Spatial Distribution of Socio-economic Inequality: Evidence from Inequality Maps of a Village in Tribal Region of Pakistan

EJAZ GUL and IMRAN SHARIF CHAUDHRY

1. INTRODUCTION

Economic and social inequality is consistently persisting in tribal region of Pakistan. People in the tribal region of Pakistan are living in deprived state whereby they lack even basic necessities in their lives. As described by Gul, the tribal areas are different than the rural areas because tribal areas are located in far flung mountainous terrain where accessibility to basic amenities is much lower than the rural areas [Gul (2013)]. In recent times, the Government of Pakistan initiated many efforts for provision of basic amenities in tribal areas as an essential component of development in the context of Millennium Development Goals (MDGs). However, according to John the desired state is yet to be achieved in tribal areas [John (2009)]. Tribal life is characterised by hardship and great insecurity especially for poor labour. Given the income vulnerabilities, the long run welfare is forgone for short run securities. Interruption, reduction or loss of earnings from the contingencies such as unemployment, underemployment, low wages, low prices and failure to find the market for the produce, old age, ill-health, sickness, disability etc. are the situations which call for social security and protection. As concluded by Talbot, this constant state of deprivation has generated deep rooted inequalities in the tribal society [Talbot (1998)]. People take rescue measures such as sending their earners to urban areas and if possible to foreign countries. Those who have lands and doing agriculture are the blessed one, although, the earning pattern is distorted due to law and order situation. To have an assessment of the overall economic inequality in the tribal region, author conducted a study in a small village Naryab which is located in the tribal region. Primary data was collected from the households physically and it was thoroughly analysed to conclude the pattern of inequality. This inequality was then mapped using latest mapping software "SURFER". The maps reveal spatial distribution of inequality and many other important social and environmental aspects. Based on the results, policy implications have been described in the paper.

Ejaz Gul <ejazgul@bzu.edu.pk> is affiliated with the Department of Economics, Bahauddin Zakariya University, Multan. Imran Sharif Chaudhry <imran@bzu.edu.pk> is Chairman, Department of Economics, Bahauddin Zakariya University, Multan.

2. LITERATURE REVIEW

Inequality mapping is a new paradigm in economics. Recently many researchers have made an attempt to map the socio-economic inequalities. Baulch has worked on the spatial distribution of poverty in Vietnam and identified the key areas for reduction of poverty [Baulch (2002)]. Alesina has elucidated that to reduce the socio-economic inequality and poverty, we must first explain and predict its distribution in the area [Alesina (2005)]. Economists like Li and Zhao have tried to investigate the extent of income inequality that exists in particular countries and, even in the absence of satisfactory theories of distribution, to determine how these relate to various characteristics of the economies [Li and Zhao (2006)]. There are social researchers like Swinkels worked on poverty mapping in Vietnam and advocated that if inequality trends are mapped they can be very beneficial to economic planners and policy makers [Swinkels (2007)]. This is specifically true in case of Pakistan since the pattern of inequalities changes with the change of geographical, environmental and climatic conditions. As explained by Javaid, Pakistan is blessed with diversified landscape and hence its poverty and economic inequality landscape is correspondingly diversified [Javaid (2001)]. In this context, tribal region can be quoted as example. Trial region consists of the seven tribal agencies which are located far from urban centers and hence suffering from deprivation of basic amenities and deep rooted socio-economic inequality. Map of trial region is shown in Figure 1.

Fig. 1. Map of Tribal Region of Pakistan
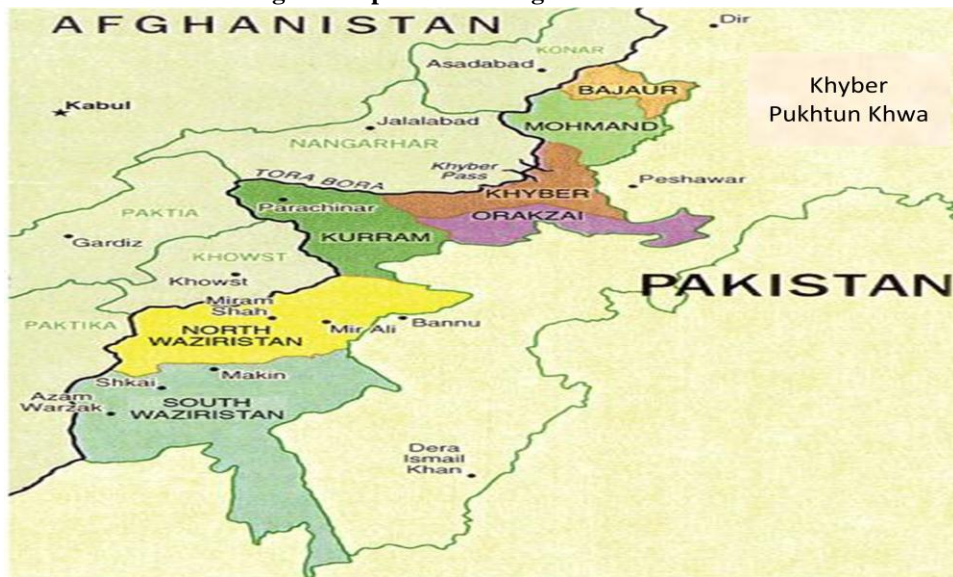
The tribal region is bordered by Afghanistan to the north and west with the border marked by the Durand Line and by Province of Khyber Pakhtunkhwa to the east. The seven Tribal Areas lie in a north-to-south strip. The geographical sequence of the seven tribal areas in order from north to south is: Bajaur, Mohmand, Khyber, Orakzai, Kurram, North Waziristan and South Waziristan.

The economy of the tribal region is underdeveloped. This region is the most impoverished and least developed. While this region has 2.4 percent of Pakistan's population, it contributes only 1.5 percent to Pakistan's economy, making it the smallest contribution to GDP. As of 2013, the per capita income of tribal region was roughly $663 per year and very small proportion of households has a sustainable living standard above the poverty level. Daniel has elucidated the socio-economic conditions of tribal region in his works on Pakistan's Tribal Belt and he narrated that being a tribal society, the local economy is mainly pastoral based, with some practice of agriculture. Households are involved in primary level activities like subsistence agriculture, rearing of livestock and small scale businesses. Many locals seek employment as skilled and unskilled labourers while some join security agencies and paramilitary forces. Some are able to travel and migrate to larger cities and urban centres outside the tribal areas within Pakistan and abroad. A significant number of these are qualified professionals and in many cases have settled permanently along with their families outside tribal areas, contributing to brain drain effect and shortage of skilled workers. Earners abroad receive their earnings and send remittances to tribal areas to support their families and relatives at home [Daniel (2008)].

There are abundant natural resources in tribal region such as marble, copper, limestone and coal which can create a potentially thriving mining industry, although the current socio-economic situation has not encouraged their profitable exploitation. Angel has explained that trade with neighbouring Afghanistan plays an active role in tribal's economy, and items imported and exported to the country via trucks pass through supply routes in tribal areas. This has made tribal region a transitional point for smuggling and trafficking of goods [Angel (2007)]. Moreover, Tierney has indicated in his works on national identity that there have been calls to implement greater measures for integrating tribal region into the mainstream economy. In this regard, there are several economic, industrial and social development ventures that have been undertaken by the government recently in order to aid tribal economy and bring this region in the mainstream [Tierney (2008)].

According to data available on the official web site of Federally Administered Tribal Areas (FATA), tribal region has a population of roughly 3.18 million. Annual population growth is calculated to be 2.19 percent. Population density stands at 117 persons per square kilometre as a whole. A rough estimate of the population in the tribal region is given in Table 1.

Table 1

Population in Tribal Region, Pakistan

Agency	Area (Square Kilometers)	Population	Population Density (Persons per Square Kilometers)	Annual Growth Rate (%)
Complete Tribal Region	27,220	3,176,331	117	2.19
Bajaur	1,290	595,227	461	4.33
Mohmand	2,296	334,453	146	4.28
Khyber	2,576	546,730	212	3.92
Orakzai	1,538	225,441	147	2.69
Kurram	3,380	448,310	133	2.50
North Waziristan	4,707	361,246	77	2.46
South Waziristan	6,620	429,841	65	1.95

Source: Official web site of Federally Administered Tribal Areas (FATA) at http://www.fata.gov.pk

The average household size is approximately 9 to 10, while the gender ratio has been estimated as 108 men for every 100 women. The tribal region has literacy rate of 12 percent, which is well below the desired rate of above 60 percent. 15.8 percent of men, and only 7.5 percent of women receive education. There is one hospital bed for every 2,179 people, and there is one doctor for every 7,670 people. Only 23 percent of the citizens have access to clean drinking water.

These social conditions in tribal region indicate that tribal region is deprived and poor. The socio-economic conditions affecting the life of households have been the main stay of recent social research. Huong has worked on the socio-economic inequality and major causes of death in adults of Vietnam. He concluded that socio-economic inequality generates denial and discontent in the society [Huong (2006)]. Similarly, Pyatt in his work on fundamentals of social accounting indicated that inequality in socio-economic factors leads to bigotry in most of the cases [Pyatt (1991)]. Alongside this, many researchers of social science have investigated the relationship between household resource allocations and socio-economic inequality. Sow has described the correlation between household resource allocation and collective well being. He concluded that justice in household resource allocation will create equity [Sow (2010)]. The work of Thomas on household resource allocation in developing countries investigated the income, expenditure and health outcomes of household resource allocation [Thomas (1997)]. Household behaviour is also an important aspect in the overall context of inequality. Few researchers have correlated the living standard with household behaviour. For example Chiappori in his work on collective models of household behaviour indicated that household behaviour has linkage with overall makeup of the society [Chiappori (1997)]. The household behaviour influences the household welfare as concluded by Fafchamps in his study on intra household welfare in rural Ethiopia [Fafchamps (2009)]. Arpino in his investigation on dynamic multi-level analysis of households' living standards and poverty has concluded a linkage between household behaviour, living standards and poverty [Arpino (2007)].

From social science point of view, injustice and corruption generate socio-economic inequality. This has been the main stay of investigation by many social scientists like Glaeser and J. S. You. Glaeser has deduced that injustice not only generates but also accelerate inequality [Glaeser (2003)]. J. S. You has elucidated that relationship between inequality and corruption is casual in nature [You (2005)].

In short we can say that the retarded growth in rural communities is due to prevailing poverty which is the outcome of socio-economic inequality. This vital fact has been investigated by Dercon in his work on growth and chronic poverty [Dercon (2011)].

3. RESEARCH AREA

Naryab is the village in tribal region at distance of 350 kilometres west of Islamabad, the capital city of Pakistan as shown in Figure 2. Village Naryab is a bowl amongst the surrounding mountains having heights up to 100 meters. An off shoot of River Kurram passes through east of the village. On this off shoot an irrigation dam of 200 cusecs capacity has been constructed in the north of village which irrigates the fields and has boosted up agriculture activity since its construction. Besides, this dam also serves a recreational spot. A metal road goes up to Naryab and ahead in the north as

shown in Figure 2. A zoom in view in Figure 2, shows that village Naryab has scattered population. There are 2500 houses with a population of approximately 25000 to 30000 at the rate of roughly 10 individuals per house. There are 10 large shops in the village with few numbers of outlets and different locations in the village. There is one hospital and a primary, middle and high school in the village. There is no worthwhile education system for female education except for one private primary girls school in the centre of the village.

Fig. 2. Satellite Images of Research Area

Houses are made of mud and bricks with 2 to3 rooms in each house. People on the fringes of village have fields where they do their subsistence agriculture. Electricity is suppose to be available as per the laid out aerial wire network but it is a hardly available. Clean drinking water from natural springs is collected in a water tank of 1000 gallons from where it is supplied to houses through a network of pipe lines.

4. RESEARCH METHODS

Comprehensive research methodology was adopted for this study. There are about 2500 houses in Naryab and primary data from all the houses was collected. Broadly, following research design was applied to complete this study.

- Detail study of the area was done from satellite and Google imageries to ascertain environmental and climatic aspects of Naryab. The geographical location of Naryab in relation to urban centres was particularly focused.
- Field visits were conducted to assess the prevailing socio-economic conditions of the village in general.
- Survey was carried out to collect primary data about income, agriculture lands, education, health, earners in urban centres, earners in foreign countries, drinking water, electricity, lavatory.
- Data obtained was analysed statistically to conclude about the trend and pattern of inequality with respect to income, agriculture lands, education health, drinking water, electricity and lavatory.
- Inequality modelling was carried out to have clear picture of existing and future trend of each socio-economic factor.
- Prismatic assessment of the inequality was done by calculation of Gini coefficient for each factor.
- Data was transferred to latest mapping software to create maps for socio-economic inequality and indicate its spatial distribution.

5. DATA COLLECTION

Comprehensive data collection process was adopted for evaluation of inequality in village Naryab. Primary data about income, agriculture lands, education, health, earners in urban centres, earners in foreign countries, drinking water, electricity, lavatory was collected from the village. For this purpose, village was divided into five zones; North, South, East, West and Central. These zones are shown in figure 3. Five data collection teams were made and one team was sent for each zone. Isolated dwellings on the fringes of village and mountain terraces were ignored. A panoramic view of the landscape of each zone is shown in figure 4. North zone is hilly in nature with numerous plateaus available on mountains. People have made their houses on plateaus, terraces and valleys. It's a fairly populated zone. Primary school of Naryab is located in this zone. There is considerable agriculture activity in this zone. East zone is located on the sloping mountain terraces. Small agriculture fields are located on these terraces for subsistence farming. A high school and rural health centre are located in this zone. Naryab agriculture dam is located in the north east of this zone. Central zone is the most populated zone and located on plain surface. Shops and markets are mostly located in this zone. South zone

has scattered population with size of the houses bigger than rest of the zones. Metal road passes through this zone and goes north. Inhabitants of this zone remain busy in agriculture activity on large fields, cattle farming and house poultry. West zone has congested dwellings, however, has huge agriculture fields on its west. The area in this zone is generally sloping from west to east.

Fig. 3. Division of Naryab Village into Zones for Survey

Fig. 4. Panoramic View of Landscape in Zones for Survey

After zoning of the research area, selection of suitable socio-economic factors for analysis of the inequality was the most important step of the research. Based on detail study of prevailing conditions in the village, a socio-economic factors matrix was developed in which relevant nine factors were included for assessment of the inequality. Factors matrix is shown in Table 2.

Table 2

Socio-economic Factors Matrix for Evaluation of the Inequality

Socio-economic factors	Description
Per Capita Income (I)	Average per capita income per year in a zone from agriculture, cattle farming, house poultry, local business, earners in urban centres and foreign countries (US$)
Agriculture land (AL)	Average agriculture land per household in a zone (acres)
Male Education (Em)	Average number of educated male per house in a zone
Female Education (Ef)	Average number of educated female per house in a zone
Health (H)	Average number of patients per house per month in a zone
Clean drinking water (Cw)	Average number of clean drinking water taps per house in a zone
Electricity (Elec)	Average number of electricity hours per day in a zone
Lavatory (L)	Average number of lavatories per house in a zone
Size of house (SoH)	Average area of house in a zone (square meters)

Door to door survey was conducted in all the zones to record the data about the factors mentioned in Table 2. Field visits and interviews were also conducted by the author. Each factor of the evaluation matrix was discussed with experts. This survey took about three months.

6. DATA ANALYSIS

Data collected from the households was summarised and average of selected nine socio-economic factors was calculated for each zone. Descriptive statistics were also calculated to know about the trends. Data along with descriptive statistics is tabulated in Table 3.

Table 3

Summary of the Data Collected from the Households

Zones	Average Income Per Year in US Dollars	Average Agriculture Lands (Acres)	Average Number of Educated Male Per House	Average Number of Educated Female Per House	Average Number of Patients Per House Per Month	Average Number of Clean Drinking Water Taps Per House	Average Number of Electricity Hours Per Day	Average Number of Lavatories Per House	Average Area of House in Square Meters
	I	AL	Em	Ef	H	Cw	Elec	L	SoH
North Zone	254	0.4	2	1	6	2	3	0	300
East Zone	378	0.8	5	0	4	5	2	1	515
Central Zone	603	0.2	3	1	5	6	2	2	245
South Zone	719	1.03	2	1	1	3	6	2	567
West Zone	313	1.5	1	0	5	2	4	0	313
Descriptive Statistics									
Mean	453.4	0.786	2.6	0.6	4.2	3.6	3.4	1	388
Median	378	0.8	2	1	5	3	3	1	313
Standard Deviation	178	0.461	1.356	0.49	1.720	1.625	1.497	0.894	128
Variance	32045	0.17	1.53	0.19	3.03	2.38	2.05	0.57	20166
Kurtosis	–2.014	–0.843	1.456	–3.33	2.608	–2.231	0.536	–3.000	–2.655
Skewness	2.235	–1.487	1.239	–2.08	0.209	–1.697	–0.286	–2.181	2.234

Some of the relevant aspects can be concluded from table 3. For example the mean per capita income of village Naryab is just \$453.4 which is much below the desired level. However, the mean per capita income of south zone is \$719 which is relatively acceptable, albeit not desirable. This indicates the inequality in per capita income distribution across the different zones of village Naryab. Similar is the case with other socio-economic factors. For example the possession of agriculture lands by households is more in the west zone, educated males per house are more in the east zone due to availability of Naryab high school is near vicinity. However, there are no educated females in the entire east and west zones. The number of patients per house are more in the north zone due to non availability of doctor and health facilities in the zone and also due to less number of clean water taps. Electricity hours are more in the south zone due to its proximity to grid station and less line losses. Lavatories are not available in the houses of north and west zones. The most congested living was observed in the central zone.

7. INEQUALITY MODELING

After statistical analysis, digital model for each selected socio-economic factor was developed using latest computer assisted qualitative data analysis software (CAQDAS). The digitised models indicated existing trends and future tendency with a best fit trend line, econo-mathical representative equation and value of R^2 as shown in Figure 5. Econo-mathical equations were obtained after digital iteration and attenuation by the software. These equations caters for the errors in the variables. Coefficient of determination, R^2 is a statistic that gives information about the goodness of fit of a curve. In regression, R^2 is a statistical measure of how well the regression line approximates the real data points. An R^2 of 1 indicates that the regression line perfectly fits the data as indicated by Brown in his work on multiple membership multiple classification models [Browne (2001)]. For example for the per capita income, the equation of the best fit polynomial trend lines is quadratic in nature with R^2 value as 0.75, which makes the arrangement acceptable. As per the trend line, south zone will continue to hold maximum per capita income followed by central zone. There are two reasons for this; south zone has maximum agriculture activity and number of earners in urban centres and foreign countries while central zone is the hub of all business activities in village Naryab.

Let's now see the scenario with regard to possession of agriculture lands. Figure 5 shows that the best fit polynomial dotted trend line for agriculture has a representative equation of degree two, quadratic in nature and the R^2 value is 0.721. The maximum land possession is in west zone owing to the open agriculture spaces available. As per the trend, south and west zones will have maximum agriculture activity while it may reduce in the east zone owing to construction of new houses and shifting of population in the vicinity of Naryab Dam in south zone. Average number of educated males per house are more in the east zone due to availability of public and private schools in this zone. Opposite conditions exist in the west zone, where due to minimum education facilities, number of educated males per house is less. In this case the best fit polynomial dotted trend line has a cubic equation with R^2 value of 0.923 which means an accurate representation of the trend. As shown by the dotted trend line, east zone will have greater number of the educated males but the situation in west zone is also likely to improve with development of new educational facilities. There are very less number of educated

females in village Naryab. In the east and west zones there are no educated female at all. However, in the north, central and south zones there is one educated female per house. There is only one private female primary education school in the centre zone. The best fit polynomial dotted trend line representing female education in village Naryab has a cubic equation with R^2 value of 0.892. As shown by the trend line, the situation is likely to remain the same unless construction and operation of new female education schools. The number of patients per house are minimum in the south zone owing to better sanitation facility. Number of patients per house are more in the north zone where the sanitation facility is not good and there are no lavatories in the houses.

Fig. 5. Inequality Modeling of Selected Socio-Economic Factors for Village Naryab
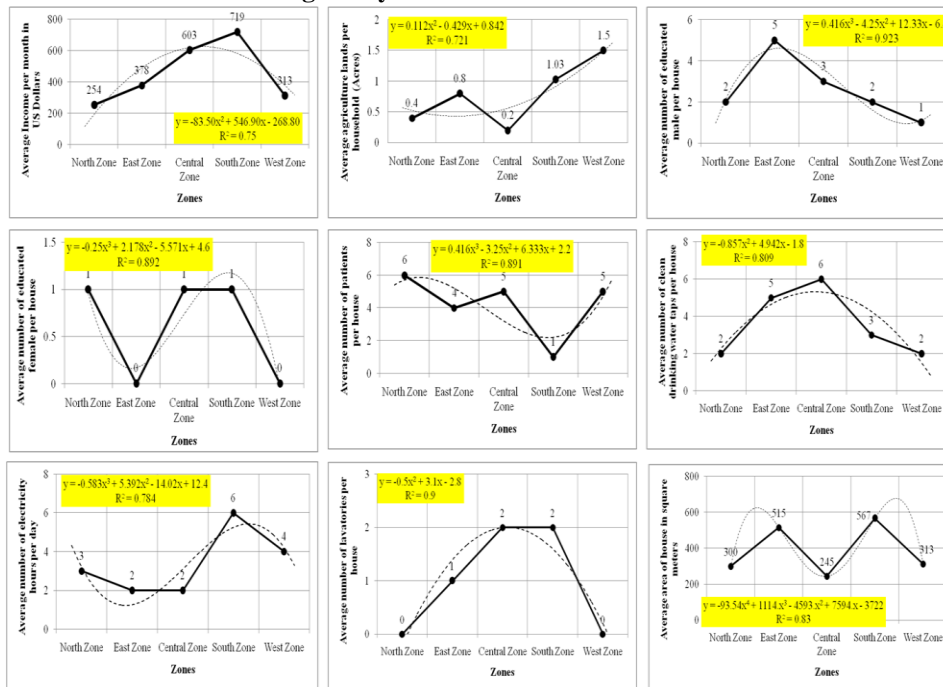
The best fit polynomial dotted trend line representing average number of patients per house in village Naryab has a cubic equation with R^2 value of 0.891. As shown by the trend line, the number of patients per house will remain minimum in the central and south zones while it will increase in the east and west zones. The best fit polynomial dotted trend line representing average number of clean drinking water taps per house in village Naryab has a quadratic equation with R^2 value of 0.809. As shown by the trend line, the number of clean drinking water taps per house will improve in the south zone in the future. The average number of electricity hours per day are more in the south zone owing to better electricity network and closeness to electricity grid station. In this case, the representative equation of the best fit polynomial dotted trend line is cubic in nature with R^2 value of 0.784. As shown by the trend line situation of electricity is likely to remain the same in future. Average number of lavatories per house is an indicator of sanitation

facilities. In north and west zones there is no lavatory in any of the house. Fields and orchards are being used as lavatories. The representative equation of the best fit polynomial dotted trend line is quadratic with R^2 value of 0.90. No change in the existing trend is expected unless sanitation measures and awareness drive is launched. In village Naryab, the most congested houses are located in the central zone while the most spacious houses are located in the south zone. However, the data exhibited huge fluctuation due variations in the dimensions of houses in all the zones. The representative equation of the best fit polynomial dotted trend line is quartic with R^2 value of 0.0.83. The whole argument regarding the trend of inequality is summarised in Table 4.
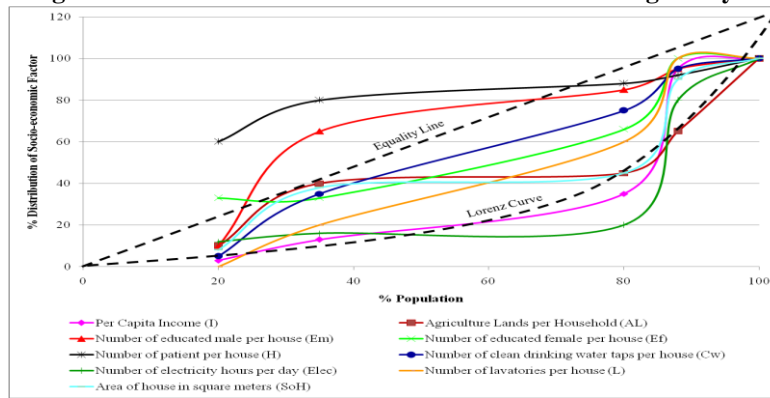
Table 4

Summary of Inequality Trend from Modelling Calculus

Socio-economic Factors	Trend Line	Equation of the Trend Line	Future Trend (Under Existing Conditions)	R^2
Per Capita Income (I)	Polynomial	Quadratic	South and central zone will continue to have concentration of per capita income	0.75
Agriculture Land (AL)	Polynomial	Quadratic	South and west zones will have maximum agriculture activity while it may reduce in east zone	0.72
Male Education (Em)	Polynomial	Cubic	East zone will have greater number of the educated males. Situation in west zone is likely to improve with development of new educational facilities	0.92
Female Education (Ef)	Polynomial	Cubic	The situation is likely to remain the same	0.89
Health (H)	Polynomial	Cubic	Number of patients per house will remain minimum in central and south zones while it will increase in the east and west zones	0.89
Clean Drinking Water (Cw)	Polynomial	Quadratic	Number of clean drinking water taps per house will improve in the south zone while it will decrease in the west zone	0.80
Electricity (Elec)	Polynomial	Cubic	Situation is likely to remain the same	0.78
Lavatory (L)	Polynomial	Quadratic	Situation is likely to remain the same	0.90
Size of House (SoH)	Polynomial	Quartic	Situation in the east and south zones is likely to improve	0.83

8. PRISMATIC ASSESSMENT OF INEQUALITY

There is very high and most probably rising inequality in the distribution of income and other social factors in tribal region as indicated from the statistics of a small village Naryab. This is rooted in extreme economic imbalances which is directly and indirectly creating uneven income earning opportunities as indicated by Gul in his study on unknown tribal economy [Gul (2013)]. As a result, inequality was found in the distribution of socio-economic amenities. In support of this argument, I took help of Gini coefficient which is a measure of inequality of a distribution of a factor. It has value between 0 and 1 with 0 corresponds to complete equality while 1 corresponds to complete inequality. For prismatic assessment of inequality in village Naryab, Gini coefficients were found for all the nine socio-economic factors The graphical representation of distribution of socio-economic factors is shown in figure 6. Equality line (45 degree line representing perfect distribution) and Lorenz Curve are also shown on in Figure 6.

Fig. 6. Distribution of Socio-economic Factors in Village Naryab

Gini coefficients for different factors were calculated using calculus for area under a curve using Lorenz Curve, equality line and Gini coefficient curves of the socio-economic factors [Zhang (2006)]. These values are shown in Table 5.

Table 5

Assessment of Inequality in Village Naryab by Using Gini Coefficient

Factors	North Zone	East Zone	Central Zone	South Zone	West Zone
Population (%)	20	15	45	8	12
Cumulative Population (%)	20	35	80	88	100
Per Capita Income (I)					
Income (%)	3	10	22	60	5
Cumulative income (%)	3	13	35	95	100
Gini Coefficient			**0.712**		
Agriculture Lands per Household (AL)					
Agriculture Land (%)	10	30	5	20	35
Cumulative Agriculture Land (%)	10	40	45	65	100
Gini Coefficient			**0.367**		
Number of Educated Male per House (Em)					
Educated Males per House (%)	10	55	20	10	5
Cumulative Educated Males per House (%)	10	65	85	95	100
Gini Coefficient			**0.651**		
Number of Educated Female per House (Ef)					
Educated Females per House (%)	33	0	33	34	0
Cumulative Educated Males per House (%)	33	33	66	100	100
Gini Coefficient			**0.795**		
Number of Patients per House (H)					
Number of Patients per House (%)	60	20	8	4	8
Cumulative Number of Patients per House (%)	60	80	88	92	100
Gini Coefficient			**0.639**		
Number of Clean Drinking Water Taps per House (Cw)					
Clean Drinking Water Taps per House (%)	5	30	40	20	5
Cumulative Clean Drinking Water Taps / House (%)	5	35	75	95	100
Gini Coefficient			**0.426**		
Number of Electricity Hours per Day (Elec)					
Electricity Hours per Day (%)	12	4	4	60	20
Cumulative Electricity Hours per Day (%)	12	16	20	80	100
Gini Coefficient			**0.603**		
Number of Lavatories per House (L)					
Lavatories per House (%)	0	20	40	40	0
Cumulative Lavatories per House (%)	0	20	60	100	100
Gini Coefficient			**0.725**		
Area of House in Square Meters (SoH)					
Area of House (%)	8	30	7	45	10
Cumulative Area of House (%)	8	38	45	90	100
Gini Coefficient			**0.633**		

As shown in Figure 7, the highest value of Gini coefficient (0.765) is for female education. There is no facility available for female education in village Naryab except for the girls who go to urban areas and educate themselves. Very few girls are permitted to go to urban areas for education. The Gini coefficient for availability of lavatories, which is the basic element of hygiene and sanitation, is also very high (0.725). There is no lavatory in any house in the north and west zones (32 percent of the population). Similarly, only 8 percent of the population possesses 88 percent of the per capita income in village Naryab which results into a high Gini coefficient (0.712). The lowest Gini coefficient (0.367) is for possession of agriculture land as people from all zones possess agriculture lands barring central zone where the business activity is more than agriculture. Overall Gini coefficient for socio-economic factors in village Naryab is 0.639 which is undesirably high.

Fig. 7. Gini Coefficients for Selected Socio-economic Factors
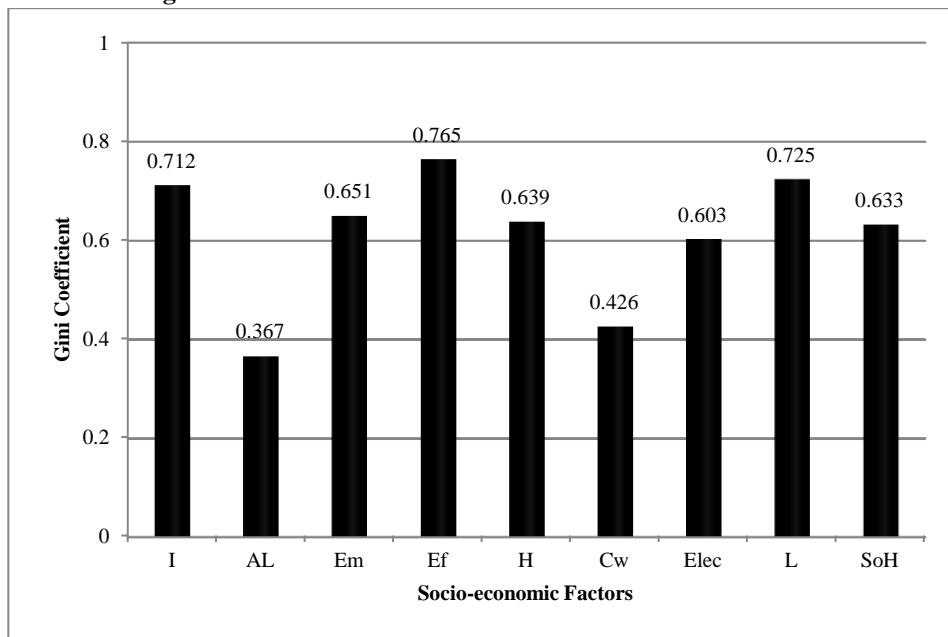
9. INEQUALITY MAPPING AND SPATIAL DISTRIBUTION OF INEQUALITY

After assessment of the inequality, its spatial distribution across the entire village Naryab was mapped using SURFER software which is a latest state of the art mapping software. SURFER uses a systematic process to create a map. Firstly, the data grid was created for each factor on excel sheet. Secondly, this data grid was converted to grid map by the software using the values of latitudes and longitudes. Thirdly, grid map was converted into contour map by the software showing spatial distribution of particular socio-economic factor. Separate contour map was created for each socio-economic factor. Key indicating the values of socio-economic factor is available with each map which makes the map comprehendible.
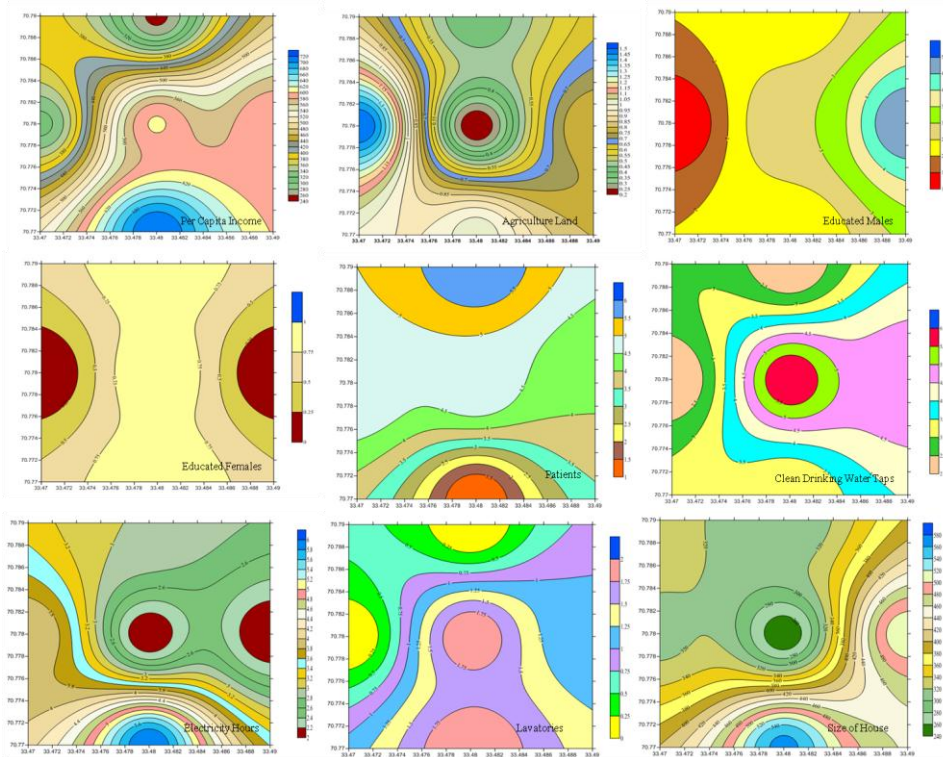
**Figure 8: Spatial Distribution of the Inequality**

Figure 8 shows the spatial distribution of selected socio-economic factors. As indicated by the map for per capita income, contours of the map are increasing from north zone to south zone. The distribution of per capita income is such that north and west zone are poor compared to east and south zone. The central zone has moderately high per capita income while the higher per capita incomes are mostly concentrated in south zone. Thus, from the map it is clear that there is inequality in the per capita income of the households in village Naryab. Similarly, the map for spatial distribution of inequality in agriculture land shows that less land is possessed by the people living in the central zone and surroundings. The people living in the west zone have a greater possession of agriculture followed by inhabitants of the east zone who own moderate quantity of agriculture land. For educated males, the contours of the map are increasing from west to east zone. Contours of the map are comparatively straight which indicate clear division amongst the zones and hence the inequality. Educated males are mostly concentrated in east zone due to presence of educational institutes. Map for female education indicates that it is highly ignored aspect of village Naryab. There is hardly any female education in the village. As indicated by the map of average number of patients per house, number of patients are less in the south zone due to availability of hospital in the zone while patients are more in the north zone due to non availability of health facilities in the zone. Moreover, due to distance between north and south zones, patients are reluctant to visit hospital and as a compulsion use the home made herbal medicines. As for as spatial distribution of clean drinking water facility is concerned, the north and west zones are at disadvantage having less number of clean water taps compared to central zone where number

of clean water taps per house are more. Due to non availability of clean water, the number of patients per house are comparatively more in the north and west zones. As shown in the electricity map, more electricity hours are available in the south zone due to proximity of grid station and less line losses. Very less electricity hours are available to people living in central and east zones. Sanitation and hygiene conditions are represented by lavatories map. There are no lavatories in the north and west zones. Due to this bad conditions of sanitation, there are more patients in the north and west zones. The map for size of houses shows that houses in the central zone are congested while houses in the south zone are specious.

10. POLICY IMPLICATIONS

Spatial distribution of selected socio-economic factors for village Naryab reflects inequality of sizeable magnitude. If this situation is generalised to complete tribal region, the overall milieu may give extremely worse picture. This perspective has certain policy implications which are shown in Figure 9.

Figure 9: Policy Implications of the Socio-Economic Inequality in Tribal Region
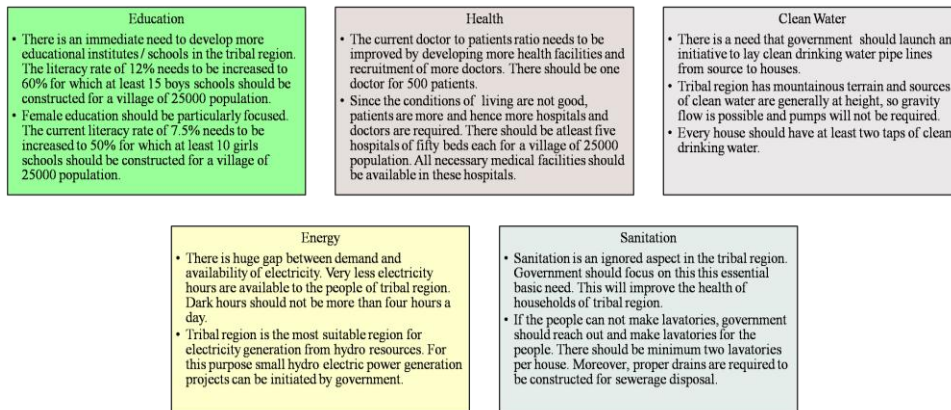
11. CONCLUSION

The socio-economic conditions in the tribal region are not very encouraging due to prevailing inequality. There are host of reason for this inequality, the major being the deprivation and discontent over distribution of resources. This has, and is still, affecting the life of commoners in the tribal region. Spatial distribution maps indicate that spread of inequality can be controlled if appropriate remedial measures are taken. There is a need to launch major socio-economic initiatives in this region, particularly fields of education, health and energy should be focused. If clean water and sanitation facilities are provided to people of tribal region, the health will improve manifold.

REFERENCES

Alesina, A. (2005) Corruption, Inequality and Fairness. *Journal of Monetary Economics* 52, 1227–1244.

Angel, R. (2007) Ungoverned Territories: Understanding and Reducing Terrorism Risks. RAND. pp. 49-67.

Arpino, B. (2007) Dynamic Multi-Level Analysis of Households' Living Standards and Poverty: Evidence from Vietnam. (ISER Working Paper 2007-10). Institute for Social and Economic Analysis, University of Essex, Essex, United Kingdom.

Baulch, B. (2002) The Spatial Distribution of Poverty in Vietnam and the Potential for Targeting. (World Bank Working Paper 2829).

Browne, W. J. (2001) Multiple Membership Multiple Classification (MMMC) Models. *Statistical Methodology* 1, 103–124.

Chiappori, P. (1997) Collective Models of Household Behaviour: Models, Methods and Policy. Chapter 3. Baltimore and London: John Hopkins University Press. 39–52.

Daniel, S. (2008) Securing Pakistan's Tribal Belt. Council on Foreign Relations. pp. 5–9.

Dercon, S. (2011) Growth and Chronic Poverty: Evidence from Rural Communities in Ethiopia. *The Journal of Development Studies* 48:2, 238–253.

Fafchamps, M. (2009) Intra-household Welfare in Rural Ethiopia. *Oxford Bulletin of Economics and Statistics* 71:4, 567–599.

Glaeser, E. (2003) The Injustice and Inequality. *Journal of Monetary Economics* 50, 199–222.

Gul, E. (2013) Economic Philosophy of Khewa Gul, an Unknown Tribal Economist of 18th Century. (MPRA Paper No. 48374).

Huong, D. L. (2006) Socio-economic Status Inequality and Major Causes of Death in Adults: A Five-Year Follow-Up Study in Vietnam. *Public Health* 120, 497–504.

Javaid, R. (2001) Indigenous Peoples and Ethnic Minorities of Pakistan: Constitutional and Legal Perspectives. Routledge. pp. 52-66.

John, H. (2009) Leaving Terrorism Behind: Individual and Collective Disengagement. *Taylor and Francis*. pp. 227–229.

Li, H. (2006) Income, Income Inequality and Health: Evidence from China. *Journal of Comparative Economics* 34, 668–693.

Pyatt, G. (1991) Fundamentals of Social Accounting. *Economics Systems Research* 315–341.

Sow, F. D. (2010) Intra-household Resource Allocation and Well-being: The Case of Rural Households in Senegal. PhD Thesis, Wageningen University.

Swinkels, R. (2007) Poverty Mapping in Vietnam, Chapter 14. In More Than a Pretty Picture: Using Poverty Maps to Design Better Policies, The World Bank.

Talbot, I. (1998) Pakistan, a Modern History (Revised ed.). Palgrave Macmillan. pp. 2–3. 606–8.

Tarzi, A. (2008) The Taliban and the Crisis of Afghanistan. Harvard University Press. 231–236.

Thomas, D. (1997) Incomes, Expenditures and Health Outcomes: Evidence on Intra-household Resource Allocation. In Intra-household Resource Allocation in Developing Countries: Models, Methods and Policy. John Hopkins University Press.

Tierney, S. (2000) Accommodating National Identity: New Approaches in International and Domestic Law. Martinus Nijhoff Publishers. pp. 190–191.

You, J. S. (2005) A Comparative Study of Inequality and Corruption. *American Sociological Review* 70, 136–158.

Zhang, Y. and G. Wan (2006) The Impact of Growth and Inequality on Rural Poverty in China. *Journal of Comparative Economics* 34, 694–712.

Zhao, Z. (2006) Income Inequality, Unequal Health-Care Access, and Mortality in China. *Population and Development Review* 32, 461–483.