ASSESSMENT OF THE SUSTAINABALE LIVELIHOOD SECURITY OF THE ECOLOGICALLY VULNERABLE INDIAN STATE – UTTARAKHAND

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ABSTRACT

The state endowed with natural beauty, Uttarakhand, is analyzed in this study. The sustainable security of its social, ecological, economic aspects is measured using the sustainable livelihood security index framework. The state government is focusing on investments in hospitality sector because of tourists coming from round the globe to enjoy the natural beauty of the state. The capital city, Dehradun, is leading the board with top performance in SLSI ranking followed by the natural beauties, Nainital and Almora. Haridwar, the pilgrimage place, is amongst the top performers. The results from the study is as expected. Government needs to frame policies in order to protect its ecological zones.

KEY WORDS: Sustainability, Livelihood, Tourist, Pilgrimage, Uttarakhand

JEL CODES: P18; Q26; R14; R38; Z32

INTRODUCTION

Uttarakhand is known for its natural beauty and tourist places. The main source of revenue is tourism and pilgrimage. Nainital, Almora, Haridwar are some of its famous tourist and pilgrimage places of the state. It is the second fastest growing state in India.

Per Capita Income of the state is greater than the national average. Foreign countries are interested in investing in the state because of its natural resources and tourist places. This has resulted in huge inflow of foreign direct investment in the state. Wheat, Basmati Rice, Soybeans, Groundnuts, etc. are widely grown crops. The state has few food processing plants for which the locally grown apples, litchis, oranges, peers are used and this aids to the economy. Medicinal plants, herbs, basmati rice are of export quality and agricultural export zones have been set up in the state for these commodities (Narayan et al., 2012). The government is investing in the hospitality sector seeing its future prospects. The state was formed in the year 2000 after getting separated from Uttar Pradesh (Manupati et al., 2018). The main reason for the separation was the cultural distinctiveness. Being the newly formed state. It draws attention as it is the second fastest growing state of the country. This rapid growth and inequality makes it more interesting in considering this state for Sustainable Livelihood Security Index (SLSI) analysis. The SLSI framework is apt for this state as it is flexible to use and considers wide range of factors measuring the development since partition. Similar study has been carried out in an Indian State, Gujarat. *Singh and Hiremath (2009)* developed the SLSI for the state of Gujarat in which they pondered upon the three dimensions that are: ecological aspect, social aspect and economic aspect. Some districts showed highest ranking in ecological security index and at the same time the lowest rank in economic efficiency index which shows the necessity of promoting holistic perspective among planners. The SLSI helps to focus on conflicts and potential synergy between economics, ecology and equity dimensions of sustainable development (Wang et al., 2018; Liu et al., 2018; Abhishek et al., 2018). Similarly, *Kumar et al., (2015)* in their study of Planning Holistic Development on Karnataka using the SLSI found out that only 10 districts out of 30 districts were placed on the very high and high degree of livelihood sustainability. Yadgir district bagged the last position in the livelihood index showing the worst performance. The capital city Bengaluru secured first position on Economic Efficiency Index (EEI) ranking, district Kolar famous for its Gold Mines secured fourth position in EEI ranking but their status in Ecological Security Index (ESI) was very low and the main reason for this is the extensive urbanization resulting to declining ecological status. The reverse case is with some

districts like Udupi, Dakshin Kannada, Bidar, Gulbarga, etc., they perform well in ESI but fails to perform in the same manner in SEI and EEI. The study treats SLSI as an aggregate index and it acts as a holistic policy tool which helps in policy formulation which are apt for making a district a better performer in all the three aspects.

In a country's context, *Mutahara et al., (2016)* developed a sustainable livelihood security model to investigate the security status of coastal livelihood system in Bangladesh. The index yielded out from the model can be used for assessing and comparing the household security level in Percentage form of different livelihood groups in storm-surge coastal areas. It can help in planning to avoid risk during disaster and adapt the measures that would reduce the damage. A study by *You and Zhang (2016)* considered the sustainable livelihood of rural farmers in China and identified the existence of the conditions necessary for sustainable development using the fuzzy comprehensive method. The assessment showed that the most adversely affected region was the western provinces with least sustainable livelihood, economic efficiency and social equity in comparison to better performing most economically secured eastern province.

The state of Uttarakhand is selected for the study based on SLSI framework because of its rapid growth. Though the inequality, improper resource management, growing population are also the reasons for consideration. This approach in the state's context will give brief idea about: Where to invest? How much to invest? Which sectors will be growing in the near future? Development oriented policies and programs can be devised by the government based on the study's result.

DATA AND METHODOLOGY

The variables considered for calculation of social equity index are, Sex Ratio, Female Literacy Rate (data collected from: Census India, 2011), Treated Source of Water, Laterine Facility, Lighting through Electricity (data collected from: Household Series Table, Census India, 2011). For calculation of ecological security index, data for percentage of forest cover was collected from Ministry of Environment, Government of India, 2005. Data for percentage of Barren and Unutilized Land was collected from Agriculture Cooperation and Farmers Welfare. The economic efficiency index was calculated using, Average Productivity of Fruits and Vegetables, Average Yield Rate of Wheat and Paddy, Percentage of Net Sown Area to Total Area obtained from Indiastat.

The secondary data for the variables were collected from different sources mentioned above for 13 districts of Uttarakhand for analyzing whether their livelihoods are sustainably secure and how secure are they when compared to the other districts. Many more variables could also have been considered but they are dropped due to unavailability of adequate data. *Saleth (1993a,)* has discussed the indicators of sustainable development at the global level. *Saleth (1993b)* has given an empirical illustration of an indexing approach for checking the status of the agro-climatic sub-zones of India. *Swaminathan (1991)* has enlightened on the pathway to sustainable agriculture and how the future generations can get the benefits out of it. The methodology adopted in this paper was proposed by (Swaminathan, 1991.a) to check whether the necessary conditions essential for the attainment of sustainable livelihood security (SLS) are present in a given region or ecosystem is known as the sustainable livelihood security index (SLSI), which has three components:

a) Social Equity Index (SEI) represented by variables, Sex Ratio, Treated Water Source, Laterine Facility, Lighting through Electricity, Female Literacy Rate. It measures how socially equitable a territory is.

b) Ecological Security Index (ESI) represented by variables Percentage of Forest Cover, Percentage of Barren and Unutilized land of total land available land.

c) Economic Efficiency Index (EEI) represented by variables such as Average productivity of Fruits, Vegetables and Spices, Average Yield Rate of Wheat and Paddy and Percentage of Net Sown Area to total area.

To operationalize the concept of SLS within the context of SD, Saleth and Swaminathan (1993) propounded the following propositions:

Let SLS_{ij} be the index for the i^{th} component of SLSI related to the j^{th} entity (districts in a state context) and let X_{ij} be the value of the variable representing the i^{th} component of SLSI related to the j^{th} entity. Then the index for the i^{th} component of SLSI of the j^{th} entity can be calculated as follows:

$$SLSI_{ij} = \frac{X_{ij} - \min j X_{ij}}{\max j X_{ij} - \min j X_{ij}} \qquad \text{where, } i=1,2\ldots\ldots\ldots, I \qquad \text{Eqn (B1)}$$

where, j=1,2……..., J

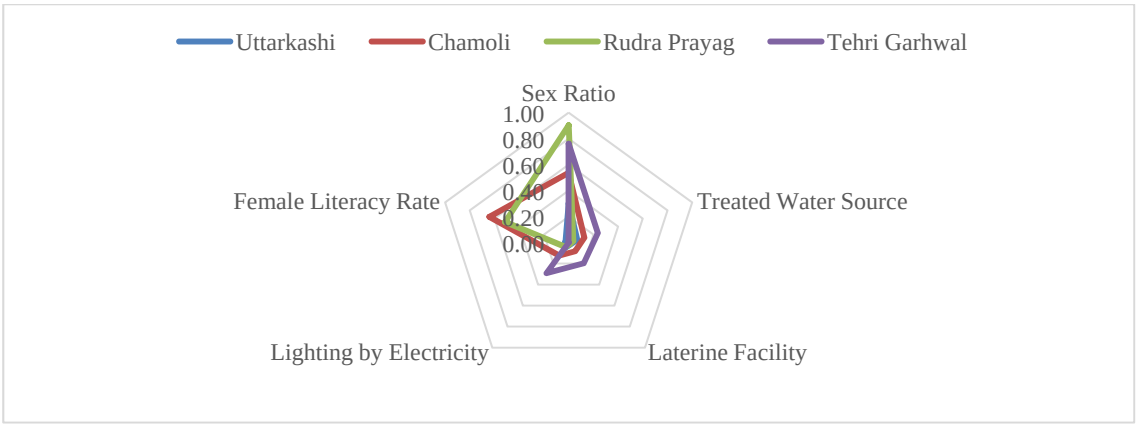
$$SLSI_{j} = \frac{\sum_{i=1} a_{ij} SLSI_{ij}}{I} \qquad \text{where, } i=1,2\ldots\ldots\ldots, I \qquad \text{Eqn (B2)}$$

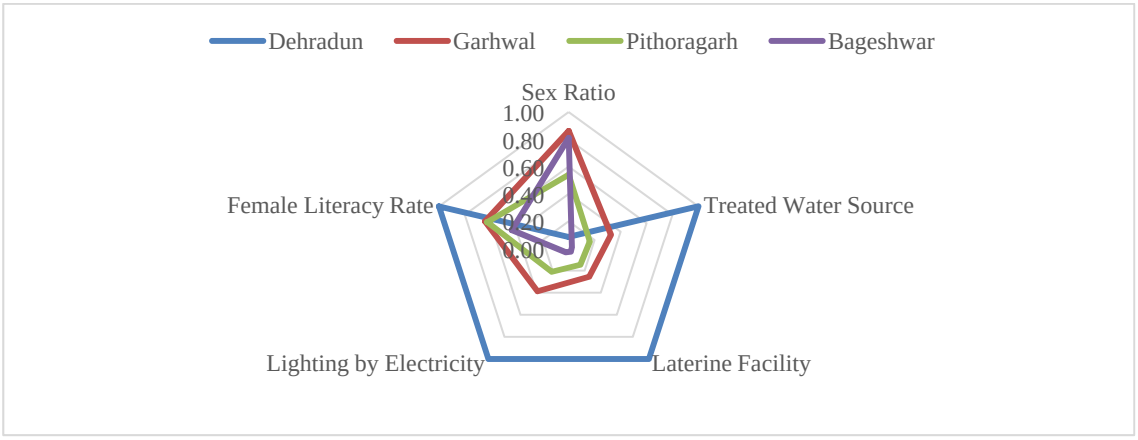
where, j=1,2……..., J

the numerator in (B1) measures the extent by which the j^{th} entity did better in the i^{th} component of SLSI as compared to the entity showing the worst performance in that component, and the denominator indicates the range (i.e. the difference between the maximum and the minimum values of the variable representing a given component). Having calculated the $SLSI_{ij}$ for all the components (i = 1,2, . . ., I) and all the sample entities (j = 1,2, ..., J), the composite index, which measures the overall performance of a given entity ($SLSI_j$), can be calculated as a weighted average of all the component indices [$SLSI_{ij}$ (i = 1,2, ….., I)]. The a_{ij} in (B2) denotes the weight assigned to the i^{th} component of SLSI of the j^{th} entity and has the property that: $a_{1j} + \ldots + a_{ij} = 1$. If a_{ij} is identical for all i and j and is equal to 1, it means that equal weights is being assumed. In SLSI ranking the district with least SLSI value is ranked first followed by districts with subsequent higher values.

RESULTS

Figure B.1 Spider web representation of Index Values of Social Equity Variables for districts of Uttarakhand





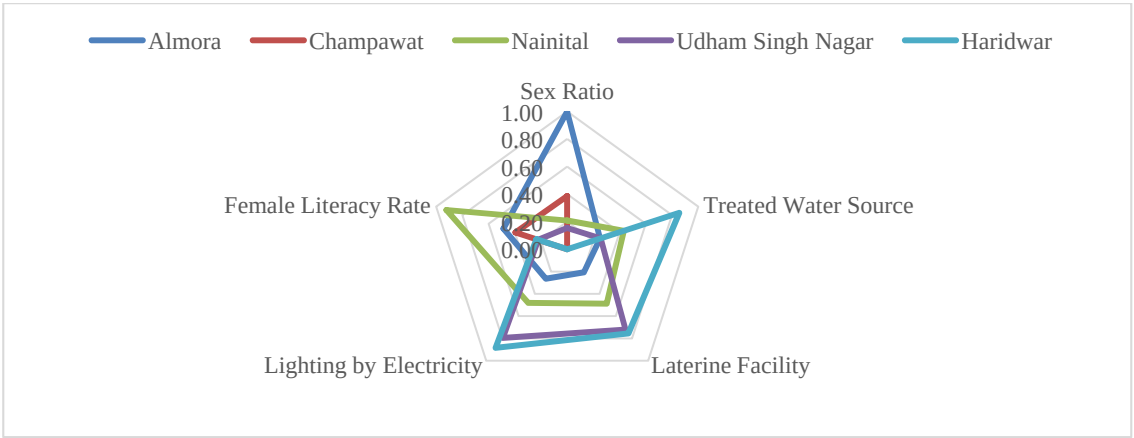
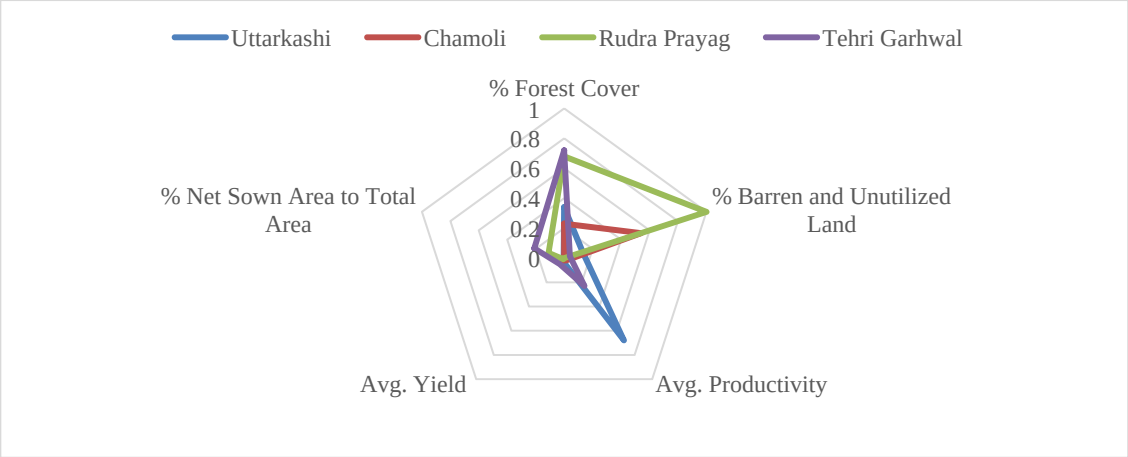
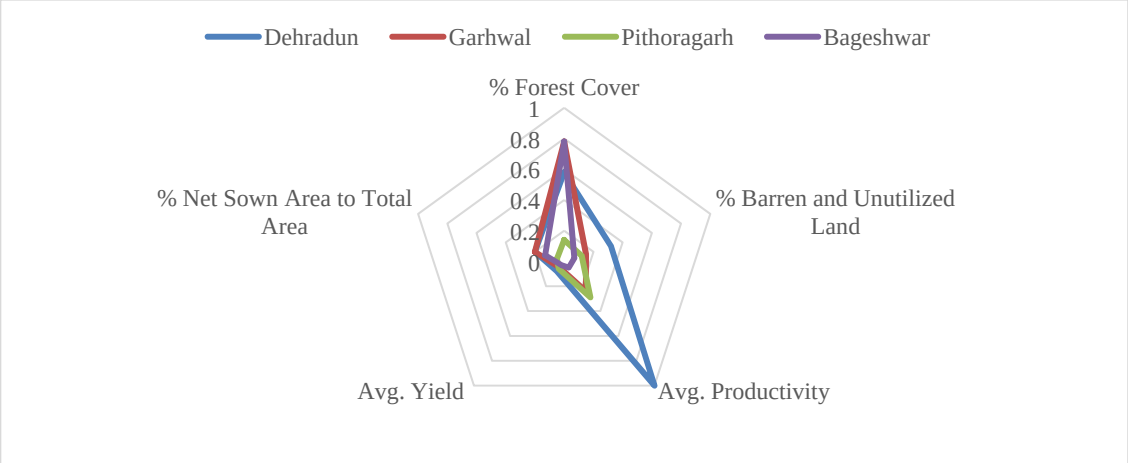


Figure B.2 Spider web representation of Index Values of Ecological Security and Economic Efficiency Variables for districts of Uttarakhand





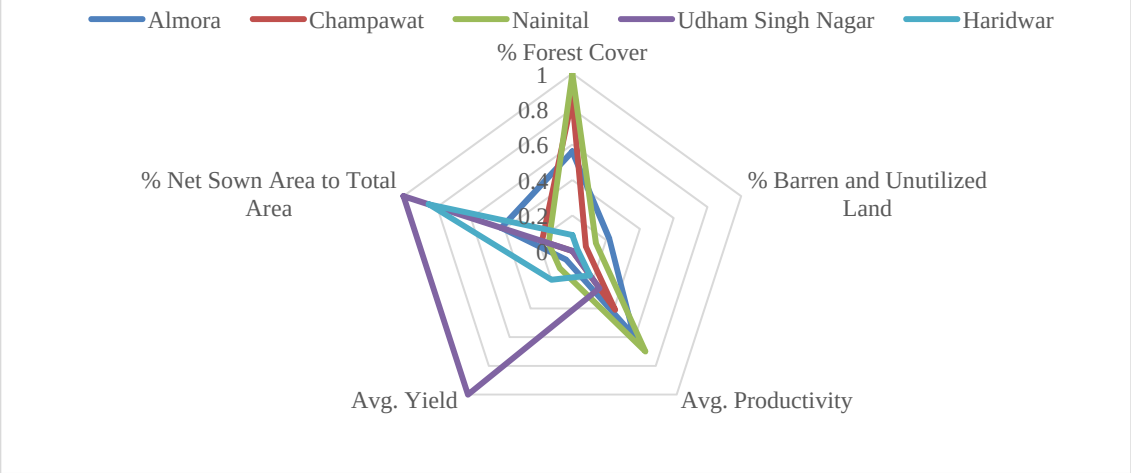
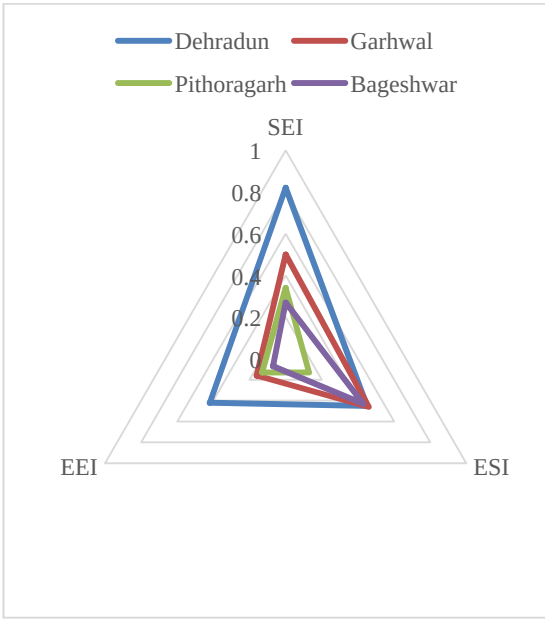
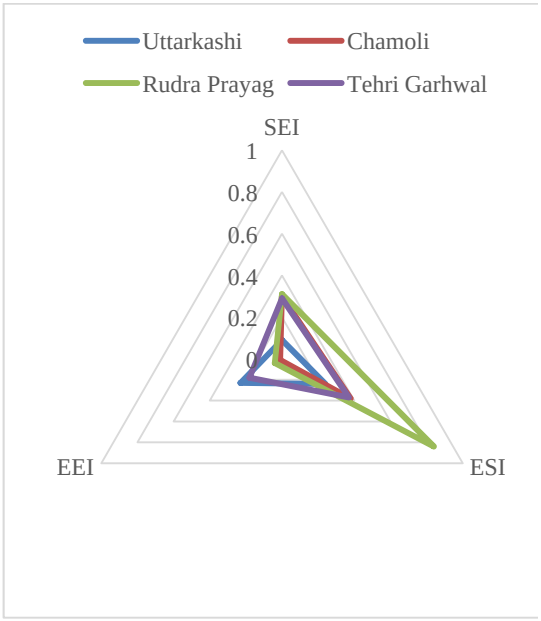
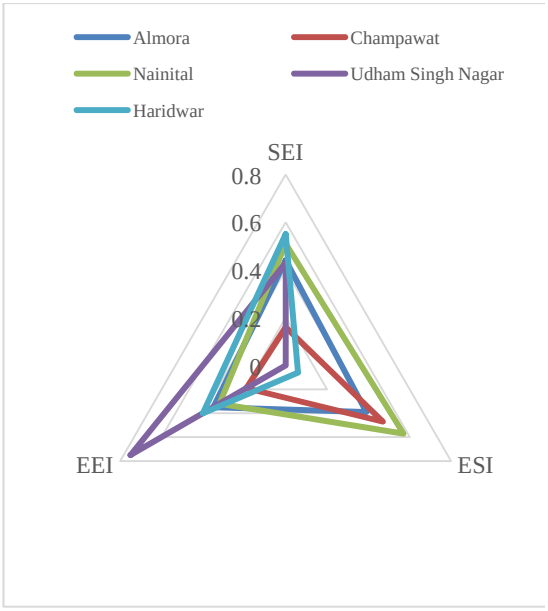


Figure B.3 Diagrammatic representation of Social Equity, Ecological Security, Economic Efficiency Index Values for districts of Uttarakhand and state average of 3 indicators.







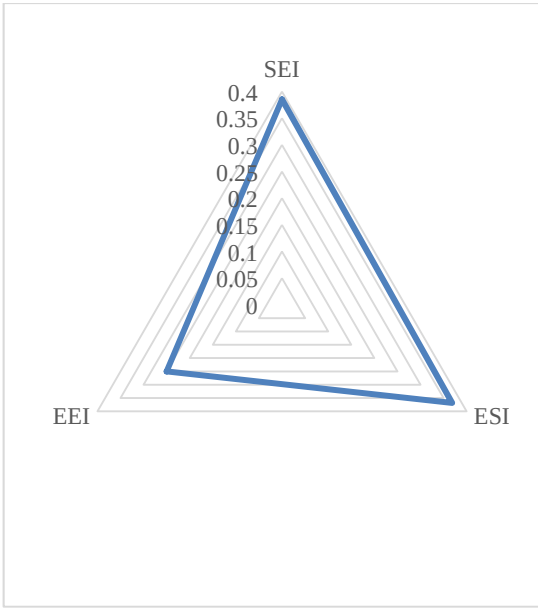


Table B.1 District wise ranking of Social Equity, Ecological Security and Economic Efficiency Indicators for the state of Uttarakhand

Districts	**SEIValue**	**SEIRank**	**ESIValue**	**ESIRank**	**EEIValue**	**EEIRank**
Uttarkashi	0.09	13	0.24	10	0.23	6
Chamoli	0.30	9	0.38	8	0.01	13
Rudra Prayag	0.31	8	0.84	1	0.04	12
Tehri Garhwal	0.29	10	0.37	9	0.18	8

Dehradun	0.82	1	0.45	5	0.42	2
Garhwal	0.50	4	0.46	4	0.16	9
Pithoragarh	0.34	7	0.13	11	0.13	10
Bageshwar	0.27	11	0.43	6	0.07	11
Almora	0.44	5	0.39	7	0.35	4
Champawat	0.16	12	0.47	3	0.19	7
Nainital	0.5	3	0.5	2	0.3	5

	1		7		2	
Udham Singh Nagar	0.43	6	0	13	0.75	1
Haridwar	0.55	2	06	12	0.40	3

Source: Self calculated by author.

Table B.2 Sustainable Livelihood Security Index Values with district wise rank for the state of Uttarakhand

Districts	**SLSI Value**	**Rank**
Uttarkashi	9.7	12
Chamoli	10.0	13
Rudra Prayag	7.0	7
Tehri Garhwal	9.0	9

Dehradun	2.7	1
Garhwal	5.7	4
Pithoragarh	9.3	10
Bageshwar	9.3	10
Almora	5.3	3
Champawat	7.3	8
Nainital	3.3	2
Udham Singh Nagar	6.7	6
Haridwar	5.7	4

Source: Self calculated by author.

(Figure B.1 & B.2) represent the index values of the Social, Ecological, Economic variables in a spider web form. The spider web representation shows the district wise performance in all the three arenas with variables specified. Diagrammatic representation *(Figure B.3)* shows the cumulative performance of districts whether it is socially equitable, ecologically secure and economically efficient. Overall state performance is depicted by the bottom right representation in *figure B.3.* The rankings based on the index values of three different segments is presented in *table B.1* and the cumulative SLSI values and rankings based on them is shown by *table B.2.*

Social Equity Index:

The Capital city Dehradun is the leading district in the segment of social equity followed by two beautiful cities Haridwar and Nainital. These are showing good performance because of the proper facilities present may it be drinking water facility, lighting facility, laterine facility, etc. The districts performing above the state level average (0.38) are, Garhwal, Almora and Udham Singh Nagar. The worst performer in the social segment is Uttarkashi, where the sex ratio, female literacy rate, basic facilities are almost negligible. The districts as bottom performers are, Bageshwar, Chamoli, Rudraprayag, etc.

Ecological Security Index:

The ecologically rich state has district Rudraprayag in the top position in ESI followed by Nainital and Champawat. The districts that are performing above state average (0.37) are Chamoli, Dehradun, Bageshwar, etc. The enriched forest cover and vegetation is the main factor of keeping these districts in the top level. The worst performer is Udham Singh Nagar. And the complementing districts in the bottom performers are, Uttarkashi, Pithoragarh, Haridwar. The increased pilgrimage and the deforestation in the area for constructing accommodation places for tourists is keeping these districts in the bottom performers in ESI.

Economic Efficiency Index:

As far as economic efficiency is concerned the district Udham Singh Nagar secures the top position followed by Dehradun and Haridwar with increased yield, high productivity and percentage of net sown area to the total area. The districts performing above state average (0.25) are, Nainital, Almora. The worst performer in the segment is Chamoli along with Garhwal, Pithoragarh, Bageshwar, Rudraprayag, etc. performing below state average.

SLSI Approach:

The top performer in cumulative SLSI ranking is capital city Dehradun followed by natural beauties Nainital and Almora. The SLSI results are as expected.

The pilgrimage and natural vegetation are supplementing the economy and the increased pilgrimage makes the government to invest more in building hotels, accommodation places for visitors to gather more revenue and in turn they also provide access to better facilities required for good sustainable livelihood.

CONCLUSION

The state after getting separated from Uttar Pradesh has grown both socially and economically. The capital city is performing well in all the three segments, likewise the tourist places are also performing good in all the three aspects and are aptly showing that they are socially equitable, ecologically secure and economically efficient and the future prospects are really bright on the path to the sustainable livelihood. The huge investments are made on developmental projects aiding to the state's growth and prosperity. The government needs to formulate more apt policies in providing facilities to the districts which are lagging far behind in the social equity aspect and economic efficiency aspect.

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