

A Study on Mining Industry Pollution in Chapagaon, Nepal

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1. Introduction

Chapagaon is located in the outlying area of the south part of Kathmandu Valley. It is dense traditional settlement area inhabited predominantly by the Newars. The area of Chapagaon VDC is 6.76 km² with total population of 12789, out of this 6516 male and 6273 female². It is taken one of the fastest growing VDCs in Kathmandu Valley. The development prospect of proposed outer ring road of Kathmandu Valley and closeness to the city center of Kathmandu, this area has been an attractive residential location for many migrants. In this VDC no proper considerations are made for settlement planning, mining, crushing and management of these. Survey has revealed that the miners are stronger in the sense that they may physically defeat to any people if they raise the voice against of them to the concern agencies. It symbolizes that the miners are on organized form for the security of their mines.

2. Demographic and Land Use Features of Chapagaon

Following table shows the demographic and land use features of Chapagaon area:

Table 1: Demographic and Land Use Features of Chapagaon

Male			6516		50.95%	
Female			6273		49.05%	
Total			12789		100.00%	
Ward-wise Households and Population			Area Coverage		Land Use	
Ward No.	No. of Households	Population	Ward-wise Area Coverage		Land Use Coverage	
			Ward	Area in km²	Use in	Area in km²
1	189	960	1	0.23	Settlement	0.12
2	211	1114	2	0.76	Bushes	1.22
3	258	1242	3	0.64	Cultivable Land	4.76
4	301	1565	4	0.5	Forest	0.99
5	252	1219	5	0.31	Useless Land	0.02
6	481	2580	6	1.77	Sandy Land	0.09
7	294	1442	7	1.44	Land Cover by Water	0.02
8	219	1073	8	0.96		
9	326	1594	9	0.61		
Total		12789	Total	7.22		

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² Central Bureau of Statistics, Preliminary Results of National Population Census, September 2011

3. Mining Industries in Chapagaon

Mining industries in Chapagaon are concentrated in Ward no. 6 which is adjoining Ward with Lele VDC. This ward is taken as the best for crushing and stone mines because of lots of open spaces and availability of stones. Streams of Chapagaon; Nakhu and Karmanasa are disturbing by stone mines and crushing industries, the volume of drinking water has been reduced gradually because of the extraction of upper layer stones and soil of spring catchment area. In the past years (2010/011) there were more than 30 stone and crushing industries but in 2012 gradually these reduced in Chapagaon and shifted in other neighboring VDCs like Lele, Nallu, Bhardeu etc. (VDC Profile, 2066).

The following table shows the Crushing and Stone Mines currently existed in Chapagaon VDC with production capacity of these:

Table 2: Crushing and Stone Mines Existed in Chapagaon VDC with their Capacity

Name of Crushing/Stone Industry	Location	Total Worker	Production Type	Production Capacity
BajrabarahiRodaDhungaUdyog	Ward No. 6	5	Gravel and stones	69 Mini Truck/day
BhanjyangDhungaKhani	Ward No. 6	6	Gravel and stones	71 Mini Truck/day
BhuwaneshworRodaDhungaUdyog	Ward No. 6	7	Gravel and stones	75 Mini Truck/day
ChampapurDhungaRodaUdyog	Ward No. 6	6	Gravel and stones	72 Mini Truck/day
Excel Stone Crusher	Ward No.6	5	Gravel and stones	67 Mini Truck/day
Lalit Concrete P.vt.Ltd.	Ward No. 6	7	Sand, gravel, and stones	73 Mini Truck/day
Nepal RodaDhungaUdyog	Ward No. 6	6	Gravel and stones	71 Mini Truck/day
PurnaDhungaKhani	Ward No.6	6	Gravel and stones	69 Mini Truck/day
SantiRodaDhungaUdyog	Ward No.6	5	Sand, gravel and stones	65 Mini Truck/day

Source: Field Survey, July 2012

4. Pollution from Mining Industries in Chapagaon

In general, mining and mineral resources are directly linked to the environmental field. In the process of making products pollution and waste are produced which ultimately threaten the human health and the surrounding environment. The similar cases are found in Chapagaon area especially from the production and transport of gravel, sand and stones. Different types of impacts of these productions and transport are analyzed below:

4.1 Health Impact to Local People

The most obvious environmental impact from gravel, sand and stone mines in Chapagaon area is degraded air quality, and associated health effects to the locals, resulting from airborne emissions from both the stack and the disturbed areas at these mines. In open areas of Chapagaon, the impact of such mines on human health is not likely to be significant. But in the residential areas, when one truck loads of sand and gravel from its excavation and starts transport to its destination mostly in Lalitpur Sub-Metropolitan City and Kathmandu Metropolitan City it fills dirt, smoke, and sound pollution. Below is a list of cumulative impacts from the development of typical gravel, sand and stone mines.

- Fumes and dust generated on the haul road to and from the mine.
- Fleeting dust blowing from the uncovered or partially covered dump trucks.
- Fleeting dust from poorly monitored crushers and out-of-compliance operations.
- Fleeting dust from piles of sand and gravel at the construction sites.
- Fleeting dust from the spreading of sand and gravel at the construction site.
- Increased air pollution from some sand and gravel mines after they are abandoned and until natural re-vegetation stabilizes the surface soil.

- Surface and ground water contamination with waste from mines.

Each of the impacts listed above produces greater impact to the human health but these are difficult to measure. In the past, smaller populations and establishment of few mines in Chapagaon made these impacts less noticeable. But now these are observed further serious most of the local people who are on the side of narrow black-topped road area like Pyanggaon, Chapakot, Bajrabarahi etc. are facing several health problems such as headache, dry nose, eye dimming problem, asthmas, respiratory diseases and lungs problems. The field survey has revealed that about 30 people per month directly or indirectly are affected by the cause of pollution from stone and stone-crushing industries in this area. In a day 1264 times the hauling trucks enter and exit from this site which produce the large amount of pollution not only smoke and dust but also sound.

4.2 Pollution on Agricultural Land

The stone and sand extraction process entails the removal of large amounts of waste too, which becomes pollution for the agricultural land. The deposits and wastes from the stone and stone-crushing mines disturb the general flow of streams and rivers that causes river and stream bank cutting in the rainy season. Most of the agricultural lands especially paddy fields are on the side of Nakhu and Karmanasha streams in Chapagaon which are under the threat of stone mine and crushing industries. The field survey of this area has recorded that about 5 Ropani paddy field of this VDC has been destroyed in average per year especially in rainy season. Moreover, the local people are agree on the fact that the vegetables farmed on about 11 Ropani of land of this VDC are also destroying per month by the dropping sand, gravel and stones on the side of road because of the unsafe coverage of hauling trucks.

4.2.1 Impact on Soil Quality

Mining in Chapagaon area has contaminated soils over a large area. Agricultural activities near mining and crushing site are particularly affected. The fugitive dust has created significant impact over the agriculture land of Chapakot, Pyanggaon and Bajrabarahi area. Erosion of exposed soils, wind-blown dust, dropped pieces of sand, gravel and stone are usually posing the greatest risk over the soil quality.

4.3 Pollution on Water Bodies

In Chapagaon VDC, two streams namely Nakhu and Karmanasa are polluted through the flow of mine waste. The main factors influencing water bodies pollution includes the volume and velocity of runoff from precipitation events. The stone mines are located on upper slope area of Karmanasa stream and the mine depositions of dry season slip down with the volume of wind and runoff. The heavy rainfall in rainy season sweeps down all deposited items of mines, it causes several floods to the stream and full of sedimentation on Karmanasa stream. The case of Nakhu stream is different than that of Karmanasa. Nakhu stream is affected by the quarrying practices on the sides of it. Due to the cause of heavy quarrying, the paddy field of both sides of this stream has converted as a water flowing area of stream, this stream is widening year by year. The water of both of these streams is polluted so the people of adjoining areas are facing the problem of drinking water and the use of water for secondary purposes.

Some cumulative impacts of mining in Chapagaon area on water bodies and water species are mentioned below:

- Lost access of locals to the clean water;
- Deposition of mining waste on the water bodies;
- Extinction of water diversity i.e. fishes, frogs, snakes, leaches, worms etc.
- Lost access of locals to the secondary use of water such as irrigating, swimming, washing, fishing etc.

4.4 Erosion/Sediment of Mining Industries

Major sources of erosion/sediment loading at mining sites can include open pit areas, heap and dump leaches, waste rock and overburden piles etc. A further concern is that exposed materials from mining operations may contribute sediments with pollutants, principally heavy deposits of gravel. The types of impacts associated with erosion and sedimentation are numerous, typically producing both short-term and long-term impacts. In surface water the erosion and waste rock of mines fill up the depth of water level which causes toxic effects in fish.

Sediments deposited in layers in flood plains or terrestrial ecosystems can produce many impacts associated with surface waters, ground water, and terrestrial ecosystems. In Chapagaon area erosion/sediment from the upper slope areas of Nakhu and Karmanasa Streams causes the several impacts on water aquatic fish and other species. Field survey has recorded that due to the cause of erosion/sediment the streams of this area are now out of indigenous fish species and other water species, but in past years several fish species were available such as before 3 years in Karmanasha and 15 years in Nakhu Stream.

5. Socio-Cultural and Economic Impacts

Gravel, sand and stone mining in Chapagaon area has increased traffic congestion and safety hazards. When these mines are operating, trucks drove through the village 10 hours per day and create dust, noise, diesel fumes, and general congestion in this small historic community. In Ward no. 6 of Chapagaon VDC most of the crushing and mines are located, it is common to note traffic hazards as trucks enter and leave public highways dozens of times each day. Another important impact of stone-crushing and stone mining is aesthetic degradation from which many land masses of Chapagaon area are altered and green vegetations are cleared. Next impact created by these mines could be called the “public nuisance” effect. The state has not been formulated essential regulations for the operation of stone, sand and gravel mines in this area.

The conversion of open spaces into built form has degraded the balance of built and non-built spaces that existed in traditional settlement planning and made the place more congested and traffic jam for the longer time. The single lane

road of Chapagaon area has been carried 1262 times of transactions of hauling trucks per day. Cumulative impacts of ripping, drilling, blasting, transport, crushing, and grinding can significantly affect the local residents. Vibrations are associated with many types of equipments used in mining operations but blasting is considered as the major source of stones. Vibration has affected the stability of infrastructures, traditional buildings and homes of people living near of mines in large scale. In Chapagaon area the traditional buildings are gradually disappearing because of the easy access of construction materials of new buildings. And the traditional buildings which are existed at present time are covered with thick dust flying from hauling trucks on the narrow road existed almost at the center of traditional settlements. The traditional identity of Chapagaon area and the great influence of Bajrabarahi Temple has found now on crisis.

The social impact of large scale mining is controversial and complex to describe, exploring minerals can create wealth, but it can also cause considerable disruption, mining activities can create jobs, roads, schools, and increase the demands of goods and services in mining areas but the benefits and costs are unevenly shared. The Chapagaon Village Development Committee fines only 200 rupees per month from a mining industry but in reality it has not found paid by each and every. The mining entrepreneurs of Chapagaon VDC are found stronger than locals, the response and social demands of locals are not found fulfilled by them. In very common sense, Social Corporate Responsibility of these mining entrepreneurs has found null. The perception of inhabitants of this area is that the community has not got any social contributions from mines owners. Once they demand to contribute them for the public school building but they provided nothing.

6. Impacts on Wildlife

Wildlife is broad term that refers to all plants and animals or other organisms that are not domesticated. Mining affects the environment and associated biota through the removal of vegetation and topsoil, displacement of fauna, release of pollutants and the generation of noise. Some of the cumulative impacts of mining on wildlife in Chapagaon area are mentioned below:

6.1 Habitat Loss

Wildlife species live in communities that depend on each other. Survival of these species can depend on soil condition, local climate, altitude and other some features of local habitat. Mining causes direct and indirect loss of wildlife. The impacts of mining to wildlife are primarily from destruction or displacement of species in areas of excavation and pilling of mine wastes. The habitat requirements of many animal species do not adjust to the changes created by land disturbance. These changes reduce living species. In Chapagaon area wildlife species like bird species, reptiles, small mammals, amphibians etc are found disappeared.

6.2 Habitat Fragmentation

Habitat fragmentation has found in Chapagaon area when large areas of land are broken up into smaller and smaller patches, making dispersal by native species from one patch to another difficult or impossible and cutting of migratory routes. Isolation has led to decline of species or genetic effects like inbreeding. The species which need large patches of forest are found disappearing from the native places.

7. Conclusions and Recommendations

Gravel, sand, and stone mines are common across Chapagaon. Although these mines are not regulated under the Mines and Minerals Acts and Regulations of Nepal, they are registered with District Development Committee and some on Village Development Committee only. The primary environmental impact from gravel, sand and stone mines in

Chapagaon area are degraded air quality from blowing dust particles, smoke, and dropping sands. Surface water quality impacts from such mines in Chapagaon due to the deposition of mine and crushing waste on the side of Karmanasa and Nakhu streams. Other environmental impacts include increased traffic on narrow roads; cumulative impacts as construction materials are hauled, stockpiled, and spread on highway and building construction areas; and aesthetic degradation caused by gravel, sand and stone mines are found on major view areas.

Existing environmental laws are limited in scope in regulating gravel, sand and stone mines in Chapagaon. All but the largest of these mines are considered minor sources of air pollutants and are allowed to emit limited quantities of emissions, may be considered nuisances in local communities. But the state does not consider these impacts to be significant or to pose serious public health hazards. Existing regulations do not account for the concentration of such mines in and around settlement areas where the majority of highway and building construction occurs.

Mitigating the environmental impacts of gravel, sand and stone mines could be improved by making some changes to existing regulations. The following recommendations are made to better manage pollution, environmental problems and mitigate the effects of gravel, sand and stone mines.

a. Deny operating permits to new operations if inactive or abandoned mines could be re-opened to provide the same resource. New operations should be permitted only if no other suitable materials are available in a given area. This would make better use of existing resources in areas where disturbance has already occurred and prevent the random and incoherent development of gravel, sand and stone mines.

b. Enforcing existed emission permits strongly and consistently. This would require that the state hire more inspectors and make certain problem mines come into compliance to set an example for all operations.

c. Deny permits to mines that propose locating in areas unsuited for mining. Mines should not be allowed to operate near native Chapagaon "historical sites," residential neighborhoods, historic rural communities, or in areas where these activities will ruin a scenic view area.

d. Encourage the use of re-cycled materials like already used gravel and stones and reduce the extraction from new mines for construction. This would reduce the need to open new mines and help with the problem of overloaded areas.

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