Impact Of A Thermal Power Project On Neighbourhood – A Case Study Of Kalisindh Thermal Power Project

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Abstract: Kalisindh Thermal Power Project is located near village Undal in State Rajasthan. For construction of this power project land of nearby villages Devri, Motipura, Nimoda, Singhania and Undal was acquired. When any project starts, it always impact on people living in vicinity in so many ways. This impact may be positive and sometimes it may be negative. This paper presents the findings about adverse impact of this Thermal Power Project on villagers living in vicinity. A survey has been carried out on residents of these villages through a structured questionnaire to collect data. All villagers belong with the almost same background, hence convenience sampling considered appropriate for collection of data. Frequency, percentage, simple arithmetic mean and ANOVA are the statistical tools used for the analysis. With help of this study, it has been concluded that for construction of this power project agriculture land of villagers were acquired; hence consequences were: loss of vegetation, loss of source of income of villagers and compensation provided for land was not sufficient.

Keywords: ANOVA, Adverse Impact, Compensation, Convenience Sampling, Loss of Vegetation.

I. INTRODUCTION

When any project commissioned, it always have an impact on social and economical well being on people living in vicinity. This impact may be positive in favour of people living in vicinity but sometimes it may be negative also. Kalisindh thermal power plant is also an example of the same. It is located near village Undal approximately 15 km far from District Jhalawar. For construction of this thermal power plant land of five villages i.e. Devri, Motipura, Nimoda, Singhania and Undal were acquired by paying compensation to villagers. Acquired land of villagers was fertile agriculture land. Due to construction of this project on that land vegetation grown on that land was lost. Villagers lost their land; hence they lost their source of income too. Compensation provided for land was not sufficient in view of villagers. Its consequences were many villagers became daily wage labourer. A research on socio-economic impact of Kalisindh thermal power project has been carrying out. As a part of this research, adverse impact of this project on villagers' of these five villages has been analyzed. This paper presents the findings.

II. LITERATURE REVIEW

Few reviews from available good deal of literature related to this work are mentioned as below:

Pandey (1983) assessed the effects of a thermal power plant on its surrounding areas, with special reference to vegetation. For this purpose the area around the Obra Thermal Power Plant was selected. The effect of the power plant emissions on soil and eco-physiological characteristics such as pH, organic matter and N, P, K and S concentrations in soil; leaf injury symptoms, number and distribution of plant species; chlorophyll content in leaves, percentages of photo synthetically active leaf area; accumulation of N, P, K, and S in leaves etc. seemed to be a function of the pollutant gradient existing in the area.

Canter and Canty (1993), summarized definitions of the significance of anticipated impacts of proposed projects included in environmental impact assessment (EIA) guidelines or regulations of many countries and international organizations.

Carrington (1996) investigated during the construction period, most notably between 1973 and 1975, crime rates in Valdez increased sharply. Rates of alcoholism, gambling and prostitution all rose dramatically. Auto theft doubled. These statistics, combined with an increase in transient residents added to a general sense of loss-of-safety in the community.

Revenga et al. (2000), concluded that Dams represent one of the most significant human interventions in the hydrological cycle. Through provision of water for drinking, irrigation and electricity, they have supported human socio-economic development, but simultaneously they have had a considerable impact on freshwater ecosystems. It is estimated that inter-basin transfers and water withdrawals for supply and irrigation have fragmented 60% of the world's rivers.

Schaeffer and Szklo (2001), identified and discussed the main issues and uncertainties affecting electricity demand and supply in Brazil, and their consequent environmental burdens, over the period to the year 2020.

Geller et al. (2004), reviewed energy trends and energy policy objectives in Brazil. They proposed and analyzed 12 policy options for advancing energy efficiency and renewable energy use. The policies were analyzed as a group with respect to their impacts on total energy supply and demand as well as CO2 emissions. It was determined that the policies would provide a broad range of benefits for Brazil including reducing investment requirements in the energy sector, cutting energy imports, lowering CO2 emissions, and providing social benefits.

Hainesa et al. (2006), stated that climate change is occurring as a result of the accumulation of greenhouse gases in the atmosphere arising from the combustion of fossil fuels. Climate change may affect health through a range of pathways, for example as a result of increased frequency and intensity of heat waves, reduction in cold related deaths, increased floods and droughts, changes in the distribution of vector-borne diseases and effects on the risk of disasters and malnutrition. They found that the overall balance of effects on health is likely to be negative and populations in low income countries are likely to be particularly vulnerable to the adverse effects. The experience of the 2003 heat wave in Europe showed that high-income countries may also be adversely affected. Adaptation to climate change requires public health strategies and improved surveillance. Mitigation of climate change by reducing the use of fossil fuels and increasing a number of uses of the renewable energy technologies should improve health in the near-term by reducing exposure to air pollution.

Chungen et al. (2008), discussed problems associated with grate-fired boilers burning biomass, primary pollutant formation and control, deposition formation and corrosion, modelling and computational fluid dynamics (CFD) simulations etc.

Sabine and Thomas (2008), presented an overview on present seawater desalination capacities by region including ways of mitigating the impacts of desalination on the environment, and of avoiding some of the dangers of the environment to desalination. A "hot spot" of intense desalination activity has always been the Arabian Gulf, but other regional centres of activity emerge and become more prominent, such as the Mediterranean Sea and the Red Sea, or the coastal waters of California, China and Australia. Despite the many benefits the technology has to offer, concerns rise over potential negative impacts on the environment.

Shanfu Yu et al. (2008), investigated in their study at a Thermal Power Plant in China, the effects of the job demand-control (DC) model and the effort-reward imbalance (ERI) model on worker's well-being, self supports for psychosocial work conditions. They found that workers reporting high job demands and low job control or high efforts and low rewards had elevated risks of job dissatisfaction, psychosomatic complaints and depressive symptoms. Odds ratio was generally higher in workers reporting both high efforts and low rewards. Furthermore, low reward proved to be a stronger predictor of poor well-being when both job stress models were simultaneously adjusted.

Matthew (2009), stated that Dams, through disruption of physiochemical and biological processes, have water and associated environmental impacts that have far reaching social and economic consequences. The impact of each dam is unique. It depends not only on the dam structure and the attributes of local biota but also climatic and geomorphic conditions. He reviewed the consequences for ecosystems and biodiversity resulting directly from the presence of dams on rivers, and of constraints and opportunities for environmental protection. He illustrated that a wide range of both technical and non-technical measures had been developed to ameliorate the negative impacts of dams. He argued that relatively few studies have been conducted to evaluate the success of these measures and that it is widely perceived that many interventions fail, either for technical reasons or as a consequence of a variety of socioeconomic constraints. He discussed the constraints to successful implementation and mechanisms for promoting, funding and ensuring compliance. Finally, he contended that there is a need to improve environmental practices in the operation of both existing and new dams.

Abbasi & Abbasi (2010), examined the environmental impacts, including impact *vis a vis* greenhouse gas emissions, of different biomass energy generation–utilization options. They stated that biomass is the first-ever fuel used by

humankind and is also the fuel which was the mainstay of the global fuel economy till the middle of the 18th century. Then fossil fuels took over because fossil fuels were not only more abundant and denser in their energy content, but also generated less pollution when burnt, in comparison to biomass. In recent years there is a resurgence of interest in biomass energy because biomass is perceived as a carbon-neutral source of energy unlike net carbon-emitting fossil fuels of which copious use has led to global warming and ocean acidification.

Dutta, Bandyopadhyay (2010) expressed his notion that development is an ever growing process, its impact is also ever increasing, leading to rapid deterioration in environmental conditions and human health, Impact assessment thus ensures that the potential problems are foreseen and addressed at an early stage in the projects planning and design.

Yang et al. (2010), found that the natural wind plays disadvantageous roles in the operation of air-cooled steam condensers in power plant. They proposed the heat transfer of air-cooled condensers in a 2×600 MW direct air-cooled power plant.

Sambo et al. (2012), opined that Electricity plays a very important role in the socio-economic and technological development of every nation. It was widely accepted that there is a strong correlation between socio-economic development and the availability of electricity. Adequate power supply is an unavoidable prerequisite to any nation's development, and electricity generation, transmission and distribution are capital-intensive activities requiring huge resources of both funds and capacity. They presented in their paper a brief history of the attempts and efforts to supply power to the nation. They also briefly reviewed the current status of energy resources, energy demand and supply, power generation, transmission and distribution, power sector national policy, summary of the major challenges and the way forward. They found some of the most critical challenges of the power sector responsible for the generation short falls, transmission bottlenecks, and distribution problems in Nigeria such as Poor utilization of existing assets and deferred maintenance; Delays in the implementation of new projects; Inadequate power evacuation at newly completed and fictionalized power plants; Erratic supply of gas domestic resources for power generation; The National Grid is yet to cover many parts of the country; Vulnerable and overloaded existing transmission system; Poor voltage profile to the tail-end consumer and many more.

III. OBJECTIVE

This study is focused to a single objective i.e. analysing adverse impact of construction of project on villagers' living in vicinity of KaTPP.

IV. RATIONALE

Kalisindh Thermal Power Project is located near village Undal, in state Rajasthan. Few more villages are also situated in vicinity of this Thermal Power Project. No study has been carried out to discover adverse impact of construction of this project on villagers' living in vicinity. This research is to analyze adverse impact on residents of villages located near to the Kalisindh Thermal Power Project. The researcher has gone through tremendous amount of literature available related to this field of study but very little research in this field has been carried out till now. This study is an attempt to plug this gap.

V. HYPOTHESIS

For this study following hypothesis has been formulated and tested:-

H_{01}: "There is no significant difference among the villagers with respect to pollution due to construction of Thermal Power Plant".

H_{02}: "There is no significant difference among the villagers with respect to soil erosion in vicinity due to construction of Thermal Power Plant".

H_{03}: "There is no significant difference among the villagers with respect to loss of vegetation due to construction of Thermal Power Plant".

H_{04}: "There is no significant difference among the villagers with respect to loss of agriculture land due to construction of Thermal Power Plant".

H_{05}: "There is no significant difference among the villagers with respect to deterioration in health of children or villagers due to construction of Thermal Power Plant".

H_{06}: "There is no significant difference among the villagers with respect to increase in crime like theft or burglary due to construction of Thermal Power Plant".

H_{07}: "There is no significant difference among the villagers with respect to villagers' land acquired for construction of Thermal Power Plant".

H_{08}: "There is no significant difference among the villagers with respect to compensation provided to villagers against land acquired for construction of Thermal Power Plant".

H_{09}: "There is no significant difference among the villagers with respect to loss of source of income of villagers due to acquisition of their land for construction of Thermal Power Plant".

VI. RESEARCH METHODOLOGY

The descriptive type of research is used in this study. A survey has been carried out for analyzing impact of this thermal power plant on nearby villages by filling a structured questionnaire. All villagers belong from the almost same background. Hence Convenience sampling considered appropriate for selection of villagers. Internal consistency of the variables identified through reliability analysis. Table – 1 shows Cronbach's alpha value of the scale, which was found to be greater than 0.7. This shows adequate internal consistency. Statistical tools used for the analysis are frequency, percentage, simple arithmetic mean and ANOVA.

Name of Village	Cronbach Alpha
Devri	0.735
Motipura	0.771
Nimoda	0.724
Singhania	0.757
Undal	0.809

Table 1: Reliability Statistics

VII. DATA ANALYSIS AND FINDINGS

Results given by data analysis are mentioned as under:

A. ADVERSE IMPACT

When any new project started in any area, it gives benefits as well as adverse impacts to the communities living in vicinity of that project. Adverse impacts may differ for communities living in vicinity depend upon their distance from project. Adverse impacts may be such as pollution, Soil erosion in near about area, loss of vegetation, loss of agriculture land, deterioration in health of children or villagers, increase in crime like theft or burglary, loss of land of villagers for construction of project, insufficient compensation of acquired land and loss of source of income due to land acquired.

Table – 2 and graph show that 72% villagers of village Nimoda and 42 % villagers of village Undal agreed that they are facing problem of pollution. During survey it was found that location of these villages is near to the plant boundary of CHP area. They might be affected from coal dust of coal stacks. Only 23% villagers of village Motipura agreed with problem of pollution.

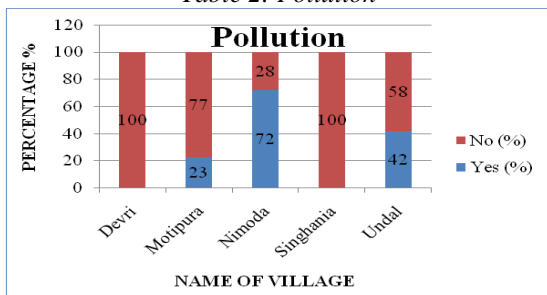| Village	Yes (%)	No (%)
Devri	0	100
Motipura	23	77
Nimoda	72	28
Singhania	0	100
Undal	42	58

Table 2: Pollution

Figure 1

Table – 3 and graph show that villagers of all five villages agreed that there is no erosion of soil due to construction of this power project. It infers that discharge of Thermal Power Projects never impacts on soil of vicinity.

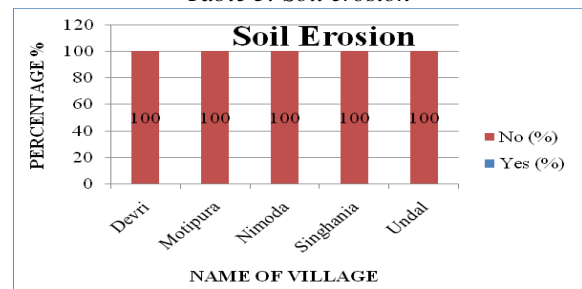| Village	Yes (%)	No (%)
Devri	0	100
Motipura	0	100
Nimoda	0	100
Singhania	0	100
Undal	0	100

Table 3: Soil erosion

Figure 2

Table – 4 & graph and Table – 5 & graph show that 80% villagers of village Devri, 51% villagers of village Motipura, 50% villagers of village Nimoda, 30% villagers of village Singhania and 85% villagers of village Undal agreed about loss of vegetation and loss of agriculture land due to construction of this power project. During survey it was found that land of these five villages was acquired for construction of this Power Plant. It was their agriculture land and whatever vegetation was planted on the land was diminished.

Village	Yes (%)	No (%)
Devri	80	20
Motipura	51	49
Nimoda	50	50
Singhania	30	70
Undal	85	15

Table 4: Loss of vegetation

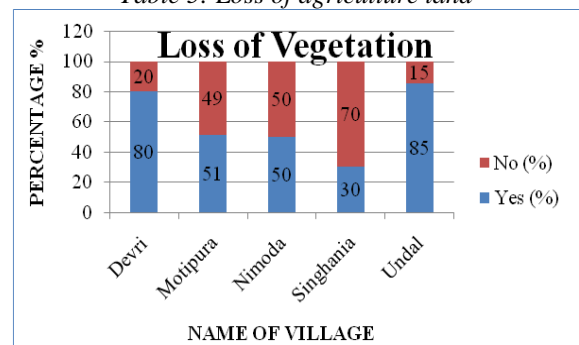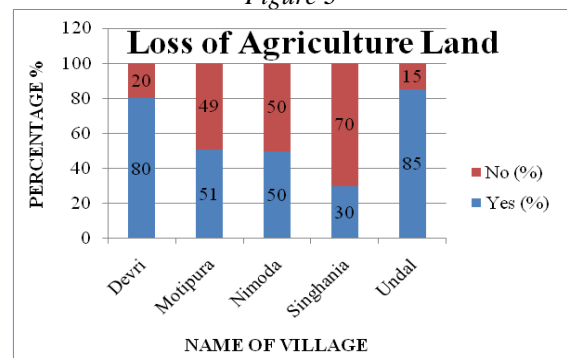| Village	Yes (%)	No (%)
Devri	80	20
Motipura	51	49
Nimoda	50	50
Singhania	30	70
Undal	85	15

Table 5: Loss of agriculture land

Figure 3

Figure 4

Table – 6 and graph show that all villagers of five villages agreed that there is no deterioration in health of children or villagers due to construction of this power project. It infers that this Thermal Power Plant is following the environment norms and aware about the discharge policies.

Village	Yes (%)	No (%)
Devri	0	100
Motipura	0	100
Nimoda	0	100
Singhania	0	100
Undal	0	100

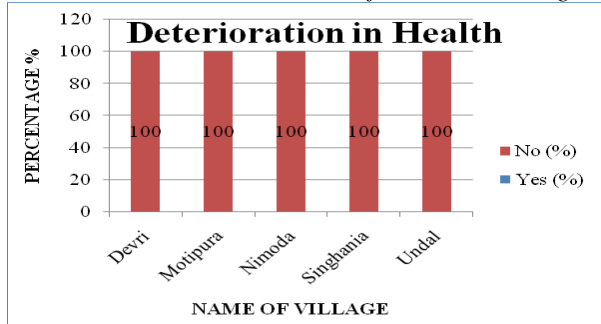*Table 6: Deterioration in health of children or villagers*

Figure 5

Table – 7 and graph show that many villagers of village Undal and few villagers of Motipura agreed for increase in crime like theft or burglary. During survey it was found that village Undal is located near to the plant boundary; hence possibility of increase in theft might be possible due to labour deployed for construction of this power project was commuting through this village.

Village	Yes (%)	No (%)
Devri	8	92
Motipura	38	62
Nimoda	9	91
Singhania	0	100
Undal	75	25

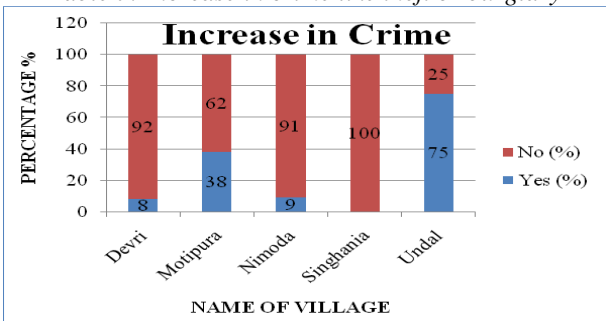*Table 7: Increase in crime like theft or burglary*

Figure 6

Table – 8, 9, 10 and graphs show that many villagers of all five villages agreed that their land was acquired for construction of this power project and compensation provided for land was not sufficient. This land was agriculture land; hence it was source of income for villagers through farming on this land. Hence many villagers lost their source of income and became daily wage labourer.

Village	Yes (%)	No (%)
Devri	80	20
Motipura	51	49
Nimoda	50	50
Singhania	28	72
Undal	83	17

Table 8: Villagers' land acquired for this project
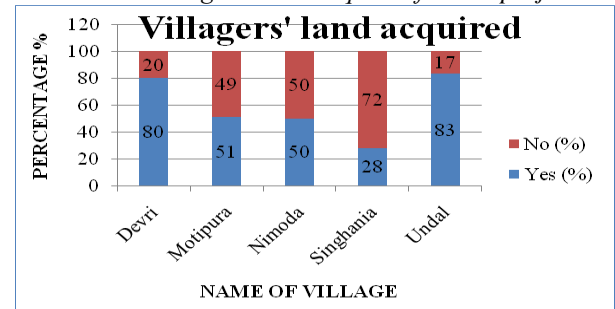
Figure 7

Village	Yes (%)	No (%)	Not Applicable (%)
Devri	20	80	0
Motipura	0	51	49
Nimoda	0	50	50
Singhania	2	26	72
Undal	0	83	17

Table 9: If land acquired, compensation given was sufficient
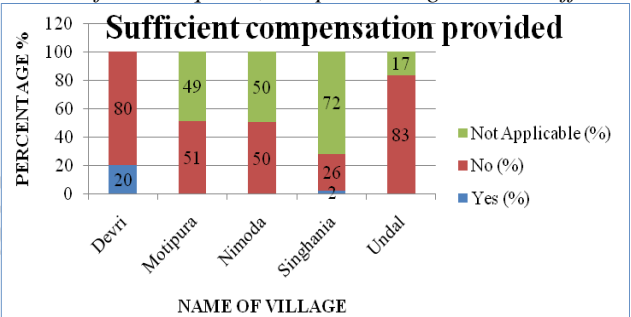
Figure 8

Village	Yes (%)	No (%)
Devri	80	20
Motipura	51	49
Nimoda	50	50
Singhania	28	72
Undal	83	17

Table 10: Loss of source of income due to land acquired

Figure 9

VIII.   INTERPRETATION OF ANOVA

Interpretation of the ANOVA table is described as under:

A. POLLUTION DUE TO CONSTRUCTION OF PROJECT

Table – 11 shows that f value of interaction between the villages and Pollution due to construction of Thermal Power Project is 34.220 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in 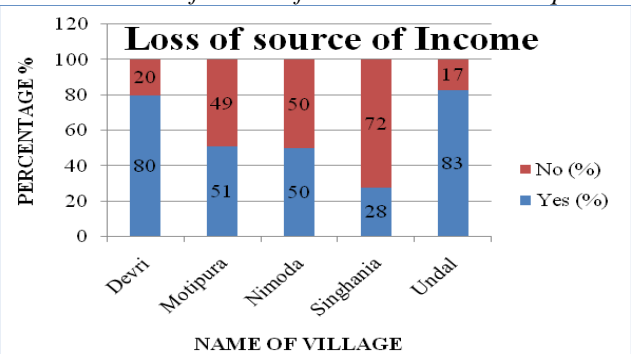the villagers with respect to Pollution due to construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to Pollution due to construction of Thermal Power Project" is rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	17.847	4	4.462	34.220	.000
Within Groups	32.335	248	.130		
Total	50.182	252			

Table 11: ANOVA: Pollution due to construction of project

Dependent Variable: Pollution due to construction of project LSD						
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Devri	Motipura	.23404*	.07336	.002	.0896	.3785
	Nimoda	.71739*	.07377	.000	.5721	.8627
	Singhania	.00000	.07222	1.000	-.1422	.1422
	Undal	.41667*	.06914	.000	.2805	.5528
Motipura	Nimoda	.48335*	.07489	.000	.3358	.6309
	Singhania	-.23404*	.07336	.002	-.3785	-.0896
	Undal	.18262*	.07034	.010	.0441	.3212
Nimoda	Singhania	-.71739*	.07377	.000	-.8627	-.5721
	Undal	-.30072*	.07076	.000	-.4401	-.1614
Singhania	Undal	.41667*	.06914	.000	.2805	.5528

*. The mean difference is significant at the 0.05 level.
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.

Table 12: Post Hoc Tests: Multiple Comparisons

Further observations from table – 12 are as follows:

✓ Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Devri is higher than that of Motipura, so it can be concluded that more villagers of Motipura are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Devri and Nimoda at 0.01 level. Mean score of village Devri is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda are facing problem of pollution due to construction of power plant.

✓ There is no significant difference between the villagers of village Devri and Singhania with respect to pollution due to construction of power plant. The hypothesis is not rejected

✓ Significant difference is found between the villagers of village Devri and Undal at 0.01 level. Mean score of village Devri is higher than that of Undal, so it can be concluded that more villagers of Undal are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Motipura and Nimoda at 0.01 level. Mean score of village Motipura is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Motipura and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Motipura, so it can be concluded that more villagers of Motipura are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Motipura is higher than that of Undal, so it can be concluded that more villagers of Undal are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Nimoda and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Undal is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda are facing problem of pollution due to construction of power plant.

✓ Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Singhania is higher than that of Undal, so it can be concluded that more villagers of Undal are facing problem of pollution due to construction of power plant.

B. SOIL EROSION IN VICINITY

Table – 13 shows that f value of interaction between the villagers of all five villages and soil erosion in vicinity due to construction of Thermal Power Project is negligible, hence insignificant. It means that there is no significant difference in the villagers with respect to soil erosion in vicinity due to construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to soil erosion in vicinity due to construction of Thermal Power Project" is not rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.000	4	.000	.	.
Within Groups	.000	248	.000		
Total	.000	252			

Table 13: ANOVA: Soil Erosion

C. LOSS OF VEGETATION DUE TO CONSTRUCTION OF PROJECT

Table – 14 shows that f value of interaction between the villages and Loss of vegetation due to construction of Thermal Power Project is 13.907 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in the villagers with respect to Loss of vegetation due to construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to Loss of vegetation due to construction of Thermal Power Project" is rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	11.080	4	2.770	13.907	.000
Within Groups	49.395	248	.199		
Total	60.474	252			

Table 14: ANOVA: Loss of vegetation

Dependent Variable: Loss of vegetation LSD						
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Devri	Motipura	-.28936*	.09067	.002	-.4679	-.1108
	Nimoda	-.30000*	.09118	.001	-.4796	-.1204
	Singhania	-.50000*	.08926	.000	-.6758	-.3242
	Undal	.05000	.08546	.559	-.1183	.2183
Motipura	Nimoda	-.01064	.09256	.909	-.1929	.1717
	Singhania	-.21064*	.09067	.021	-.3892	-.0321
	Undal	.33936*	.08693	.000	.1681	.5106
Nimoda	Singhania	-.20000*	.09118	.029	-.3796	-.0204
	Undal	.35000*	.08746	.000	.1777	.5223
Singhania	Undal	.55000*	.08546	.000	.3817	.7183

*. The mean difference is significant at the 0.05 level.
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.

Table 15: Post Hoc Tests: Multiple Comparisons

Further observations from table – 15 are as follows:

- Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Motipura is higher than that of Devri, so it can be concluded that more villagers of Devri agreed about loss of vegetation due to construction of power plant.
- Significant difference is found between the villagers of village Devri and Nimoda at 0.01 level. Mean score of village Nimoda is higher than that of Devri, so it can be concluded that more villagers of Devri agreed about loss of vegetation due to construction of power plant.
- Significant difference is found between the villagers of village Devri and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Devri, so it can be concluded that more villagers of Devri agreed about loss of vegetation due to construction of power plant.
- There is no significant difference between the villagers of village Devri and Undal with respect to loss of vegetation due to construction of power plant. The hypothesis is not rejected.
- There is no significant difference between the villagers of village Motipura and Nimoda with respect to loss of vegetation due to construction of power plant. The hypothesis is not rejected.
- Significant difference is found between the villagers of village Motipura and Singhania at 0.05 level. Mean score of village Singhania is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed about loss of vegetation due to construction of power plant.
- Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Motipura is higher than that of Undal, so it can be

concluded that more villagers of Undal agreed about loss of vegetation due to construction of power plant.
- Significant difference is found between the villagers of village Nimoda and Singhania at 0.05 level. Mean score of village Singhania is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda agreed about loss of vegetation due to construction of power plant.
- Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Nimoda is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about loss of vegetation due to construction of power plant.
- Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Singhania is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about loss of vegetation due to construction of power plant.

D. LOSS OF AGRICULTURE LAND DUE TO CONSTRUCTION OF PROJECT

Table – 16 shows that f value of interaction between the villages and Loss of agriculture land due to construction of Thermal Power Project is 13.907 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in the villagers with respect to Loss of agriculture land due to construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to Loss of agriculture land due to construction of Thermal Power Project" is rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	11.080	4	2.770	13.907	.000
Within Groups	49.395	248	.199		
Total	60.474	252			

Table 16: ANOVA: Loss of Agriculture Land

Dependent Variable: Loss of Agriculture Land LSD						
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Devri	Motipura	-.28936*	.09067	.002	-.4679	-.1108
	Nimoda	-.30000*	.09118	.001	-.4796	-.1204
	Singhania	-.50000*	.08926	.000	-.6758	-.3242
	Undal	.05000	.08546	.559	-.1183	.2183
Motipura	Nimoda	-.01064	.09256	.909	-.1929	.1717
	Singhania	-.21064*	.09067	.021	-.3892	-.0321
	Undal	.33936*	.08693	.000	.1681	.5106
Nimoda	Singhania	-.20000*	.09118	.029	-.3796	-.0204
	Undal	.35000*	.08746	.000	.1777	.5223
Singhania	Undal	.55000*	.08546	.000	.3817	.7183

*. The mean difference is significant at the 0.05 level.
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.

Table 17: Post Hoc Tests: Multiple Comparisons

Further observations from table – 17 are as follows:

- ✓ Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Motipura is higher than that of Devri, so it can be concluded that more villagers of Devri agreed about loss of agriculture land due to construction of power plant.
- ✓ Significant difference is found between the villagers of village Devri and Nimoda at 0.01 level. Mean score of village Nimoda is higher than that of Devri, so it can be concluded that more villagers of Devri agreed about loss of agriculture land due to construction of power plant.
- ✓ Significant difference is found between the villagers of village Devri and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Devri, so it can be concluded that more villagers of Devri agreed about loss of agriculture land due to construction of power plant.
- ✓ There is no significant difference between the villagers of village Devri and Undal with respect to loss of agriculture land due to construction of power plant. The hypothesis is not rejected.
- ✓ There is no significant difference between the villagers of village Motipura and Nimoda with respect to loss of agriculture land due to construction of power plant. The hypothesis is not rejected.
- ✓ Significant difference is found between the villagers of village Motipura and Singhania at 0.05 level. Mean score of village Singhania is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed about loss of agriculture land due to construction of power plant.
- ✓ Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Motipura is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about loss of agriculture land due to construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Singhania at 0.05 level. Mean score of village Singhania is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda agreed about loss of agriculture land due to construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Nimoda is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about loss of agriculture land due to construction of power plant.
- ✓ Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Singhania is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about loss of agriculture land due to construction of power plant.

E. DETERIORATION IN HEALTH OF CHILDREN OR VILLAGERS

Table – 18 shows that f value of interaction between the villagers of all five villages and deterioration in health of children or villagers due to construction of Thermal Power Project is negligible, hence insignificant. It means that there is no significant difference in the villagers with respect to deterioration in health of children or villagers due to construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to deterioration in health of children or villagers due to construction of Thermal Power Project" is not rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.000	4	.000	.	.
Within Groups	.000	248	.000		
Total	.000	252			

Table 18: ANOVA: Negative impact on health of children or villagers

F. INCREASE IN CRIME LIKE THEFT, BURGLARY DUE TO CONSTRUCTION OF PROJECT

Table – 19 shows that f value of interaction between the villages and Increase in Crime like Theft, Burglary due to construction of Thermal Power Project is 44.663 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in the villagers with respect to Increase in Crime like Theft, Burglary due to construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to Increase in Crime like Theft, Burglary due to construction of Thermal Power Project" is rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	21.387	4	5.347	44.663	.000
Within Groups	29.689	248	.120		
Total	51.075	252			

Table 19: ANOVA: Increase in Crime like theft, burglary

Dependent Variable: Increase in Crime like theft, burglary LSD						
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Devri	Motipura	.30298*	.07029	.000	.1645	.4414
	Nimoda	.00696	.07069	.922	-.1323	.1462
	Singhania	-.08000	.06920	.249	-.2163	.0563
	Undal	.67000*	.06625	.000	.5395	.8005
Motipura	Nimoda	-.29602*	.07176	.000	-.4374	-.1547
	Singhania	-.38298*	.07029	.000	-.5214	-.2445
	Undal	.36702*	.06740	.000	.2343	.4998
Nimoda	Singhania	-.08696	.07069	.220	-.2262	.0523
	Undal	.66304*	.06781	.000	.5295	.7966
Singhania	Undal	.75000*	.06625	.000	.6195	.8805
*. The mean difference is significant at the 0.05 level.						
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.						

Table 20: Post Hoc Tests: Multiple Comparisons

Further observations from table – 20 are as follows:

- Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Devri is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed about Increase in Crime like Theft, Burglary due to construction of power plant.
- There is no significant difference between the villagers of village Devri and Nimoda with respect to Increase in Crime like Theft, Burglary due to construction of power plant. The hypothesis is not rejected.
- There is no significant difference between the villagers of village Devri and Singhania with respect to Increase in Crime like Theft, Burglary due to construction of power plant. The hypothesis is not rejected.
- Significant difference is found between the villagers of village Devri and Undal at 0.01 level. Mean score of village Devri is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about Increase in Crime like Theft, Burglary due to construction of power plant.
- Significant difference is found between the villagers of village Motipura and Nimoda at 0.01 level. Mean score of village Nimoda is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed about Increase in Crime like Theft, Burglary due to construction of power plant.
- Significant difference is found between the villagers of village Motipura and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed about Increase in Crime like Theft, Burglary due to construction of power plant.
- Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Motipura is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about Increase in Crime like Theft, Burglary due to construction of power plant.
- There is no significant difference between the villagers of village Nimoda and Singhania with respect to Increase in Crime like Theft, Burglary due to construction of power plant. The hypothesis is not rejected.
- Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Nimoda is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about Increase in Crime like Theft, Burglary due to construction of power plant.
- Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Singhania is higher than that of Undal, so it can be concluded that more villagers of Undal agreed about Increase in Crime like Theft, Burglary due to construction of power plant.

G. VILLAGERS' LAND ACQUIRED FOR CONSTRUCTION OF PROJECT

Table – 21 shows that f value of interaction between the villages and villagers' land acquired for construction of

Thermal Power Project is 14.008 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in the villagers with respect to villagers' land acquired for construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to villagers' land acquired for construction of Thermal Power Project" is rejected.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.219	4	2.805	14.008	.000
Within Groups	49.658	248	.200		
Total	60.877	252			

Table 21: ANOVA: Villagers' land acquired for this project

Dependent Variable: Villagers' land acquired for this project LSD						
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Devri	Motipura	-.28936*	.09091	.002	-.4684	-.1103
	Nimoda	-.30000*	.09142	.001	-.4801	-.1199
	Singhania	-.52000*	.08950	.000	-.6963	-.3437
	Undal	.03333	.08568	.698	-.1354	.2021
Motipura	Nimoda	-.01064	.09281	.909	-.1934	.1722
	Singhania	-.23064*	.09091	.012	-.4097	-.0516
	Undal	.32270*	.08716	.000	.1510	.4944
Nimoda	Singhania	-.22000*	.09142	.017	-.4001	-.0399
	Undal	.33333*	.08769	.000	.1606	.5061
Singhania	Undal	.55333*	.08568	.000	.3846	.7221
*. The mean difference is significant at the 0.05 level.						
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.						

Table 22: Post Hoc Tests: Multiple Comparisons

Further observations from table – 22 are as follows:
- Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Motipura is higher than that of Devri, so it can be concluded that more villagers of Devri agreed with villagers' land acquired for construction of power plant.
- Significant difference is found between the villagers of village Devri and Nimoda at 0.01 level. Mean score of village Nimoda is higher than that of Devri, so it can be concluded that more villagers of Devri agreed with villagers' land acquired for construction of power plant.
- Significant difference is found between the villagers of village Devri and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Devri, so it can be concluded that more villagers of Devri agreed with villagers' land acquired for construction of power plant.
- There is no significant difference between the villagers of village Devri and Undal with respect to villagers' land acquired for construction of power plant. The hypothesis is not rejected.
- There is no significant difference between the villagers of village Motipura and Nimoda with respect to villagers'

land acquired for construction of power plant. The hypothesis is not rejected.
- ✓ Significant difference is found between the villagers of village Motipura and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed with villagers' land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Motipura is higher than that of Undal, so it can be concluded that more villagers of Undal agreed with villagers' land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Singhania at 0.05 level. Mean score of village Singhania is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda agreed with villagers' land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Nimoda is higher than that of Undal, so it can be concluded that more villagers of Undal agreed with villagers' land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Singhania is higher than that of Undal, so it can be concluded that more villagers of Undal agreed with villagers' land acquired for construction of power plant.

H. SUFFICIENT COMPENSATION PROVIDED TO VILLAGERS AGAINST THEIR ACQUIRED LAND

Table – 23 shows that f value of interaction between the villages and sufficient compensation provided to villagers against their acquired land for construction of Thermal Power Project is 20.090 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in the villagers with respect to sufficient compensation provided to villagers against their acquired land for construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to sufficient compensation provided to villagers against their acquired land for construction of Thermal Power Project" is rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	55.972	4	13.993	20.090	.000
Within Groups	172.732	248	.697		
Total	228.704	252			

Table 23: ANOVA: If yes, Compensation given for land was sufficient

Dependent Variable: If yes, Compensation given for land was sufficient LSD					
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval

					Lower Bound	Upper Bound
Devri	Motipura	.77872*	.16956	.000	.4448	1.1127
	Nimoda	.80000*	.17050	.000	.4642	1.1358
	Singhania	1.26000*	.16691	.000	.9313	1.5887
	Undal	.13333	.15981	.405	-.1814	.4481
Motipura	Nimoda	.02128	.17309	.902	-.3196	.3622
	Singhania	.48128*	.16956	.005	.1473	.8152
	Undal	-.64539*	.16257	.000	-.9656	-.3252
Nimoda	Singhania	.46000*	.17050	.007	.1242	.7958
	Undal	-.66667*	.16355	.000	-.9888	-.3445
Singhania	Undal	-1.12667*	.15981	.000	-1.4414	-.8119

*. The mean difference is significant at the 0.05 level.
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.

Table 24: Post Hoc Tests: Multiple Comparisons

Further observations from table – 24 are as follows:
- ✓ Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Devri is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.
- ✓ Significant difference is found between the villagers of village Devri and Nimoda at 0.01 level. Mean score of village Devri is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.
- ✓ Significant difference is found between the villagers of village Devri and Singhania at 0.01 level. Mean score of village Devri is higher than that of Singhania, so it can be concluded that more villagers of Singhania agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.
- ✓ There is no significant difference between the villagers of village Devri and Undal with respect to sufficient compensation provided to villagers against their acquired land for construction of power plant. The hypothesis is not rejected.
- ✓ There is no significant difference between the villagers of village Motipura and Nimoda with respect to sufficient compensation provided to villagers against their acquired land for construction of power plant. The hypothesis is not rejected.
- ✓ Significant difference is found between the villagers of village Motipura and Singhania at 0.01 level. Mean score of village Motipura is higher than that of Singhania, so it can be concluded that more villagers of Singhania agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.
- ✓ Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Undal is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Singhania at 0.01 level. Mean score of village Nimoda is higher than that of Singhania, so it

can be concluded that more villagers of Singhania agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.

- ✓ Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Undal is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.
- ✓ Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Undal is higher than that of Singhania, so it can be concluded that more villagers of Singhania agreed with sufficient compensation provided to villagers against their acquired land for construction of power plant.

I. LOSS OF SOURCE OF INCOME OF VILLAGERS DUE TO LAND ACQUIRED FOR CONSTRUCTION OF PROJECT

Table – 25 shows that f value of interaction between the villages and loss of source of income of villagers due to their land acquired for construction of Thermal Power Project is 14.008 with degree of freedom 4, which is significant at the 0.01 level. It means that there is significant difference in the villagers with respect to loss of source of income of villagers due to their land acquired for construction of Thermal Power Project. In the light of this the null hypothesis namely "There is no significant difference among the villagers with respect to loss of source of income of villagers due to their land acquired for construction of Thermal Power Project" is rejected.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	11.219	4	2.805	14.008	.000
Within Groups	49.658	248	.200		
Total	60.877	252			

Table 25: ANOVA: Loss of source of income due to land acquired

Dependent Variable: Loss of source of income due to land acquired LSD						
Village Name (I)	Village Name (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Devri	Motipura	-.28936*	.09091	.002	-.4684	-.1103
	Nimoda	-.30000*	.09142	.001	-.4801	-.1199
	Singhania	-.52000*	.08950	.000	-.6963	-.3437
	Undal	.03333	.08568	.698	-.1354	.2021
Motipura	Nimoda	-.01064	.09281	.909	-.1934	.1722
	Singhania	-.23064*	.09091	.012	-.4097	-.0516
	Undal	.32270*	.08716	.000	.1510	.4944
Nimoda	Singhania	-.22000*	.09142	.017	-.4001	-.0399
	Undal	.33333*	.08769	.000	.1606	.5061
Singhania	Undal	.55333*	.08568	.000	.3846	.7221

*. The mean difference is significant at the 0.05 level.
**. I-J: If mean difference column has a negative number, it interprets that 'I' is better and if it is positive then 'J' is better.

Table 26: Post Hoc Tests: Multiple Comparisons

Further observations from table – 26 are as follows:

- ✓ Significant difference is found between the villagers of village Devri and Motipura at 0.01 level. Mean score of village Motipura is higher than that of Devri, so it can be concluded that more villagers of Devri agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Devri and Nimoda at 0.01 level. Mean score of village Nimoda is higher than that of Devri, so it can be concluded that more villagers of Devri agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Devri and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Devri, so it can be concluded that more villagers of Devri agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ There is no significant difference between the villagers of village Devri and Undal with respect to loss of source of income of villagers due to their land acquired for construction of power plant. The hypothesis is not rejected.
- ✓ There is no significant difference between the villagers of village Motipura and Nimoda with respect to loss of source of income of villagers due to their land acquired for construction of power plant. The hypothesis is not rejected.
- ✓ Significant difference is found between the villagers of village Motipura and Singhania at 0.01 level. Mean score of village Singhania is higher than that of Motipura, so it can be concluded that more villagers of Motipura agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Motipura and Undal at 0.01 level. Mean score of village Motipura is higher than that of Undal, so it can be concluded that more villagers of Undal agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Singhania at 0.05 level. Mean score of village Singhania is higher than that of Nimoda, so it can be concluded that more villagers of Nimoda agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Nimoda and Undal at 0.01 level. Mean score of village Nimoda is higher than that of Undal, so it can be concluded that more villagers of Undal agreed with loss of source of income of villagers due to their land acquired for construction of power plant.
- ✓ Significant difference is found between the villagers of village Singhania and Undal at 0.01 level. Mean score of village Singhania is higher than that of Undal, so it can be

concluded that more villagers of Undal agreed with loss of source of income of villagers due to their land acquired for construction of power plant.

IX. CONCLUSION AND SUGGESTIONS

Every project gives various benefits to people living in vicinity. Along with benefits sometimes projects have their negative impacts also on people living in vicinity. The same has happened with Kalisindh Thermal Power Project. For construction of this power project agriculture land of nearby villages were acquired. For this compensation was provided to villagers in the monetary form. As per villagers' view this compensation was not sufficient. This agriculture land was fertile and used by villagers for farming. Farming was source of income for the villagers. Hence villagers, who lost their land, also lost their source of income. Its consequences they became daily wage labourer and are facing financial crisis.

Government provide monetary compensation to people against their land, where as Government should rethink and reformulate policies of compensation. Accordingly equivalent area of fertile land shall be provided in any other feasible area against acquired fertile agriculture land as compensation. Most of villagers are dependent on farming for their livelihood. If they get agriculture land again elsewhere, they can carry on farming there. It will be source of income for long life. While insufficient money provided by Government they normally loose very soon for fulfilling their basic needs and face financial crisis later.

X. LIMITATIONS OF THE STUDY

Major limitations of this study are mentioned as under:-
- ✓ The study is limited to the people living in villages located near to the Kalisindh Thermal Power Plant only; therefore findings may not be valid for other areas. However, it may indicate some common negative impacts.
- ✓ For collecting primary data from villagers, non probabilistic convenience sampling has been used in this study. It has its own limitations.
- ✓ Results cannot be generalized.

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