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Soil Contamination and Socio-Economic Conditions Around Pharmaindustryusing Rs & GIS

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ABSTRACT---Environmental Impact Assessment (EIA) is one of the important aspects that needs to be considered for any developmental activities for a sustainable development. This paper presents the EIA for the industry covered by the present study. Further, the management plan that will improve the environmental condition is presented. The present study is aimed to evaluate socio economic conditions. Soil, samples are analyzed for physio-chemical parameters to create attributes. The spatial and attribute database are integrated and maps are prepare during ArcGIS Software. Soil Quality Index (SQI) are calculated to assess land is used for irrigation purpose.

Keywords: EIA, Soil Quality Index, Water Quality Index, Impact.

I. INTRODUCTION

The study area has Good soil, groundwater contributed positively towards a very good crop yield. The present location of industrial area was very green before the establishment of the industry with large fields of fine various crops in rabbi and kharif season. These contaminants are related to a number of anthropogenic sources of pollution such as emissions from industrial plants, vehicle exhausts, dumping of different wastes in soil etc. With the advent of small and large-scale Industries, this study area suffered from ENVIRONMENTAL IMPACT, amounts of pesticides and fertilizers in agriculture that can result in surface water and or ground water contamination. So there is need to study EIA around industries.

1.1 PRIMARYDATACOLLECTION

Gland Pharma wasfoundedin1978atDundigal Gland Pharma have a wide range of injectable, including vials ampoules pre-filled syringes, lyophilized vials, dry powder infusions and ophthalmic solutions. The company enjoys the distinction of having pioneered Heparin technology in India. Company offer an array of 60+nicheinjectable across several therapeutic segments and operates through 4 divisions:

1. ORIHEP (Heparin range) 2. SURGE (Antibiotics range) 3.MARS (Critical Cardiology, Aesthetic sand other critical care segments) 4. ENVISAGE (Anti-Infective and Gastrointestinal range)

1.2 SAMPLE COLLECTION

Various samples are collected which is shown in figure 1.1 and analysed for a number of physical and chemical properties of the soil. The sampling stations were distributed as evenly as possible. Samples were collected in the area surrounding the industry shows sampling locations of study area. The soil sampleswerecollectedatadistanceof0.5km, 1.0km, 1.5kmand 2km and so on.

In the present study soil quality parameters are analysed and data is compared with base data.

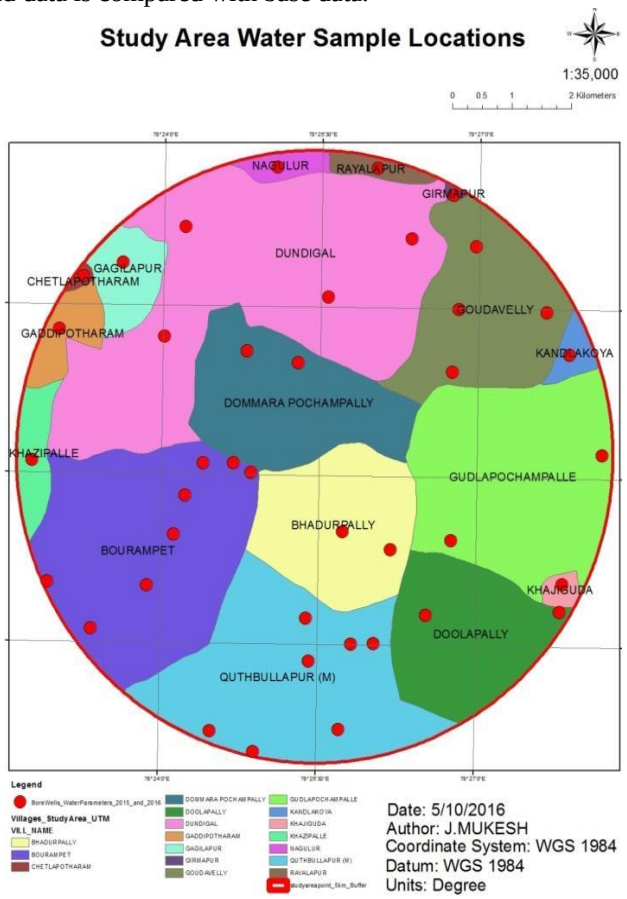

Fig 1.1 Water sample collection points

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II. STUDYAREA& RESULTS

Geographical Area: Gland Pharma Limited manufacturing facility is located at Dundigal, Hyderabad. Dundigal is a semi urban village located in Ranga Reddy district. It falls under Quthbullapur mandal. Its coordinates are17°37′38″N 078°24′12″E.Theentirestudyarea covers a radius of 5kmsfromthe Gland Pharma limited manufacturing facility.

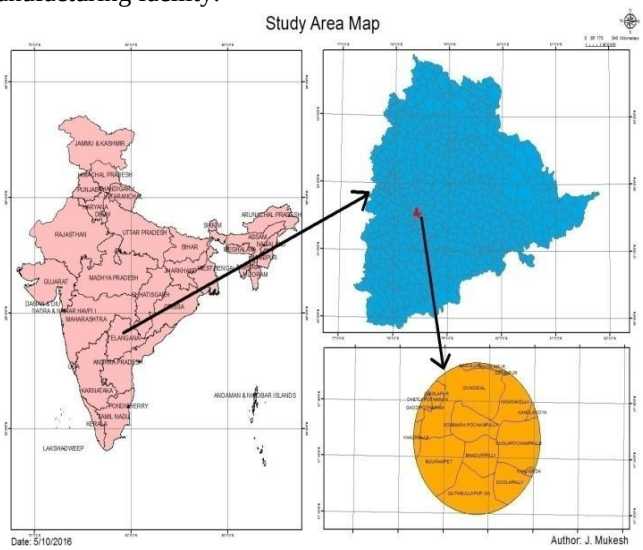

Fig 1.1 Location Map of the study area

analyzed .Samples are collected at a distance of 1KM and 2KM and samples are kept as representative of ground soil quality, and following are findings .Bulk density can be determined by Standard proctor compaction test Moisture content is determined by oven-dry method, Organic carbon and Organic matter are determined by Walkely and Black method, pH is determined by pH meter, Electrical conductivity is determined by conductivity meter, Phosphorous is determined by spectro photometric method and potassium is determined by flame photometry.

3.1 SPATIAL DISTRIBUTION MAP OF BULKDENSITY

From the bulk density map, it can be seen that the average bulk density of the study area was greater than 1.60 g/cm3which was not with in the permissible limits. If the bulk density is greater than 1.60g/cm3, than that type of soil restricts root growth.

3.2 SPATIAL DISTRIBUTION MAPOF

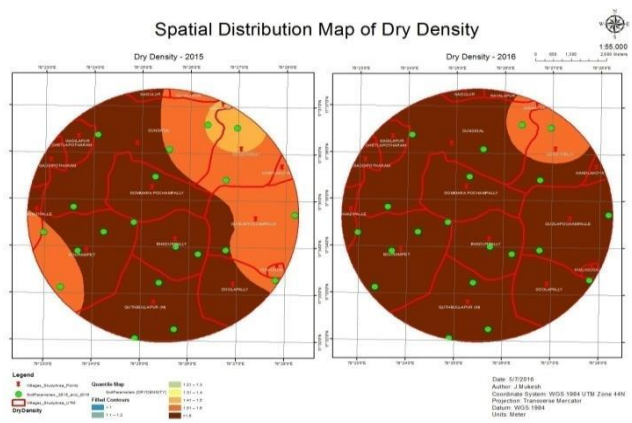

Fig 1.3 showings spatial distribution map of Dry density for theyear2018 and2019

3.3 SPATIAL DISTRIBUTION MAPOF ELECTRICAL CONDUCTIVITY

From the electrical conductivity map, It can be seen that the average electrical conductivity ofthestudyareawas1.86ds/m. If the electrical conductivity value ranges between 0-2 ds/m then it causes poor and spotty stands of crop sun even and stunted growth and poor yields

Potassium content in soil is low whereas in other villages its moderate.

From the map of, it can be seen that some parts of Gundlapochampalle village, Bhadurpally, Bourampet and Khazipalle villages were showing potassium deficiency. Low and short supply of potassium in plants and crops result in low crop yields.

The average dry density ofthestudyareawas1.7465g/cm3 which was above the permissible limits.

DRY DENSITY

From the dry density map, it can be seen that

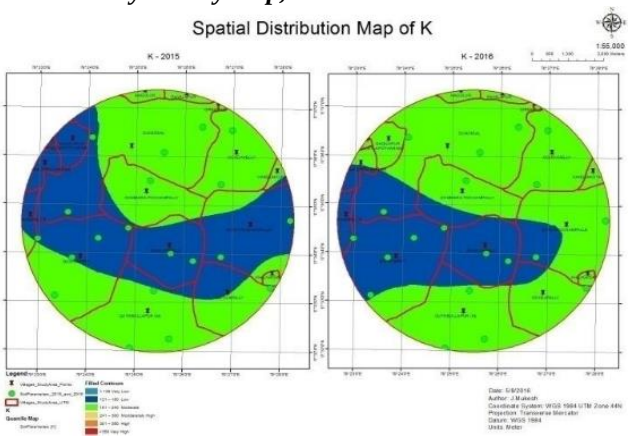

Fig 1.4 showing spatial distribution map of potassium for the year 2018 and 2019

3.4SPATIALDISTRIBUTION MAPOF ORGANICCARBON

From the map, it can be seen that in villages of Gundlapochampalle, Bhadurpally, Khajiguda, Doolapally, Quthbullapur showed low percentage of soil organic carbon which is rangingfrom0.5% to0.63% per 100gmof soil. The villages like Nagulur, Rayalapur, Gramper, Dundigal, Goudavelly, Kandlakoya, Dommarapochampally and Bourampet showed moderate presence of SOC. The villages like Gagilapur, Gaddipotharam, and Khazipalle showed high percentage of so presence.

From them AP villages like Nagulur, Rayalapur, Gagilapur, Dundigal, Dommarapochampally showed high presence of soc. The villages like Goudavelly, Kandlakoya, Gudlapochampalle, Bhadurpally, Bourampet, Quthbullapur, Doolapally and khajiguda showed moderate presence of soc.

3.5SPATIAL DISTRIBUTION MAPOF PHOSPHORUS

From the map, it can be seen that medium percentage of phosphorus was available in soils of villages of the entire study area which was sufficient for several crop production. But in the map of Gudlapochampalle village and some parts of Doolapally village showed low percentage of phosphorus.

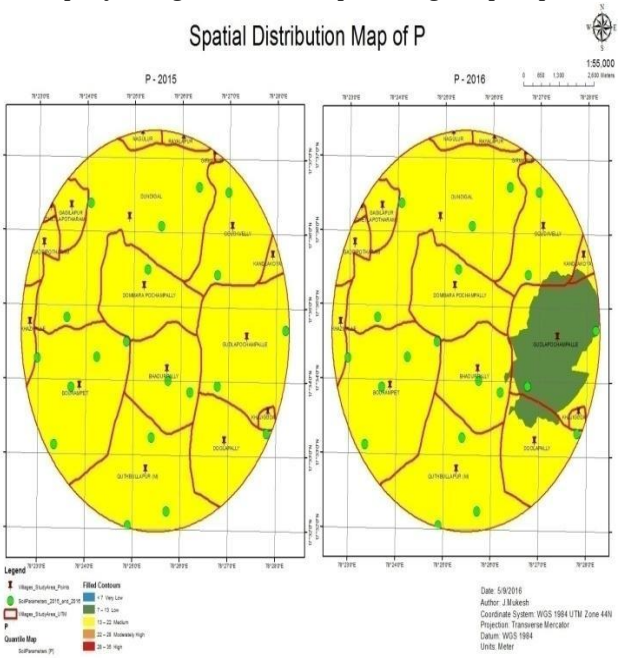

Fig 1.5 showing spatial distribution map of Phosphorus for the year2018 and2019

3.6 SPATIAL DISTRIBUTION MAP OF PH

From the map, it can be seen that villages like Goudavelly, Kandlakoya, Gudlapochampalle, Bhadurpally, Khajiguda, Doolapally, and Quthbullapur showed strongly acidic in nature. The villages of Nagulur, Rayalapur, Dundigal, Dommarapochampally, Bourampet and Gagilapur show neutral in nature the villages of Khazipalle and some parts of Dundigal village showed slightly alkaline nature of soil.

From the map of, it can be seen that Dundigal, Gagilapur and Nagulur showed

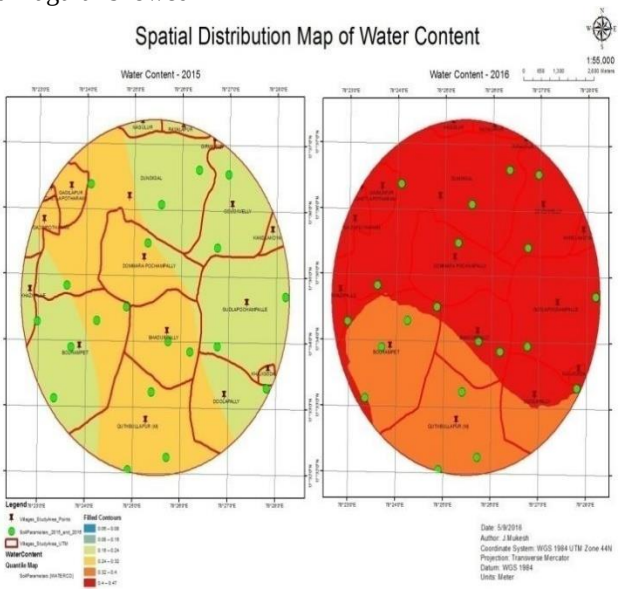

Fig 1.6 showing spatial distribution map of water content for the year2018 and2019

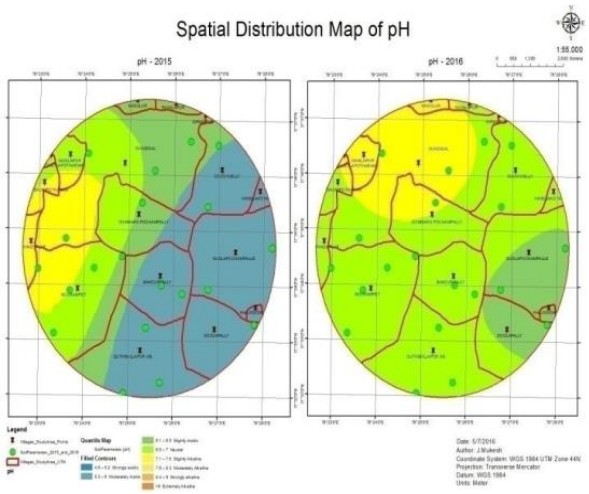

Fig 1.7 showing spatial distribution map of pH for the year2018 and2019

3.7 Calculation of EIA Score

In preparing base line matrix table the following procedure is followed. The table has the following three headings for different environmental elements.

1) Scale of importance
2) Scale of present condition
3) Scale of management

1) Scale of importance

Scale of importance of an environmental element provides the importance of a specific environmental element for the project under reference. This is indicated by a numerical value between 1 and 5. On this scale 1 indicates minimum importance and 5 indicate maximum importance. For example for the village surrounding Pharma industry, the importance of environmental element such as flora, fauna, water, earth, household and economy are very important. So these elements have been given highest point of 5 each. Similarly recreation, ecological relationship, communication etc., are considered to be relatively less important hence, they were given lower points ranging from 2 to 4.

2) Scale of present condition

The scale of present condition is also marked on 1 to 5 scale. If the present pollution levels/damage levels are high, the scale of present condition is indicated by 5, and the pollution levels are minimum, they are indicated by 1.

In the village surrounding the Pharma industry major damage has presently caused in flora, fauna, atmosphere, water and earth. Though the pollution loads are high they can be remediated/contained with suitable method. Hence, highest point was limited to 4. Though, the damage caused to household and economy is significant because of soil and water pollution, due to the Pharma industry, the industry also provided job opportunities to household conditions and economy of the community. Hence, the effective damage to household and economy are marked with 3. There was minimum damage to communities hence marked by 2.

3) Scale of management

The scale of management indicates magnitude of efforts to be kept by the industry management improving the environmental parameter/element under the study. If the management needs to improve significantly the scale will be marked with 5. Otherwise is indicated with 1. Since, the management methods of Pharma industry can significantly need to improve in effluent treatment, disposal and to improve the polluted soil and water, hence, on this scale 4 and 3 are indicated.

Table 1.2 shows the base line matrix parameter for the Pharma industry. It may be noted that the scale of importance for each environmental item has been scaled at same scale values in tables 1.2

i.e. Score = Scale of importance * Scale of present condition * Scale of management

For example calculation of EIA for Pharma industry is shown in Table 1.1

For flora:

Scale of importance = 5

Scale of present condition = 4

The score for flora for Pharma industry = 5 * 4 * 4 = 80.

3.7.2 The minimum and maximum score for project

125 +125 + 100 + 125 + 100 + 100 + 50 + 100 = 1375.

The minimum score for the project = 55.

3.7.3 Relative impact factor for Pharma industry

Relative Impact Factor (RIF) is defined as.

RIF = (Score of the industry – Min score) / (Maximum score – Min score) * 100.

RIF for Pharma industry = (681 – 55) / (1375 -55) * 100 = 47.42

By comparing the relative factor, Pharma industry is tenfold more than the sugar industry. This indicates Pharma industry causing significant contamination pollution to the environment compared to sugar industry in the similar environment.

Identification	Evaluation			Score
Environmental elements/units	Scale of importance(**A)**	Scale of present condition(**B)**	Scale of management(**C)**	**(A*B*C)**
	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
	low high	low high	low high	
Biological				
Flora	5	4	4	80
Fauna	5	4	4	80
Ecological	3	4	4	48
relationship				
Physical-chemical				
Atmosphere	4	4	4	64
Water	5	4	4	80
Earth	5	4	4	80
Cultural				
Households	5	3	4	60
Communities	4	2	3	24
Economy Communications	5	3	3	45
Bio-cultural linkages/units	4	3	3	36
Resources				
Recreation	4	3	3	36
Conservation	2	2	3	12
	4	3	3	36
TOTAL				681

Table 1.1Calculation of Environmental Impact Assessment for Pharma industry

The, EIA score for each environmental element is computed by multiplying the three scale values. i.e. Score = Scale of importance * Scale of present condition * Scale of management

Scale of importance = 5

Scale of present condition = 4

Scale of management = 4

The score for flora for Pharma industry = 5 * 4 * 4 = 80.

3.7.4 The minimum and maximum score for project

The maximum score for a project is computed by giving maximum points (5) for columns B, C and multiplying the values of three columns and adding the maximum score of a project has been computed.

The maximum score for the project = 125 + 125 + 75 + 100 + 125 + 125 +125 + 100 + 125 + 100 + 100 + 50 + 100 = 1375.

The minimum score for the project = 55.

III. CONCLUSION

1. Obtained score of EIA renders that there might be a negative influence on the industry of Pharma which is harmful for the social environment. Additionally, led to significant amount of contamination.

2. Initially the soil quality index (SQI) of the soil surrounding the location of Pharma industry was 0.8 (Good). The effluents of the industry contaminated the soil and water quality in the area surrounding the industry. And the SQI has fallen down to a value of 0.2 (Poor).

3. It was shown that higher levels of contamination in other parameters. The reduction of values in organic matter is from 4.8 to 1.1 (> 2% is acceptable), similarly, reduction of phosphorus and potassium values from 38 ppm to 11 ppm (> 20 ppm is sufficient), and 98 ppm to 62 ppm (> 80 ppm enough). and there is an enhancement in the electrical conductivity from 1 d s/m to 25 d s/m (< 2 d s/m is acceptable).

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