

IMPACTS OF URBANISATION ON ENVIRONMENTAL CHANGE OF ZIRO VALLEY, ARUNACHAL PRADESH

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Abstract: *Urbanization is a process of growth of cities and town; which is directly linked to the degradation of environmental quality and the quality of water, air and noise. Ziro valley, the place has an imposing landscape of beautiful lush green forest, rivulets, and elevated patches. It is famous for paddy cum pisciculture cultivation. The area is renowned for the terrace paddy fields where the unique system of poly-culture and water management is practiced by local people. But due to rapidly increase of urban area in Ziro valley, the environment become changed day by day. The purpose of the paper is to present the effects on environment due to urbanization in Apatani society in Ziro valley of Lower Subansiri district of Arunachal Pradesh. There are several areas where urbanization has affected along with environment settings. The induced of development of urbanization which is affected on the balance of the ecosystem in the valley portion. The study based on secondary data, satellite image, photography etc. and primary sources, the study area map has prepared through QGIS.*

Key words: Urbanisation, Environment Degradation, Biotic Life, Pisciculture, Water Management.

introduction

Urbanization is the process of transformation of agricultural land into densely cities. Urban areas can grow from increases populations who are migrated from rural area into urban areas. Urbanization is the results of deforestation, habitat loss, and the extraction of freshwater from the environment, which can decrease the biodiversity. Human activities in urban areas, like the burning of fossil fuels and wastages of household and industrial material also increase pollinations in the environment that can affect the health of people and other species of environment. According to definition of Wikipedia, *“Urbanization refers to the population shift from rural to urban areas, the decrease in the proportion of people living in rural areas, and the ways in which societies adapt to this change. It is predominantly the process by which towns and cities are formed and become larger as more people begin living and working in central areas.”*

Arunachal Pradesh is situated north eastern part of India. Most of part of this state is mountain region. So, the urbanization in this state began later and slowly spared in the state. The present condition of urbanization in the State creates many towns. Due to population size the towns are qualified as the urban status without necessary infrastructures. The urbanization of Arunachal Pradesh is unplanned. So, the impact of urbanization is destructing the social forestry and it is degrading the environment. Due to unplanned construction is leading various problems like landslide, soil erosion, water logging etc. The agricultural land, forest areas are coming in urban area and day by day the environment of Arunachal Pradesh rapidly degrades.

Ziro valley is one of the oldest towns of Arunachal Pradesh which is a district headquarter of Lower Subansiri district and the valley is situated around 115 km from the state capital of Itanagar. It is the land of Apatani community; there is no written record when the settlement was started. The historical evidence found in different parts of Upper Subansiri and *Pij Cholo* peak and upper *Kamala* valley of *Hure* remains the footprints of Apatani migration and their Neolithic tools and pottery work found of the Apatani community. It is the famous for its canopy cover of the mountain ridges and rice fields; Ziro Valley is also included in the list of UNESCO World Heritage Site for the Apatani cultural landscape and their unique agricultural system. The Apatanis are among the few tribes in the world who continue to worship nature. It is their relation with the nature that regulates their cultural practices. All the traditional festivals are in a way, celebration of nature.

Agriculture is the mainstay for the Apatani community people. At the same time, they practice wet rice cultivation cum fish cultivation. This practice has boosted their economy and food supply. The system of integrated farming using combination of paddy and fish together, is claimed to be the most productive and efficient agricultural systems in the state. Apatanis share a deep relationship with their land, forests, water and agriculture and use their resources wisely; every inch of cultivable land is use to its fullest. One can see millets grown on the bunds constructed in between paddy fields. Urbanization is a universal phenomenon which is growing rapidly. In Arunachal Pradesh the urban area growing fast, which is create problem in biodiversity. Due to urbanization, Arunachal Pradesh lost the agricultural land, forest area and brings change in climate system. Urbanization also affects in environment of Ziro valley that's why possibilities of loss of flora and fauna is increased day by day.

Plate 01: Nature and agriculture Field of Ziro Valley



Source: Photo courtesy- (Seema Sonar)

Objective

The paper will focus on the traditional practice of agriculture of Apatani people in Ziro valley and its geographic location and how urbanization has increased in study area gradually. Discuss the problems with increasing urban growth in Ziro valley with a correlated study of present and past settlement.

Methodology

The study has done based on the secondary data and tertiary sources. The secondary data has collected from different sources like research articles from different journals, books, reports, websites, and newspapers etc. whereas different open map sources and satellite images have used as tertiary data. To prepared the location map of study area Arunachal Pradesh state map, Lower Subansiri district and Ziro circle maps are digitised by using QGIS 3.14 version software in GIS lab of AUS. To analyse the growth of population in study area census data has used. Different satellite images have collected from Google Earth and Google map website for identification of past and present situation.

Study Area-The Landscape of Ziro Valley

The study area is located in Ziro valley, Lower Subansiri district of Arunachal Pradesh. It lies at an altitude of 1750 meters and old Ziro valley at 1600 meters and Hapoli town of Ziro valley situated at 1570 meters from the sea level. Extent of area is between 27°32' to 27°37' N latitude and between 93°48' to 93°52' E longitude. The valley is situated at the central part of Arunachal Pradesh. The Ziro valleys have an area of 1058 km² of which 32 km² under agricultural and remaining under forest, plantation and settlement. The climate of Ziro during summer makes it a favoured destination for vacation; it is relatively pleasant throughout the year. The valley experience moderate rainfall and snowfall throughout the years. Due to sub-Himalayan climate with moderate sunshine, rainfall and strong winter makes the valley a paradise of tall trees and foliage. The land and climate conditions are favourable for agricultural.

The entire region of Ziro valley falls within the heavy rain zone. The Monsoon starts from the month of March/April and continues till the month of September. The annual rainfall is 2240-2910 mm with the maximum rainfall during the month of June and July. The minimum and maximum temperature during summer is 6.5°C and 29°C respectively and that of winter is 1.0°C and 19°C respectively. Thus, it is characterized by cold, humid, high-altitude type of

climate, where relative humidity remains constant between 70 – 80 percent. The place is surrounded by hills and forest and river (*Kiile*) passing through the valley. This *kiile river* act as the main source of supplying the water to the agriculture fields of Ziro valley. Once the valley was remained as swampy and there lived a reptile – *Buru* in local it means for Crocodile. The settlement area is mostly found in the adjacent part of the valley. There are mainly seven main villages and two towns. Old Ziro is town located at the northern part of the valley, the distance between Ziro and Old Ziro is nearly 6.0 km. The village’s houses are constructed in a compact manner. Several paddy fields were brought under the construction of roads. Today huge changes can be seen like in commercial and settlement setup as compared to the past.

Figure 01: Location Map of Ziro Valley

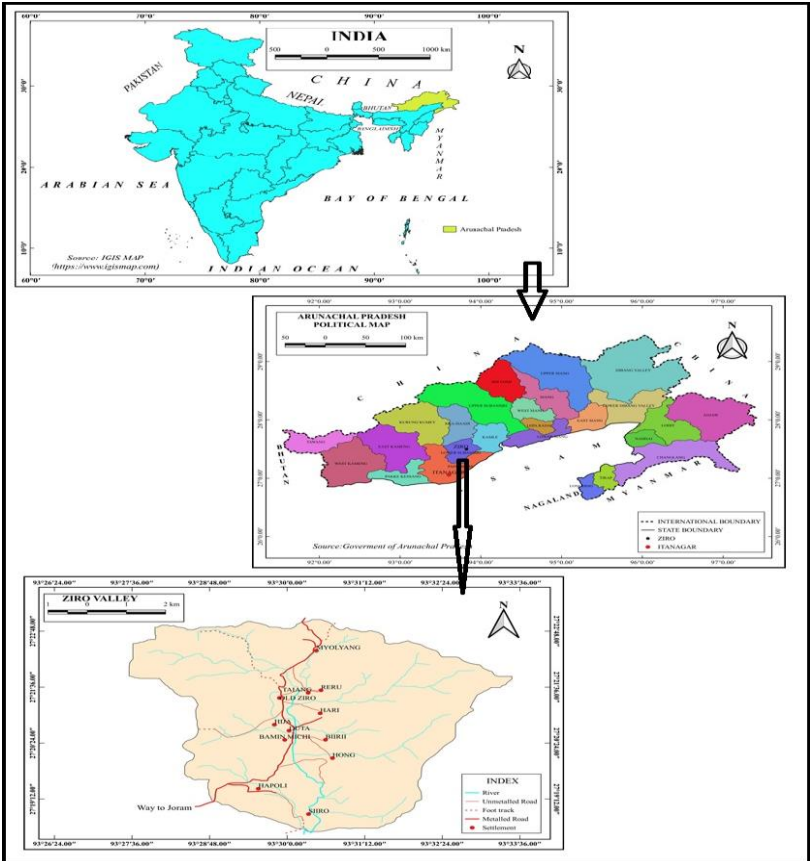
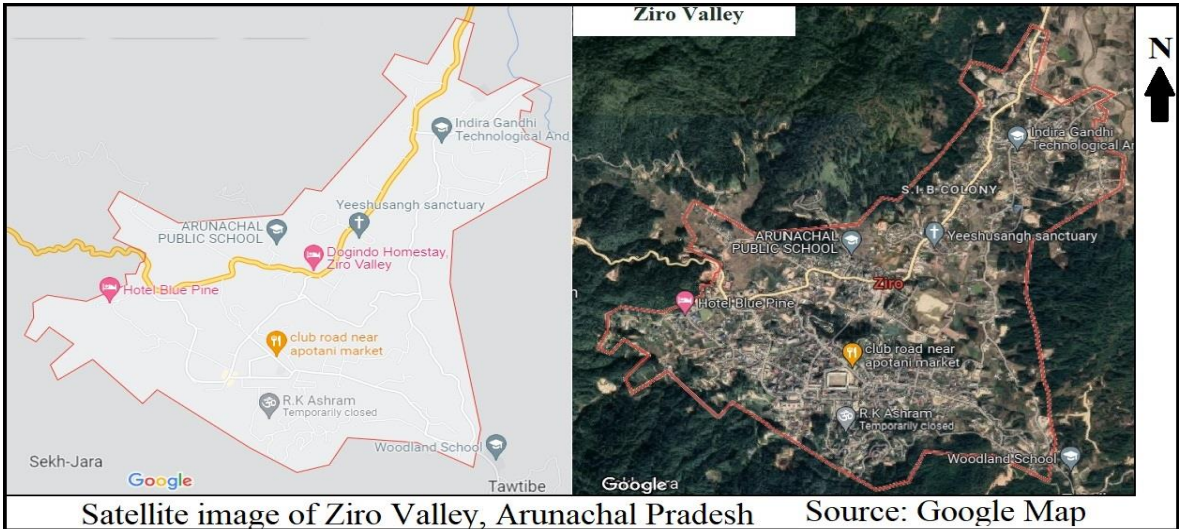


Figure 02: Satellite Image of Ziro Valley



Satellite image of Ziro Valley, Arunachal Pradesh Source: Google Map

Agricultural Practice in Ziro Valley

The Apatanis people practice aquaculture along with rice farming on their plots. Rice - fish culture in the valley is a unique practice in the state, where two crops of rice (Mipya and Emoh) and one crop of fish (Ngihi) are raised together. Integrating aquaculture with agriculture assures higher productivity and year-round employment opportunities for farmers. Organic inputs are used in the plots utilised for rice cum fish culture. The Apatanis have developed a multipurpose water management system, which integrates land, water and farming systems by protecting against soil erosion, conserving water for irrigation and paddy-cum-fish culture. It is managed by diverting streams which connected each field with bamboo or pinewood pipe. The streams are trapped into a major channel and again redistributed to numerous secondary channels to convey water in each and every field plots. The irrigation systems are managed by a group of farmers led by Bogu Ahtoh to ensure proper supply and sharing of water. The household's waste water drained to the irrigation canals provides good source of manure in the field. Soil nutrients are also maintained through recycling of agricultural wastes, paddy straw, rice husk, ash, weeds, etc. After the harvest free cattle grazing is allowed to add green manure. They also used decomposed leaf for soil nutrients. The Practices of agro-forestry in Ziro valley in particular areas as grazing ground, sacred groves, plantations areas, etc. has helped maximum utilization of limited land to produce various resources while sustaining agriculture with improved yields. So, in present world, such traditional ecological knowledge has special value.

Plate 02: Agricultural Land of Ziro Valley.



Source: Photo courtesy- (Seema Sonar)

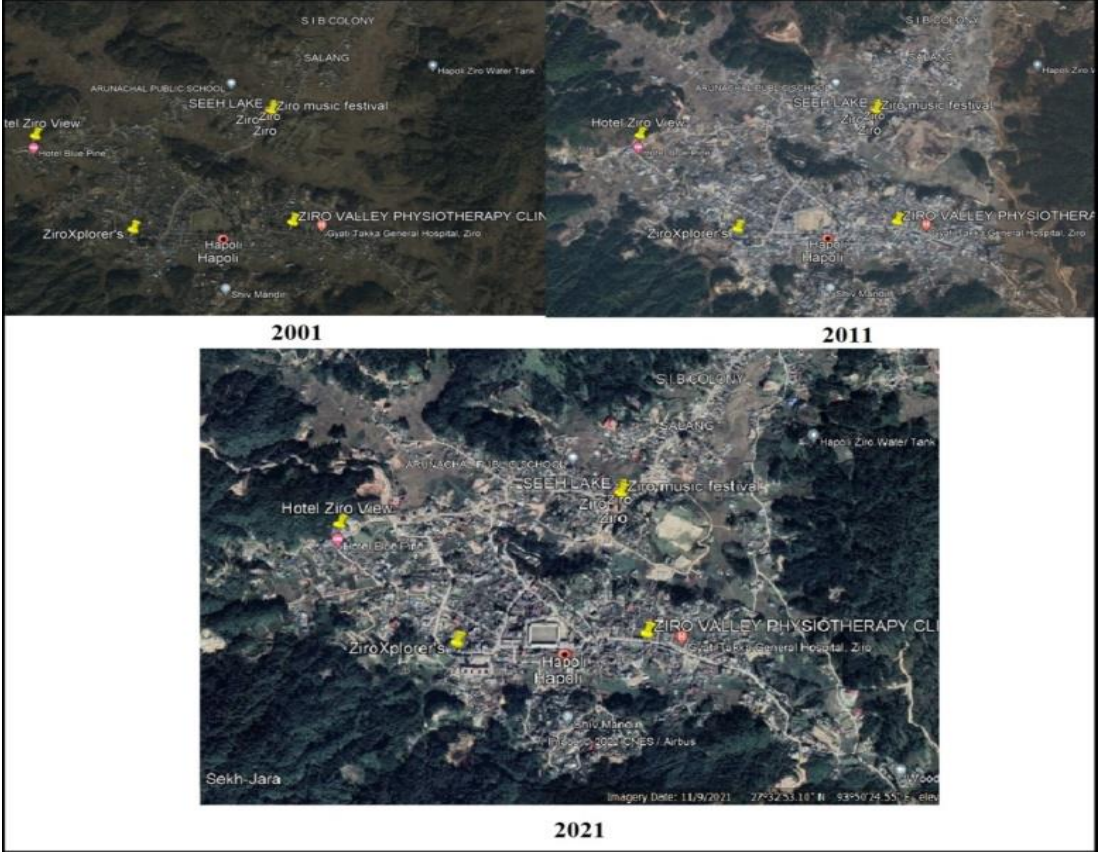
Urbanization in Ziro Valley

The process of urbanization in Ziro valley has been started since 1952 with the administrative centre at Old Ziro. The intensity of development and the migration to Ziro town began much later. Infrastructure development is an indicator of urbanization and also a sign of modernization. Urbanisation brings about social and cultural changes in community life, which is also a step towards modernization. The rapid growths of shop and market in the centre part of the urban area of Ziro valley and also its surrounding area, which led to the mass concentration of population and building construction in this valley. Due to increasing the urban population and infrastructures, there the drainage problems and proper garbage disposal system are hampered day by day in the market and other areas. So, these problems are affected on environment of Ziro town.

The urban area shifted from old Ziro to Ziro (Sadar) because of well connectivity from the capital, modern administrative machinery and the induced of political development. In the year of 2001 the development was started in this valley and today there is no empty place to

build the house so urban area captures the agriculture and forest area. Due to growth of urban area the pollution is increased day by day which create problem in environment. Some spices are reduced from this valley.

Figure 03: Satellite images showing trend of urbanization from 2001 to 2021 in Ziro Valley of Lower Subansiri



Source: Google Earth

Plate 03: Increasing the Settlement Area beside the Agricultural land of Ziro Valley



Source: Photo courtesy- (Seema Sonar)

Plate 04: Hapoli town of Ziro Valley



Source: Photo courtesy- (Seema Sonar)

The Growth of infrastructures is attraction of the nearby villagers that is why increase of settlement haphazardly in the urban area. The unplanned and haphazard settlements bring an issue both for the government department and for the public. There is a compact settlement are seen in different parts of the urban areas in Ziro valley with a different style of modern and traditional house. The colony roads are not safe during the night time and also the road conditions of this area are very bad. Due to growth of the urban area the swampy and marshy land, forest area, agriculture lands are used for housing purpose. The streams are polluted due to human waste. As a result, the breadth of the stream and biotic life in the Ziro valley are greatly affected and also reduced the agricultural and forest area.

Plate 05: Changes of Agricultural Land in Ziro Valley



Source: Photo courtesy- (Seema Sonar)

It is cleared that; from the above picture the urbanization captures the agricultural land and the people are build the settlement haphazardly. Before 12 years from 2022 there is agricultural land where the Apatani people farming different type of rice crops. The most of that agricultural land are privet and the owners are lived in urban area. The agriculture work was managed by the group of people is called *patang ajng* but due to urbanization and education development the people of *patang ajing* numbers have declined very fast, presently the women's are managed the paddy field in this valley. At Present the quality of water is decreased due to wastage material and also house, road constructions, so when the polluted water enters into rice field the production of crops and fishes are declined which is affect the farmer life.

Table 01: Showing the Growth of Urban population of Lower Subansiri Dist. 1991-2011

| Year | Total Population | Urban Population | Rural Population |
|------|------------------|------------------|------------------|
| 1991 | 83167 | 8862 | 74305 |
| 2001 | 55726 | 12384 | 43342 |
| 2011 | 83030 | 12806 | 70224 |

Source: Census data of 1991(<http://lsi.gov.in>), 2011 (www.censusindia2011.co.in)

Figure 04: Growth of Urban Pop. in Lower Subansiri Dist.

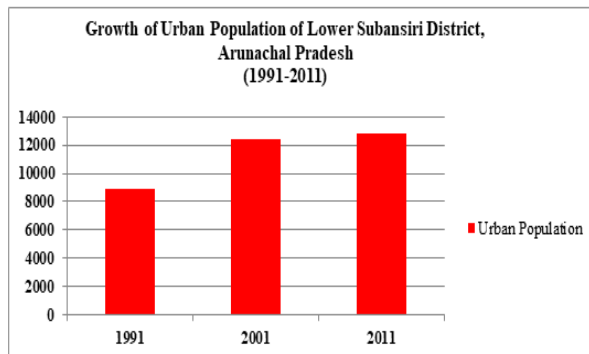
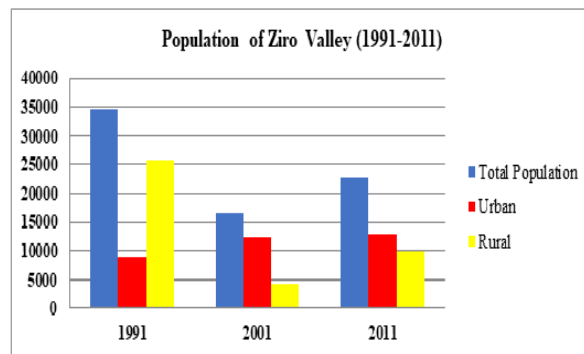


Figure 05: Showing the Population in Ziro Valley



The population of urban area are increased in Lower Subansiri district day by day. In 2011 the number of total urban population is 12806 persons where record increased the previous total number of 8862 in 1991. In Ziro Valley due development the main attraction of the village people so the village people are migrated from village and build their home in the town that is why the urban population is increased in this valley. The census data shows that the population of rural is decreased. Hapoli is the main town of Ziro Valley. So, the other community peoples are also lived permanently or temporarily who are coming from different point for work or other purposes. Generally, the other people and also other tribal people cannot buy the land here but presently the landowners are selling the land to other person, that's why day by day the population growth is increased through internal and external way. In 1991 where the rural population is high but in 2001 and 2011 the rural population is decreased and the urban population is increased because of different type of facilities are available. The growth percentage of urban population represented that, in census year 2011 maximum number of urban population has increased, approx. 74.50 percent where as in the census year 1991 it was only 25.57 percent. Although the census year of 2011 represented a decadal rate of urban population of 56.30 percent but the increasing settlement has decreased the green land or agricultural land of study area.

Table 02: Percentage of Urban Population

| Census Year | Total Urban Population | Percentage of Urban Population |
|-------------|------------------------|--------------------------------|
| 1991 | 8862 | 25.56 |
| 2001 | 12384 | 74.50 |
| 2011 | 12806 | 56.30 |

Source: Census Data of government of India, 2011. <https://censusindia.gov.in>

Figure 06: Trend of Urban Population Growth

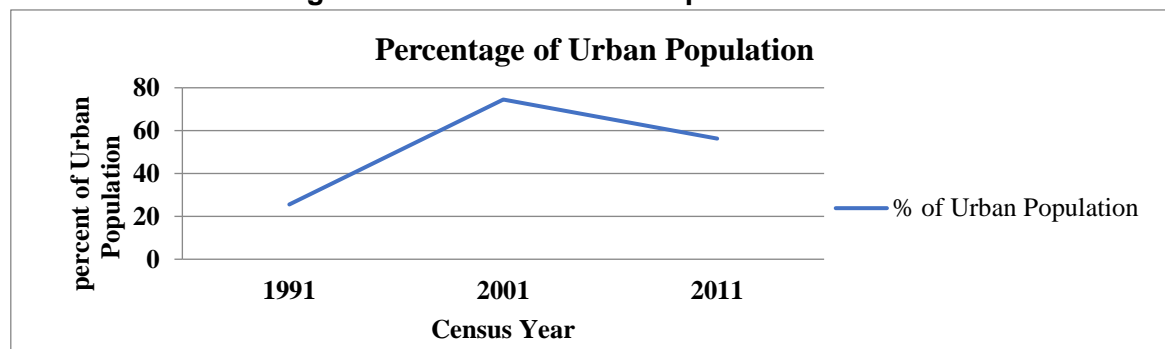
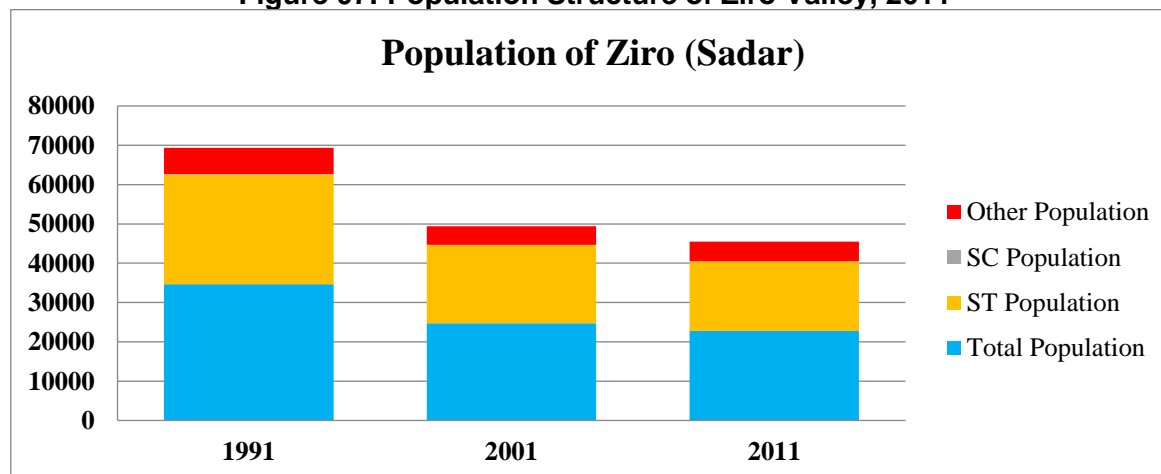


Table 03: ST, SC and other Population in Ziro Valley

| # | Year | Name of the Circle | Total Population | ST Population | SC Population | Other Population |
|---|------|--------------------|------------------|---------------|---------------|------------------|
| 1 | 1991 | Ziro(Sadar) | 34661 | 27870 | 115 | 6676 |
| | 2001 | | 24703 | 19867 | 104 | 4732 |
| | 2011 | | 22747 | 17742 | 0 | 5005 |
| 2 | 2011 | Old Ziro | 19605 | 18177 | 0 | 1428 |

Source: Census Data of government of India, 2011. <https://censusindia.gov.in>

Figure 07: Population Structure of Ziro Valley, 2011



In the year 1991 the ST population is 80.40 percent, SC population is 0.33 percent and the other population is 19.26 percent and 2001 census ST population is 80.42 percent is, The SC population is 0.42 percent and the other population is 19.16 percent so the SC and other population is decreased but the ST population is increased but in 2011 census year the other population is 22 percent which is increased then the 1991 and 2001 census year and the ST population is 80 percent which is decreased. So, the other population are increased day by day because of increased the facility like electricity, large market, banking facility, government department is closer, medical, education institution, recreation and service centre for family outing. So, the rapidly grow the population in Ziro Valley, the Hapoli town is expanding in length

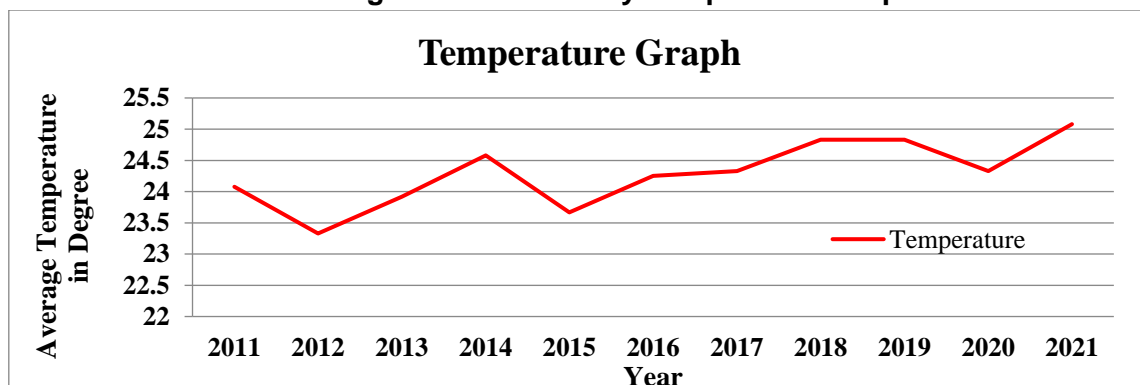
and breadth by occupying the nearby isolated dry land, bamboo groves, forest, and agriculture fields. Due to occupied the river and forest area the environmental problem is increased day by day in Ziro valley and another side due to capture of agricultural land the production of crop and fish are decreased which create the economic problem of famer.

Impact of Urbanisation

Urbanisation and development are related to each other. So, we can develop the urban area without affecting the physical change but the people gradually bring the changes in urban area to construction of roads into the rice fields, garden, bamboo groves and forest which affect the environmental ecology. The construction of malls and selection of the area for administrative offices change the landscape in town area and also in village areas. Large forest area and agriculture plots was taken away for the construction of roads, building, administrative office which reduced the agricultural land and forest area as a result the animal are homeless and it is create problem in food chain. Due to development activities, reduced the varieties of endangered flora and fauna in this valley. So due to urbanization rapidly change the environment and also find that various impact in environment.

- **The creation of urban heat island:** Due to various construction materials like concrete, tin, bricks etc. absorb and reflect the solar energy than the vegetation and soil and the town remain warm in night when the nearby area already cooled. So due to urbanization the temperature gradually changes in Ziro Valley which create problem in flora and fauna.

Figure 08: Ziro Valley Temperature Graph



Source: www.timeanddate.com/weather

As per graphical analysis of temperature of last 10 years, Ziro valley becomes more too warmer then past. Almost 1°C has increased from 24.08°C to 25.08 °C from the period of 2011 to 2021. So climatologically, there Ziro valley becomes changing its atmosphere and its increasing has proved it.

- **Changes in Air Quality:** The various activities of people emissions carbon dioxide, carbon monoxide, ozone, sulphur oxides, led and many pollutants which degraded the air quality. In Ziro Valley due to private car and reduced forest area the different type of gases is increased in the air.
- **Quality of Water:** Sometime the people are throwing the wastages material in the river or in drain which degraded the water quality. Due to pollution of river in Ziro valley the production of paddy and fish near the Hapoli town is decrease.
- **Changing the land use pattern:** The construction of the housing complex, market, administrative infrastructure led to deforestation and the shortage of wood at the

beginning of the development. The agriculture plots were taken away for the construction of airfield, administrative building and roads. A large number of trees were cut down for the ring road. Due to development activities, varieties of endangered flora perished from Ziro Valley and other side, several varieties of animal species and bird species are displaced from their original inhabitants or killed. So, the land use pattern changed due to develop.

Map No 3, proved that day by day settlement has increased in the Ziro valley. So, the land use patterns are changed in Ziro valley.

- **Environmental Pollution:** The different types of pollutants material are often dispersed across the city or town. In Ziro valley the garbage system is very poor due to the lack of human power, materials, and financial position and also in Ziro town lacks proper drainage system, dustbin for waste materials. So, the people thrown the wastage material here and there and the wastage material spared the gas which is affect the environment.
- **Problem on Biosphere:** Due to extend the urban area in Ziro Valley the flora and fauna are affected, so some time flora and fauna are died or changing their habits. Ziro valley is rich for its animal and bird species. It is home of various wild animal like deer, tiger, leopard, monkey, squirrel, kingfisher, hornbill, and woodpecker but due to urbanization and reduced the forest area this animal is homeless. The local birds like Crow, Hawk, Eagle and house sparrow have been declined in the past few years due to pollution. The rising of the population in the urban areas in recent time brings changes in the natural surrounding and local environmental changes.
- **Soil Pollution:** Soil pollution is increased in Ziro Valley due to Urbanization. It is causes by the dumping of waste. So, the fertility of soil is decreased and the production of paddy and other vegetable is low. It is also affecting the human body.
- **Increasing the greenhouse gas:** Due to increase the number of vehicles and uses of other electronic material increased the greenhouse gas and other side due to cutting of the tree for the development the forest area is decreased. So, the greenhouse gas increased in Ziro Valley.
- **Noise Pollution:** Due to constant noise of traffic, the noise pollution is increased in Ziro valley which create problem in wild life so the wild animal going far from the town and its one of the major problems of environment.

The new pattern of life style, rise in pollution from the increasing vehicles and construction sites, contamination of water had harmed both human and animal population, haphazard and unplanned housing, lack of proper drainage, and changing environment has detrimental role for increasing the rate of disease and sickness in the society.

Conclusion

Urbanisation is universal process which changes the society in various sides like infrastructure, social life, economic condition etc. but it has various positive and negative sides. Urbanisation in Ziro valley is seemed to be based because of administrative setup. It is political mobilization that has changed the traditional heredity based administrative system and reduced into a just cultural representative for the community. The economic structures have changed over the period of time, the practices and imparting knowledge is at peril stage. With present situation it is certain that the popular agriculture cum fish cultivation of the community is belongs in danger zone because of environmental changes. The consumption pattern of the people has also been changed. The urbanisation and development activities in the valley is need but it is

duty for all local people and also the local government to develop in sustainable way and conserve the endangered flora and fauna to balance the biodiversity.

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