

Spatial Transformation of Hetauda in Federal Structure of Nepal

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Abstract

In Nepal federalism was introduced in 2015. Hetauda was established as the provincial capital of Bagmati province in 2020. After the initiation of federal structure in the government bodies and overall administration of Nepal i.e, in the executive, legislative and judiciary sectors, multiple changes took place in the physical, social, economic and other related areas in Hetauda. However, as the nation's capital Kathmandu functioned as the center for all administrative and economic activities, the nature of transformation after Hetauda became the provincial capital have to be taken under consideration. This study took into account of the components that fall under each of these areas like urban forms, demography, land value, economy and so on. The methods for this research initiated by formulation of questionnaire to collect necessary data and information from key informants belonging to various sectors of Hetauda, as well as from local people of Hetauda. After that, field visit to Hetauda was conducted to collect other data and information about Hetauda city. As a result, three major areas of transformation were deduced viz. physical, social and economic, after the analysis of collected primary and secondary data from the study.

Keywords

Spatial Transformation, Land Value, Urban Form

1. Introduction

Hetauda is the administrative center of Makwanpur District and the provincial capital of Bagmati Province, which was declared on January 12, 2020 by a majority of Provincial Assembly members (105 out of 110). It is one of Nepal's largest cities, located at the crossroads of two major national highways, the Tribhuvan highway and the east-west route. Hetauda is 76 kilometers from Kathmandu, the capital city, through the fast track, 132 kilometers via Daman, the Tribhuvan Highway, and 224 kilometers via Narayangadh. The city's overall area is 261 km², with 97 percent of that being land and the remaining 7 km² (3%) being water [1]. Hetauda is bordered on the east by Chhatriwan VDC, on the west by Manahari, Haandikhola, and Sarikhet, on the north by Naamtaar, Bhainse, and Makwanpurgadhi VDC, and on the south by Bara and Parsa District. The city is bordered on three sides by rivers: the Rapti to the west, the Samari to the north, and the Karra to the south, and it is located in one of the country's most important industrial zones. Because of its location along the Tribhuvan Route, the settlement grew and was eventually connected to another major national

highway, the Mahendra Highway, commonly known as the East-West Highway. Hetauda is also home to Nepal's largest industrial estate. Hetauda Industrial Estate is the name given to it (HIE). As per 2011 census; population of Hetauda is 84,671 with 19,851 households [2] and is the twelve largest cities in Nepal. The rate of increase of population is 2.36% per annum and the rate of increase of population is lower than of 2001 censuses which was 2.72[3]. Both of Kathmandu's existing roadways, the Tribhuvan Highway and the Mahendra Highway, pass through the city. The completion of the Tribhuvan, the country's first highway, marked the beginning of Hetauda's economic significance. Through a series of tunnels, a proposed and long-debated new roadway would reduce the travel distance to Kathmandu from 133 km to less than 60 km. If completed, such a route might turn Hetauda into a crossroads for trade between India and China's fast-growing economies. For light vehicles, two dirt roads provide a shorter route to Kathmandu: one passes via the villages of Fakhel and Pharping, and the other passes through Markhu and Sisneri. For light vehicles, two dirt roads provide a shorter route to Kathmandu: one passes via the villages of Fakhel and Pharping, and the other

passes through Markhu and Sisneri.[1]

2. Literature Review

2.1 Spatial transformation

Spatial transformation is process of the changes land use, expanding buildup areas and changing urban form. According to Bourne (1976), there are 4 main process in urban land use change [4]. The first is the expansion of the urban periphery or suburbanization, the second is the renewal of the core region, the third is the expansion of infrastructures, particularly transportation, and the fourth is the growth and decline of nucleations, such as industry, institutions, and so on. Spatial transformation is the indicator of urban transformation. It is associated with social transformation and economic transformation. A close look of this transformation process helps to identify the pattern and characteristics of urban expansion. The pattern of transformation helps to trace the history and its characteristics and plan for better management in future. [5]

2.2 City image and its elements

The public image of any given city is an amalgamation of many different distinct images as seen by the public. Physical form, social significance of an area, function, history, and even name all have an impact on a city's ability to project an image. These influences don't exist in isolation; however, the physical form is generally dominant over rest of them. According to Kelvin Lynch, the physical form of the city (i.e. urban form) can be classified into paths, edges, districts, nodes and landmarks [6]. The Kelvin model is applicable in case of Hetauda as well. Major and minor roads and other access lanes are the paths. The junction of these roads forming chowks and community space are nodes. The building blocks along the roads/ streets form the edges. The neighborhood units like tole represents the district while the temples/ monument, parks, school are the landmarks. All these elements have been synthesized in Hetauda.

2.3 Emergence of urban forms

'We know that most of the towns in history came about without designing. Many just grew incrementally followings paths that in turn found their way among riverbanks and slopes. It is long wat from

the organic growth of the settlements via preconceived layout, to the idea of the professional town design' [7]. A town is very complex spatial entity which incorporates needs and desires of different people inhabiting on it. It has physical, social and cultural dimensions. Physically, it is seen as synthesis of private and public spaces in a hierarchical system. It has taken long time to shape our cities to come to present form. They first appear as functional requirement, used tested for years and improved to overcome difficulties realized. Designing came later than actual making and using. Hence, cities might have undergone continuous transformation before it reached the shape and form that we know now as conventional form or vernacular form system. According to Habackken, 'the carrying of image in minds as collecting good, continuously reinforced by the presence of the artifacts that embody it is what constitutes conventional form. This is the form that we all share and see the image as well as in things. Conventional form is self-evident and hence always found in artifacts, we make, so that these come to share it with us. It takes time for knowledge of the form to roots in the social body that shares it. [7] Habackken further argues that 'for a system to be vernacular, it must allow some form of control to all parties. The purpose of the system is to simultaneously serve different interests. To the extent that it is successful in doing so, it will become a shared property in minds of people and it will stay alive growing and changing towards ever richer and ever more effective manifestation.[7] The clue behind the homogenous and coherent form of the cities is the shared image of the urban fabric and respect to neighborhood. According to Habracken, the shared image of the urban fabric can be of the system that people do share a tacit understanding of the system in the complex environment that surround them. Shared image can be manifested in terms of cultural milieu, social milieu, religious milieu or common desire for better environment, economic opportunities quality of life. It creates a situation that people of different interest, skill and background come to a place; everyone knows what to do and what others are doing. This plays role to provide coordination and instruction needed for different actors of urban community. The result is obviously, the integrated and well organized system for better living and appreciable township without depriving individual requirements as well.

2.4 Land Value Theory

The bid rent theory is a geographical economic theory that describes how real estate prices and demand fluctuate as distance from the central business district (CBD) grows. Different land users would fight for land near the city center, according to the document. This is based on the assumption that retail businesses want to maximize their profits, thus they are ready to pay more for land near the CBD and less for land further away. This hypothesis is founded on the idea that the more accessible and area (i.e., the higher the client concentration), the more profitable it is. For each land use function, Alonso created a bid rent curve, with the slope representing the activity's sensitivity to changes in accessibility. Desire to attract customers from all over the city and, as a result, in pursuit of the most central location, businesses are willing to pay the maximum leasing price. However, as distance increases, the amount they are willing to pay decreases.[8]

2.5 Central Place Theory

Walter Christaller developed the theories in 1933. The central locations theory aims to explain how a system of cities is distributed spatially. The central place studies determine the extent of the peripheral area required to support town, specifically optimal spacing of settlements try to organize space suitable to the activities of human. [9] The theory explains extent required of the peripheral area to support a town, the optimal spacing of settlements and tries to organize space for human activities. It establishes the relationship between the rarity of a service and the population needed to support it. However, in explaining the process of hierarchical development of market centers. Christaller started from the top down to develop central place hierarchy, wherein high order centers containing higher order goods are first established and later followed by successive lower order centers, whereas Losch began from the bottom up wherein small centers which provide basic necessities are first established and larger one are created as the demand intensifies. [10]

2.6 Growth Pole Theory

Perroux, a French economist, created the growth pole idea. The growth pole theory is based on the strategy of urban industrial development and on large-scale and heavy industries. It helps to identify key

Industrial and urban centres. Growth does not appear everywhere and all at once, according to the growth idea. It manifests at points or development poles with differing intensities and spreads through various pathways with varying degrees of impact on the entire nation. According to this idea, economic concentrations would form in locations with the material and infrastructural resources required for the establishment, maintenance, and growth of vital sectors. These resources would contribute to the cluster's economic growth, making them essential or propulsive industries capable of producing an economic thrust in associated industries via fields of economic forces. The thrust would not necessarily be felt in the surrounding regions of the growth pole, or even within the country itself. Perroux and other growth pole writers strive to ground the term in external economics, agglomeration, and linkages. [11] The most significant distinction between growth pole policy and growth policy is The difference between the pole and center policies is that the pole policy necessitates the development of a specific industrial focus comprised of propellant firms from leading industries, whereas the center policy entails the concentration of investment in a specific location of those facilities that will create attractive urbanization economics for the industries.[10] Thus, growth centers at the highest order central places, the next lower ones are service centers and the lowest ones may be termed as the small market center.[12] Oversimplification of the development process as a linear process with observable stages of development is one of the theories' general flaws, as evidenced by the literature. It expects significant spatial expansion in terms of built-up area while paying little attention to the quality of development. The cyclic nature of depressions, crises, and booms that characterize the capitalist economy has yet to be investigated. [13]

2.7 Lee's Theory of Migration

Everett Lee, a professor of sociology at the University of Georgia, is recognized for developing the Push and Pull Theory, often known as Lee's Theory, which is a pioneering theory of migration. Conditions that can cause people to leave their homes and are related to the country from which they move are known as push factors. Non-availability of sufficient livelihood possibilities, poverty, and rapid population growth that outpaces available resources are all push factors. Situations such as "primitive" or "poor" living conditions, desertification, famines/droughts, and fear

of political persecution, poor healthcare, money loss, and natural disasters are examples. Pull factors are the polar opposite of push forces in that they draw people to a specific spot. More job opportunities and better living conditions are common examples of pull factors, as are easy availability of land for settling and agriculture, political and/or religious freedom, superior education and welfare systems, better transportation and communication facilities, a stress-free environment, and security.[14]

3. Case Study

3.1 Ranchi

Ranchi is the capital of Jharkhand, an Indian state founded on November 15, 2000, when the Bihar districts of Chota Nagpur and Santhal Parganas were carved apart. With the arrival of the twenty-first century, not only has India's development accelerated, but there has also been an increase in upward social mobility among its billion-strong population. Economic activity, along with infrastructural development to satisfy the demands of tremendous population increase and migration into metropolitan areas, has resulted in considerable urbanization, with about 3% of the population living in cities. As a result, urban and per-urban areas are growing, resulting in a shift in land use along highways that traverse cities and in the surrounding neighborhood.[15]

3.1.1 Urban growth pattern of Ranchi

Ranchi began as a little town in 1869, with a population of around 12,000 people and a land area of around 6 square kilometers. The area steadily increased to 55.44 square kilometers in 1965, 97.12 square kilometers in 1972, 212.29 square kilometers in 2004, and eventually 273.23 square kilometers in 2010. From 1965 to 1972, the city grew at a rate of 2.08 square kilometers per year; from 1972 to 2004, it grew at a rate of 6.08 square kilometers per year; and from 2004 to 2010, it grew at a rate of 10.16 square kilometers per year (RMC and Satellite data interpretation). Simultaneously with the expansion of space, the population surged by leaps and bounds. Because the city is bordered by hills and plateaus, the majority of the expansion occurred at the expense of scarce fertile and plain agriculture land, which may be a sign of future food scarcity and green space non-availability. Furthermore, satellite imagery corroborated the study's findings.[16] The

understanding of a city's spatial growth will be gained through built-up expansion. Ranchi has undergone intermittent expansion in urban land usage throughout its history. During the previous 78 years, the built-up area has grown by more than five times its original size. Ranchi's urban growth is at an early stage of development compared to other Indian cities, with a smaller population increase and a very rapid pace of built-up expansion. Between 1927 and 2005, the relationship between population and urban expansion in Ranchi Urban Agglomeration. Built-up development has predominantly impacted agricultural land as monocropping is the agricultural system in states like Jharkhand, where arable land is scarce. According to UNPD's 2007 population projections, the Ranchi urban areas will have densified by 577,000 people by 2025, necessitating extra land for development.[16]

3.2 Deharadun

The capital and largest city of the Indian state of Uttarakhand is Dehradun. The city is nestled in the foothills of the vast Himalayan range, gently descending north to south and southwest. Dehradun has undergone rapid population increase after being appointed as the state capital on November 9, 2000. According to the Indian Census, the city's population increased from 0.497 million in 2001 to 0.578 million in 2011. The creation of administrative offices, business complexes, and industries has resulted in a significant increase in migration of people from the surrounding districts into the city, resulting in city expansion and an increase in the price of land in many parts of the city. [17] After becoming the capital of Uttarakhand, Dehradun's urban area grew by 160 percent from 1987 to 2008, and nearly doubled in a decade from 1998 to 2008. The urban expansion radius has increased from 8 kilometers in 1987 to 15 kilometers in 2008. The south, south east, and south west directions had the most growth. Despite a northward tendency in expansion from 2003 to 2008, the land area in the north and north-west is practically saturated due to physical boundaries in the form of forest and hills. Dehradun's urban area is rapidly expanding, and it will soon expand farther into neighboring agricultural territory, putting it on the verge of being a metropolis in the near future. The strain on infrastructure and neighboring land has risen dramatically. The need of the hour is to effectively manage and plan the expanding urban area and infrastructure for long-term sustainability. The

direction and distance from the city center of urban expansion give crucial inputs for understanding the causes and effects of growth in a specific area.[18]

4. Methodology

In this study, a human instrument was utilized to identify the research’s topic and choose important informants as data sources, particularly for stakeholders in the Hetauda urban region who have firsthand experience with the process of change brought on by spatial transformation. This research will be conducted in three stages: First, there’s the pre-field stage, which includes things like study design, literature evaluation, research field selection, research instrument selection, data collection design, data analysis technique design, and conclusion. Then, when collecting data, critical informant data will be collected. Several stages will be taken in this process, including I confining the key informant interview questionnaire to the scope of the research, (ii) capturing data with notes, and (iii) recording data with technologies such as audio recording devices and video recorders if the subject does not object. (iv)Collecting data in the form of reports, maps, bulletins, and other documents. Following that, an analysis in the field will be conducted to examine the concepts that will be elaborated according to the research objectives. For data validity, triangulation will be used. Triangulation is a data-gathering process that compares and combines information from many sources. To evaluate the validity of the data and interpret spatial physical changes in the socio-economic development of the urbanizing areas in Hetauda, this research will combine observations, in-depth interviews, and documentation for data sources at the same time. As a result, the data collected will be more consistent, detailed, and certain in order to meet the research objectives.

5. Finding and Discussion

5.1 Driving factors of transformation

The first objective of this research was to determine various factors that played influential role in the spatial transformation of Hetauda, under various dimensions like social, economic and physical. In reference to the case studies of Ranchi and Deharadun, literature studies and field observation, six major driving factors for transformation of Hetauda in Post-federal structure

is derived in this study. These Driving Factors are:

5.1.1 Restructuring

With the promulgation of its constitution in 2015, Nepal replaced a unitary government with a federal system of government. This process has made Nepal a federal democratic republic governed with three levels of government: a federal level, seven provinces and 753 local governments.[19] In Hetauda, which became the permanent capital of the Bagmati province in 2020 three levels of government that is executive, judiciary and legislative were formed along with their respective institutions. Under the legislative provincial Assembly was established, under the judiciary system high Court was established and under the executive, the office of the chief minister and the Council of Ministers was established.



Figure 1: Federal structuring of Nepal

5.1.2 Investments

The annual budget of government for Hetauda sub metropolitan city is found to be increasing when compared the years from 2074 to 2078. In 2074/75, the budget for Hetauda was Rs 1.3 billion, which increased to Rs 2.08 billion in 2077/78. This is an increase of 60% in the budget for Hetauda sub metropolitan city in 4 years.

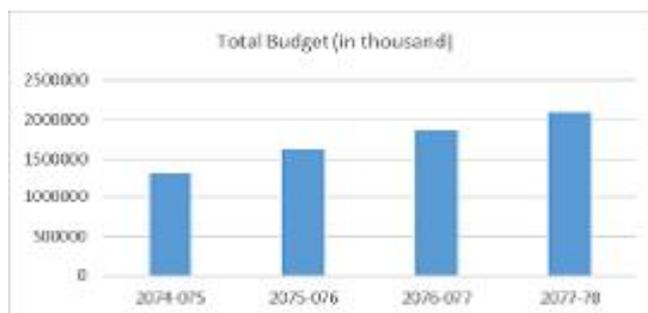


Figure 2: Annual Budget of Hetauda Sub-metropolitan City

5.1.3 Services

There are 8 hospitals in Hetauda. Most of the hospitals lie in Ward 2, whereas there are 19 wards in Hetauda. This shows that the distribution of health care is uneven across Hetauda.

Name	Number of beds	Location
Hetauda hospital	50	Ward 2
Makwanpur Sahakari Hospital	15	Ward 2
Hetauda Community Hospital	15	Ward 2
Devi Hospital	15 (Closed)	
Hetauda Community Eye Hospital		Ward 10
Orthopedic Hospital	15	Ward 2
Hetauda CT Hospital	25	Ward 2
Hetauda Model hospital		Ward 2
Chure hill hospital		Ward 11

Figure 3: Number of Health institution (2076)

In Hetauda, more than 60% of the educational institutions are found to be owned by government, whereas less than 40% are owned by private sector.

5.1.4 Accessibility

In Hetauda, until 2070, a total of 106km road was blacktopped, 99km road was graveled and 34km was concrete road. However, a sharp increase in the number and total length of roads concreted can be seen in subsequent years, which is supported by the data from the years 2074, 2075 and 2076 shown in the tables below. Also, the number of buses have been

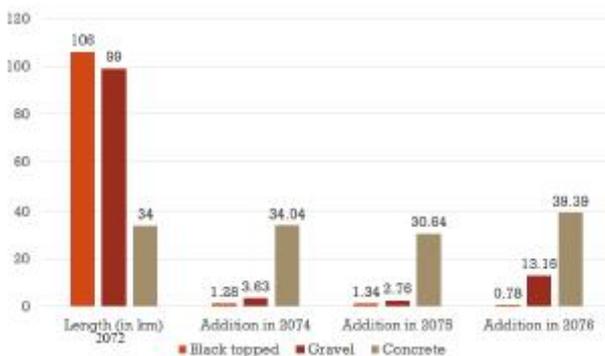


Figure 4: Length of Road Network

increasing to each of the major routes, which shows that the demand and the population has been rising in

most of these areas.

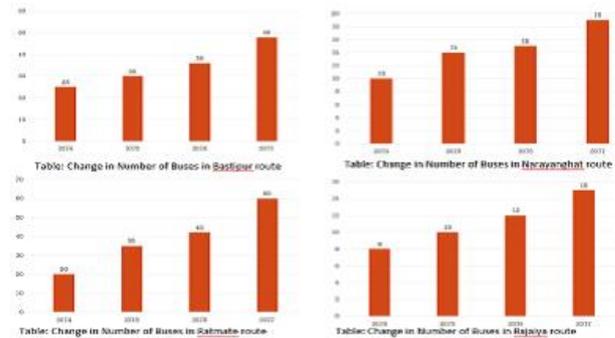


Figure 5: Number of busses in different route

5.1.5 Income potential and economic productive forces

The number of registered businesses increased from 1039 in 2065 BS to 3132 in 2077 BS. This shows an increase of number of 2093 businesses or an increase of 200% in number of business in 12 years.

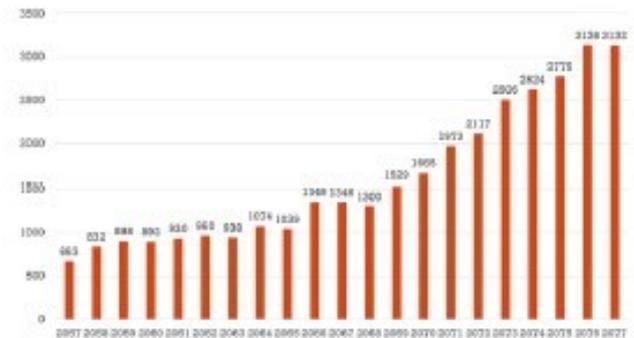


Figure 6: Number of registered business

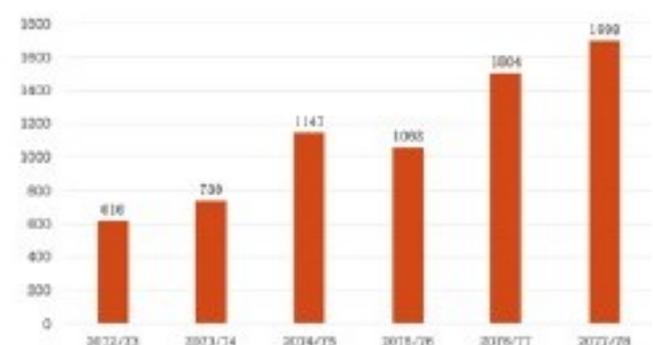


Figure 7: Change in Number of small and cottage industries

5.1.6 Technological advancement

After the introduction of online system in various government institutions of Nepal like department of Inland Revenue, department of transport management, public Service Commission etc, the delay in time for processing felt by the general public has reduced. Nagarik app has been released in May 2, 2021 which includes various government services in a single application. The digitalization in data entry and other technological advancements is hence crucial driving factors for transformation of Administrative operations in Hetauda.

5.2 Areas of transformation

The second objective of this research was to determine the key areas of transformation that played influential role in the spatial transformation of Hetauda. These areas of transformation were found out during the data analysis stage of the study. They are;

5.2.1 Change in urban form

The Google earth imagery of core area of Hetauda in 2002 shows less built up density. The periphery around the urban core consisted mostly of agricultural land. Similarly, the core area of Hetauda in 2010 shows some increment in built up density. The periphery which consisted mostly of agricultural land had started the process of converting into built up areas. However, the core area of Hetauda in 2018 shows rapid increment in built up density. The periphery also showed increase in the process of conversion into built up areas, and encroachment of built up areas into catchment areas like riverside land, forest areas etc. The areas like Kamane and Karra which was showing increase in filling up of the built up areas shows slow rate of urbanization arriving at 2021. Other areas like Goplingtar, Huprachowr and Core Hetauda Bazar shows increase in rate of urbanization.

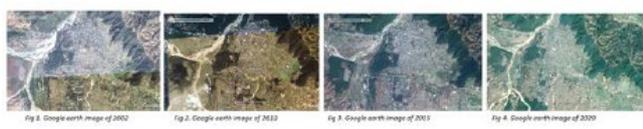


Figure 8: Change in urban form

5.2.2 Change in land prices

The major increase in land prices were seen in fast urbanizing areas like Kamane, Hupra Chowr and

Goplingtar. At Kamane, the land price increased from Rs 100,000 per dhur to Rs 450,000 per dhur from 2072 to 2078 BS, which is an increase of 350%. At Huprachowr, the land price increased from Rs 500,000 to Rs 1,500,000 per dhur from 2072 to 2078 BS, which is an increase of 200%. Similarly, at Goplingtar, land prices rose from Rs 70,000 to Rs 200,000 per dhur from 2072 to 2078 BS, which is an increase of 185%. This increase in land prices show that there is a demand for land in these areas of Hetauda, which shows a positive increase in the rate of urbanization.

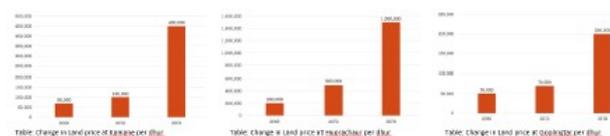


Figure 9: Change in Land Price

5.2.3 Demographic change and migration

In all the years from 2073 to 2077, the in-migration has exceeded out-migration in Hetauda. However, in the year 2077, Hetauda was declared as the permanent provincial capital of Bagmati province. Hence this is the reason behind the change in in-migration of Hetauda from 1711 people in 2076 to 6242 people in 2077. However, out-migration has also increased comparing the years 2075-77 from 298 people in 2075, 808 people in 2076 to 2608 people in 2077. The increase in out-migration can be attributed to presence of better facilities and job opportunities in Kathmandu or abroad.

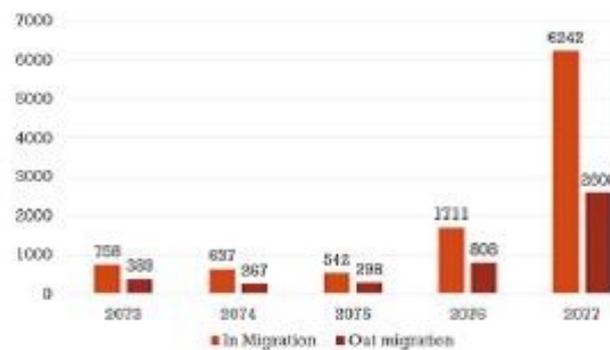


Figure 10: Change in Migration Pattern

6. Conclusion

Spatial transformation is process of the changes in land use, expanding built up areas and in changing

urban form. Some of these transformative changes were identified in this study, which are crucial as Hetauda is the administrative center of Makwanpur District and the provincial capital of Bagmati Province. It is one of Nepal's largest cities, located at the crossroads of two major national highways, the Tribhuvan highway and the east-west route. The literature was carried out under various study areas of spatial transformation like the elements of city form, emergence of urban forms, land value theory, gateway model, push pull theory and urban rural linkage to understand the changes that are occurring in Hetauda. The conglomeration of neighborhood units in Hetauda represents the city where the temples, monument, parks, school are the landmarks. All these elements were found to be transforming in Hetauda. Gateway model define Hetauda growth though it was identified as growth centre. It was built as a long-distance trading post for the interchange of products and services between the Terai and the hill regions at first. Hetauda city, on the other hand, now serves as an intermediary for the movement of products and services between several locations, and hence might be considered a secondary gateway city. Hetauda is located along the east-west highway and connects to the key town of Birgunj as well as other towns and capital cities. In Ranchi after it became the capital of Jharkhand in 2000, economic growth, in combination with infrastructural development, were necessary to fulfill the demands of enormous population expansion and migration into urban areas, resulting in substantial urbanization at a rate of over 3% per year. Hetauda is now in the same position as Ranchi was at that time. As a result, urban and peri-urban areas are growing, with a shift in land use along highways that intersect cities and in their near proximity. Dehradun city has saw a significant rate of population growth of 16 percent between 2000 and 2010, after being declared as the state capital in 2000. With the creation of administrative offices, business complexes, and industries, migration from surrounding districts rose significantly in Deharadun, resulting in city expansion and an increase in the price of land in many parts of the city. [17]. In Hetauda, these exact changes were also observed in the study, namely demography and migration change, land value change and changes in urban forms. These changes have shaped the city of Hetauda significantly. The driving factors identified in this study like investment, services, accessibility, income potential technological advancement have shown a positive growth in the past subsequent years.

This shows that even though Hetauda was termed as a city with sluggish development and urbanization [3], the prospect of Hetauda to be developed as an emerging urbanized center for Bagmati province looks promising as per this study. Further research to better understand the relationships between the driving factors of spatial transformation and between the areas of transformation of Hetauda can be done, as the significance of Hetauda as the provincial capital of Bagmati province is substantially increasing.

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