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Socio-economic impacts of land use changes in low hills of Himachal Pradesh, India

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Abstract
A survey was conducted to study the impacts of land use changes on local habitats and their economy in low hills of Himachal Pradesh. Three districts namely; Bilaspur, Kangra and Hamirpur districts were selected in low hills of Himachal Pradesh. 260 respondents were interviewed to assess the impacts of land use changes in low hills of the state. The road expansion under Kiratpur-Nerchock project crossing Bilaspur district has positive impacts like development in tourism (10% respondents), better transportation (10% respondents), increased employment (16%respondents) and telecommunication system (8% respondents). In Kol-dam hydro project (Bilaspur), the respondents have lost their livelihood, agriculture land, livestock, social bonding and displaced to other places. The industrialization in Sansarpur-Terrace (Kangra) resulted in enhancement of private business (36.7% respondents). The mining activities in sampled areas of Hamirpur district have provided employment to the local population, but its processing affected biotic and abiotic components near to mining area. Thus, the land use changes have raised the living standards of local habitats but somewhere, it affected their socio-economic status.

Keywords: Socio-economic, impacts, low hills, Himachal Pradesh

1. Introduction
Land use and land cover changes (LULCs) are known for changes in environment (Shi *et al*, 2009) [13] with considerable implications for many international policy issues (Liu *et al*., 2010) [9] and in current strategies it act like a central part in management of natural sources and monitoring environmental changes (Minale and Rao, 2011) [11]. The LULC pattern of any area is an effect of natural and socio-economic factors and their exploitation. In 2006, according to United Nations the impacts of land use changes have more and more stimulated from significant to frightening extent for last few years and with a few exceptions, anthropogenic activities explains the changes, extent and harshness. The greatest fatalities of these land use changes are the forest and agricultural and land covers which manifests in loss of significant amount of natural vegetation and agricultural land as a result leading to degradation of environment (Dewi and Ekadinata, 2010) [4]. LULCs account for approximately 30% of past human efflux of carbon dioxide and making it the second major driver of anthropogenic carbon dioxide efflux behind burning of fossil fuels (Robinson *et al*., 2010) [12]. From many years, the anthropogenic activities have customized the environment for example, increase in population increased and accelerated socio-economic activities. Urbanization, which has been categorized not only by increasing population but also by increasing economic expansion in industrial area, social activities and intensified use of land resources (Karuga, 1993) [7]. Rapid urbanization has resulted in high development densities, environmental degradation, proliferation of slum and squatter settlements and general low productivity (Linn, 1983; Nzioki, 1988; Obudho, 1983) [10]. A survey has been carried out to analyze the impacts of land use changes on people and their economy of selected areas in low hills of Himachal Pradesh. Participation of people is really a good part of social evaluation process thus, this survey included public discussion/talk/meetings which are a process of two way communication where it involves full public understanding/perceptions about project, its profits, problems and solutions. Kasish (2018) [8] and Sharma (2018) [1] have also found the socio-economic and environment impacts of national highway expansion in Himachal Pradesh.

2. Methodology
2.1 Study Area
In order to assess the socio-economic impact of major land use changes, a study has been

conducted in Bilaspur, Kangra and Hamirpur districts of Himachal Pradesh. Bilaspur having an area of 1,167 km^2 is located at latitude of 31.34° N and longitude of 76.68° E, lies at the foot of Bandla Hills, near the reservoir of Govind Sagar on the Sutluj River. The major land use changes in Bilaspur and the establishment of Kol-Dam hydropower project, which is located on Satluj river, covers some part in Bilaspur and the road expansion under Kiratpur-Nerchowk project passing through two States of India namely Kiratpur in district Ropar in the State of Punjab and ends at Bilaspur district in the State of Himachal Pradesh (Fig. 1). The project passage passes through mostly plain and undulating terrain like forest land, agricultural land and important settlements along and around the existing alignment covering 21 villages.

Fig 1: Map of Kiratpur-Nerchowk road expansion project *(Source: NHAI report).*

Kangra district of Himachal Pradesh having an area of 5739 km^2 is located at latitude of 31.2° to 32.5° N and longitude of 75 to 77.45° E. Hamirpur district having an area of 1,118 km sq, located at latitude of 31.68° N and longitude of 76. 52°E.Sansarpur-Terrace in Nurpur, Kangra district and mining areas of Hamirpur were taken into consideration for analyzing the land use changes.

2.2 Sampling and Data Collection

50 respondents in Kiratpur-Nerchowk project, 150 respondents in case of Koldam hydro-project, 30 respondents in Sansarpur-Terrace and 30 respondents in Hamirpur district were selected randomly. A pre-tested questionnaire was used as a tool for collecting information on socio-economic aspects include influence on their property loss (residential and commercial structure), land holdings (pasture, uncultivated barren land & waste land) and different sources of income (both on-farm & off-farm sources) etc. According to the Environmental & Social Safeguards Due Diligence Report, the total land required for the widening and reinforcement of the existing two-lane road carriageway section of NH-21 by four-laning is 374.2076 hectare (ha) out of which the existing RoW (Right of way) is 44.05 ha., private land is 183.6367 Ha and forest land is 121.8834 ha *(Source: NHAI report).*

3. Results and Discussion

The survey revealed that about 14% respondents were illiterate falling under Kiratpur-Nerchowk project, under Koldamhydro-project the illiterate respondents were 10.7%, in Sansarpur-Terrace the illiterate respondents were 23% and in Hamirpur districts, the illiterate's respondents were 13% (Table 1).

Table 1: Qualification Profile of respondents in sampled areas of Himachal Pradesh

Sr. No.	Educational profile of sampled area	Kiratpur-Nerchowk project		Koldam hydro-project		Industrialization in Sansarpur-Terrace		Industrialization in Hamirpur district	
		Respondents	%	Respondents	%	Respondents	%	Respondents	%
1	Illiterate	7	14	16	10.7	7	23	4	13
2	Middle	6	12	29	19.3	4	13	3	10
3	Matric	11	22	18	12	9	30	8	27
4	Sr. Secondary	9	18	42	28	3	10	3	10
5	Graduate	8	16	19	12.7	3	10	7	23
6	Post Graduate	9	18	26	17.3	4	13	5	17
	Total	50	100	150	100	30	100	30	100

3.1 Road expansion under Kiratpur-Nerchowk projectin Bilaspur

A few public meetings were carried out along the project road, villages, shopkeepers and the project affected people and the people of the different section of the society in Bilaspur district to evaluate about the impacts on people and their economic activities. As expected survey findings revealed that there were mostly positive impacts and few negative impacts on people and their economy (Table No. 2).10% respondents were of the opinion that tourism activities have accelerated, road expansion has presented a better facility for transportation (10% respondents) as tourists visiting Manali-Rohtang Pass from India and abroad and12% respondents have shifted their business (Table No. 2) where land is less expensive and eye-catching.

The road expansion has induced greater accessibility to educational facilities (6% respondents), employment generation for local population (16% respondents)**,** health and development of telecommunication facilities (8% respondents) and other modes of connectivity leading to a greater contact to the localities for markets and infrastructure facilities. According to the 10% respondents, all the above mentioned benefits were a good sign of changes in the land use pattern of their income generation, economic activities, and employment condition in the sampled areas of Bilaspur. The affected households were compensated due to land acquisition. 60% respondents did not satisfy with the compensation whereas, 30% were satisfy and 10% did not respond. The increase in employment is evident from the fact that 1033 persons got jobs in which 91 were skilled, 195 were semi-skilled, 680 unskilled and 64 were engineers (*Source: NHAI report*).

According to 8% respondents there was destruction of structures (Table No. 2), which was verified by NHAI report according to which1110 houses were destroyed during the expansion of the road including 750 cemented houses. 8% respondents have reported about breaking of social bond and 4% respondents reported about loss of health (Table No.2). During the survey it was found that there are two wildlife sanctuaries: Naina Devi ji Wildlife Sanctuary and Govind Sagar Wildlife Sanctuary which are very near to the existing alignment but there were no as such significant impacts found on wild animals during construction and operation phase.

Table 2: Impacts of Kiratpur-Nerchowk project on different sectors in Bilaspur district

Sr. No.	Sectors	Respondents	Percentage
1.	Tourism development	5	10
2.	Agriculture land loss	4	8
3.	Development in Private business	6	12
4.	Increase in employment	8	16
5.	Loss of health	2	4
6.	Development of telecommunication facility	4	8
5.	Break down of social bonds	4	8
6.	Better transportation system	5	10
6.	Educational facilities	3	6
7.	Destruction of structures	4	8
8.	All the above	5	10
	Total	50	100

3.2 Koldam Hydro Project (Bilaspur)

The Koldam hydro-project has affected many of the families and displaced to different places. These families are now residing at different places like resettlement colonies of Kangoo (Mandi), Mundkhar (Solan), Sunni (Shimla), Jamthal and Chamyon (Bilaspur). Thehydro-project has resulted inloss of land holding per family in affected sampled areas i.e. cultivated land, loss in grazing land, and decrease in crop area. Similar findings were given by Chand *et al*, 2016 [5]. According to study conducted by Katoch *et al* in 2014 [6] during their study on impacts of Nathpa Jhakri project in Kinnaur and Shimla districts of HP, they observed that after project implementation, cultivated and uncultivated areas had decreased by 5.82 and 42.78 %, respectively. Adams in 1985 conducted a study to assess the impacts of Bakolori Dam on Skoto River and found that cropped area was decreased. It was observed that after hydro-project induced there were side effects on the occupation and composition of respondents families. The profile of affected families before and after the displacement period due to Koldam hydro-project construction has been summarised in Table 3. The occupational structure showed that due to dislocation agriculture is decreased from 43.3% to 20%, the private business has increased from 13.3% to 30%, shop owner have increased from 20% to 26.7% and the government jobs has decreased from 16.7% to 13.3% (Table No 3). These affected and displaced families were compensated for their agriculture, non-agriculture, private business and they were asked whether the amount compensated to them was adequate to remake previous standards of life. 30 out of 150 (20%) respondents were replied that they satisfied with the compensated amount to recreate previous standards of life whereas, 53.3% were unsatisfied with compensation. It was also observed that the 83.3% families were reduced to smaller families (Table 4).

Table 3: Profile of respondent's occupation in Koldam Hydro-project

Sr. No.	Occupation	Pre-occupational profile		Post-occupational profile	
		Respondents	Percentage	Respondents	Percentage
1	Agriculturist	65	43.3	30	20.0
2	Private business	20	13.3	45	30.0
3	Government job	25	16.7	20	13.3
4	Private job	10	6.7	15	10.0
5	Shop keeper	30	20	40	26.7
	Total	150	100.0	150	100.0

Table 4: Family composition before and after Koldam hydro-project

Sr. No.	Family Composition	Before construction		After construction	
		Respondents	Percentage	Respondents	percentage
1.	Joint	125	83.3	20	13.3
2.	Separate	25	16.7	130	86.7
	Total	150	100.0	150	100.0

The compensated amount was utilized by respondents for various purposes like investment on their existing private business, purchase agriculture land, deposited or saved in banks etc. (Table No 5). Majority (26.7%) have constructed new houses, 20% invested in new business, 13.3% kept their money in banks, 10% purchased agriculture land, 6.7% invested in children education and rest used their money in household appliances.

Table 5: Utilization of compensated amount by respondents in Bilaspur

Compensation amount utilized	Respondents	Percentage
Purchased Agriculture Land	15	10.0
Constructed New house	40	26.7
Invested in business	30	20.0
Invested in Children education	10	6.7
Cleared Pending debts	20	13.3
Deposited and saved in Banks	25	16.7
Purchased Vehicles for personal use	5	3.3
Purchased T.V and Refrigerators	5	3.3
Total	150	100.0

After the displacement of affected families, women in the villages who were engaging in economic activities to sustain their families by selling ghee, milk and butter also affected due to lack of space (cattle shed at new places) and unavailability of fodder at resettlement colonies after the displacement period from 43.3% to 23.3%. So it was observed that the livestock reduction and the agriculture land loss were the reasons for portrait them as workless (Table No 6). The source of revenue from agriculture has reduced from 33.3% to 30% and the workless women have increased from 23.3% to 46.7%.

Table 6: Women's sources of livelihood in pre and post- displacement

Sr. No.	Livelihood source	Before		After	
		Respondents	Percentage	Respondents	Percentage
1.	Selling Milk, Butter and Ghee	65	43.3	35	23.3
2.	Agriculture	50	33.3	45	30.0
3.	No source (workless)	35	23.3	70	46.7
	Total	150	100.0	150	100.0

Therefore it was evident that this hydropower construction has several impacts on the respondents. It destroyed their livelihood, shelter and other property sources and also impacts on their socio-economic rights.

3.3 Industrialization in Kangra

The other major land use change considered for survey was Sansarpur-Terrace, which transformed into industrial area in Nurpur in Kangra district of Himachal Pradesh. About 30 respondents in the sampled area (Sansarpur-Terrace) were consulted, personally interviewed through a questionnaire at their homes and place of work during the survey, which included families of Reri, Sansarpur-terrace, Nari and Ghati villages. According to survey findings there were settlements in previous time but due to increasing industrialization in Sansarpur-Terrace there were very few settlements found which inhabited on government land. Pharmaceutical factories, beer factories, battery manufacturing factory, marvel manufacturing factories and other micro level enterprises were set up in the industrial area. The localities of the sampled area exhibited strong opposition towards the industrial set up as it created health problems for localities. As expected about 22 out of 30 (73.3%) respondents opposed the industrial set up in Sansarpur Terrace, while only 5 out 30 (16.7%) were in favour of the industrial set up and remaining 3 out 30 (10%) did not reply the questions (Table 7). The respondents adopted various methods in previous time to oppose the industrial area establishment in Sansarpur-Terrace. But after the establishment of industrial area, it affected the occupation and provided employment to the local population of sampled areas Reri, Sansarpur-terrace, Kotla, Nari and Ghati (Table No 8).

Table 7: Opposition by respondents to the industrial set up in Sansarpur-Terrace (Kangra)

Sr. No.	Opposition of industrial set up	Respondents	Percentage
1.	Yes	22	73.3
2.	No	5	16.7
3.	No Reply	3	10.0
	Total	30	100.0

Table 8: Profile of respondents occupations before and after industrialization in Sansarpur-Terrace (Kangra)

Sr. No.	Occupation	Before Industrialization		After Industrialization	
		Respondents	Percentage	Respondents	Percentage
1.	Private business	2	6.7	11	36.7
2.	Agriculturist	12	40.0	7	23.3
3.	Private jobs	2	6.7	5	16.7
4.	Govt. Jobs	9	30.0	7	23.3
5.	Workless	5	16.7	0	0
	Total	30	100.0	30	100.0

The study revealed that private business has increased from 6.7% to 36.7, private jobs have increased from 6.7% to 16.7%, and no workless force is available in the area. The agriculturist has decreased from 40% to 23.3% and government jobs have decreased from 30% to 23.3% (Table No. 8).After the industrial set up new 5 hotels and 12 *dhabas* were setup in the sampled area and also small enterprises like chemical based, wooden based furniture, auto-repairing, Cyber cafe, Mobile repairing, boutiques, new photo printing labs have been developed in Sansarpur-Terrace including nearby sampled areas (Figure 2). During the people consultation in sampled areas, it was found that the respondents faced cleanliness problem which did not properly maintain by these industries set up in Sansarpur-Terrace. Some of the factories like beer and battery manufacturing factories discharged their effluents into Swan *khad* near the industrial area. As there is no water flow in Swan *khad* except in monsoon season, thus the stagnant waste water created foul smell and raised health issues. According to the response of 5 out of 30 (16.7%) respondents in the sampled area, this polluted water sometimes reached to nearby agriculture fields through various processes like leaching or runoff and deteriorate the soil quality, which affected the plants growth and indirectly the crop production (13.3 % respondents), 3 out of 30 (10 %) respondents were in the favour that the stagnant water discharged from factories make the ground water quality poor. About 6.6% respondents considered that industrialization and development in Sansarpur are the main cause that water have gone dried up the Swan *Khad* and declination of natural ground water resources like *Bowri* and *Nalus* in nearby villages (Table 9).

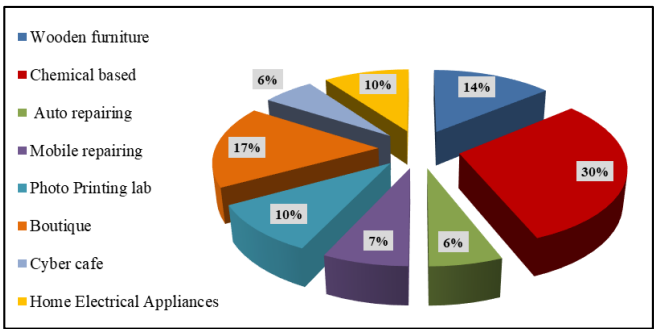

Fig 2: Diagrammatic representation of small enterprises developed in sampled area (Kangra)

Table 9: Problems faced by respondents in sampled areas of Sansarpur-Terrace (Kangra)

Sr. No	Problems faced	Respondents	Percentage
1.	Deterioration of soil quality	5	16.7
2.	Indirectly affect plant growth and crop production	4	13.3
3.	Deterioration of ground water quality	3	10
4.	Create foul smell	4	13.3
5.	Declination of natural sources	2	6.7
6	All of the above	12	40
	Total	30	100.0

3.4 Mining Activities in Hamirpur

A survey of 30 respondents regarding harmful effects of mining activities on the local environment, on their health and on their livelihood too on selected mining sites in Hamirpur carried out through a pretested questionnaire, people consultations, and personal interviews at their work of place. The sampled areas were near the mining sites where some major streams drained their water into Beas and Satluj River Catchment. The streams which taken into consideration for study were Bakar *khad*, Pung *Khad* Baghera *khad*, Sukhad *Khad*, Riani *Khad*, Salasi *Khad*, Kunah *Khad*, form part of Beas catchment area and other Sir *khad*, Chainth *khad*, Sukkar *khad* form the Satluj River catchment area. As shown in Figure 3 most of respondents (40%) were engaged in agriculture as their main livelihood, 26.7% respondents have indulged in their services (Government or private service), 23.3% respondents were labourer, 6.7% had their private business and only 3.3% respondents were workless.

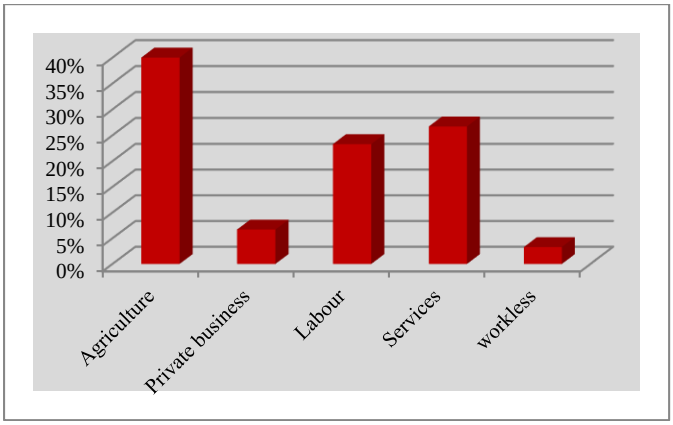

Fig 3: Occupation of respondents in sampled areas (Hamirpur)

The mining activities in the sampled areas provided employment to the local people and some migrated labour. According to the respondents about53.3% of labour, 16.7% mining owner, 16.7% transporters and 13.3% mineral traders depend on mining for their livelihood (Table10), but somewhere about 4 out of 30 respondents (13%) considered that these mining activities degraded air quality as the stone dust and particulate matter generated from stone crushers or through blasting and affected the workers on the site and indirectly the people who are not working by constant exposure to various air borne diseases. Priyadarshi in 2010 found the most widespread diseases like tuberculosis, cold, malaria, cough, skin diseases, joints pain, diarrhoea, arthritis etc. In 2015 according to Das, continuous exposure with toxic elements found in atmospheric air while working lead to complicated health problems like lung disease, cancer, silicosis etc. According to 10%respondents it affected the quality of water sources (losing ground water table), 17 % respondents said it deteriorate the soil quality (soil is deficit in nutrients, poor fertility, low water holding capacity, stoniness of land) indirectly affect vegetation cover (3% respondents), degraded forests (13% respondents) and results in low productivity and indirectly affect to the livestock (10% respondents) of sampled areas near mining sites.

Table 10: Respondents dependent on mining for their livelihood in sampled areas (Hamirpur)

Sr. No.	Types of people	Respondents	Percentage
1.	Owner	5	16.7
2.	Labour	16	53.3
3.	Transporters	5	16.7
4	Mineral products	4	13.3
	Total	30	100

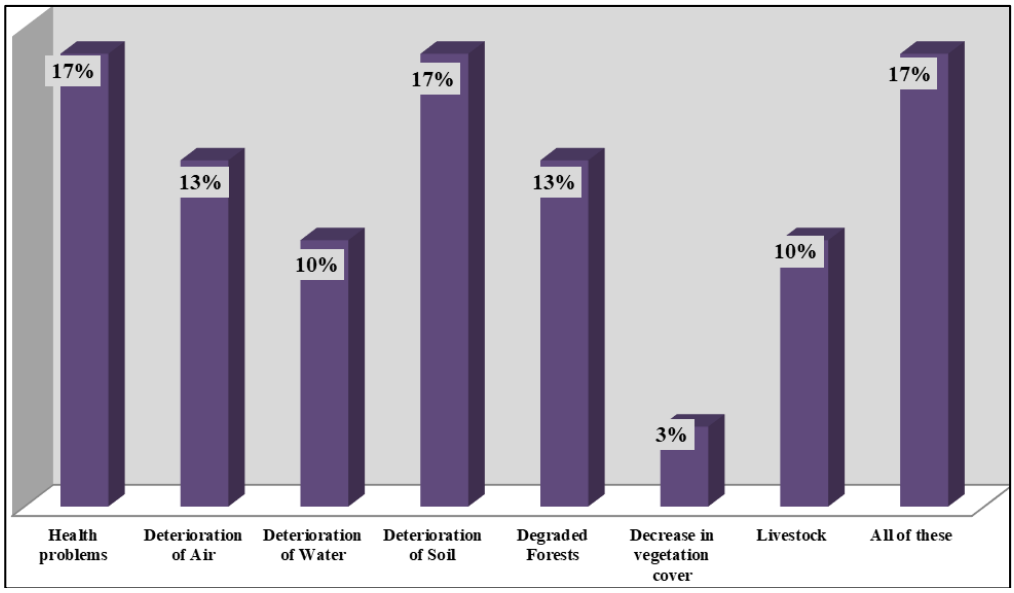

Fig 4: Diagrammatic representation of respondents affected by mining activities in sampled areas (Hamirpur)

Therefore, the mining activities in selected areas of Hamirpur district has both positive and negative impacts on the livelihoods of respondents as it raised the standard of living but somewhere it diminished the mineral resources and modified the social and economic association.

4. Conclusions

The present study revealed that major land use changes have affected the people and their economy positively and negatively. The Kiratpur-Ner Chowk Project in Bilaspur have improved the living standard of local population whereas, Koldam hydro project in Bilaspur district have deteriorated the environment, loss of agriculture land and livestock population. The industrialization in Sansarpur-Terrace has improved the socio-economic condition of local habitats. Mining activities in sampled areas of Hamirpur district have both positive and negative impacts on local population. Therefore, these land use changes in sampled areas have raised the living standards of people but somewhere it impacted adversely their socio-economic rights.

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