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# Resource Development, Displacement, Environmental Degradation and Health in Rihand Valley

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**Abstract**

The present study is related to India's power generation hub of Rihand Valley, spread over Sonebhadra and Singrauli districts of Uttar Pradesh and Madhya Pradesh, respectively. This coal and water rich region has seen extensive development of coal mining, hydel and thermal power stations over last 60 years. The aim is to unravel the patterns of displacement, environmental pollution and related health problems due to development of mining and industrialization in the region.

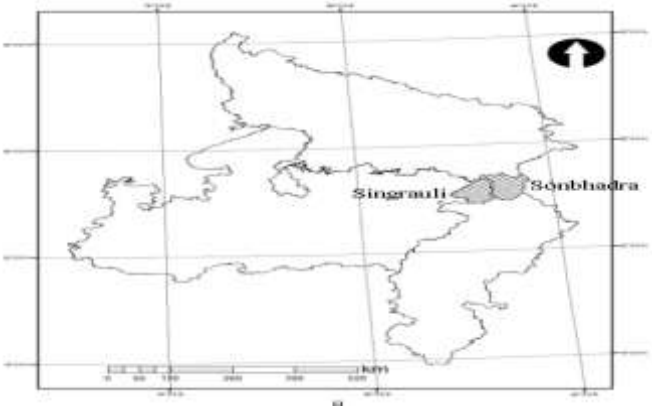
**Keywords:** Resource Development, Displacement, Environmental Pollution, Health Problems, Rihand Valley, Sonebhadra, Singrauli.

**Introduction**

Utilisation and exploitation of resources is necessary for development of different societies and regions. Resources are not distributed equitably and hence the resource developmental projects tend to be concentrated at few points in space. The economic logic, guided by principle of low inputs and high returns, tends to make this pattern even more imperative. As a result, such resource-rich regions are provided not only with various developmental projects, but often with large or even mega projects. These projects may be in the form of hydel power, mines, industries and thermal power stations etc. Resource development projects are increasingly becoming responsible for forced /involuntary migration or displacement of the resident population. Industries, mines and dams often cause environmental degradation in the form of pollution of air, water and land; erosion of soil and deforestation; and loss of biodiversity. Whenever such projects are managed inefficiently- as they often are- these cause disasters for the man and nature. Displacement and improper rehabilitation of the affected populace leads to widespread problems ranging from physical, economic, physiological and psychological maladjustments and deprivations to afflictions. Polluted and degraded environment not only causes lowered quality of life support base and living environment, but also serious health problems for those living near the project area.

The present study is focused on the Rihand valley region of Sonebhadra district of eastern Uttar Pradesh state and Singrauli district of eastern part of Madhya Pradesh state of India (Fig. 1). The Rihand, a tributary of River son, flows through a narrow Valley in table land (plateau) topography. Besides river water, the Valley has rich deposits of coal.

**Fig. 1: Rihand Valley Region of Sonebhadra & Singrauli**



**Review of Literature**

Kamga et al. (2018) reviewed the mining potential, legislation and mining policy in Cameroon. They covered the latest developments in terms of institutional and regulatory framework for mining and environment in the country, along with evolution of environmental and social impact assessment system in mining sector until 2016.

Nayak and Chowdhury (2018) examined the productive days' loss of local communities in the open cast coal mining area of Angul (Talcher district) in Odisha due to respiratory illness caused by air pollution. They found positive and significant relationship between level of air pollution (RSPM) and respiratory illness related sick days.

Nayak (2015) outlined the pattern of opposition by local people against land acquisition for POSCO project at Jagatsingpur in Odisha and tested the perception of people towards possibilities of development. According to him, opposition of people arose in view of the loss of land, due to fear of loss of permanent agriculture-based livelihood, the dangers of socio-cultural disintegration and ecological imbalances.

Anish T.V. & Patil (2015) studied the land acquisition and displacement due to Kochin airport so as to understand the perception and experience of people in the era of economic reforms. Revealing the multidimensional effects on the project-affected people they concluded that people's rehabilitation is still a vexed problem.

Ota (2013) proposed a checklist on social aspects of projects in reference to social risks arising from lack of appropriate measures by the governments and project-related companies in the mineral-rich states like Odisha and Jharkhand.

Areendran et al. (2013) carried out a study of land use change due to coal mine development in Singrauli district of Madhya Pradesh. They found negative changes in extension and composition of vegetative cover, along with deforestation and disintegration of forest area due to extension of built-up area and mines.

In his investigation of pollution of Rihand Dam reservoir, Rai (2010) reported that highest level of heavy metal pollution was found at Belwadah site. In his experiment with aquatic plants, he showed that at different sites plants removed a minimum of 25 and maximum of 77.14 percent of heavy metals. Lobo and Kumar (2009) evaluated the present concept of development in light of the marginalisation due to displacement of people in Gujarat state for about six decades since 1947.

Pandey (2005) used BEES method to make EIA of Vindhyachal Thermal Power Project. In this method, 78 measurable environmental parameters are divided into four categories of ecology, environmental pollution, aesthetics and human dimensions, and a scale of environmental quality is constructed.

**Objective of the Study**

The objective of this study was to outline the patterns of displacement and environmental degradation engendered by resource development projects in the Rihand valley region of Uttar Pradesh and Madhya Pradesh states of India.

**Hypothesis**

The work was guided by the hypothesis that resource development in the Rihand valley region had caused extensive population displacement and environmental degradation.

**Methodology & Sources of Information**

The study is based upon secondary as well as primary sources. Information and data on resource development and environmental degradation in the Valley region is derived from various official and non-official sources. The patterns of displacement, as well as the health effects of all-round industrial pollution, have also been outlined on the basis of fieldwork carried out in the study area during May-June 2013. A total of 526 households were selected by stratified random sampling from 43 resettlement sites in Sonbhadra (UP), 09 resettlement sites in Singrauli district (MP) and 04 sites from adjacent Balrampur district of Chhattisgarh.

**Results & Discussion**

**Resource Development**

First of all, Rihand Dam was constructed in the year 1961 at the place Pipri. In order to use the power and water of the Dam, Hindalco aluminium Plant was established by the Birla Group in 1962 at Renukoot. It was followed by the setting up of another intensive power-and-water use based chemical industry of Kanoria Chemicals. In the year 1963, the first coal mine was established at Jhingurdah. In order to use the available coal, thermal power plants began to be established in the region. The first such plant was of Hindalco at Renu Sagar in 1966. In 1968, another 99 MW hydel power dam was established below Rihand at Obra. Uttar Pradesh State Electricity Board established its on Thermal Power Plant at Obra in 1971. The period from 1961 till 1979 can be called as first stage of resource and industrial development in the Rihand Valley, which started the process of land acquisition, displacement and industrialisation there (Choudhary, 2016).

The second stage of resource development, industrialisation, land acquisition and displacement can be assumed to start from the year 1980. Sufficient water in the Rihand Dam, and a 200 km long belt of open cast coal mines were providing favourable conditions for establishment of Super Thermal Power stations in the region. The first thermal power station of 2000 MW was established in 1980 by Uttar Pradesh Electricity Board. Around this time, the largest electricity production company in the country National Thermal Power Corporation (NTPC) was attracted to the region and an age of Super Thermal Power stations began with Vindhyachal Super Thermal Power Station at Vindhyanagar in Singrauli district of Madhya Pradesh in 1982. After 2 years, Singrauli Super Thermal Power Station was established at Shakti Nagar in Sonbhadra district. Both these stations were of 2000 MW capacity. Kanoria Chemicals established its own thermal power station at Renukoot in 1998. Along with the establishment of these thermal power stations, coal mines were developed at an extensive scale in this stage (Verma, 2004).

The present and third stage of resource development and industrialisation in Rihand Valley started in 2006, around which time Mega Thermal Power stations and coal mining projects started. Such thermal power stations require their own coal mines. The proposed and ongoing Mega Thermal Power station and coal mining projects in the valley include those of NTPC at Vindhyanagar, Hindalco Industries at Devsar, Mahan power plant at Bergava, Reliance ADAG project, Hindalco, Mahan aluminium project along with captive

Thermal power plant, Jaypee electricity power project at Nigri and Majholi, Mahan Super Thermal power project of ESSAR Global Group, Sasan ultra mega power project of Reliance ADAG etc. Due to attractive policies of Madhya Pradesh government, many of these ongoing and proposed projects are to be established in Singrauli district on MP side of Rihand Valley. Presently, there are 11 thermal power plants (05 in Singrauli district), 16 coal mines and around 350 industries in the region. It produces 22 GW (Gigawatt) of coal-fired energy, besides hydel power, and 75 million tonnes of coal every year (Jagran, 2018; Sharma, 2018).

**Displacement in Rihand Valley**

The first development-related displacement of people in the study area occurred due to the construction of Rihand Dam in 1961. It affected fully or partially 106 villages. More than 50000 villagers were displaced and 1.06 lakh acres of land was submerged (Hoddy, 1999). An age of industrialization began after the establishment of dam. Gradually, during the next two decades, several coal mines and thermal power stations were established Besides these, heavy industries, project townships, resettlement colonies, railway lines and looped railways in the mining areas, called Merry-Go-Round were established which changed the landscape of the region completely. Towards the end of the 1980s, Rihand Valley became one of the foremost power producing regions of the country. It now accounts for about 15 percent of India's energy needs (Sharma, 2018). All these projects meant that people were displaced at a very large scale from their habitats and livelihoods. The ash generated by the thermal power plants was washed away with hot water and stored in large-sized ash dykes/ponds. After cooling, it was released into the Rihand Dam reservoir. Now this process is being abandoned. The ash from the thermal power stations is now being recycled and converted into cement and construction bricks. However, thermal power plants in the study area have been responsible for multiple displacement of people. After the first displacement due to the establishment of thermal power stations, either their extension or the establishment of ash ponds became responsible for second displacement of the same people again. In this manner, a small area of the Rihand Valley region has seen more than one displacement of people due to various reasons like dams, industries, mines, thermal power stations and ash dykes (Verma, 2004). During the decade of 1980 alone, 20504 families were displaced from their lands while 8504 families were displaced from their homes (Sharma and Singh, 2009).

Causes and patterns of displacement in the study area can also be understood from the trends obtained in field survey. All the surveyed people had to leave their original lands and hearths due to the construction of Rihand Dam and emergence of Govind Ballabh Pant Sagar reservoir. Around one-fifth of the surveyed households were reportedly displaced for the second time due to the establishment of thermal power stations and their ash dykes. Another 3.5% households were displaced due to the establishment of coal mines and other factors. The table, thus, also throws light on the patterns of multiple displacement in the study area. It indicates that at least one-fifth of the total surveyed households have been displaced two times, and another at least 3.5% households have been displaced a minimum of 3 times from their hearths and livelihoods (Table 1).

**Table 1: Factors and patterns of displacement in Rihand Valley**

(Households)

| Factors | SC | ST | OBC | General | Total |
|---|---|---|---|---|---|
| Submergence | 156 (100) | 122 (100) | 150 (100) | 98 (100) | 526 (100) |
| NTPC | 10 (6.41) | 32 (26.22) | 44 (29.3) | 14 (14.2) | 100 (19.01) |
| Other Factors | 06 (3.84) | - | 08 (5.33) | 04 (4.08) | 18 (3.42) |
| Affected Households | 156 | 122 | 150 | 98 | 526 |

**Source:** Field Survey, 2013; Note: Categories are not mutually exclusive.

**Environmental Degradation in the Valley**

First of all Birla industrial group established an aluminium plant, based on bauxite brought from distant parts of Madhya Pradesh and Jharkhand. This plant at Renukoot was later named as Hindalco. In order to produce different chemicals like caustic soda, used in Hindalco, Kanoria Chemicals was established. With the establishment of these industries, industrial pollution and environmental degradation began in the Rihand Valley. In order to generate around 21000 Megawatt of thermal power around 27400 trucks of coal is burnt everyday (Jagran, 2018), which produces around 35 million tonnes Fly Ash every year (Singh, 2016). The ongoing and proposed thermal power stations in the valley will use an estimated 3 lakh tonnes of coal everyday to generate 30,000 MW of power. This toxic ash will turn the region into a heap of ash if its proper disposal is not managed (Amar Ujala, 2012). With the establishment of thermal power stations around Rihand reservoir, and different coal mines towards its North Western direction, environmental degradation and pollution began to grow rapidly. According to National Green Tribunal (NGT), burning of coal generates 14.61 tons of mercury every year (Singh, 2016).

In 1996, the SPM (suspended particulate matter) levels were about the standard, except at Bijpur thermal power station. It's high levels at Dala were due to cement industry and stone crushers. Levels of sulphur dioxide and nitrogen oxide too were above the ideal condition. The presence of mercury as SPM, and in gaseous form, around Shakti Nagar thermal power station was at a level of 0.11 microgram per $m^3$. Before this, mercury pollution was seen around Kanoria plant only (Banwasi Sewa Ashram, 1998). Mercury is natural element of coal and is, perhaps, the most harmful too. The proportion of mercury in the coal samples of the area varies between 0.09 to 0.048 parts per million (ppm). At about 1000 degree centigrade and over, the mercury of the coal gets evaporated and a big portion of it's mixes into the atmosphere (Down to Earth, 2012). Coal and its wastes like fly ash, bottom ash and boiler slag etc. contain several heavy metals and toxic elements, including arsenic, lead, mercury, nickel, vanadium, beryllium, cadmium, barium, chromium, molybdenum,

zinc, selenium etc. which can become dangerous if let out in the environment (Greenpeace, 2011).

A Central Pollution Control Board (CPCB) sponsored study found that during two years from 2003-04 to 2005-06 there was considerable decline in the levels of sulphur dioxide and nitrogen oxide along with those of gaseous fluoride and mercury. However, levels of finer Respirable Suspended Particulate Matter (RSPM) and SPM, as well as those of particulate mercury, were found at higher levels, especially in Dala and Obra area. In Dala area, acid rain was reported due to increased levels of nitrogen oxide (Banwasi Sewa Ashram, 2007). Farmers are unable to cultivate their farms due to pollution. Moreover, acid rain is becoming a bane for agriculture since last several years.

Different thermal power stations, coal mines and industries on the banks of Rihand Dam reservoir have long been dumping their solid and liquid wastes directly into the water body. The effluents of the dyke, constructed to dispose off the fly ash emanating from Anpara thermal power project, have been led directly to the reservoir through an underground outlet. A big proportion from Renu Sagar Thermal plant is directly released into the Rihand reservoir. The officials evade their responsibility of safe disposal of effluents, through construction of wastewater treatment plants, by saying that they have been disposing of their wastes like this for years and it takes time to change the situation (Chaurasia, 2010). Kanoria Chemicals of Renukoot (now Aditya Birla Chemicals Limited, ABCL) throws its effluents in Dongiya Nala which carries its water to the reservoir. Effluents of ABCL and Dongia Nala were found to be polluted with fluoride and mercury elements (Down to Earth, 2012). The nallah was found to be devoid of any aquatic life (Chaurasia, 2010). The process of extracting aluminium from bauxite requires cryolite and caustic soda, which release fluoride and mercury, respectively. A study sponsored by CPCB showed that levels of Chemical Oxygen Demand (COD) in 2005-06 were higher in all the Nalas leading to Rihand reservoir as compared to the year 2003-04 (Banwasi Sewa Ashram, 2007). The COD level of surface water in Singrauli in 2011 was reported as high as 1057 mg/litre (Vidyarthi, 2016). This shows chemical pollution in these water bodies.

The soil and underground water of villages and resettlement sites of Rihand Valley, situated near fly ash disposal sites/ dykes or coal mines, are getting polluted due to contamination by toxic elements obtained by leaching of the heaps of coal and fly ash. The underground water of Belwadah village near ash pond of Anpara thermal plant has been contaminated due to fly ash of the pond. The fertility of the little arable land left in the village has also been destroyed by the fly ash (Greenpeace, 2011). In fact, villages like Belwadah were not initially affected by displacement. However, the land of these villages was later on selected for disposal of fly ash from Anpara and Lanco thermal plants. More than half of the villages have been surrounded by fly ash heaps. In order to arrange for drinking water, people dig 2 to 3 feet deep holes near the vast expense of fly ash, and use the toxic water (Chaurasia, 2010). In a study by CSE, the hand pump water of Dibulganj (0.26 ppm) and Chilkadaand, and well water of Anpara (0.008 ppm) were found to contain mercury higher than level permitted (0.001 ppm) by BIS (Down to Earth, 2012). Fast pace of industrialisation and urbanisation in Rihand Valley is causing heavy deforestation and soil erosion, leading to siltation and filling up of the Rihand Dam (Amar Ujala, 2012). As a result of all this, Rihand area (Singrauli) was classified as the fourth most polluted industrial cluster in India in 2013, as per CPCB's Comprehensive Environmental Pollution Index or CEPI (Nandi, 2018). It has since become the third most polluted industrial area (Jagran, 2018).

**Pollution and Public Health**

People of the Rihand Valley have been severely affected by industrial pollution in the region. Characteristics like untimely ageing, joint pains, and osteoporosis and stomach disorders are common. TB is prevalent in tribals near Dibulganj. This village is extremely poor and surrounded by vast sea of fly ash. The villages are prone to drinking water from small pits dug near fly ash dykes. About two dozen villages around the reservoir are affected by fluorosis. Nearly 62% of children of 147 villages in Sonbhadra district were found to be affected by fluoride. The catchment area of the biggest source of water in the region- Rihand reservior- is so polluted that on drinking this water death of children has occurred several times (Chaurasia, 2010).

Due to mercury pollution, high levels of mercury have been reported in the blood of the people living near projects. Besides respiratory diseases, fluorosis, insanity, infertility, untimely graying of hair, impotency, skin diseases and cancer have become common place (Jagran, 2018), as the 'power capital of India' has turned into 'toxic hotspot' for pollution. During summer months, air quality becomes extremely low. At this time, velocity of wind is extremely low. Due to heavy blasting in the mines and release of fly ash from the chimneys of thermal plants thermal power plants air at this time is extremely polluted. For the people living near mines and ash dykes of the thermal power plants life during summer months is sheer hell. Many people die due to fall of lightning during monsoon period as there is heavy presence of coal, heavy metals and chemicals in the atmosphere. Thousands of domestic animals die due to drinking contaminated water. Fish in the village ponds are no more to be seen. Lung capacity is decreasing due to particulate matter pollution in the atmosphere (Greenpeace 2011). Pollution has heavily affected forest and agriculture activities. Between 1970 and 1996, production of fruit continuously decreased, and there was no fruiting in many areas (Behan, 2004). Fruit production reportedly shows a decline of 50-85 percent, while agricultural production has been reduced to one-half (Jagran, 2018).

A field survey amongst the displaced people of Rihand Valley showed that before displacement major health problems of the people were malaria, cholera, chicken pox, cough and general weather-related health problems. The major factors behind these health problems were reported to be lack of health infrastructure, lack of awareness and contamination (Table 2 & 3).

**Table 2: Health Problems before Displacement**

(Households)

| Health Problems | SC | ST | OBC | General | Total |
|---|---|---|---|---|---|
| Cholera | 140 (89.74) | 108 (88.52) | 96 (64.00) | 62 (63.26) | 406 77.18) |
| Chickenpox | 106 (67.95) | 88 (72.13) | 44 (29.33) | 54 (55.10) | 292 (55.51) |
| Malaria | 156 (100) | 122 (100) | 126 (84.00) | 72 (73.47) | 476 (90.49) |
| Skin Infections | 134 (85.90) | 98 (80.33) | 114 (76.00) | 36 (36.73) | 382 (72.62) |
| Whooping cough (Pertussis) | 96 (61.54) | 66 (54.10) | 58 (38.67) | 26 26.53) | 240 (46.77) |
| Seasonal disease | 112 (71.79) | 58 (47.54) | 74 (49.33) | 34 (34.69) | 278 (52.85) |
| Poliomyelitis | 36 (23.07) | 28 (22.95) | 46 (30.67) | 22 (22.45) | 132 (25.09) |
| Total Household | 156 | 122 | 150 | 98 | 526 |

**Source:** Field Survey, 2013; Note: Categories are not mutually exclusive

**Table 3: Causes of Health Problems before Displacement**

(Household)

| Causes | SC | ST | OBC | General | Total |
|---|---|---|---|---|---|
| Lack of medical facilities | 132 (84.61) | 110 (90.16) | 138 (92.00) | 78 (79.59) | 438 (83.26) |
| Infectitious diseases | 152 (97.43) | 114 (93.44) | 124 (82.66) | 46 (46.93) | 436 (82.88) |
| Lack of awareness | 112 (71.79) | 98 (80.32) | 92 (61.33) | 26 (26.53) | 328 (62.35) |
| Total Household | 156 | 122 | 150 | 98 | 526 |

After rehabilitation, present health problems of the people were reported to be malaria related to reservoir, respiratory diseases, skin diseases related to air and water pollution, eye diseases, joint pain and disability due to fluoride pollution etc. Major factors perceived by people behind these problems were reported to be the pollution, deforestation, fluoride contamination of water and lack of healthy food due to poverty engendered by marginalization of the displaced people (Table 4 & 5, Fig. 2).

**Table 4: Health Problems after Resettlement**

(Household)

| Health Problems | SC | ST | OBC | General | Total |
|---|---|---|---|---|---|
| Asthma/Respiratory diseases | 144 (92.30) | 108 (88.52) | 128 (85.33) | 82 (83.67) | 462 (87.83) |
| Skin diseases | 138 (88.46) | 112 (91.80) | 134 (89.33) | 76 (77.55) | 460 (87.45) |
| Skeletal/Joint pain | 90 (57.69) | 56 (45.90) | 84 (56.00) | 62 (63.26) | 292 (55.51) |
| Eye diseases | 128 (82.05) | 98 (80.32) | 118 (78.67) | 78 (79.59) | 422 (80.22) |
| Cholera | 94 (60.26) | 76 (62.29) | 96 (64.00) | 44 (44.90) | 310 (58.93) |
| Malaria | 150 (96.15) | 104 (85.24) | 136 (90.67) | 74 (75.51) | 464 (88.21) |
| Physical disability | 46 (29.48) | 36 (29.51) | 54 (36.00) | 24 (24.50) | 160 (30.42) |
| Total Household | 156 | 122 | 150 | 98 | 526 |

**Source:** Field Survey, 2013; Note: Categories are not mutually exclusive

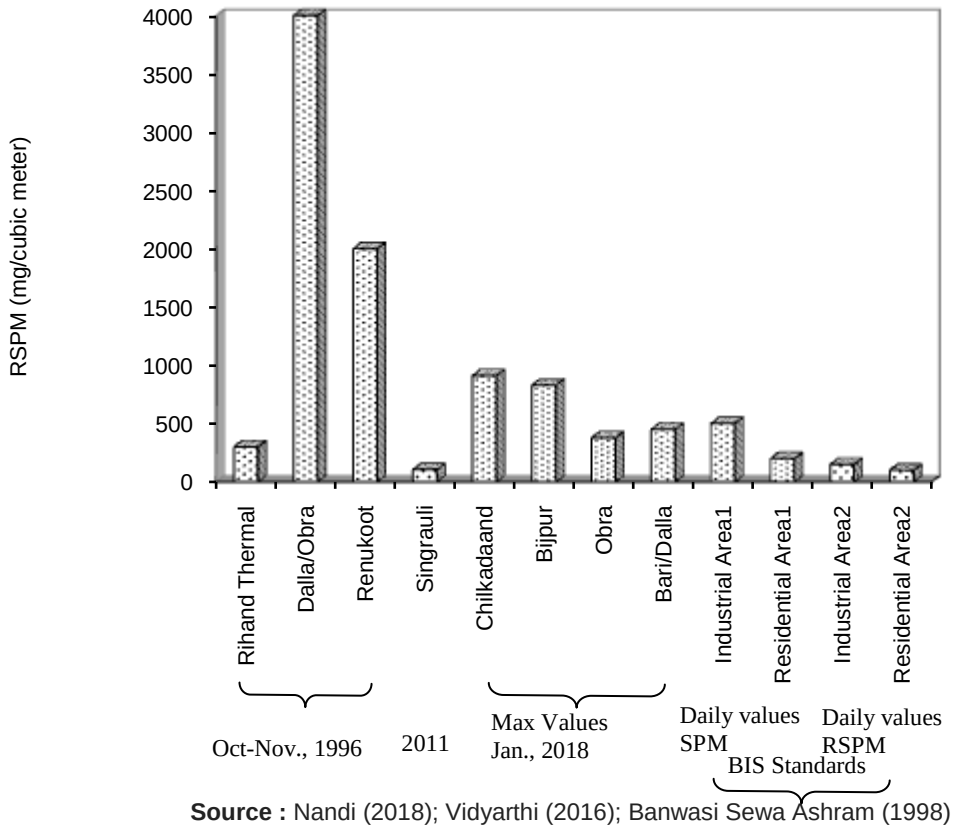
**Table 5: Factors of Health Problems after Resettlement**

(Household)

| Factors | SC | ST | OBC | General | Total |
|---|---|---|---|---|---|
| Pollution | 156 (100) | 122 (100) | 150 (100) | 98 (100) | 526 (100) |
| Deforestation | 122 (78.20) | 76 (62.29) | 116 (77.33) | 62 (63.26) | 376 (71.48) |
| Fluoride in water | 104 (66.67) | 62 (50.82) | 94 (62.67) | 76 (77.55) | 336 (63.87) |
| Lack of nutrition and poverty | 90 (57.69) | 78 (63.93) | 56 (37.33) | 24 (24.49) | 248 (47.15) |
| Total Household | 156 | 122 | 150 | 98 | 526 |

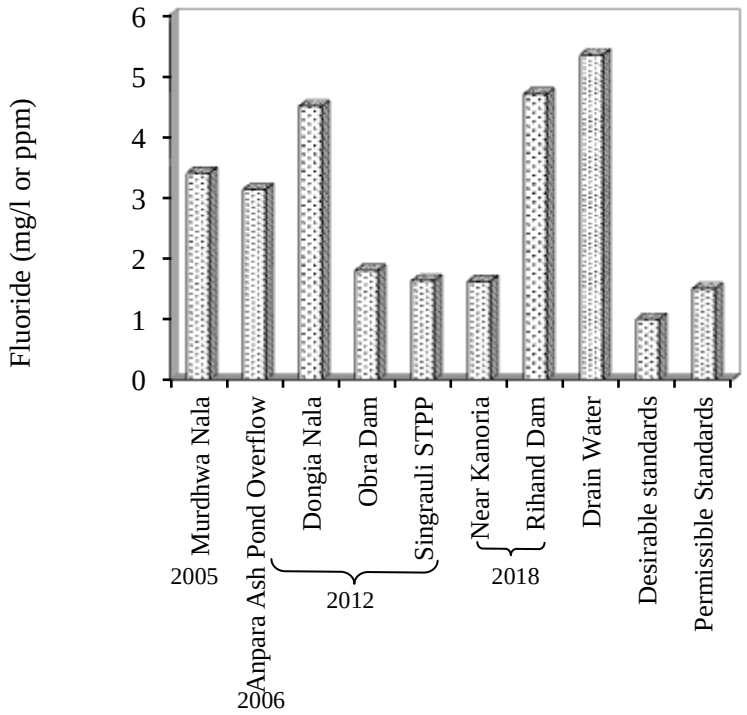
**Source:** Field Survey, 2013; Note: Categories are not mutually exclusive

**Fig. 2: RSPM Pollution in Rihand Valley, 1996-2018**




**Source :** Nandi (2018); Vidyarthi (2016); Banwasi Sewa Ashram (1998)

**Fig. 3: Fluoride Pollution in Surface Water & Industrial Effluents of Rihand, 2005-2018**




**Source :** Usham *et al.* (2018); Pandey & Pandey (2012); Down to Earth (2012); Banwasi Sewa Ashram (2007)

**Conclusion**

Development of mines, dams, thermal power stations and industries in the coal and water resource rich, narrow valley of Rihand, flowing through a plateau region, has become bane for both local man and environment. It has not only caused extensive, but also repetitive, displacement of the affected local populace. Widespread pollution and environmental deterioration have degraded the living environment and human health in the region. The on-going and proposed, massive resource exploitation and industrialisation projects in the region would need to be informed from its past experience.

**References**

*Adam, A.B. Owen, John, R. and Kmp, Deanna (2015). Household, Livelihoods and Mining - Induced Displacment and Resettlement. The Extractive Industries and Society. Aug. 2 (3), 581-89.*

*Amar Ujala (2012). Newspaper, Sonebhadra edition.*

*Anish, T.V. and Patil, R.R. (2015). Development and Displacement in Kerala : An Experience of Cochin International Airport Ltd. (CIAL). European Scientific Journal, June, Special Edition, Vol. 1.*

*Banwasi Sewa Ashram (2007). Environmental Quality Monitoring in Singrauli Problem Area. Sponsored by Central Pollution Control Board, 2005-06. Banwasi Sewa Ashram, Govindpur, Sonebhadra, U.P.*

*Behan, Ragini (2004). Paryavaran prabandhan: samasyen aur prayay (Hindi). Banwasi Sewa Ashram, Govindpur.*

*Choudhary, Vinod (2016). Resource Development and Involuntary Migration: A Geographical Study of Rihand Valley. Unpublished Ph.D. (Geography) Thesis, Maharaja Ganga Singh University, Bikaner.*

*Chourasia, Atul (2010). Mahan Loktantra ki Sauteli Santanein, Tahalka (Hindi), 15 April, pp. 12-20.*

*Down to Earth (2012). India's Minamata. Oct. 16-31, p.29.*

*Greenpeace (2011). Singrauli : The Coal Curse, A Fact Finding Report on the Impact of Coal Mining on the People and Environment of Singrauli. Greenpeace India Society, Bengaluru, p. 56.*

*Hoddy, Elizabeth (1999). The Banwasi Seva Ashram. In Gandhi's Footsteps – A model Gandhian Development Project. Gandhi Peace Foundation, New Delhi, p. 176.*

*Kamga, M. Anselme et al. (2018). Sustainable development and environmental challenges in Camerooon's Mining Sector : A Review. Journal of Mining & Environment, Published online 5 Jan. 2018.*

*Lobo, Lancy and Kumar, Shashikant (2009) Land Acquisition, Displacement and Resettlement in Gujarat, 1947-2004, Sage Publication Pvt. Ltd., New Delhi.*

*Nayak, Subhakarta, (2015). Industrial Development V/s Resistance (A Study of Posco Project in Odisha) International Letters of Social and Humanistic Sciences. Vol. 50; 55-69.*

*Nayak, Tapaswini and Chowdhury, Indrani Roy (2018). Health damages from air pollution : Evidence from open cast coal mining region of Odisha, India. Ecology, Economy and Society, January, Vol. 1, Issue 1.*

*Ota, Anil (2013). Development Induced Displacement in 21st Century India: The Dimension of Rising Community Distrust. Quest Int. Multidisci. Res. J., June, Vol. 2, No. 1.*

*Pandey, Rakesh Kumar (2005). Assessing the Overall Environmetnal Impacts of Vindhyachal Super Thermal Power Project at Singrauli. Poll Res., 24 (4) : 871-874.*

*Rai, Prabhat Kumar (2010). Phytoremediation of Heavy Metals in a Tropical Impoundment of Industrial Region. Environ Monit Assess, 165 : 529-537.*

*Sharma, R.N. and Singh, Shashi, R. (2009). Displacement in Singauli Region : Entitlements and Rehabilitation. Economic & Political Weekly, December 19, Vol. XLIV (51) : 62-69.*

*Verma, Manish Kumar (2004). Development, Displacement and Resettlement. Rawat, Jaipur, p. 332.*