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# The Impact of Urbanization on Environment: A Study in Durgapur City

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*Urban centres are acting as engines of the country's growth. Industrialization has also ushered in an era of economic progress of a region. But in recent years, the trends and patterns of urbanization in India as well as in West Bengal, is heading towards a situation, which may be termed as 'urban disaster'. The twenty first century is expected to witness not only sustained population growth but also more of urbanization. In this globalizing era Indian cities and towns are in transition and have become especially important in understanding the environment of any urban space in relation to its ecological components, socio-cultural groups and economic and political activities. This unprecedented urbanization accompanied by major changes in social, economic, environmental and technological arena are impacting adversely on traditional land-use, water resources, environmental quality and management practices; which actually brings changes in total ecology of Durgapur Municipal Corporation in West Bengal. The main focus of this paper is to evaluate the impacts of these environmental issues upon the urban dwellers in this 'Steel city'. The present study empirically documents the perception of ordinary people on the urban environmental issues in Durgapur city with the help of both qualitative and quantitative methods. The data used in this paper are collected from both the primary and the secondary sources.*
***[Key Words:** Urbanization, Industrialization, Environmental Pollution, Urban Landuse, Peoples' perception etc.**]***

## Introduction

**T**he urban environment is a complex mixture of natural elements and the built environment. The built environment of any town includes its aesthetic and historical heritage. Here, physical environment is modified for human habitation and activity encompassing buildings, infrastructure and urban open spaces. The quality of urban environment is influenced by its geographical location; the scale and nature of human activities; the waste, emissions and ecological disruptions that local people generate and the competence and

accountability of the elected institutions. The urban environment is also influenced by the social and cultural components of the residents such as the values, behaviour, beliefs, knowledge, traits, laws, traditions etc. In this globalizing era, Indian cities and towns are in transition and have become especially important in understanding the environment of any urban space in relation to its ecological components, socio-cultural groups and economic and political activities. The use, protection and conservation of physical environmental aspects like land, water, soil and air are very much dependent upon the behavioural approach of the socio-cultural groups and the policies formulated by the socio economic forces. The quality of urban livelihood is related to its pace of sprawling and the rate of extension of civic amenities. In case of Durgapur, a municipal corporation in West Bengal, the unprecedented urbanization accompanied by major changes in social, economic, environmental and technological arena are impacting adversely on traditional land-use, water resources, environmental quality and management practices. As a corollary, there is qualitative change in the total ecology of this city. The perception of the individual resident on the management of urban centres, if measured, can give an approximate subjective evaluation of the quality of urban governance. It may also provide direction for action and can be used as guidelines for strategy formulation for future urban planning. This paper tries to reflect on the emerging issues of environmental pollution in the city of Durgapur through an assessment of the views of its residents.

It is worth noting here that the perception of the living environment by inhabitants is one of the important dimensions to be considered in town planning and administration, as it reflects the residents' reaction to the living environment. However, the 'perception' is subjective and does not necessarily and always reflect the objective reality (Kulkarni 1984). The perception about their living environment is influenced by a number of factors such as age, gender, marital status, family structure, economic status, levels of education, location of houses, occupation, duration of stay in the present environment etc. Al-Soliman (1990) in his study on urban environmental attributes has found that the type of setting on lives influences the perception of a common environment. It becomes inevitable to the decision makers or town planners to standardise the living urban environment in terms of certain attributes for making it comparable with the respondents' perceived environment. Based on psychological concepts, Lynch's work (1976, 1960) is one of the earliest examples of urban environment perception study. Mental images of the residents of Boston, New Jersy and Los Angeles were traced, comprising of sequential elements such as nodes and paths; spatial elements such as districts, edges and landmarks. The detailed work of Appleyard (1970) established the idea of mental image of the living environment by comprising field survey of form, visibility, use and significance pattern with the inhabitants' maps, as it was apparent that they were using each of these attributes to structure the city.

**Study Area**

Durgapur Municipal Corporation ($23^0 48^/$ N and $87^0 32^/$ E) is situated on the north bank of River Damodar, just before it enters the alluvial plains of Bengal. Durgapur Subdivision is surrounded by Asansol Subdivision on the west, Barddhaman Sadar North Subdivision on the west, Bankura district across the Damodarian South and Birbhum district across the Ajoy River to the north. As per 2011 Census, Durgapur Municipal Area having a total population of 5,66,937 with its density of 3667 persons/sq. km. acquires an area of 154.20 square kilometres. In the midst of *Jungal Mahal* tract, Durgapur Municipal Corporation emerged and evolved as a planned industrial town. Heavy industries are concentrated in its periphery in the planning era of the Indian Federation. This modern industrial city is gaining its importance as post-colonial planned city in India. As a post independent industrial town Durgapur was constituted as a Notified Area Authority in 1962 and was upgraded to the status of a Municipal Corporation in 1996. As per Census 2011, this 'Steel city' is the second (after Kolkata) and the third (after Kolkata and Howrah) largest town in West Bengal in terms of area and population respectively.

**Objectives**

The aim of this paper is to develop an empirically-based assessment about recent environmental issues due to rapid urbanization since independence in Durgapur Municipal Areas. This paper is designed to achieve the following objectives:

(i) To trace the important environmental issues due to rapid urbanization and industrialization;

(ii) To analyze the social and cultural status as well as behavioural patterns of the city dwellers;

(iii) To evaluate the level of awareness of the city dwellers regarding issues related to urbanization as well as industrialization; and

(iv) To assess peoples' perception on matters relating to the major ecological changes.

**Methodology**

This paper is based on the empirical survey done with the help of both qualitative and quantitative methods. The data used in this paper are collected from both the primary and the secondary sources. The main focus of this paper is to evaluate the impact of various environmental issues upon the urban dwellers of Durgapur. Primary data have been collected through structured and in-depth interviews based on questionnaire containing pre-mediated questions. Apart from the primary data, the present study has also used secondary data obtained from the Office of West Bengal Pollution Control Board. Four wards based on the availability of different infrastructure, industrial clustering, concentration of Slum dwellers etc. were selected in Durgapur municipal areas. They were as follows:

- Central Business District with good infrastructure – Ward No. 22
- Peripheral Residential ward with Average infrastructure - Ward no. 2
- Industrial Landscape dominated ward –Ward No. 37
- Slum dominated ward –Ward No.13 (94.62 per cent slum population).

The selection of the respondents was made from the voters' list by random sampling. The survey was carried out in four different municipal wards selecting 50 from each ward making a total of 200 respondents. For finding out the perception of city dwellers about urban environment, a Likert-type scale was used and divided the respondents in the relevant cases into three categories: high, medium, low marked on the basis of the scores obtained by them.

**Urbanization and Industrialization in Durgapur Municipal Areas**

Industrialization has been the causative factor of urbanization in this steel city. It is now an important 'urban industrial complex' in India. As per Administrative Report (2007 – 2008) there are 47 large scale and 194 small scale industries in Durgapur Municipal Corporation. Industrial land use also increased from 0.72 sq. km. in 2008 – 2009 to 1.42 sq. km. in 2012 – 2013 (see Table no. 3). Table 2 states that population has grown steadily in this city from 41,696 people in 1961 to 5, 66,937 in 2011. The literacy rate in Durgapur Municipal Areas has increased from 74.01 percent in 2001 to 80.01 percent in 2011 Census. About 97.40 percent of its workers are engaged in urban occupation as per 2001 census (see Table no. 2).

**Table 1: Growth of Population in Durgapur Municipal Corporation**

| Year | Population | Growth Rate | Density | No Of Household |
|---|---|---|---|---|
| 1961 | 41696 | -- | 566 | 10401 |
| 1971 | 206638 | 395.58 | 1340 | 48680 |
| 1981 | 311798 | 50.89 | 2022 | 69584 |
| 1991 | 425836 | 36.57 | 2762 | 93966 |
| 2001 | 493405 | 15.86 | 3200 | 109925 |
| 2011 | 566937 | 14.90 | 3667 | 163916 |

Source: Different Census Reports, Burdwan District, West Bengal

**Table 2: Literacy, Sex Ratio and Work Participation in Durgapur Municipal Corporation**

| Year | Literacy (%) | Sex Ratio | Worker (%) | Non Worker (%) |
|---|---|---|---|---|
| 1961 | 64.03 | 338 | 62.48 | 37.52 |
| 1971 | 56.77 | 764 | 30.91 | 69.09 |
| 1981 | 66.76 | 822 | 26.96 | 73.04 |
| 1991 | 70.07 | 825 | 27.53 | 72.47 |
| 2001 | 74.01 | 871 | 31.15 | 68.85 |
| 2011 | 80.01 | 926 | 35.12 | 64.87 |

Source: Different Census Reports

**Table 3: Land use Land cover Change (Area in sq.km) in Durgapur Municipal Corporation**

| Year | 2008-09 | 2012 |
|---|---|---|
| Agriculture | 10.61 | 9.08 |
| Commercial Area | 0.25 | 0.87 |
| Existing Green Belt | 11.47 | 11.47 |
| Public Utility | 21.07 | 24.96 |
| Industrial Area | 0.73 | 1.42 |
| Institutional | 3.25 | 3.34 |
| Recreational | 0.54 | 3.81 |
| Residential | 22.85 | 50.93 |
| Open Space | 81.18 | 43.32 |
| Water Bodies | 2.25 | 5.00 |
| Total | 154.20 | 154.20 |

Source: Draft Development Plan, 2008-09 and High Resolution Image, 2012

**Environmental Issues in Durgapur**

The specific and more acute problems in Durgapur Municipal Area are discussed below:

**Air Pollution**

In recent years there has been an increasing concern towards the problem of air pollution in Durgapur. These concerns arise particularly when concentration of pollutants at certain places reach harmful levels. Such concentrations are prevailing in Durgapur and its surrounding area, because here the atmosphere is adequately unable to dilute or disperse the pollutants vertically or horizontally. Air pollution is of great immediate concern than any other aspects of pollution. Human being can live without food and water for days together, but they can do so only for five minutes without air. The major source of air pollution around Durgapur city is industrial pollution.

Industrial pollution is nothing but undesirable changes in the physical, chemical and biological characteristics of air, water and soil by releasing pollutants from industry. Gaseous and non-gaseous substances emitted from various industries may render air polluted through mixing with it. The Durgapur Industrial Area comprises two large Steel Plants, viz. Durgapur Steel Plant (DSP) and Alloy Steel Plant (ASP), apart from approximately 47 large scale and 194 Small scale industries. The emission of various gases such as sulphur dioxide, carbon monoxide, nitrogen oxide, particulate matters, choloro-fluro carbon, ammonia, fly ash particles, smoke, dust and toxic materials cause serious problems surrounding the industrial environment. Increased industrial expansion in this region, play a crucial role for the deterioration of the quality of air, water and soil. Various industries in this industrial region emit major air pollutants. Table 4 reveals the level of such pollution.

**Table 4: Air Pollution in Durgapur City**

| Station | 24 hour Average Concentration of Pollutants (µ g/m³) | | | |
|---|---|---|---|---|
| | SPM | RPM | SO2 | NOx |
| Durgapur Municipal Corporation | 527.55 | 183.76 | 55.71 | 48.41 |
| Residential Standard | 200.00 | 100.00 | 80.00 | 80.00 |

Source: Pollution Analyser Consultant (November 2000-March 2001)
Sponsor: WBCPCB, 2001

This air quality monitoring was conducted in winter season covering the period November 2000 to March 2001. The arithmetic mean values of the concentration of SPM and RPM in Durgapur town are 527.55 µg/m³ and 183.76 µg/m³ respectively. Both the value exceeded the residential standard. From Table 4, it is obvious that arithmetic mean concentration of Sulphur dioxide is 55.71 µg/m³ and that of oxides of Nitrogen is 48.41 mg/m³. Both the values in this town satisfy the residential standard.

The results of the Table 5 and the charts (1, 2 & 3) show that during the period 2012–2014, except PM 10, the levels of $NO_2$, $SO_2$ and PM 2.5 all are in permissible level. This is mainly because of different pollution control measures taken by the West Bengal Pollution Control Board.

**Table: 5. Average Monthly Level of Pollutants in the Air, 2012-2014**

| Date | NO2(µg/m³) | PM10(µg/m³) | PM2.5(µg/m³) | SO2(µg/m³) |
|---|---|---|---|---|
| Oct '12 | 71.05 | 85.41 | 53.10 | 12.64 |
| Nov '12 | 42.33 | 147.47 | 98.81 | 10.19 |
| Dec' 12 | 41.51 | 172.73 | 108.68 | 16.63 |
| Jan'13 | 57.27 | 186.38 | 97.48 | 9.94 |
| Feb '13 | 72.03 | 143.41 | 93.23 | 18.88 |
| March '13 | 78.84 | 153.70 | 102.63 | 29.31 |
| April '13 | 28.80 | 129.36 | 71.55 | 24.20 |
| May '13 | 71.83 | 75.15 | 45.36 | 16.19 |
| June '13 | 76.02 | 72.24 | 45.74 | 12.36 |
| July '13 | 34.99 | 45.30 | 29.63 | 9.54 |
| August '13 | 20.04 | 59.89 | 36.58 | 7.68 |
| Sept '13 | 15.95 | 94.10 | 42.14 | 10.37 |
| Oct'13 | 30.80 | 91.40 | 41.99 | 9.73 |
| Nov '13 | 38.39 | 174.60 | 95.82 | 10.77 |
| Dec '13 | 55.52 | 232.03 | 107.32 | 9.77 |
| Jan '14 | 6.61 | 167.46 | 69.59 | 8.10 |
| Feb'14 | 48.70 | 145.31 | 73.19 | 10.22 |
| March '14 | 40.30 | 166.76 | 74.69 | 16.12 |
| April '14 | 49.36 | 183.36 | 73.08 | 21.28 |
| May ' 14 | 62.16 | 134.75 | 62.85 | 21.39 |

Source: West Bengal Pollution Control Board

**Chart 1: Ambient Air Quality (SO2 Level)**

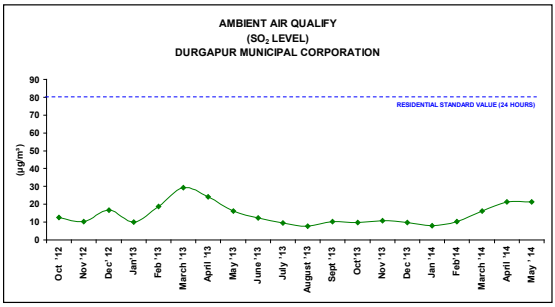



**Chart 2: Ambient Air Quality (PM 10 Level)**

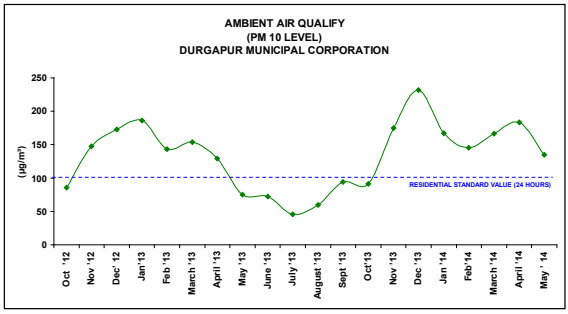
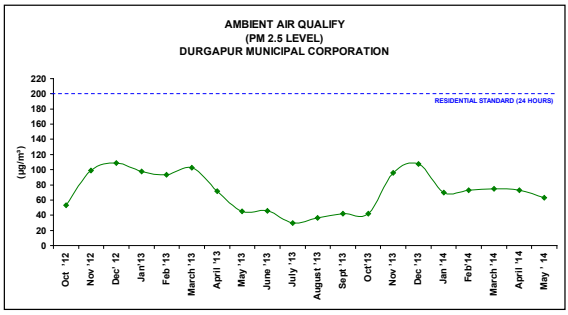



**Chart 3: Ambient Air Quality (PM 2.5 Level)**




## Water Pollution

Since the pollution of surface water changes the physical and psychological nature of water, it can have serious impact on the quality of human life. Release of sewage from domestic and industrial effluents including organic wastes causes the turbidity and colour of water. A rain fed stream originates near Tamla village under Durgapur Sub-division, and has been named after the place of origin. Tamla Nullah flows across the steel city

Durgapur and is carrying all the domestic as well as industrial discharges of Durgapur Municipal Areas. It crossed NH2 near DSP main gate junction and enters into the industrial area, and finally reaches to river Damodar at downstream of Durgapur Barrage. The State Pollution Board monitors Tamla Nullah at nine different locations in every month throughout the year, 2011-2012 and measures physico-chemical parameters and micro-pollutants. The results of these nine stations are as follows:

**Table: 6. Water Pollution in Tamla River, Durgapur**

| Parameters | STATIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 9 | Average |
| PH | 7.40 | 7.30 | 7.40 | 7.20 | 7.30 | 8.40 | 8.20 | 9.60 | 7.85 |
| TSS (mg/l) | 28.00 | 22.00 | 16.00 | 20.00 | 18.00 | 304.00 | 284.00 | 264.00 | 119.50 |
| BOD (mg/l) | 6.75 | 7.08 | 3.08 | 5.42 | 3.08 | 5.13 | 3.42 | 3.28 | 4.66 |
| Phenol (mg/l) | BDL | BDL | 0.027 | 0.268 | 0.245 | 0.723 | 0.519 | 0.427 | 0.37 |
| Lead (mg/l) | BDL | BDL | BDL | NT | 0.003 | NT | 0.004 | 0.006 | 0.00 |
| Mercury (mg/l) | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Cyanide (mg/l) | 0.02 | 0.014 | 0.016 | 0.008 | 0.02 | 0.600 | 0.160 | 0.04 | 0.11 |

BDL: Below Detectable Limit; NT: Not Traceable, Data not available in 6th station. Source: West Bengal Pollution Control Board (2011- 2012)

The values of several parameters have shown that there is a definite fluctuation from one place to another along the river Tamla. PH is an important parameter in order to detect the quality of water in terms of acidic or alkaline. It was found that the PH value remained neutral to slightly alkaline in the first five stations. Stations 7th, 8th and 9th have excessive high PH value. Total Suspended Solids (TSS) is considered as a pollutant and in excessive amount it can affect water quality. General study considers that alkaline water have more TSS than acidic water. This is also true for this study. Last three stations also possess higher TSS values. Excessive sedimentation can affect the growth and development of fisheries and reduce habitat complexity. Bio-chemical Oxygen Demand (BOD) concentration at all eight stations were well above the standard value of 3 mg/ lit. Also the average BOD value exceeds the maximum permissible limit. This indicates that the quality of the river water is not suitable for aquatic life. Mercury pollution as measured was found to be well within the limit in all the stations. Chemical agents like phenol, lead and cyanide which are concentrated in small quantity ultimately going to hamper the overall water

quality and aquatic biodiversity in the river Tamla and cause toxic effects in fish and human life.

**Fly Ash Pollution**

Fly ash is important industrial waste of coal-fired thermal power stations. The fly ash an is so fine and light that it remains air borne for a long time, thus contributing to the air pollution. It occupies a large space in the vicinity of power plants. The Steel Plants and heavy metallic industries handle large quantity of raw materials. In the course of transportation, stacking, reclaiming, screening, crushing, these materials generate considerable amount of dust. Such industrial hub for a long time has been known for its visible cloud of dust. The other major emissions from these industrial units are oxides of sulphur, nitrogen and carbon, yellow brown smoke and fume etc. Such a dust dominated smoky environment prevails at Angadpur and surrounding areas of Durgapur Industrial Complex.

**Peoples' Perception Regarding Environmental Change in Durgapur Municipal Area**

The urbanization and industrialization in Durgapur Municipal Areas in recent times have led to drastic changes in the existing land use pattern. These changes have ultimately affected the city environment. Though information about the existing problems of urban environment for proper environmental management can be obtained from a variety of secondary sources, it is equally important to consult the public too, regarding their perception of the same. The perception of the urban inhabitants regarding their living environment is very much helpful in developing a diverse and adoptable strategy for sustainable urban environment management. Cultural background as well as various socio-economic characteristics, like education, age group, residential location, migration characteristics etc., exerts some influence on the differential perception regarding a common environment.

**Background Characteristics of the Respondents**

The background characteristics of the interviewed residents are shown in Table 7. The total sample size for the study was 200, out of which 30 per cent were of age groups 18-34 years and 35–54 years. The majority of the population (40 per cent) were in between 55 years and 75 years of age. As far as educational level was concerned, the respondents were divided in to five categories: Illiterate, Primary education, Madhyamik education, Graduates and Others. It was found that about 09 per cent of the sample was illiterate, while 36 per cent of respondents had poor educational level. In this study migrants outnumbered the natives marginally. Almost 69 per cent of the samples residents had their own house either legal or illegal as in the case of few slum dwellers.

**Table: 7. Percentage distribution of respondents against selected background characteristics**

| Sr. No. | Variable/ Category | Percentage |
|---|---|---|
| 1 | **Age of the respondent** | |
| | 18 to 34 Years | 30.00 |
| | 35 to 54 Years | 40.00 |
| | 55 to 75 Years | 30.00 |
| 2 | **Educational Level** | |
| | Illiterate | 09.00 |
| | Primary education | 25.00 |
| | Madhyamik education | 11.00 |
| | Graduates | 37.00 |
| | Others | 18.00 |
| 3 | **Migration Status** | |
| | Migrant | 52.00 |
| | Native | 48.00 |

**Table: 8. Percentage of respondents against perceived categories of various Environmental problems in Durgapur Municipal Corporation**

| Sr. No. | Environmental Problem | Percentage of respondents | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| 1 | Air Pollution | 06.00 | 21.00 | 73.00 |
| 2 | Water Pollution | 28.00 | 30.50 | 41.50 |
| 3 | Fly ash Pollution | 04.00 | 31.50 | 64.50 |

Source: Field Survey, 2011 -2012

Among various environmental problems (shown in Table 8), my respondents perceived air pollution to be of greater impact in comparison to other types of pollution in this town. While only 06 per cent respondents perceived the air pollution level in the town to be low, 28 per cent had similar opinion about water pollution. Almost 96 per cent of the respondents considered that the level of fly-ash pollution in the town was at medium or high level. Though air pollution and fly ash pollution were being perceived as two major environmental concerns in Durgapur Industrial Complex, more than 41 per cent of the respondents were also of the opinion that water pollution was in a critical stage in the town. From the results of the Table 9 it is clear that about 75 per cent of respondents are aware about the increasing level of pollution. More than 60 per cent respondent strongly agreed with the opinions that open lands being converted as well as trees, greeneries being destroyed rapidly.

**Table: 9. Perception Regarding Recent Environmental Concern in Durgapur City**

| Sr. No | Changes Occurred Recently | Percentage of Respondents | | | | |
|---|---|---|---|---|---|---|
| | | Strongly Agree | Just Agree | Partially Disagree | Largely Disagree | No Opinion |
| 1 | Ponds are being filled up | 47.00 | 38.00 | 06.00 | 05.00 | 04.00 |
| 2 | Open lands being converted rapidly | 62.00 | 23.50 | 10.50 | 04.00 | _ |
| 3 | Trees , greeneries being destroyed | 61.00 | 20.00 | 09.50 | 09.50 | _ |
| 4 | Increasing pollution | 74.50 | 20.50 | 05.00 | _ | _ |
| 5 | Declining balance physical & cultural aspects | 43.00 | 26.50 | 11.00 | _ | 20.50 |
| 6 | Corporate aggression changing its ecology | 17.00 | 49.00 | 18.50 | 15.50 | _ |
| 7 | Increasing breathing problems | 35.00 | 43.50 | 13.50 | 08.00 | _ |

Source: Field Survey, 2011 -2012

**Conclusion**

It is well known that for achieving better quality of life, city development must match with the growth of city population and its requirement. Therefore, availability of infrastructure is a very important issue and equally important is the peoples' perception regarding the process of developmental activities, as perception decides the level of use of available amenities and reflects the level of satisfaction too. From this analysis, as far as city dwellers' perception is concerned, a few emerging issues of concern came out, in which the steel city seemed to be at a critical stage. Recently, the impact of urbanization as well as industrialization has changed the land use pattern of Durgapur Municipal Areas and created significant problems to its ecology and environment. Open lands are being converted to residential and industrial areas. As a result, fly air pollution as well as water pollution increases day by day.

With the expansion of urban area and its population, there is, therefore, need to increase the infrastructural facilities of the industries to reduce air pollution, so that it could cope with the increasing population of the urban environment. Immediate actions by the Durgapur Municipal Corporation (DMC) and Asansol Durgapur Development Authority (ADDA) are to be taken for sustainable 'Steel City' development and to facilitate the requirements of the urban inhabitants in Durgapur Industrial Complex.

**Note**

1. This article is based on Ph. D work of Mr. Sandip Tah under the joint supervision of Prof. Biswajit Ghosh and Dr. Ananda Mohan Kar, Department of Sociology, The University of Burdwan, West Bengal.

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