 and by the year 2000 almost half of the world's population will live in urban areas. The changes in urban population—a result of internal demographic increase but also of exodus from rural areas have multiple implications and dimensions. Cities are focal points of innovation, progress and social transformation. If properly planned and managed, they hold promise for human development and more restrained use of the world's natural resources through their ability to support large numbers of people, while limiting their direct impact on the environment.

All urban areas draw on natural resources produced or supplied from land outside their build-up areas, in terms of agricultural crops, timber products, water, fuel and other resources. The disadvantage with cities is that if they grow too much, they can exhaust natural resources from large areas. Cities are synonymous with social and environmental problems that require intensive management in order to maintain the quality of life and minimize environmental deterioration. As human populations continue to grow and demand more resources, allowing them to spread uniformly throughout the landscape will become impossible, because supporting large diffused population is difficult and may lead to insidious environmental deterioration. Canadian economist William Rees (1992) has used the term 'ecological foot print' to refer to the amount of

productive land need to supply a given community or city with its requirements and to assimilate the waste products generated by the community's consumption patterns. Therefore, at least three factors impose limits on the size of the cities; the ability to maintain a healthy internal environment, the tolerance of human component; the ability of regional or national economics to supply the city's needs from the outside.

In the mountain areas, rapid increase in population with its unending needs, man presses upon limited available resources, and makes inroads into the mountains. Extension of plantation, agriculture development, building up hydro-electric power stations, building new roads and bridges, construction of housing complexes are taking place at the cost of depleted environment which is further despoliated.

The growth of a city is basically permanent. It is a growth machine (Molotch, 1975) and lack of growth points to deterioration. It can be said that in principle, the negative effect of growth of environment cannot be completely reversed. However, to contain damaging effects, it is better to concentrate population in limited areas rather than to spread it into large areas.

Barbara Ward (1976), a pioneer in the field of urban sustainable development, espoused the concepts of 'inner limit' and 'outer limit' of the urban environment. The social values such as responsibility, security and participation, the free exchange of thought and experience, and a degree of human respect that is independent of monetary rewards or bureaucratic hierarchies pivoted by minimal physical requirements with regard to food, shelter, energy and employment, constitute the inner limit which can be violated at the risk of the social conflict, disorder and even social breakdown. The 'outer limit' is related to carrying capacity of the ecological system "the life support systems of the planet's biosphere" (Ward, 1976 : 6). When its outer limit is violated, the human existence, itself is danger. The

environmental question in relations to rapidly growing urban population utilizing the limited resources envelops multi-faceted issues like socio-cultural identity, economic welfare and ecological sustainability. It can be divided into two fundamental and often contradictory issues of community versus poverty and economic growth versus ecological damage and sustainability.

This paper discusses Leh, the capital of Ladakh a small town slowly graduating into city. Leh is a quaint mix of village, town and city - with few modern amenities that are its lot as Ladakh's capital, and yet the space, peace and a view that only the remote countryside would enjoy. A unique relaxed pace typifies life. It is not a city in typical sense, but the area here has definitely a inner limit and outer limit because of unelastic nature of environment and unique traditional culture. It is a most remote region of India, a barren rain less area, which lies north of Himalayas. Ladakh is an isolated high-altitude desert that has a climate characterised by extremely low precipitation, intense prolonged sunshine and cold winters. Ladakh's steep mountainous terrain makes ground transportation difficult. The roads connecting the region to the rest of India are closed because of snow for six to eight months each year. The inhabitants of Ladakh live primarily in small villages scattered over a vast region. The region is extremely poor in conventional energy sources (fossil fuels and wood) and has almost no industrially exploitable resources.

Over the centuries, the Ladakhis have adapted well to these conditions, and have developed a rich culture and a traditional economy in harmony with the environment, which provides an ample material existence.

#### **SELF-SUFFICIENCY: CLOSE ECONOMIC SYSTEM (PRE 1960)**

After the Independence in 1947, the area was closed to outsiders because of political turbulence. The original land use of Ladakh region was determined by the need of self-sufficiency. A system of land use was developed which was characterized by scattered farms resulting in agro-pastoral economy. Deficient in agro-pastoral economy was supplemented by trade, as the region was at the cross-roads of different trade routes.

#### ***Transition From the Close to Open System***

Ladakh was virtually closed to the outside world from the end of World War II up to 1974, when it was opened to foreign tourists. The area is connected by land and air. Till 1979, there was no regular civilian flight into Ladakh, though defence flights were regular. Even today, the main high way is open for six months because of harsh weather conditions.

Ladakh is in a period of rapid change. During the last twenty years, increased contact with the outside world has brought an unprecedented influx of wealth and rising expectations. The present economic boom has been brought by tourism and a large amount of subsidies-being released by central government - currently much higher than the national average. The unprecedented expansion of the activities of Government, which has become a giver instead of taker has made substantial difference. Today, no revenue is taken and every village has a ration shop selling food grains and kerosene at subsidized rates. Development programmes, apart from their direct and ostensible effect involve a large number of administrators at all levels from gazetted officers to chaprasis, motor mechanics, shopkeepers and traders. Together with the growing literacy rates, this has brought enormous change in the valley.

The other factor for economic boom is tourism. The district has good tourism potential and receives an average annual traffic of 12,000 foreign tourists and 5,000 home tourists by surface and air transport. The traffic essentially comprises of three types of tourism depending upon number of nights tourists spend in the district, (i) stop over tourism, (ii) adventure tourism (mountaineering, trekking, rafting etc; and (iii) cultural tourism. Most tourists make Leh city their base and their number has increased from 527 in 1979 to 16573 in 1996. The opportunity to earn wages in Leh has attracted many Ladakhis, increasing population of Leh from 2895 in 1901 to 8718 in 1981. The occupation structure has also changed with farmers decreasing from 26 per cent in 1971 to 16 per cent in 1981, and tertiary workers increasing from 61 per cent in 1971 to 74 per cent in 1981. Its recent census figures are not available we rely upon the 1981 data. The 48 per cent of the population is under 20 years of age. The increased



population and its related activities are making Leh an endangered city.

Direct impacts of human activities on the physical environment are the most immediate and conspicuous: land eroded, streams polluted, plants damaged, areas become littered, noise level increase and trails become wider and deeper, especially when used by houses. Indirect inputs arise with the construction or expansion of tourist-oriented facilities such as - hotels, boarding houses and lodgings. Infrastructure is built to support these, and areas are made more accessible by constructing roads and trails.

Tourism also results in positive as well as negative social and economic consequences. Increased sales, increased employment appeal to local people initially, but as tourism expands, pressure on local facilities such as health care, sewage treatment and other amenities increases. Land prices, along with those of goods and services, often rise to the point where the local inhabitants are priced out of the market. As growth continues, residents soon find out that the peace and tranquility of the rural areas is being transformed into a more urban life-style. If the already fragile eco-systems are exposed to cataclysmic demographic pressures and entry of tourists, and if the revolution in rising expectations leads to a sequential over exploitation of limited resources, the outcome is well imagined. The area will become grotesquely endangered and this is what is happening in Leh.

### LEH

The Leh town, capital of Ladakh lies on an alluvial fan on the northern side of the Indus river. It is a town in desert, which itself bears the signs of the past and the scars of the present. The desert, however, is not a plain but a sloping valley surrounded by barren mountains, with oasis like cultivation stretches, where irrigation can be carried from the stream upon which the life of Leh depends. The settlement was apparently established by king Sengye Namgyal in the early 16th century. A small spring flows from the western side of the projection on which the first castle was built and provided water for the first settlement of the small town, placed round the watershed of Chubi (Snellgrove and Skorupski). The valley below it came to be known as Leh, meaning mud

or cultivable soil and this term gave the name of the place which gradually grew up around the castle constructed by king Sengye Namgyal. Towards the east the city faces an arid waterless desert but on west side water from above Chubi allows extensive cultivation with many terraces, field works and a complex irrigation system regulated from the Gompa village at the head of the valley. This alluvium does not extend as far as the river Indus for the stream fade out in desert short of the Spituk monastery on a rock above the river. This was built by king Lde under the influence of Tsongkapo, which was one of the reformed monasteries.

Leh is a town of flat-topped, terraced houses built of sun-dried bricks. There is one broad street with a line of poplars and quaint two-storied houses. The main street is entered at the south-end by a large gateway. At the other end is a steep slope of a rocky ridge with terraced houses and a very large chorten with white paint and red spire. Traditional architecture, perhaps more than any other form, exemplifies the cultural values of a community in material form and has historically been an important channel of expression for a community's creative energy. Leh's architecture — an architecture without architects — encompasses the wealth in distinctive dwelling types, which reflect locally inspired solutions to bioclimatic settings. In dry sandy Ladakh, sun dried brick houses were built tightly bound together by narrow streets to deter invasions, avoid problem of dust, provide shade from sun and allow forage and dung to be dried on the flat roofs of the closely set houses.

Leh has some historical buildings, the ruins of which are still scattered around. The first royal castle built by Tashi Namgyal about 1500-1530 on the top of the Namgyaltsemo hill and below it the hamlet of Chubi. The greater part of this palace is now in ruins, but some of its ancient walls were used when the present monastery on the top of that hill was built. The best known of Leh's buildings is the Leh castle, above the city, a huge building of nine stories which was completed in about three years by Sengye namgyal about 1590-1620. On the top of the hill behind the palace, there is a red monastery, and a wood and clay statue of Maitreya in a sitting posture, 25 feet high, the head of which projects above the floor of the second storey. The ruins of little monastery

on the crog resembling an elephant can be seen in lower part of Leh. One mile above Leh, is the largest chorten in the Leh (Francke, 1907).

There is one mosque which is found at the upper end of bazaar in Leh. As the palace is high up on the right side, the mosque is the central building at the end of the main bazaar road. This mosque was built in 1594 by Singye Namgyal, a tribute to his Muslim mother. The Leh-mosque is an exquisite work of Turko-Iranian architecture. The twisting streets of old Leh town lie behind the mosque in the market place extend around the southern and western faces of the hill below the castle.

Leh palace can be seen from every angle and in any light. It is no longer inhabited. The queen and her family now lives in a smaller palace at Stok, ten miles away. The Leh-palace is empty and crumbling. One can see and hear water everywhere in Leh. The water is regulated from the Gumpa village (Fig. 1) at the head of the valley into rugged stone channels that lead it through the town into the fields below.

Leh is no longer the exotic market with Chinese, Yarkandi, Tibetan and Russian traders that De-Vigne described (De-Vigne, 1880). There is only one main street with an post office, library, cultural academy, and two rows of overexpensive and understocked shops. Streets and houses are haphazard. There is a market of fruits and vegetables in the evening along the main street, and another market all day in the side street, where bells, thankas turquoises are sold, along with other things.

Leh has for ages been a meeting place of the caravans from Yarkand, Tibet, Kashmir and Kulu. Perhaps in the modern context, the phenomenon has been extended to a meeting of cultures from west and the east. It remains to be seen how the Ladakhis absorb the recent exposure. For centuries Leh has been a resting place for the travellers of different nationalities who stayed here for few days before continuing the mountains along the ancient trade routes that radiated from the town. Today, Leh is popular with different kind of visitors. Travellers and trekkers to Ladakh come to Leh first as it makes an ideal base for treks in the region. Before embarking on a trek, people stay here to get accalimatise to rarefied air and to explore the countryside with famous monasteries and different way of life. Scattered along the

Indus valley, both east and west of Leh, are other fascinating villages, monasteries and palaces.

At present Leh town is a Notified Area Committee spread into approximately 9.45 km. For administrative purposes, the Leh town is divided into nine *Mohalla* or wards (Fig. 1). On the outskirts of the area on south-western side are General Hospital area and Military areas. Leh town is inhabited by 8,718 persons (5932 males and 3686 females) living in 1785 residential households (Census of India, 1981 Handbook). The density per square kilometre is 953.

In all Ladakhi villages, the irrigation systems are fine-tuned mechanisms for distributing water equitably and efficiently and Leh is no exception. Each and every village have its own rotational scheme depending on village topography, agricultural land and its relative exposure to sun, average temperature, size of the snowfields or glaciers from which villages draw their water, soil type and seepage in the irrigation channels. Most villages obtain their irrigation water from tributary streams that flow down from the glaciers high above. These water works are managed at the village level.

Leh town with a population of nearly 11,000 as estimated in the 1991 census and over 5000 hectares of area to be irrigated has a complex water distribution system. Most of the fields of the area obtain water from three major water sheds (*drogpo*): Drugchu, Sheldon and Shenam. These three watersheds supply areas above and below these. The lower parts of watershed are given water from 10 a.m. to 4 p.m. and from 10 p.m. and in the intervening time, the water is routed to areas above Samkar Gangpa, Yurthang and Ganglas, which have their own distribution system.

Irrigation of the fields starts in March (*thachu*) even before the ploughing and is continued till Mid-May. Each watershed consecutively receives water for a period of 20 to 29 days and nights. Exact number of days depends on the time taken by all the fields along the watershed. After the initial watering the watersheds received water in turn i.e. if one watershed gets water during the day time, the second will receive during night. Similarly if second receives water during the day time, the third will get during the night and if third will get water during day time the



# LEH NOTIFIED AREA COMMITTEE

(approximately 4 miles radius)

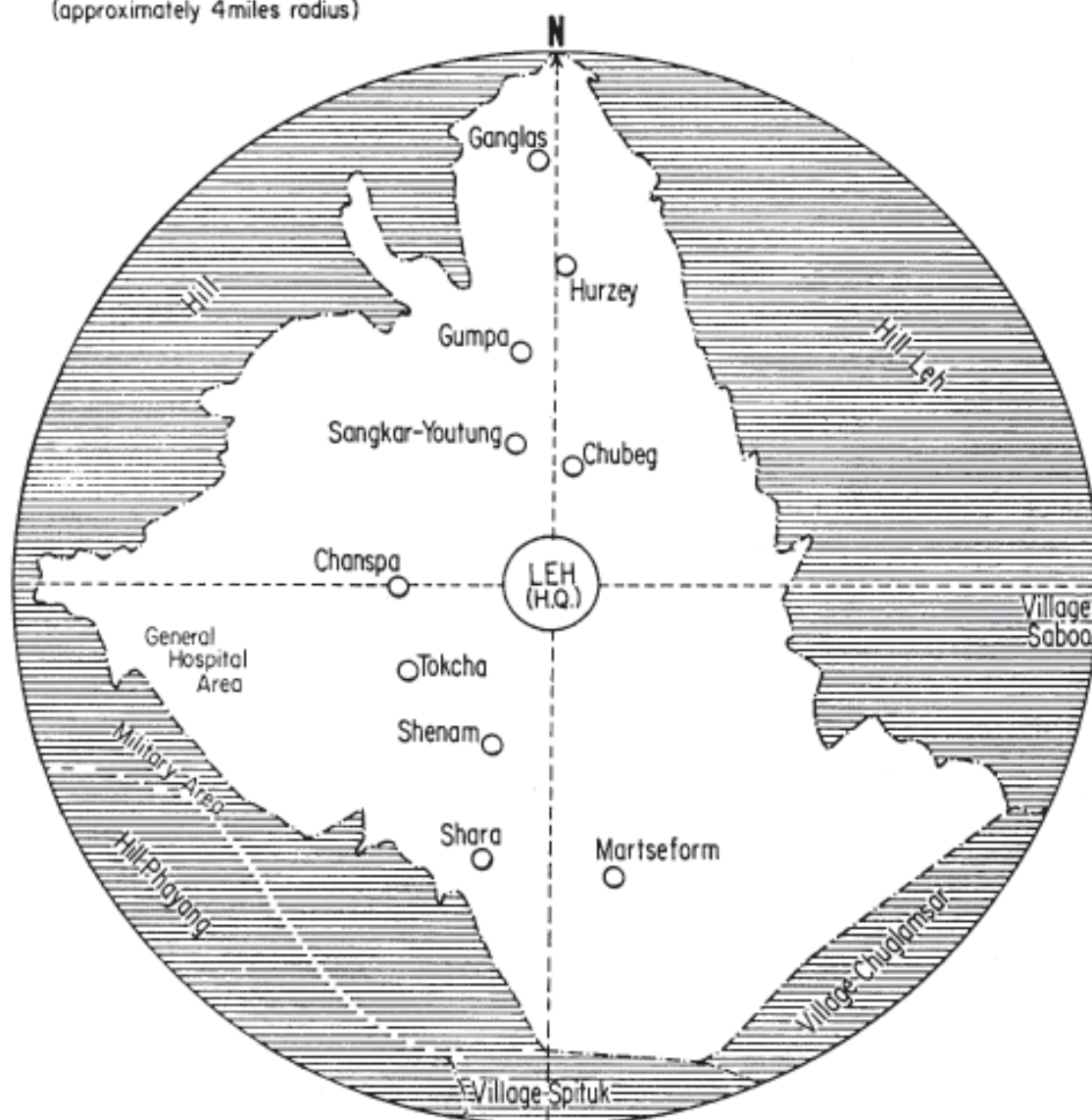


Fig. 1. Nine Mohalla or wards of Leh town

number one will get in the night. This goes on for the whole summer season. The field lying along the watersheds receive water at night which is diverted to storage tanks (*Zing*) which is let out the following day to make watering convenient. In the month of May-June when the flow of water is heavier, it usually take 10-12 days to irrigate all the fields along a watershed. The upper areas of watersheds receive a stronger flow of water because of natural topography, fields in upper areas receives more water than fields in the lower areas. Skalzahling and Skare region of Leh receives less water and remain drier. In times of abnormal weather conditions, special measures are taken by *Churpon* and modifications made accordingly in the distribution of water.

In Leh town, this complex water system is managed by ten *Churpons* which are selected on the rotational bases from the following wards or *Mohallas* of Leh - four from *Skyaagos*; four from *Gogsum* one each from *Chanspa* and *Compa*. *Samkas* and *Yur thung* have their own *Churpons* as they are on a separate distribution system. The duty of *Churpon* is rotated between all the *Khangpa* (main houses) in a given sub-section. In Leh *Churpon* are paid Rs. 1000 per summer by the Government since 1982. Previously the payment was in kind i.e. one *khal* of grain per family. During summer the *Churpon* are required to go to the head of the Leh valley, eight *Churpon* go to the *Tazes*, the principal junction where the *Drugchu* and *Sheldan* watersteds split off from one another and two men go to *Gangles* to check that by 10 a.m. all of the channels are closed off. This is the time of filling up of water sheds. As there are more than 100 channels along any given watersheds, each *Churpon* is assigned to check the distribution of water along certain number of channels. At night one or two *churpon* are stationed by the storage tanks along the watersheds which are receiving water (*tsan chu* or night water) to be distributed in the morning to the appropriate fields.

It is the duty of *Churpons* to check that the fields along the watershed receive an equitable share of water. This inspection of the fields by the *churpons* after the watering is a routine matter to ensure that people are not diverting the water to their willow groves. Because of developmental schemes and associated population increase, wood is needed for construction purposes. The people who grow willows need more water than they are entitled to. The *churpons* are responsible for stopping the abuse of water and reporting to the *Goba* of Leh if any such incident happen. Disputes, cheating and bribery have become common due to the changes in the Leh economy and demography.

The primary source of power supply to Leh town and its immediate suburbs is the 4 MS Stakna Hydel Power House, which utilises water from the Indus river and was commissioned in the year 1987. However icing problems prevent its functioning in mid-winter. It was observed in the Stakna Hydel Project, the hydel project with a gravity canal system can be run only for a period of 9 to 10 months i.e. from March to December. The problems faced due to ice formation at the intake structures and power house are manageable with some difficulties, but the problem faced in the canal system is totally unmanageable. Some villages in Leh have small Diesel Generating sets for evening hours only.

Before 1947, Ladakh was a important market for central Asian trade in wool. During summer caravanas of central Asian traders used to come to Leh and exchange their goods with Kashmiri, Indians Lahull and Punjabi traders. Today this place has grown into township. Table 1 shows the growth of Leh from 1911 onwards. The population increase is accelerated both by the push of rural poverty and pull of expanding service sector.

The central Asian trade was disrupted because of the political events. The closure of border between India and China resulted in the eventual cessation of the trade between Ladakh and

Table 1: Population and growth rate of Leh

| Population and Growth Rate |          |          |         |         |         |          |          |
|----------------------------|----------|----------|---------|---------|---------|----------|----------|
| 1911                       | 1921     | 1931     | 1941    | 1951    | 1961    | 1971     | 1981     |
| 2895                       | 2401     | 3093     | 3372    | 3546    | 3720    | 5519     | 8718     |
|                            | (-17.06) | (+28.82) | (+9.02) | (+5.16) | (+4.91) | (+48.36) | (+57.96) |

Source: Census of India, 1981



Western Tibet. This total rupture of the close trading and religious connections which have existed between Ladakh and Tibet over the last thousand years, have resulted in the most unhappy consequences. The general effects of closure of border and Indo-Tibetan trade created shortfalls in Ladakhi economy. Because of ecological conditions and limited resources, the Ladakhi prosperity in the past depended on this trade. As Ladakh plays an essential part in India's defensive position, Indian army numbering more than 40,000 as compared to the Indigenous population of about 110,000 are permanently stationed in Ladakh. At present Leh town supports a large number of military personnel. Many Ladakhis, those who live within easy reach of Indian administrative centres whether military or civilian have profited materially from the present situation. Both military and civilian administrative services offer wide range of opportunities for employment.

Since last two decades tourism has very much developed in Ladakh. From a tourist point of view Ladakh offers both natural and cultural attractions. The annual influx of several thousand tourists into Ladakh, where famous Buddhists monasteries (Gompas) exists and culture persists,

has created various demands on the limited natural resources of the area. It has resulted in the substantial tourist related construction in the district capital Leh. Between 1975 and the 1990s, the annual number of tourists visiting Ladakh rose from a few hundred to several thousand (Table 2).

For centuries Ladakh has enjoyed a stable economy based on self-reliance. But over the last 50 years, the region has shifted away from this sustainable economy towards one based on dependence on outside forces and is slowly being drawn into much wider economic sphere. Government development programmes, subsidise along with build up of large population of Indian army and the influx of the foreign tourists, have all contributed to encouraging a money economy.

Ladakh has traditionally been an agricultural subsistence economy based on growing barley, wheat and peas and the domestication of Yaks, *dzos* (yak-cow cross breeds), cows, sheep and goats. Ladakhis have evolved a highly productive subsistence system that provided the population with most of their needs for centuries in spite of the harsh ecological conditions. The success of this system is due to the refinement of techniques to suit the environment and a social structure that supports agriculture.

For irrigation, glacial melt water from mountain stream is diverted along sophisticated irrigation channels to the fields. An extensive system of sharing resources throughout the village, called *langde*, evolved so that the labour intensive activities such as sowing and harvesting, can be completed without having to hire labourers. Another system called *rares*, is prevalent, under which each family has to take it in turn all the animals of the village for herding for a day. Living in a place where resources are severely limited, Ladakhis adopted customs which kept the population stable and prevented the fragmentation of family land. The law of primogeniture, whereby all the land was inherited by the eldest son and could never be split or sold and the practice of poyandrous marriages (whereby brothers share a common wife) prevented the fragmentation of land. Naturally, the law of primogeniture, left the remaining sons without an inheritance. It was therefore the custom that at least one son would become a monk, while the others were free to seek

Table 2: Tourist arrival in Ladakh from 1974 to 1996

| Year  | Foreigner | Home | Total |
|-------|-----------|------|-------|
| 1974  | 500       | 27   | 527   |
| 1975  | 650       | 128  | 778   |
| 1976  | 1708      | 253  | 2051  |
| 1977  | 7127      | 266  | 7392  |
| 1978  | 8748      | 873  | 9621  |
| 1979  | 9213      | 621  | 9834  |
| 1980  | 13104     | 1013 | 14117 |
| 1981  | 14000     |      | 14000 |
| 1982  | 12768     |      | 12768 |
| 1983  | 12833     |      | 12833 |
| 1984  | 11785     |      | 11785 |
| 1985  | 12245     | 6666 | 18911 |
| 1986  | 12828     | 3683 | 16511 |
| 1987  | 13688     | 4114 | 17802 |
| 1988  | 16256     | 8508 | 24854 |
| 1989  | 16079     | 6669 | 22748 |
| 1990* | 6342      | 396  | 6738  |
| 1991* | 8014      | 1041 | 9055  |
| 1992  | 13508     | 2438 | 16018 |
| 1993  | 12401     | 2000 | 14401 |
| 1994  | 15369     | 2080 | 17449 |
| 1995  | 12391     | 5594 | 17985 |
| 1996  | 13036     | 3537 | 16573 |

\* Problem in Kashmir. Communal tension in Leh finished by 1994.

fortunes in any way without the sport of the family, or alternatively, to enter into a polyandrous marriage with their elder brother's wife. In this way a family could live off the same land for centuries without increasing the size of population. A polyandrous family is unlikely to produce any more offsprings than one husband and wife.

Although these customs of primogeniture and polyandry are still occasionally practised in interiors of Ladakh, it has been to a much lesser degree since they were abolished in the early 1940's. Now the population is increasing and the village land can no longer support the population. Unfortunately, growth of population has not been matched by an increase in irrigation facilities and food production. During 1985 and 1986, about 6 thousand metric tonnes of food grains (wheat and rice) were brought into Leh district alone, against the production of about 7 hundred metric tonnes of cereals in the district. This shows that during the last thirty years or so, Ladakh's dependency has increased from zero to about 50 per cent. This was partly due to changes in the food habits of the Ladakhi people, who are gradually switching from barley to wheat and rice.

Winter temperatures in Ladakh are minimum of about  $-40^{\circ}\text{C}$ , due to the high altitude as most villages are between 3,000 and 4,000 m. Additional heating is required in houses, primarily in the evening and early morning. The kitchen stove, fueled with dung or brushwood, was traditionally the primary source of heat. People tended to sit around the stove or around pans of glowing coals. Increase in population in Leh has created a need for a huge quantities of hard coke. This practice of improved heating is especially prevalent in the government and commercial sectors, though in the private sector it is now becoming increasingly common. The amount of wood imported and distributed by the government in 1986 was 60 per cent greater than in 1984, rising from 3,650 quintals to over 6,000 quintals.

Ecology of Ladakh and its unique culture has been attracting visitors since long. Despite the harsh climatic conditions, Ladakhis have managed to create a prosperous and harmonious way of life that reflects the Buddhist principle of interdependence of all things. Stability and fairness inherent in family and community relations is demonstrated in all aspects of life.

However, the last fifty years of being incorporated into Indian Union, and in particular the last twenty-two years of having foreign tourists, has had more effects on Ladakh's culture, environment and economy than several centuries of foreign merchants and traders. The changes can be seen in and around Leh, which have resulted in steady erosion of the traditional values in favour of western style materialism and rise of environmental problems. Short-sighted government sponsored development programmes promoted western method of economic and technological growth. This was reinforced by mass-communication portraying a biased picture of the west with all its glamour and wealth. Whatever was shown on television, cinema and advertisements had nothing even approximate to the Ladakhi style, making them seem absurd. On top of it, the lifting of ban on foreign tourists and their arrival in Ladakh propagated the myth that west is best. It is not surprising that young generation with impressionable ages are influenced by this alluring new culture.

It is a known fact that no society is static. Changes have permeated into Ladakhi society also. No matter how attractive a traditional society like Ladakh may seem, it is wrong to stop the winds of change and damaging to make the region some kind of museum. The Ladakhis now have a choice over how their regional development should be. By taking some simple and practical steps, the development can be managed so as to make it beneficial to Ladakh's culture, environment and economy.

So far no environmental impact assessment programmes have been made. This should include economic impacts, social impacts, landscape, material and cultural assets, climate, soil and geology, water and finally interaction between impacts.

Traditionally Ladakh's geographical position at the cross-roads of some of the most important trade routes in Asia was exploited to the full. Fortunes can be made more easily at cross roads than at destination. Ladakh's kings happily collected tax on the goods that crossed their kingdom from Turkistan, Tibet, the Punjab, Kashmir and Baltistan, while a minority of Ladakhi people were profitably employed as merchants and caravan traders. After the Indo-China war and closure of border, this trade has completely dried



up. Business is now reliant on the more fickle market of the Indian army and summer tourists.

### *Tourism*

Since 1974, when Ladakh was opened to tourists, the industry has expanded rapidly. It receives 6,000 tourists a year on average. Although in Ladakh as a whole tourism only employs 4 per cent of the workers, in Leh it employs 15 per cent. It also accounts for almost 50 per cent of the region's GNP.

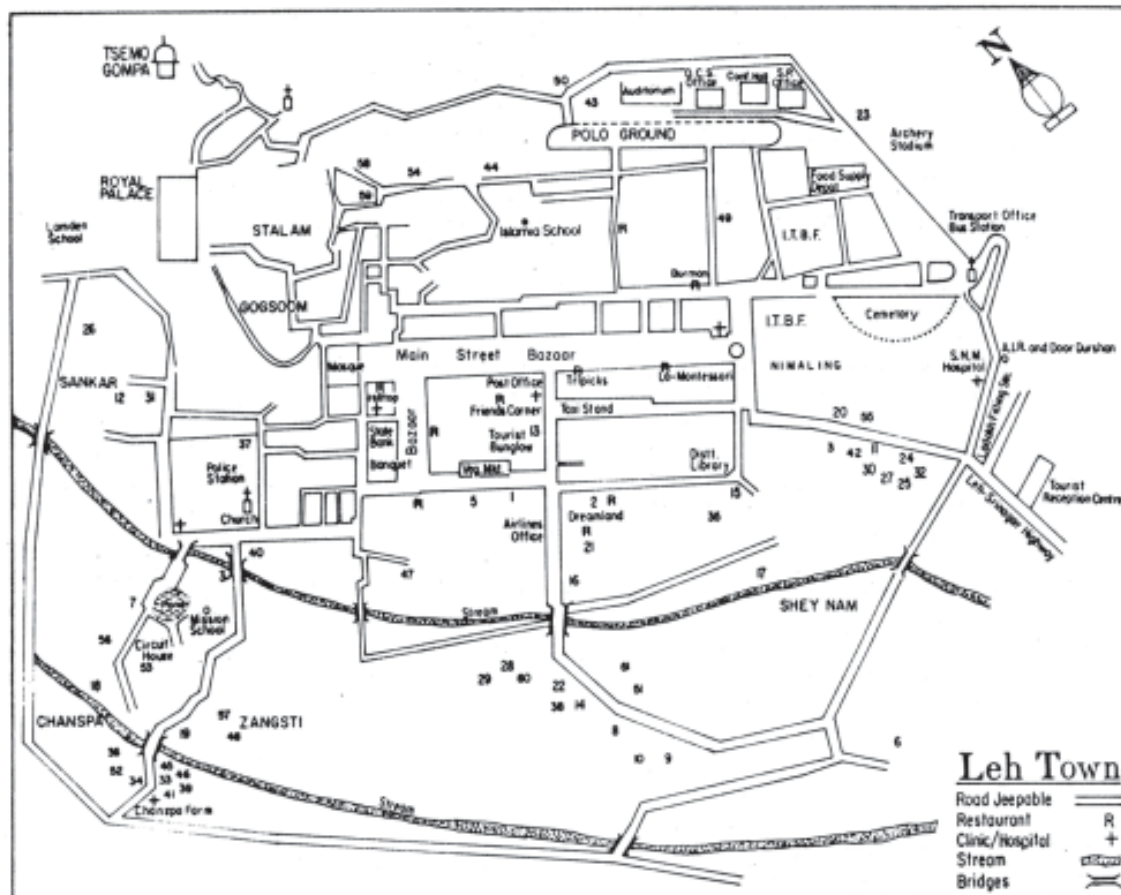
As in many other countries, tourism has only been considered as an answer to economic problems without evaluating its impact on the physical, social and cultural environment and carrying capacity of the area, (Boselli, 1993). There are many reasons for favouring tourism as the initial costs are relatively low compared to other industrial activities. Gestation period of tourism industry is short and the returns arrive earlier than other industrial projects. Tourism is still considered to be a pollution free industry despite the environmental degradation. The 'unidirectional' approach has been gradually changing as the negative aspects of tourism are becoming apparent (Kripendorf, 1989; Mason, 1992; Singh et. al., 1993).

In 1938, at the time of Prince Peter's study, Leh was inhabited by few aristocratic land-owners remaining from the days of Ladakh's independence prior to the Dogra conquest, few merchants mostly engaged in the sale of local goods in the market place, a small but flourishing Muslim community mostly engaged in distant caravan trade, supporting services and labouring community, monks from local Gompas near the town and farmers coming and going with their wares and implements. People lived in compact settlements near irrigated terraces created and maintained by tremendous effort. Settlements and buildings were in ecological balance with their environment. Until recently, through social system of communal obligations, houses and buildings were constructed by often virtually free of cost, out of practically free materials. Such a system resulted in the majority of families having spacious homes carefully built and nicely decorated. There was no hotel or inn, industry of any kind, and the ambience of the place was pastoral, uncluttered by machines. Many residents farmed successfully and prospered.

In the past, the settlement pattern was controlled by natural laws. Houses were often grouped together for protection to get maximum benefit of sun and wind; and placed in accordance with water supply as water is precious in this desert. In Ladakh, the houses were built on a piece of unfertile land which could not be irrigated and hence unfit for agriculture, but in the vicinity of fields. The proximity of the fields to settlements has certain advantages, when the crop is ripening, it must be guarded day and night to protect it from birds and animals. To do this adequately the fields should be within seeing and calling distance of the settlement. Secondly, productivity of the land correlates directly with the distance of the field from the owner's house, because land closest to the house recover more manure than distant land does. As Ladakh is devoid of much vegetation, the animal dung is used as cooking fuel and for heating the house. Human night soil is used as fertilizer. Ladakh's traditional composting toilets are ideally suited to the environment. No water is used or wasted, because of dry climate there is negligible smell. The end product is one of the best fertilizers. The Ladakhi toilet (*Chaksa*) is usually situated upstairs.

In 1938, the area was administered by a small Kashmir government, British representative and a missionary hospital. By 1981, following the wars of Independent India with both Pakistan and China, the Leh town has become the centre of military activities, airport and other elaborate infrastructure of communication, educational, medical, public security and administrative services and proliferatory expansion of mini-hotels and shopping centres for a massive influx of tourists every summer.

The centre of tourism is the town of Leh with a stable population of 8718 (1981 census). Over 72 boarding houses and hotels have been built in this area in less than three decades (Fig. 2 shows list of Hostels and Guest Houses). These accommodations are totally booked during the summer season. The multiple employment opportunities in the tourism industry have made Leh a target of internal migration from other parts of Ladakh, so that housing is insufficient for this population. Construction and services of tourism create two labour markets which differ fundamentally in qualification and attractiveness (e.g. year-round

**A CLASS HOTELS**

|                      |    |
|----------------------|----|
| Galdan Continental   | 1  |
| Indus (Choglamsar)   | 17 |
| Kangri               | 2  |
| Kanglachen           | 3  |
| KeSar                | 10 |
| Lharimo              | 4  |
| Ladakh Sarai (Stock) | 18 |
| Lingzi               | 5  |
| Shambala             | 6  |
| Pachola              | 7  |
| Singay Palace        | 8  |

**B CLASS HOTELS**

|             |    |
|-------------|----|
| Bijoo       | 15 |
| Dragon      | 11 |
| Himalaya    | 12 |
| Ilex        | 13 |
| Lungre-Jung | 14 |
| Yak-Tail    | 16 |
| Mandala     | 19 |
| Omasla      | 9  |

**C CLASS HOTELS**

|          |    |
|----------|----|
| Chokor   | 17 |
| Snowview | 18 |

**D CLASS HOTELS**

|                        |    |
|------------------------|----|
| Chompa                 | 20 |
| Dream Land             | 21 |
| Delux                  | 22 |
| Firdex                 | 23 |
| Hills View             | 24 |
| Khayul                 | 25 |
| Phetsong-Ling (Phyang) | 26 |
| Tamne View             | 27 |
| Nerla                  |    |

**UPPER CLASS (GUEST HOUSES)**

|             |    |
|-------------|----|
| Bimla       | 28 |
| Indus       | 29 |
| Kangla      | 30 |
| New Antelop | 31 |
| Zar-La      | 32 |

**ECONOMY CLASS (GUEST HOUSES)**

|            |    |
|------------|----|
| Alsu       | 33 |
| Eagle      | 34 |
| Iqbal      | 35 |
| Kung Yang  | 36 |
| Khan Lodge | 37 |
| Lunga-Snow | 38 |

**Larchang**

|                   |    |
|-------------------|----|
| Larchang          | 39 |
| Mantok-Ling       | 40 |
| Mannoor           | 41 |
| Nazer View        | 42 |
| Namgial           | 43 |
| Old Ladakh        | 44 |
| Obal              | 45 |
| Oriental          | 46 |
| Paul              | 47 |
| Pyig              | 48 |
| Palace View Kidar | 49 |
| Palace View       | 50 |
| Paduma            | 51 |
| Rinchen           | 52 |
| Rainbow           | 53 |
| Shalimar          | 54 |
| Skulrang          | 55 |
| Two Star          | 56 |
| Tsawu             | 57 |
| Taj               | 58 |
| Tak               | 59 |
| Ti-Sai            | 60 |
| Yasmeep           | 61 |

Fig. 2.



positions, professional image, income) (Messerli, 1983, p. 19). The resident population prefer to work in construction, while young people from neighbouring villages prefer to work as drivers, guides or in other services. These qualitative differences between the construction and tourists service sectors, favour the expansion of the former through sustained demand. The construction for tourism (mainly hotels, guest houses and boarding houses) is problematic on the grounds of construction material and availability of land, with particularly unfavourable consequences for residents and agriculture; and it intensifies awareness of local economic (and social) disparities (Wiesmann, 1986, cf. Messerli, 1987). Ill conceived and unplanned land use in mountains takes three forms - road construction, building construction, and terracing - which together cause land instability. This instability, causes translocation of surface material and soil erosion. Agricultural fields are damaged by erosion and silting. As a result of unplanned construction, problems of sanitation and sewage disposal with negative environmental impacts have come up in Leh. The blockage of drains are causing irrigational problems resulting in decline in agricultural production and productivity.

### ENVIRONMENTAL IMPACT

#### Litter

Litter is a recent phenomenon in Ladakh. The non-biodegradable material from outside the world has created the concept of litter. Before, everything was made from biodegradable materials or continuously recycled thus producing no waste. However, today it is a serious problem both in Leh and on major trekking routes. The tourists leave lavatory paper, tampons, sanitary towels, empty mineral water bottles, used batteries and polythene bags. Leh has no infrastructure to cope with litter. Few litter-bins are situated around the town, but there are few appropriate places for the collected litter to be taken after that. Because of inadequate facilities, the litter heaps are soon scattered far and wide by scavenging dogs and the wind.

#### Sanitation

As mentioned before, all Ladakhi houses

had a traditional toilet (*Chaksa*), in which no water was used or wasted. These toilets were valuable source of manure for enriching the soil. This saved animal manure which when dry, could be used more efficiently for fuel, essential in a region with hardly any wood.

At present the town of Leh, is being overwhelmed by modern toilet systems. These are having disastrous effects on the local environment. First, they are using up extremely valuable fresh water supplies. Second, Leh has no sewage system to deal with the waste that is produced. Instead the poorly maintained septic tanks contaminate the ground water supplies and streams. Even if sewage treatment works should be built and there was enough water, polluting chemicals would have to be introduced into the systems and the toilets would still be useless in winter when they freeze over.

Public toilets are virtually absent in Leh. Sanitation is made worse by the great number of people who use the few toilets that there are. There are an increasing number of shops and offices with only a singly traditional toilet or none at all. And if there is one, there is an irregular supply of soil, with the result that it is no better than an open septic tank. This helps in proliferation of diseases. The absence of public toilets make people relieve themselves either on street corners or against street wall leading to foul smell and flies.

#### Water

The water source and streams are being polluted by unhygienic habits. The pollution of drinking water is creating health problems. Not many years ago, a stream that passed through the settlement used to be as clean when it flowed out as when it flowed in. People had a sense of hygiene, borne out of religious beliefs.

Keeping footpaths clean was a matter of religious belief. Spitting or throwing garbage on the path, or washing clothes in the stream was thought to be sinful. To wash himself, a man would take water in a container and would take bath at a distance so that the dirty water did not go back in the stream. In the villages, the same trend still prevails. But in Leh town the stream water has become too polluted even for washing. Garbage and kitchen wastes are flowing and blocking the streams. (Figs. 3,4) However, the problem

of water supply has improved markedly, as a result of installation of plastic pipes that bring water from unpolluted springs. However, fast development activities along the river sides lead to imbalance of vegetational cover, thus resulting in heavy disposition of silt in water.

This dismal lack of hygiene has helped in proliferation of water borne diseases. It can be seen from the hospital records that both hepatitis and diarrhoea have been increasing every year.

### ***Fuel Use***

As the region is extremely poor in conventional energy sources (fossil fuels and wood) every year about 50 thousand cubic feet of timber and 9 thousand quintals of firewood are imported into Leh district alone to meet local demands as the area has a climate characterised by extremely low precipitation, intense and prolonged sunshine and cold winters. A spurt in construction activities in recent years has created a need for a huge quantity of hard coke (9 thousand quintals annually) to be brought from the outside. This dependence is likely to increase. Scarcity will provide an incentive for felling trees, and there is the possible danger that monetary considerations may prevail over ecological considerations, as has happened in other countries. To meet the tourist demands during summer, consumption of fuel and other energy sources goes up. Cooking and heating increase pollution in the atmosphere.

### ***Erosion and Vegetation Depletion***

Natural processes like soaring heat of summer and freezing conditions of winter all combine to give the mountains of Ladakh a high rate of denudation. Although the development activities and tourist influx may seem miniscule in comparison to these natural processes, when they are multiplied by several thousand army personnel, workers and trekkers each year they become rather more significant. Fragile high altitude ecosystem of Ladakh is being disrupted by human activities. While carrying out developmental work or travelling, people damage walls and irrigation channels, mountain pastures and rare plants. Camp fires with scarce wood resource are creating ugly scars on the ground that take years to fade away.

### ***Economic Effects***

There is no doubt that economy of Leh has benefited by developmental activities and tourism. This is particularly valuable now that the traditional trade routes, which previously provided with a stable economic base, have closed. Although tourists may spend a large amount of money, much of that goes straight into the pocket of non-Ladakhis only to be taken out of the region at the end of the tourist season. In Leh, there are two kinds of restaurants available - seasonal and regular. In Leh, permanent restaurants are run by Ladakhs and Tibetans. The seasonal restaurants are mostly run by non-Ladakhis (e.g. Punjabis, Dogras and Tibetans). At present 60 per cent restaurants are seasonal running on rent basis.

Transportation is the basic need of developmental activities and tourism. Tourists visit Ladakh by both air and roadways during summer. In winter, the communication is confined to air only because the passes are closed. Both east and west of Leh town are scattered villages, monasteries and palaces. People either trek or hire a Jonga to visit these Gompas. Number of vehicles in Leh has increased tremendously (Fig. 5) Buses connect most of the principal villages and provide a cheap means of transport. Hiring a taxi is convenient.

### ***Cultural Impact***

Today, although some progress can be seen in Ladakh, it is sad to notice the effects of tourist money on traditional culture. Success and prosperity in other fields is being achieved at the cost of cultural values. Till recent time, Buddhists and Muslims maintained cordial and friendly relations which were prevalent in Ladakh for centuries. In early 1980, the State Government mishandled several simple, localised problems, sparking off demonstration throughout Ladakh. Corruption and continued apathy and Muslim bias from the State Government throughout the decade provided the catalyst for violent riots in Leh in 1989 between Buddhists and Muslims. This resulted in the police firing on a peaceful demonstration, killing three people. It was followed by further demonstrations and Ladakh Buddhists Association (LBA) called for a social and



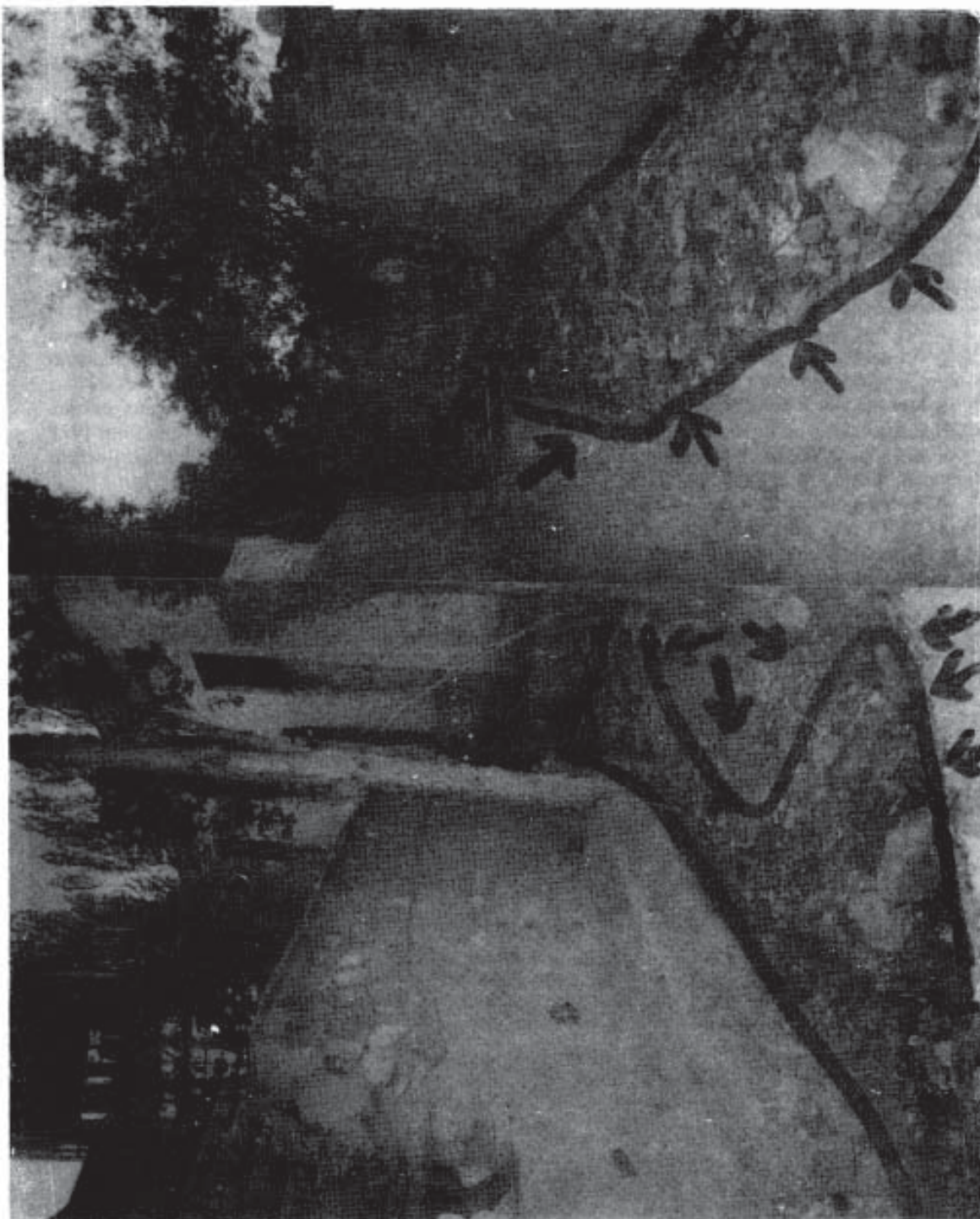


Fig. 3.4. Garbage and kitchen wastes blocking the water channels

economic boycott of Muslims. This boycott against Muslims was lifted in 1992. The inter-religious riots in Leh have exploded the myth of timeless and homogenous Ladakh.

Today, Ladakh finds itself in a precarious culture transition period, the effect of which can be seen more in Leh, as it is the centre of all activities. Some inherited values are being abandoned and modern habits adopted. Traditionally, Ladakhis were involved in agricultural activities. However, changes have been brought about in all fields of life. Other gainful employment opportunities as a possible alternative to self-sufficient family agriculture are many. In 1938, as reported by Prince Peter, all males were involved in the family agriculture on estates which were inherited by the eldest son (Primogeniture). Now-a-days, a considerable diversity of alternatives have become available and Ladakhis are taking advantage of the opportunities. During tourist season, younger generation from surrounding areas come to Leh town to work as drivers, guides, porters, cooks and horsemen for the tourists. They earn cash in this period. But this period usually coin-

cides with the agricultural season, the left out in the villages face manpower shortage. To fulfil this shortage, Nepali labourers are employed at higher wages. In the vicinity of Leh and its surrounding villages, co-operative character of the Ladakhi agriculture is vanishing. People are moving towards growing single cash-crops. Among women there is much less sign of change in traditional activities. Women have always played a major role in farming, animal husbandry and in marketing vegetables in the Leh market. As the men have changed or changing their occupation, women role in agriculture has become more important. However, in Leh number of young women are being employed as nurses, teachers, waitresses or in administrative services. The changing economic scenario has brought changes in the women's status and sex ratio. There is a decrease in sex ratio from 1971 onwards, being 1012, 926 and 733, respectively in 1971, 1981 and 1991.

Traditionally, one son or daughter from the family was offered to the *Gompa*, because of the inheritance pattern. However, as there are other means of earning money, parents prefer to teach



Fig. 5. An number of vehicles in Leh increasing



their sons and daughters, so that they can earn their living from non-traditional sources.

Because of developmental activities, there is a change in the religious beliefs and traditional ceremonies connected with agriculture. Traditional practices like *Sarak doldol*, *Lhu-star*, *Stadke-Tukchos*, *Small-Do-chos*, *Shinge Du Jak* and *Gya-she* connected with agricultural activities are losing their significance because people have started using pest control to protect the crops from birds by other means and not religious ceremonies. Government is promoting highly subsidised hybrid seeds, chemical fertilisers and pesticides. If these trends go unchecked agriculture will suffer a lot, there will be a decline in the quality of soil and water and Ladakh will become dependent on imported food.

Both, the tradition of passing on land only to the eldest son and the practice of polyandrous marriages (whereby brothers share a common wife) which prevented the fragmentation of family land are the relics of past. People are beginning to perceive farming as a lowly occupation as there are other avenues for earning livelihood. This trend can be seen in Leh town where about 110 families or 13.2 per cent population have hotels or guest house business for their subsistence and hence entirely dependent on tourism (The calculation is made on the basis of extrapolated Leh town population to 10,000 in 1992) (cf. Jina, 1994, pp. 128-138). In Leh, restaurants have remarkable market position. In 1992, about 60 per cent restaurants offered boarding facilities. However, the remaining 40 per cent were seasonal and totally dependent on tourist season. During tourist season, the restaurant owners face problem of procuring food for tourists. Costly food stuff is brought from outside. The over-demand of food item in the Leh town creates scarcity of food stuffs for local people. Government is distributing subsidised food at half its actual price to the markets of Leh for local people.

### DISCUSSION

For centuries Ladakh has enjoyed a stable economy based on self reliance. But over the last 50 years, the region has shifted from sustainable economy towards one based on dependence on outside forces, and is being drawn into much wider economic sphere. Build up of a large population of Indian army and the influx of foreign tourists,

along with the developmental policies of government (subsidised and ration shops) have all contributed to encouraging a monetary economy. A materialistic culture of notion of having a job and buying what one needs is replacing the idea of self producing and self-sufficiency.

In the fifteenth century both Leh and the village of Shey shared the responsibility of being the capitals of upper Ladakh. Leh was in a prime position of trade. The first royal residency on top of the Namgyal Peak by Toshi Namgyal in the sixteenth century and then the building of the majestic Royal Palace by Sengye Namgyal a century later made Leh the administrative and commercial capital of Ladakh. The location of the Leh at the foot of the Khardang La, the gateway of the infamous trade route to Yarkand in Turkistan turned it into an important market. A typical year would see 300 caravans making the month long journey to Yarkand, each caravan consisting of up to 200 camels, donkeys and horses. The traders were spurred on by the enormous profits that could be made on silk and carpets from Yarkand or the spices, cotton, hashish and opium that were transported north from India. The trade involved the people of Leh at all levels; a few undergoing the rigorous journey over the mountains themselves, some merely setting up as merchants, while others profited indirectly by providing services to the constant stream of visitors. Since then, Leh has remained the capital of Ladakh.

Since Chinese closure of the trade routes in 1949, Leh's economy has transformed, its whole economic base has shifted. It is now concentrating on providing services to the new comers—whether it is Indian troops who have moved into the area since the 1960s or the influx of foreign tourists since 1974. Ladakhis are experiencing an economy for the first time wherein technological advances and economic gain are the driving forces. Leh is gradually adopting this inappropriate model of development and beginning to suffer from corresponding environmental and social problems.

Population and construction pressure in and around Leh have created irrigation problems. New colonies have developed around the original Chubi village (see map). For example, at the housing colony near Leh town there were four to five families in 1978. Now there are more than 550 families settled there. Population growth has led to unhygienic environment. Ill conceived and unplanned land use and mismanaged

construction activities in Leh have resulted in degradation of the socio-economic and physical environment.

Faulty designed water-based system is contaminating local streams, and people are suffering from gastric diseases. The local canals are water-logged because of polythene bags and other non-biodegradable materials. Studies have shown that in Nainital accumulation of water and addition of waste material and sewage caused higher concentration of dissolved organic matter and growth of various kinds of water fungi. This reduces the drinking quality of water (Khulbe, 1982). It has been reported from Garhwal region that water quality at Uttarakashi, Devprayag and Rishikesh has considerably deteriorated. The values of dissolved oxygen are reduced in the lower stretch and bacterial contents increased due to more load of organic pollution (Kumar and Singh, 1989). No such studies have been carried out in Leh, but increase in disease pattern points towards pollution. Apart from water pollution, the air is also being polluted by increased consumption of fuel and other sources of energy because of increased number of tourists. Until recently, Leh had no waste problem as everything was being recycled to the land. Now with increasing number of hotels, guest houses and restaurants, the Leh city is facing the problem of large quantities of waste. People bath and wash their clothes near the streams and water canals, thus contaminating the water.

The multiple employment opportunities in the tourism industry has made Leh a target of internal migration from other parts of Ladakh, so that housing is insufficient for this population. As a result of unplanned construction, problems of sanitation and sewage disposal with negative environmental impacts have come up. Most of the farmers of the estates of Leh have given up farming in favour of the more lucrative, tourist related activities. Positive as well as negative social and economic consequences, "produce ambivalent feelings on the part of local residents: appreciate of the opportunity for employment and income, but resentment at changes in their way of life. Conflicts are also created between those individuals who prefer living in a remote, quite less urbanized area with a less hurried life style, and those who seek growth and development often with little awareness of the changes they engender" (Kariel, 1984: 227).

However, all is not bleak. The changes that have been brought about are relatively recent and are not irreversible. Leh is the home of several excellent grass routes Organisations who are striving to stem this tide, and adopt a more sustainable and appropriate way forward for this fascinating city. These NGOs (non-governmental organisations) are *Ladakh Ecological Group*, *Ladakh Environment and Health Organisation* and *Student's Educational and Cultural Movement of Ladakh*, all aim to promote ecological and sustainable development which harmonises with and builds on the traditional culture. In all its activities, they emphasize the primacy of local capabilities and needs.

The dynamics of the development of tourism in other parts of the world have shown that like any other growth process, tourist development can be understood as a self-intensifying spiral which persists until the resources required for development are exhausted or substitutes are found. The basic model of the development of tourism shows links which were studied in the MAB programme, interpreted as cause and effect relationship started and kept going by the growth spiral of tourism. There is an emphasis on key factors which have central role in the internal control process, either as resources which determine development or as regulating variables.

Rapid growth of visitors over the last 22 years (from 1975 to 1997) dates back to the building of the air port at Leh. The promotion of tourism is possible because of the good transportation facilities, even though the area is remote. All the famous monasteries are connected by road. The bus has become the most important means of tourist transportation of the region. Low price lodging for less well to-day has encouraged tourism. This can go on if land, water, agriculture and animal resources of Ladakh improve upon and enable it to face the problems and challenges of the future. If the nexus of man, animals, plants and environment is strengthened it will sustain the material foundation of Ladakh's cultural supra-structure to make it more adaptive to the problems and challenges of the future. A culture is threatened when the material base of the culture is eroded. In Leh, it will not be possible to preserve the culture in its pure form, nor is it desirable, but it is certainly possible to ensure the continued community life, amidst peace of prosperity, in close ecological nexus with land, plants and animals. The interaction of these factors has fundamentally shaped



Ladakhi culture strengthening and diversification of these factors will not only preserve the basic values of the culture but will allow it to develop further and radiate in new forms.

It has to be seen that if the observations in the region depicted as economic and social change and as modification of the land-use practice are to be interpreted as signs of instability or only as process of transition from one stable situation to another. As agriculture income is low compared with the income level of tourism and its connected branches, it is difficult to remain in agriculture and its allied branches without subsidies and governmental support. On the other hand, development depends mainly on natural and human potential, accessibility and demand. However, there are limiting factors, which at least, slow down the growth process to moderate rate. The mechanisms which these factors control are migration of labour from agriculture to tourism. Increasing disparity between and within communities; urbanization and changes in the land-use practice. "Economic reality changes for local populations as fast as tourism growth. Cultural adaptations to new economic and social conditions and constraints appears to be slower than growth thus creating a gap between new socio-economic reality and traditional value systems. This phenomenon called 'cultural lag', is another point of potential instability which normally is augmented as the rate of economic changes increases" (Messerli, 1983: 290).

Research undertaken in one of the four UNESCO/MAB-6 test areas in the Swiss Alps as reported by Messerli (1983) provides data on concept of stability and instability of mountain ecosystems which are subject to development, mostly in the form of tourism. He has shown "that a new dynamic equilibrium on all three levels considered namely the economic, the social and ecological, can be achieved if the existing self-regulatory capacity of system is deliberately used and so becomes a part of a future development strategy" (Messerli, 1983, p. 281).

Generally speaking, the solution to environmental problems in the broad sense is very complex because choices have to be made between the consequence in the short and in the long run, between the protection of the ecosystem and standard of living of the inhabitants, as well as the economic growth and equity. The concept of

ecological footprints (Rees, 1992) offers an explanatory bridge between consumption patterns and population resource development-environment relations, which lie at the heart of economic, social and environmental futures.

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