

Chapter VIII

Technical Notes and Construction of Life Table in Sikkim

There are broadly two methods in the construction of life tables, namely (i) Direct method and (ii) indirect method. Indirect method is used here. In this method, data on age distribution are essential. In Sikkim, the registration of births and deaths are not recorded regularly and systematically. The registration of births and deaths Act 1969 was launched in Sikkim w.e.f. 27.9.79. The publication of its kind in the state is "Annual Report on the Registration of birth and death in Sikkim - 1991" during 1994. This is because that the registration of births and deaths was not functioning effectively and the number of registration were very negligible.

The method of construction of life tables is based on the comparison of the age distribution of two census report and the surveyed age distribution of 1992-93 in Sikkim. This method imposes a cohort living at one point of time to the survivors at the other point of time. Smoothing the age distribution for two censuses we get the probabilities of survival. Computation of survival rates are classified into three categories, e.g. (i) ages below 5; (ii) for ages 5 to 60 and (iii) ages 60 and above. Survival rate of 5-60 are obtained from smooth census age distributions but the survival rate in under five and old ages are derived by other indirect methods:

Derivation of survival ratios : Assumption : There is a common mortality scale, which is applicable to all cohorts. L_x implies the number of persons living between age x and $x + 1$ at any time, which is built up by these rates of mortality, P_x is the observed population aged x at 1971 census and ${}^1P_{x+10}$ the observed population aged $x + 10$ at 1981 and the observed values of L_x and L_{x+10} . Thus ${}^1P'_{x+10}/P_x = L_{x+10} / L_x$

We know $L_x = L_{x+1/2}$, L_x implies the usual life table number at age x , we get

$$(P'_{x+10}) / P_x = L_{x+10+1/2} / L_{x+1/2} = {}_{10}P_{x+1/2}$$

This estimates the probability that a person aged exactly $x + 1/2$ will survive for the next 10 years.

(a) Calculation of P_x for ages 5-60.

Obtaining the value of ${}_{10}P_{x+1/2}$ where x stands for 5,10,15,20,25 etc. at quinquennial intervals, we have to compute L_x from ${}_{10}P_{x+1/2}$ for values of x at decinial interval and then to compute L_x at five year age interval by interpolation. The other method is direct computation of ${}_5P_{x+1/2}$ from ${}_{10}P_{x+1/2}$ and then obtain the values of L_x . The method provides smooth rates of mortality.

(b) Ages over 60 : It is well known and accepted that most mortality tables follow Gompertz's law fairly closely in old ages. The relation $\text{colog } P_x = BC^x$

$$\text{Hence } \log (\text{colog } P_x) = \log B + x \log C.$$

This is Gompertz equation. It is used in British life tables and for official tables for all India 1957.

(c) Ages below 5 : There are two types of mortality i.e. infant and childhood mortality. It observed that a second degree polynomial would be suitable. UN found the same relationship in preparing life tables. The fitted equations are for males

$${}_5q_0 = -34.08 + 1.783q_0 - 0.000590873 q_0^2,$$

$$\text{for females } {}_5q_0 = -37.386 + 1.93462 q_0 - 0.000888462 q_0^2 \text{ and}$$

$${}_4q^1 = ({}_5q_0 - q_0) / (1 - q_0)$$

Description of other components of the life table :

1. n : The age interval from one exact age (x) to another ($x + n$) is n .
2. ${}_n P_x$: It is the probability of survival from age x to $x + n$.
3. ${}_n q_x$: te probability that a person of exact age x will die before reaching age $x + n$.

4. L_x : The number of persons who reach exact x out of a cohort.

5. ${}_n d_x$: It shows the number of deaths in the interval x to $x + n$.

It follows a relationship

$${}_n q_x = {}_n d_x / {}_n L_x$$

6. ${}_n L_x$: It gives the number of years lived in the aggregate, by the cohort to persons between ages x to $x + n$.

7. T_x : It shows the person years lived by the cohort after attaining age x or the total future life time of the L_x persons who reach age x .

$$\text{So } T_x = L_x + L_{x+1} + \dots + L_{x+n}$$

8. e_x : It is the average remaining life time. It implies the average number of years lived after age x by each of the L_x persons who attain that age. It is popularly known as life expectancy of age x and obtained from the relation $e_x^0 = T_x / L_x$ and e_0^0 is the expectation of life at age 0 or the average longevity of a person in a community.

The relationship between L_x & l_x : In our study the following relationships are used for x below 5.

$$L_0 = 0.276l_0 + 0.724L_1$$

$$4L_1 = 0.034L_0 + 1.184L_1 + 2.782L_5$$

Above ages 5 year, the following relationship is used

$${}_n L_x = n/2 (L_x + L_{x+n}) + (n/24) ({}_n d_{x+n} - {}_n d_{x-n})$$

This approximation, being less direct and theoretically less exact, but 0 practically it produces better results in real life.

The relationship of L_x for the values of the last two groups are

$${}_5 L_{80} = 1/2(L_{80} + L_{85})$$

$${}_w L_{85} = L_{85} (\log_{10} L_{85}), W \text{ is the terminal age.}$$

Technical drawbacks and insufficiency of data sources :

(i) The census age distributions are highly distorted due to errors in age reporting; under statement or over statement or digital preference. This requires a careful adjustment of the age data. In case survey, this reporting of age was very frequent; proper attention and cross-questioning techniques were used to minimise the error.

(ii) Migration is another factor. There is no proper record of state in and out migration. Although Jain, Zacharich and Sutharam have shown that migration contributes very little to the total population of the Indian states. Lack of transportation, and communication and inaccessibility and illiteracy are the major factors discouraging migration. It is well known that there are a continuous process of in-migration of Nepali from Nepal and Tibetans from Tibet, and very recently the migrants from Bhutan have created the problem critical. Although a proper care has been taken to overcome this internal migration problem.

(iii) Lack of adequate registration data, the registered infant mortality rate does not reflect the true picture. The first publication of births and deaths- 1991 came out in 1994; but there is no any complete set of data. It is only partial and unreliable. So, the probable infant mortality rate was fixed by considering all the data sources, e.g. survey, project report, Sikkim Govt, India Govt. etc.

(iv) The survival rates for the age group 1-4 were derived from relationship between childhood mortality and infant mortality as shown by other countries. It also needs better data on age specific at lower age and younger age. The record of the government is very poor, it is mentioned earlier. The mortality rates are taken by considering all the reliable data sources. And lastly the old age mortality was extrapolated by Gomperts curve.

The infant mortality rate plays a crucial role in the construction of life tables. It has a significant influence on the derived values of expectation of life at birth. The basic source of data for measuring birth, death and infant mortality rates is vital registration. It is plight is poor in India. The plight of the state vital registration is basically insufficient and rare. Its functioning is inadequate. The state level shows

a political motivated and biased arbitrary and estimated data:

The main sources	Infant mortality rate	
(i) Centre for monitoring Indian Economy	India 1992	79
(ii) Sikkim Herald, govt. of Sikkim Feb. 8, 1993	Sikkim	49
(iii) Sunshine in sikkim, Ananda Bazar Patrika 12 Dec. 1996	Sikkim	45
(iv) Veena Bhasin - Survey 1989	Sikkim	117

The rates shows a high variation and these differences are due to different types of errors. So considering all the data from the different sources, the level of probable infant mortality rate is estimated in following manner :

(i) The Publication of Sikkim government is given a moderate weightage; it is an approximation and estimation of state government.

(ii) More emphasis is imposed on Indian infant mortality rate; this is based on vital registration and sample survey by NSSO.

(iii) The estimation of Veena Bhasin is given a less weightage; this is survey based.

The probable infant mortality rate (1992-93)

$$= \frac{1}{4} (45 + 49) + \frac{1}{3} (79) + \frac{1}{8} (117) = 23 + 26 + 14 = 63$$

(Fractions are neglected in the calculation)

Likewise, the death rates varies widely from source to source; main sources are given :

			Death rates	
			1991	1992
(i) Centre for monitoring	T		7.5	6.9
Indian Economy	Sikkim	R	8.5	7.1
		U	3.0	2.0
(ii) - do- (CMIE) India	T			9.3
		R		10.6
		U		5.8
(iii) Veena Bhasin - Sikkim Survey 1989			10.9	
(iv) Sikkim Herald	Sikkim		17.3	
(v) Sunshine in Sikkim				
Ananda Bazar patrika 1996	Sikkim		6.6	

The are high variations in all the death raes. So we consider a composite probable death rate. The average death rates of Sikkim in 1991 & 1992 is added with the one third of the India rate, 1992 to obtain the estimation. the probable death rate= $1/2(6.9 + 7.5) + 1/3(9.3) = 7.2 + 3.1=10.3$.

It implies a more emphasis on state's mortality and moderate weightage to National death rates.

Human Development indicators and its Technical Framework : The notion of Modified Human Development Index (MHDI) was incorporated the Human Development Report 1993, to make the indicators comparable over time. The algebraic expression is as follows : X_1 is the life expectancy as health and longevity indicator, X_2 is the Adutl literacy rate X_3 is the mean years of schooling and X_4 is

the per capita income indicator adjusting with purchasing power parity and the threshold income level- The contribution of each stock as flow variables to the HDI can be expressed as Z_i where :

$$Z_{ijt} = (X_{ijt} - \min_{j,t} x_{ijt}) / (\max_{j,t} x_{ijt} - \min_{j,t} x_{ijt})$$

Hence j implies the country, t denotes the time period and $i = 1, 2, 3$, and 4 the indicators as flow variables.

To keep the denominator fixed over time and over all countries, the maximum and minimum normatively are fixed for all times and for all countries

$$MHDI_{jt} = 1/3 z_{ijt}$$

The HDI for 1994 has suggested a new basis of calculation from the previous years. Consequently, the respective limits for four basic variables have been fixed as follows : for longevity the maximum would be 85 years and minimum would be 25 years, for gender specific, female would be 87.5 years and male would be 82.5 years. Adult literacy is prescribed as 100 per cent and 0 per cent as upper and lower limit. To make it more meaningful and affect the literacy rate is adjusted with mean years of schooling. The limit of the mean years schooling is taken as 15 and 0 years. Income limits purchasing power parity \$ 40,000 and \$ 200. To calculate income, the threshold value is taken to be the global average real GDP per capita of PPP \$ 5120. Beyond the threshold point multiples of income are discounted using a progressively higher rate.

Technical Perspectives : National or United Human Development Index concept considers the whole country as an unit. But it is very obvious that within each country there is a wide disparity of HDI among the different regions, climatic zones, ethnic and religious groups, between urban and rural areas and sexes. As a consequence, we need a disaggregating HDI within a country which would be very useful to the planners and policy makers to reach the target group. Disaggregating HDI needs disaggregating data by which we can make internal human development analysis.

One of the major components of Human Development Index is life

expectancy, Life expectancy represents the overall health status of the people. It depends on the incidence of mortality rate which in turn depends on a large number of factors such as the occurrence of epidemics, the prevalence of diseases, the level of nutrition, the conditions of living and housing, care of women, infant mortality, sanitation condition etc. The infant mortality is an important factor, depressing the life expectancy. Vital registration is very poor in this region. That is why reliable data are not adequate in this backward region.

Literacy plays a crucial role in developing the quality of human resource, raising the consciousness, efficiency and productivity. The spread of modern system of education is replacing the traditional system. Inaccessibility, natural hazards and the lack of basic needs hinder the growth of literacy in the backward Sikkim.

Income is the most decisive factor. Command over resources is the prime condition of decent living - but it is very difficult to measure. Sikkim is a hilly state. People living in mountainous areas need more energy from food and fuel and more expenditure on cloths and shoes because they lose more energy in the colder temperature.

Life Table : Sikkim 1981

<i>Age Group</i>							
<i>l - n</i>	q_x	l_x	${}_n d_x$	${}_n L_x$	T_x	e_x (Years)	
0-1	0.100000	100000	10000	092760	4574573	45.745730	
1-4	0.049750	090000	04478	347942	4481813	49.797920	
5-5	0.018270	085522	01562	422930	4133871	48.336930	
10-5	0.008990	083960	00755	417970	3710941	44.198920	
15-5	0.022132	093205	01842	411786	3292971	35.330410	
20-5	0.031328	081363	02514	400770	2881185	35.411490	
25-5	0.037982	078849	02995	386997	2480415	31.457790	
30-5	0.046234	075854	03507	370733	2093418	27.597990	
35-5	0.056732	072347	04104	351769	1722685	23.811420	
40-5	0.072121	068243	04921	329466	1370916	20.088740	
45-5	0.106826	063322	06763	300510	1041450	16.446890	
50-5	0.149408	056588	08450	263213	0740940	13.093590	
55-5	0.279524	048138	13476	207694	0477727	09.924114	
60-5	0.339935	034662	11782	143574	0270033	07.790462	
65-5	0.529983	022880	12126	083154	0126459	05.527054	
70-5	0.679933	010754	07312	033523	0043305	04.026874	
75-5	0.779779	003442	02684	009111	0009782	02.841952	
80-5	0.849604	000758	00644	000436	0000671	00.885224	
85+	1.000000	000114	00114	000235	0000235	02.061404	

Life Table : Sikkim 1992

<i>Age Group</i>						
<i>l - n</i>	<i>q_x</i>	<i>l_x</i>	<i>ⁿd_x</i>	<i>ⁿL_x</i>	<i>T_x</i>	<i>e_x(Years)</i>
0-1	0.063000	100000	06300	095438	5468105	54.680
1-4	0.033400	093700	03129	366380	5372667	57.340
5-5	0.009130	090571	00827	450220	5006359	55.270
10-5	0.004490	089744	00403	447749	4556139	50.770
15-5	0.011066	089342	00989	444441	4108390	45.980
20-5	0.015664	088353	01384	438443	3663949	41.470
25-5	0.018991	086969	01651	430839	3225506	37.080
30-5	0.023117	085318	01972	421808	2794667	32.750
35-5	0.028366	082246	02364	041017	2372859	28.470
40-5	0.036060	080982	02920	397983	1961842	24.230
45-5	0.053213	078062	04153	380469	1563859	20.030
50-5	0.074704	073909	05521	536870	1183390	16.010
55-5	0.139960	068388	09571	320168	0826520	12.080
60-5	0.269900	058817	15874	256782	0506352	08.600
65-5	0.048920	042943	21007	161892	0249570	05.810
70-5	0.065689	021936	14409	070463	0087678	03.996
75-5	0.075429	007527	05677	015353	0017125	02.287
80-5	0.831210	001850	01537	001081	0001862	01.006
85+	1.000000	000313	00313	000781	0000781	02.490

References:

1. Kohli K.L. Mortality in India - A statewise study sterility Publishers Pvt. Ltd. AB/9 Safdanig Eudave, New Delhi No 16 1977 P45-49
2. Greville, T.N.E. "Short Methods of constructing Abridged life Tables" in Jaffe, a.J. (Ed) Handbook of statistical methods for Demographers, Washington, U.S. Govt. Printing office 1960 p40
3. UNDP : HDR Report- 1993 Oxford University Press, New York
4. Personal computation.

Comparative Human Development condition in Nepal, Bhutan & Sikkim.

o Growth and development are the two major goals of our society from a macro-economic view point. This is reflected through changes in incomes. But recently, the focus has been shifted to distribution of incomes. The 'goals of development' stresses the reduction of poverty rather than raising per capita income.¹ The role of social services like health, education, nutrition and environmental preservation are receiving greater attention. Thus, the term 'development' has undergone many changes in its implication from the Gross National Product approach to the idea of social development.

Broadly speaking, development has two aspects : the quantitative and the qualitative. The essence of the view was underpinned in the work of Prof. A.K.Sen. The concept stress on certain basic capabilities rather than lack of incomes. It is an admixture of the qualitative as well as quantitative aspects of development. The main and basic question is 'development for whom' and how : As explained in HDR-1990. "Human Development is a process of enlarging people's choices ... at all levels of development, the three ones are for people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living."² Human development explains beyond basic needs and it is related with all human beings, not only the poor, but the poor countries. A human development strategy always tries to enhance and improve the human condition. Paul streeten has described that it is development of the people, for the people, by the people. Of the people indicates adequate income generation through jobs, for the people implies social services for those who need help, and by the people means participation. It may be explained as the economic, social and political dimensions of development.

The concept of judicious development was also elucidated in the writings of G.Myrdal "when food production has been increased by expanding cultivated

areas, the blessing has often been mixed. This expansion has often caused damage to the soil, particularly in areas of shifting cultivation. Deforestation and over-grazing combined with Indian taboos ... it is harder to keep production level with population increases".³ Hence there is a net work of relationship among the population, production or development, customs, natural setting, policy implications and people's acceptability.

Anand and Ravallion have recently postulated that economic growth works not by itself automatically on reducing poverty, promoting human development and in particular enriching health, but only if there is at the same time (i) "income poverty reduction" through the productive and remunerative use of labour and income distribution, and (ii) the provision of social services, particularly health service. with the implementation of provision (i) and (ii) we can also reduce poverty without growth (e.g. Sri Lanka and State Kerala); while growth with them does not reduce poverty (e.g. Brazil and Pakistan).⁴ As a result, the concept of Human development has become so popular. Beside this the sustainability of development is endangered due to the increasing threat to the nature and environment and the question of intergenerational equity comes into focus. So the concept of sustainable development is evolved as a process of development in which economic, fiscal, trade, energy, agricultural and industrial policies are designed to bring about development that is economically, socially and ecologically sustainable. Economic growth should be designed in such a manner that could lead Human development process in proper way to uplift the quality of life and to conserve the environment and future generation.

The HDR reports of 1990, 1991, 1992, 1993, 1994 classified all countries into three broad categories i.e. more than 0.80 point is regarded as high ranging 0.50 to 0.789 is counted as medium and below 0.50 is considered as low human development.⁵ But the comparison is made with without considering the stages of development, its historical, cultural trends and inherent nature. The HDR report - 1990 depicts that India as a whole ranks 37th in terms of HDI. The value is 0.439. But the study of A.K.Shivkumar disaggregates the unified HDI. It shows that out of 17 major states. Uttar Pradesh with 0.292 is placed between Ethiopia and Zaire

and is ranked between 19th and 20th respectively. The HDIs for Bihar, Rajasthan, M.P and Orissa are in the same region as Bangladesh. Nigeria, Uganda and Kerala and achieved the highest HDI value i.e. 0.651 despite low per capita income among the Indian states.⁶ So the variation is very prominent within the country. It depicts that different states are passing through different stages of development at a particular period due to their historical, geographical, technical, demographic, socio-economic and other facts. There are also heterogeneous stages of development within a region, ethnic groups and religion. The state Sikkim has a subsistence agricultural economy with traditional values, customs and beliefs where the minimal requirements remain out of reach to the common people.

Most of the small, poorer and backward state like Sikkim are characterised by internal inequalities; between individuals, classes, religions and regions and in many parts, the inequalities and deprivations are still increasing. Developed countries and states are making rapid progress due to social consciousness and regulated population growth. In Sikkim the literacy programme which leads to social consciousness has got momentum after its merger with India in 1975. Although with the spread of modern medical facilities, there is a considerable improvement over health and hygiene but the birth rate and survival proportion has also increased and as a result the population growth remains unregulated and another notable cause for unregulated population growth is due to unregulated migration from neighbouring Nepal and Bhutan.

In the following section, we are elaborating the human development profile of Nepal, Bhutan and Sikkim. This region belongs to Eastern Himalayas. Topographically being similar, these regions have been extended from sub-tropical to alpine. Demographically, they are multi-racial. There is a striking similarity between their social, cultural, religious and economic life.

Nepal Profile

Rectangular shaped Nepal is bordered by China in the North and India in the east, west and south. Rugged terrain, wild rivers and snow clad mountains are

the natural features of it. The total land area is 147, 181 sq. kilometres with a length of 885 km (east-west) and a width of 193 km (non-uniform). Its geographical composition is as follows :

- (i) Mountains 25% of the total land coverage
- (ii) Hill 58% of the total land coverage
- (iii) Terai (plain) 17% of the total land coverage

There are three major ecological and topographical zones, namely the mountains in the north, the hills in the middle and the plains in the south. The land use pattern is as follows 18 per cent as agriculture, 37.6 per cent is covered by forest, 15.3 per cent under snow, pasture comprises 13.4, water 2.7 per cent and others 13 per cent.⁷

The total population is 15,022, 839 with a growth rate of 2.57 in 1990 (estimated). Besides these, there are 75 districts 33 municipality and 4915 village development community.⁸ Nepal initiated her development programmes only a few decades back with the introduction of five year plan in 1956-57.

Table : 1

HDI NEPAL

The Human development of Nepal is shown in the following⁹

<i>Year</i>	<i>Life (Yrs) expectancy</i>	<i>Adult Literacy (%)</i>	<i>Mean Years of schooling</i>	<i>Real GDP per capita (PPPP)</i>	<i>HDI</i>
1990	52/1987	26/1985	N.A.	722/1987	0.273
1991	52.2/1990	22.4/19	1.8	770/1988	0.158
1992	52.2/1990	25.6/1990	2.1/1990	896/1989	0.168
1993	52.2/1990	25.6/1990	2.1/1990	920/1990	0.170
1994	52.7/1992	27.0/1992	2.1/1992	1130/1991	0.289

Source : United Nations Development programme, 1990,91,92,93,94.

The above table shows that the HDI of Nepal is 0.170 and it occupies 152th position out of 173 countries. A sharp decline is observed from 1990 to 1991 due to the technical restructuring. The HDR 1994 reveals that Nepal with 0.289 point ranks 149 out of 173 countries. The reports of 1990-94 suggests that its HDI is better than Bhutan, Sudan, Burundi but it has improved its position over Uganda, Rawanda and Angola during this period.

World population data sheet has given the life expectancy as 50 years, birth rate 42 and death rate 17 per 1000. It indicates both a high fertility rate i.e. 6.1 and infant mortality rate very high. It is 112 and natural growth rate 2.5. The per capita GNP is recorded at Us \$ 170¹⁰.

Nepal suffers from a number of handicaps so far as its development programme and implementation are concerned. The most important of them are : (a) geographical location, (b) historical factors, (c) cultural taboos, (d) political factors, (e) social system and (f) natural barrier.

Bhutan Profile :

Bhutan is bordered by China, India and Nepal. It is a hilly land-locked country, comprising an area of 47,000 sq. km. with a population of 1.165 million in 1982.¹¹ In 1986, the total population of Bhutan was estimated at 1.2 million with a growth rate of 2 per cent per annum. Bhutan is an absolute monarchy, without a written constitution. The political set up is so closed that not many information are forthcoming.

Economically, Bhutan is one of the poorest country in the world. Agriculture contributes 45.2 per cent of gross domestic production in 1987 and more than 90 per cent of the working force were engaged in agriculture whereas industry employed only one per cent of the labour force and contributed 27 per cent of the GDP in 1987. The first five year plan was launched in 1961 with an outlay of NU 107.2 million where as the outlay rose to N.U. 3367.8 million in the fifth plan in 1981-86. At present, the seventh plan is in progress.¹²

There was no formal education system in Bhutan except the teaching of religion and classical Dzongkha in monastic schools, in monasteries and dzongs. The formal education pattern is two years of pre-school five years of primary education (Class I-V), five years for secondary education (Class VI-X) and two years as "Plus Two Programme" at the Junior College. At present, there are 150 primary schools, 21 junior high schools, 9 high schools, 7 technical and vocational institutes, 5 sanskrit pathasalas, 17 monastic schools, 2 traditional arts schools and a typing school. ¹³ Bhutan has no missionary or private schools and all the educational institutes are sponsored by the Royal Government of Bhutan.

Table : 2¹⁴

HDI - Bhutan

<i>Year</i>	<i>Life (Yrs) expectancy</i>	<i>Adult Literacy (%)</i>	<i>Mean years of schooling</i>	<i>per capita Real GDP (PPP)</i>	<i>HDI</i>
1990	49/1987	25/1985	N.A.	700	0.236
1991	48.9/1990	32.2/1985	0.2/1980	750/1985	0.159
1992	48.9/1990	38.4/1990	0.2/	750/1989	0.146
1993	48.9/1990	38.4/1990	0.2/1990	800/1990	0.150
1994	47.8/1992	40.9/1992	0.3/1992	620/1991	0.247

Source : UNDP 1990, 1991, 1992, 1993, 1994

The urban-rural population ratio is 13:89 with an illiteracy rate of 77 per cent. The per capita Gross National product in 1980-81 was US \$ 113 which. The above table shows that the life expectancy has gradually declined to 47.8 years in 1992 from 49 years in 1987. The life expectancy reflects that the health care, nutrition and mortality rates are unfavourable. There is a remarkable improvement over adult literacy rate i.e. 40.9 per cent in 1992 from 25 per cent in 1985, although

the mean years of schooling has improved very slightly. The per capita real GDP has mounted to PPP \$ 800 in 1990 from \$ 700. But it sharply declines to \$ 620 in 1991 from \$ 800 in 1990. It is seen that Bhutan has occupied 162th position in HDR - 1994 out of 173 countries.

A UNESCO study shows a poor condition of overall literacy rate although the achievement in education is quite impressive. They have increased 13 per cent adult literacy within five years during 1985-1990. Another report, the World Population Data sheet shows life expectancy of 46 years, GNP is US \$ 190 which is more than Nepal.¹⁵ GNP or GDP is a significant indicator influencing the quality of life or HDI of a country. In case of Bhutan, the population Data sheet and UNDP report give two different economic indicators. This makes the determination of Human development condition in Bhutan a difficult task.

Sikkim Profile :

Sikkim became a part of India in May, 1975. Economic development of Sikkim was, however, launched with seven years plan in 1954. The main population composition of Sikkim are the Nepalese, Lepchas, Bhutias and Plainsmen. The latest census report 1991 reveals population figure of 4,03,612 persons composed of 214,723 males and 188,889 females. The growth rate is 28.47 per cent with a just favourable sex ratio 878 females per 1000 males and the urban population is 9.10 per cent in 1991 as against Indian urban population 25.73 per cent. It reflects that more than 90 per cent of the total population live in rural areas where the basic amenities and modern facilities are not adequate.

Land Area and Population composition¹⁶

Table 3

	<i>Sikkim</i>	<i>North</i>	<i>East</i>	<i>South</i>	<i>West</i>
Land area(sq.km.)	7096	4226	954	750	1166
Population (1991)	406457	31240	178452	98604	98161
man Land ratio (sq.km/man)	0.0174	0.135	0.0053	0.0076	0.0118
Urban Population	9.10	2.57	17.86	2.61	1.80
Density of population	57	7	187	131	84
Sex ratio	878	828	859	892	915
Growth rate	28.47	18.09	28.60	29.78	30.55

Source : Sikkim : A Statistical profile

The land area is 7096 sq. km. It consists 0.047% of the Indian population. the density of population per sq. km. is very low i.e. 57 as compared to Indian density 274 in 1991 has the highest concentration of 187 person per sq.km. The growth rate of population (absolute) is 28.47 which is higher than Indian growth rate i.e. 23.50. If we observe district wise, it is the west district which realise highest growth 30.55 followed by South and East district. the sex disparity is observed from the sex ratio. In Sikkim the sex ratio is unfavourable: it is 878 which is far below the all India sex ratio 927, indicates that there is a clear discrimination between male and female at all stages of life. Urbanisation reflects a better health, hygiene and social consciousness, means a better quality of life. In Sikkim only 9.10 per cent population lives in urban area which is far below than all India average 23.50. It implies that the natural hazards and the slow progress of the state and the traditional beliefs keep them in the isolated world.

East has the highest concentration of 187 persons per sq. km. where the North consists of 7 persons per sq. km. which is very low. all India figure show 274 per sq. km. The man-land ratio is 0.0053 in East district which is lowest out of four districts and it is highest in North i.e. 0.135. But this variation is due the land composition and economic persists of area.

Table 4¹⁷

Classification of land

<i>1980-81</i>	<i>Survey</i>	<i>Area in hectares</i>	<i>Per Cent</i>
1.	Total operated land	1,09,968	15.37
2.	Forest	2,56,533	36.15
3.	Miscellaneous trees and groves	5,450	0.77
4.	Pastures	72,937	10.28
5.	Land put to non-agricultural	85,362	12.03
6.	Barren	1,80,250	25.40
		7,09,600	100.00

Source : Sikkim : A statistical profile

Agriculture is regarded as the backbone of the state since inception. Industrially, it is very backward. So the main economic emphasis depends on the land use system in the state. According to 1980-81. Survey the total operated land area is 15.37 per cent. It is divided into two parts namely for cereals production

and cash crops production like cardamom, ginger, orange and potato. It is also evident from the above table that the forest area is 36.15, Barren land is 25.4, land put to non-agricultural use is 12.03 per cent and pastures is 10.28 per cent of the total land. So the contribution of Agriculture is limited to the state economy due to natural barriers. It needs judicious plan to foster and develop the economy through agricultural planning and animal rearing. Besides this, there are two major rivers in sikkim. There is an ample scope of hydro-electricity in the state. But the hydro-electricity projects must be matched with environmental and social issues¹⁸.

Life expectancy and Health profile of Sikkim:

Hence the calculated life expectancy and different health indicators are shown in a table to reflect the overall picture of the state. These results are assembled here from previous chapters. The life expectancy is calculated at 45.76 yr. in 1981 and 54.68 years in 1992. There is an improvement of ten years within 10 years of duration. This is possible due to overall improvement of health facilities which in turn lowers down infant mortality rate and age-specific mortality rate in the state. Although still the percentage of population above 60 years in the life table is very limited i.e. 3 to 4 per cent. The major vital causes of low life expectancy are high infant mortality death of pregnant mothers. Alcoholism, Tuberculosis, water borne diseases etc. The annual growth rate of population is very high i.e. 2.51 in 1991¹⁹. Beside natural population growth, the neighbouring state Nepal and politically disturbed Bhutan are contributing the latent population in the State. In the Age composition of population, Sikkim is found to have the highest percentage of population 38.28 in age group 0-14. the percentage of population aged 15-60 years in this state is 58.15, while the percent of population aged 60 years above is 3.57. This indicates a young Age structure of population. Dependency ratio is largely depends on the Age-structure²⁰.

Table 5

Life expectancy and health

	<i>Earlier</i>	<i>Latest</i>
Life expectancy(year) 1981/1992	45.76	54.68
Fertility rate/1000 1984/1990	164.8	154.6
Crude birth rate 1981-83/1991	32.4	26.5
Total population (million) 1981/1991	3,14,999	4,06,457
Annual growth rate 1991		2.51
Urban Population (%) (1981/1991)	16.15	9.10
Annual growth rate 1971-81/1981-91	50.77	28.47
Dependency ratio (total) 1992 70.86/old age	4.66	75.62
Contraceptive prevalence rate/1991		20.6
Infant mortality rate/1000 1981/1992	100	63
Under five mortality rate 1990		9.4
One year old immunized (%) 1991	NA	87
Access to health services 1990		25.33
Access to safe water (%) 1991		73.05
Access to sanitation (%) 1991		34.97
Births attended by health serv. (%)		NA
Population per doctor 1991		3359
Population per nurse 1991	NA	2894
Sex ratio 1971/1981/1991	862	834 878

Source : Compiled from different source mentioned earlier

Life expectancy is regarded as the sole condition of the impact of demographic factors. But due to the lack of disaggregate data, the formation of life table is not possible to work out life expectancy for smaller states like sikkim. As S.K. Shivakumar wrote. "However the absence of disaggregated data for the smaller states and union territories and for the state of North-East India prevents the computation of the HDI for these regions". As a result we have taken the estimated life expectancy in computing HDI for sikkim with its detail health informations. In accordance with Sikkim at a glance 1993. There are 5 hospitals, 23 primary health centers, 143 primary sub-centers, 805 beds, 121 doctors, 46 staff nurses and 379 ICDS centers all over sikkim. The population per doctor is 4452 it increases from East to West.

Table 6

Education and Communication

Adult literacy (% 15+)	51.78
Mean Years of schooling (25+)	1.93
Scientists/technicians (per 1000)	NA
Primary enrolment ratio	59.94
Primary drop out (%) (1993-94)	62.27
Secondary enrolment ratio	6.07
Combined primary and secondary enrolment	66.01
Radios (per 1000)	40
Television (per 1000)	7
Teacher-pupil ratio (30.9.93)	
Pre-Primary	1:23
Primary	1:18
J.H. School	1:19
Secondary	1:11
Sr. Secondary	1:13

Source : Personal survey and Govt. Publication

Education and Communication Profile:-

Adult literacy is calculated on the basis of survey. It is found to be 51.78 percent and mean years of schooling is 1.93 years. The primary drop out ratio is 62.27 per cent during 1993-94. But the teacher pupil ratio is very favourable. It is basically due to high drop out at the primary stage.

Education is an integral part of human development. Specially, the contribution of primary education to development - in all societies is very significant. Education, specially primary, regarded as a valuable unique investment, serving as an effective instrument leading to development. It has its own intrinsic value, enhancing the human capabilities to enjoy life, including better habits and approaches to life and that leads to enhance the quality of life. It is an important instrument of economic development at personal level. It enhances the productivity of labour force in the labour market and their efficiency, thereby increases the earnings and production at a time, widens the market.

From the national economic front, primary education is found to contribute to miracles in transforming nations from poor undeveloped societies to rapidly developing countries (World Bank - 1993). Besides these primary education plays a contributory role in improving health. The impacts are more significant in case of women education. It directly contributes to reduction in fertility rates, indirectly by increasing the rates of participation of women in labourforce and increasing the minimum age at marriage and directly through better approached to family planning and development (nair-1981), thereby reducing population growth. Primary education is also found to improve significantly the rates of child survival and life expectancy.

The literacy rate is 56.53 per cent in Sikkim. The male literacy rate is 64.34 per cent which is higher than the female literacy rate of 47.23. There is a wide gap between male-female literacy. To enhance the human development of Sikkim not only depends on the accelerating the literacy mission but also gender specific gulf should be reduced very sharply. It is evident that there is a high correlation between the female literacy and the human development. In India, highest female

literacy is observed in Kerala and it also occupies the highest position in the human development Index in the country. So it needs a special care to reduce the gap.

Besides this, the Tibetan influence in educations and moral training play a crucial role too. There are more than six important monasteries. They have their traditional and religious education. Traditional education system is imparted in different monasteries and are in existence along the modern education system. For higher studies in religion, there are two institutions at Gangtok - one for Nyingma sect at Deorali and other at Rumtek for Karma-Kargyupa sect.

Table 7

Income & Poverty²¹

	Earlier	Latest
People below poverty line 1987-88/1992	34.67	46.58
Real SDP per capita (PPP US \$)/1992		1825

Income Profile : Income is the crucial economic indicator in the Human development Index. This income is converted into real state Domestic product per capita in people's purchasing power parity in US dollar. It is found to be 1825 (PPP US \$) in 1992.

In Sikkim, population below poverty line was 34.67 per cent during 1987-88 but it rose to 46.58 per cent during 1992. It depicts that the poverty of Sikkim has increased more than 10 per cent within a very short period. It occurred due to two reasons e.g. the introduction and revised estimation of poverty line as proposed by Lakdawala Committee and another reason is the inelastic nature of the state economy. Agriculturally subsistence and industrially backward state failed to boost up economic development in the state.

Table : 8

Economic Classification of population - Sikkim ²²

	1971	1981	1991
(i) Population	209843	316385	406457
(ii) Main workers	111609	147436	164392
	(53.20)	(46.60)	(40.44)
a) Cultivators	N.A.	88610	95.078
		(60.10)	(57.84)
b) Agricultural labours	N.A.	4887	12851
		(3.31)	(7.81)
c) Household industry	N.A.	1586	1267
		(1.08)	(0.77)
d) Other workers	N.A.	52353	55196
(iii) Marginal worker	N.A.	5378	4329
(iv) Non-workers	98236	163571	237736
	(46.80)	(51.70)	(58.49)
(ii) + (iii) + (iv) = 100%			

Source : Census of India 1971, 81,1991

Economic classification of population reflects the relative change in proportion of total population in the state. The population composition of Sikkim reflects a young age structure. The row (ii) in the table shows that the per cent of main workers declined from 53.20 to 46.60 during 1971 to 1981 and it further declined to 40.44 per cent in 1991. Whereas the proportion of non-workers raised from 46.80 per cent to 51.70 per cent during 1970 to 1981 and later on it increased to 58.49 per cent during 1991. So we observed that the proportion of the main

workers were falling sharply and the proportion of non-workers i.e. social dependency had increased rapidly with time. And it is also clear that the change is nearly 13 per cent for both the proportion of workers and non-workers in opposite direction. So the social dependency has increased from 1971 to 1991.

The classification of main workers show that the proportion of cultivators declined from 60.10 per cent in 1981 to 57.84 per cent in 1991. But the proportion of agricultural labours has increased more than 4 per cent. It aggravates the poverty line. On the other hand the proportion of household industry declined from 1.08 to 0.77 per cent. So the above data clearly shows that dependency ratio has increased significantly after merger and the economically working force has declined upto 1991.

Computation of Human Development Index : National and State Level

The present calculation of Human Development Index is based on the formulation of UNDP Report - 1994. The maximum of value of expectation of life is taken as 85.0 years and the minimum value is taken as 25 years. Maximum and minimum adult literacy rate have been taken as 100 per cent and zero percent respectively and mean years of schooling as 15 years and 0 years respectively. Upper and lower ceilings of income have been fixed at PPP \$ 40,000 and \$ 200 respectively. The threshold value of income is estimated to be the world average real Gross Domestic Product per capita of PPP 5120 dollar. Incomes above the threshold point are adjusted by discounting, using a progressively higher rate.

To evaluate the HDI of Sikkim, a very small and hilly state, in comparison to whole India, a developing big country, we take the following four basic variables

Table : 9

	1992	1992	1992	1992
<i>Country/ State</i>	<i>Life (years) Expectancy</i>	<i>Adult Literacy (per cent)</i>	<i>Mean years of schooling</i>	<i>Income (PPP \$)</i>
Sikkim	54.68	51.78	1.93	1825
India	59.7	49.8	2.4	1552

Life Expectancy

Sikkim :

$$\text{Life Expectancy Indicator} = (54.68 - 25.0) / (85.0 - 25.0) = 29.68 / 60.0 \\ = 0.4946$$

India :

$$\text{Life Expectancy Indicator} = (59.7 - 25.0) / (85.0 - 25.0) = 34.7 / 60.0 \\ = 0.5783$$

The above table is compiled from previous chapters e.g. Health, Education and Income. Hence the life expectancy indicator of India is more than Sikkim. This is due to low life expectancy of Sikkimes and the reason behind these are explained in the previous chapter, health.

Adult literacy indicator of Sikkim is more than national average : it is due to rapid expansion of educational facilities in the state after merger. A huge amount was invested to promote the literacy mission in the state. But the mean years of schooling is 1.93 years in the state which is undoubtedly less than national average. It happened due to basically the old generation remained out of the purview of modern education and new generation come under it. Income front, per capita real SDP of Sikkim is more than India.

Adult Literacy

Sikkim :

Table : 11

$$\begin{aligned} \text{Adult Literacy Indicator} &= (51.78 - 0.00) / (100 - 0.00) = 51.78 / 100 \\ &= 0.5178 \end{aligned}$$

$$\begin{aligned} \text{India : Adult Literacy Indicator} &= (49.8 - 0.00) / (100 - 0.00) = 49.8 / 100 \\ &= 0.498 \end{aligned}$$

Means year of schooling

Sikkim :

$$\text{Schooling Indicator} = (1.93 - 0.0) / (15.0 - 0.0) = 1.93 / 15 = 0.1286$$

India :

$$\text{Schooling Indicator} = (2.4 - 0.0) / (15.0 - 0.0) = 2.4 / 15 = 0.16$$

Education attainment

Sikkim :

Total Educational

$$\text{Index} = \{(2/3) \times (0.5178)\} + (0.1286 / 3) = 1.1642 / 3 = 0.3880$$

India :

Total Educational

$$\text{Index} = (2/3) \times (0.498) + 0.16 / 3 = 1.156 / 3 = 0.3853$$

Income

$$\text{Sikkim} = (1825 - 200) / (5385 - 200) = 1625 / 5185 = 0.3134$$

$$\text{India} = (1552 - 200) / (5385 - 200) = 1352 / 5185 = 0.2607$$

Table : 10

Human Development Index - Sikkim & India

	Year -1992				
	<i>Indexed Life ex- pectancy</i>	<i>Indexed Educational attainment</i>	<i>Indexed Income</i>	<i>Summa- tion / 3</i>	<i>Human Develop- ment Index</i>
Sikkim	0.4947	0.3880	0.3134	1.1961	0.3987
India	0.5783	0.3853	0.2607	1.2243	0.4081

Human development Index of Sikkim is 0.3987 in 1992 and

Human development Index of India is 0.4081 in 1992. So Sikkim is lagging behind national average in respect to Human Development Index.

Table : 11

Sikkim Human Development Index : 1992

	<i>Indexed Life ex- pectancy</i>	<i>Indexed Educational attainment</i>	<i>Indexed Adjusted Income</i>	<i>Summa- tion / 3</i>	<i>Human Develop- ment Index</i>
Total	0.4947	0.3880	0.3134	1.1961	0.3987
Male	0.5078	0.4304	0.3134	1.2516	0.4172
Female	0.4797	0.3582	0.3134	1.1513	0.3837

In this consequence, Government and policy makers need a special attention to march the hilly stgatic backward State in the main stream of Human and Economic development. Not only this, the policy makers must take care of every of item of Human development, e.g. Health, Education and Income for a decent living.

The combined Human Development Index of Sikkim is 0.3987 in 1992. The male human development Index is 0.4172 in 1992 and the female human development Index is 0.3837 in 1992. The difference is 0.0335. Gender bias is prominent in Sikkim. Hence the female HDI is lagging behind male HDI. In Sikkim, females are deprived or backward in every front of human development Indix. So it is evident that Sikkim is running behind national average and the females are lagging behind male within the state. So we require a Gender sensitive human development programme in the state to nourish balanced Human development in Sikkim.

Table : 12

Stages of Human Development in Sikkim, Nepal & Bhutan :

Indicators	Year 1992		
	Sikkim	Nepal	Bhutan
Life expectancy(years)	54.68	52.2	48.9
Adult Literacy	51.78	25.6	38.4
Mean Years of schooling	1.93	2.1	0.2
Real GDP/SDP (PPPS)	1825	920	800
Crude birth rate	26.5	39	40
Crude death rate	8.8	14	17
Fertility rate	5	5.6	5.9
Infant mortality rate	63	100	131
HUMAN DEVELOPMENT INDEX	0.3987	0.168	0.146

The comparative Human Development Index of Sikkim, Nepal and Bhutan are 0.3987, 0.168 and 0.146 respectively in 1992. It is clear from the above table that Sikkim undoubtedly occupies a better position in terms of human development. And it also depicts that as compared to Nepal and Bhutan, Sikkim is in a better condition in respect of demographic factors too. Besides this, Adult literacy rate is 51.78 per cent, Mean years of schooling is 1.93 and Real GDP/SDP (PPP\$) is 1825 in Sikkim in 1992. It is evident that in the field of Adult literacy, Sikkim is far ahead of Nepal and Bhutan whereas in economic front, the gross domestic production (PPP\$) of Nepal is more than Bhutan by PPP \$ 120 and the per capita Net state domestic production of Sikkim at 1980-81 prices is 1825 (PPP \$) in 1992.

The human development of Sikkim is mostly influenced by its merger with India and a huge investment in the social sector to uplift the state. General literacy boosted up from 34.05 in 1981 to 46.84 in 1991. Not only this, all the vital indicators shows an impressive improvement. The Govt. of India initiated a planned infrastructural development in Sikkim to uplift the quality of life of the people of the state. So it has achieved a better position than neighbouring Nepal and Bhutan. Although, in terms of Human Development, the state is lagging behind National Average. In this consequence, it requires a more special judicious and rational programme to bring the state in mainstream in terms of Human development.

The primary concern of human development is to ensure that the poors and deprives have access to basic needs and obtain sustainable livelihoods. To attain this, Macro level planing is very much essential but not sufficient, naturally the focus must be on the basic needs capabilities, priorities and mass involvement. It is obligatory to propagate the civil society — democratic political bodies, Non-Governmental organisations, grassroot organisation, action groups and the public at large and the motivation, involvement participation and decision making power to be matched with Govt. policies. Hence the need of micro-level planning are very useful and essential.

The local bodies may play an important role in reaching the concept of

human development programme to the masses. this requires a proper organisation and mechanism of local bodies which would perform as the work head of the macro policy, the local bodies are best suited to perform various functions in the sphere of education, health, developmental activities and preservation of ecological balance, because, by their intimate knowledge of local area. Above all, those bodies would act as the agent of political participation raising social consciousness while maintaining a delicate balance between the motive of functioning delicate balance between the motive of functioning of the state and the people of the respective region.

Human development not only incorporates the three basic components, it has a prolonged consideration of the political set up and freedom of the state. Historical, Political, cultural and geographical identity are the latent causes behind the performance and development of the state. Inaccessibility and immobility are two significant factors which has a crucial impact on the development process. These regions require a special human development programme which must not be in conflict with the traditional customs and beliefs. Sikkim, Nepal and Bhutan though belong to the same geographical region with same ethnic and cultural identity, yet their historical development, ethnic traits and the stages of political progress possess diversified dimension. This is amply manifested by the variation in human development process and achievement.

References

1. S. Anand & Ravallion : M. "Human Development in Poor Countries : On the role of Private Incomes and Public Services", Journal of Economic perspectives, 7:1, Winter 1993, p. 133.
2. UNDP : Human Development Report - 1990, New York, Oxford University, Press, p.10.
3. G. Myrdal : Economic theory and Underdeveloped Region. London EC-4. Methuen & Co. Ltd. 1957.
4. Sudhir Anand and Martin Ravillion : "Human Development in Poor Countries : On the role of Private incomes and public services", Economic Perspectives, Vol. 7. No. 1, Winter 1993, pp. 133-150.
5. UNDP : Human Development Report 1993, UNDP, New York, Oxford University, Press, p.102.
6. A. K. Shiva Kumar - "UNDP's Human Development Index A Computation for Indian States" Economic and Political Weekly, Oct 12, 1991.
7. Nepal Planning Commission - Statistical Year Book of Nepal 1989.
8. Central Bureau of Statistics, HNG, Nepal
9. UNDP - Human Development Report 1990, 91,92,93,94. Oxford University Press
10. World Population Data Sheet, the population Reference Bureau Inc. 1988, 777, 14th Street NW Suite 800 Washington D.C. 20005
11. Ibid, 1985.
12. Ibid, 1985.
13. J.M. Mujumder - A select Bibliography Centre for Himalayan Studies 1993, NBU, Darjeeling pp II-III.
14. UNDP - Human Development Report 1990,91,92,93,94, New York, Oxford University Press.

15. World Population Data Sheet 1988 opcit.
16. Sikkim : A Statistical profile (1979-80-91-92) Bureau of Economics and Statistics Govt. of Sikkim Gangtok.
17. Ibid
18. Ibid
19. Ibid
20. Sikkim at a glance 1993, BES. Gangtok Sikkim : A Statistical profile op cit.
21. Sikkim : A Statistical profile op cit. and CMIE
22. Census of India, Sikkim, RGI 1971, 81,91, Govt. of India.