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Unruly urbanisation on Delhi's fringe

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6 THE EFFECTS OF URBANISATION ON LIVING CONDITIONS

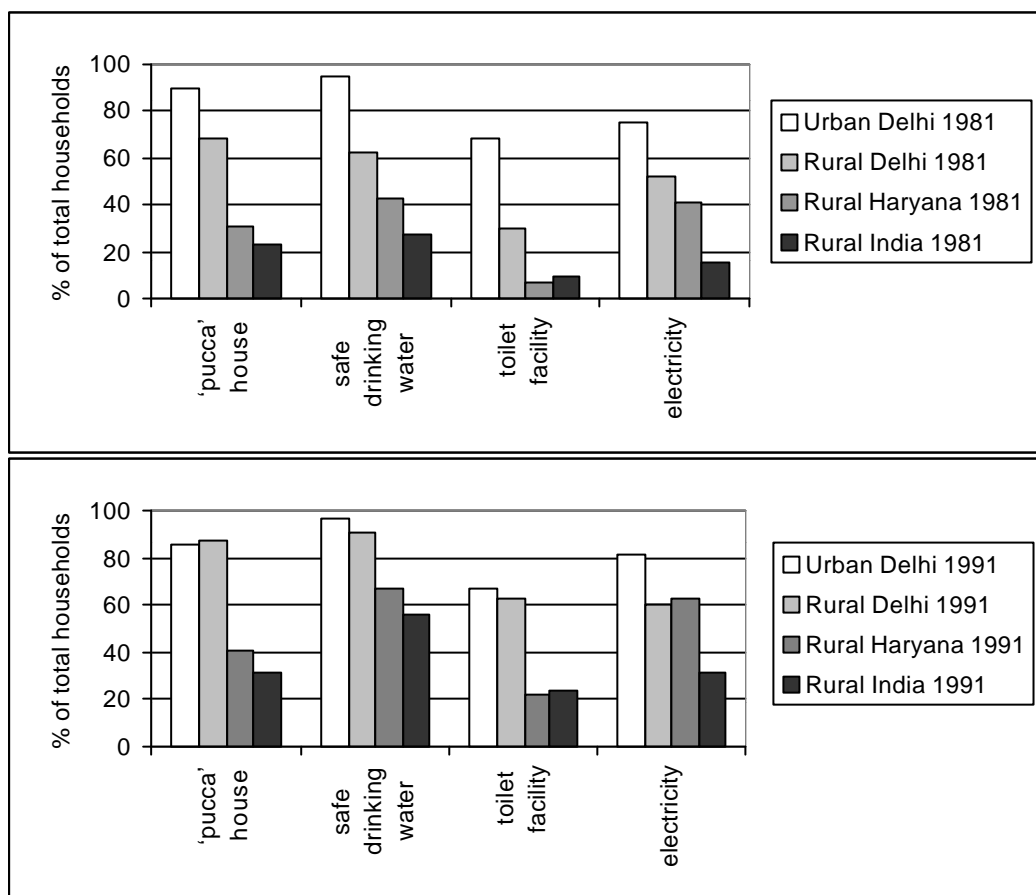
Urbanisation causes changes in the living conditions under which people live and work. Especially in developing countries, this often leads to adverse living conditions (see introductory remarks in Section 1.2.5). In the particular setting of urbanising villages, there are places where chaotic urbanisation and industrialisation causes hardship, particularly for local residents. This is not the whole story, however. There are also many positive effects of urbanisation: improving housing conditions, better amenities and services, and higher living standards. Yet these benefits are often ignored in the literature on urban environmental issues in developing countries. As argued in this chapter, the selective impact that one can observe there depends to a large degree on the type of settlement, the socio-economic position of the population, and people's occupations. This is illustrated by presenting the case of the fully urbanised and industrialised village of Samaipur. It was chosen for a case study because of its radical and rapid transformation; Samaipur was a rural village until 15 years ago. Presently, this 'village' is the scene of many of the environmental problems generally ascribed to urbanisation mentioned in the literature (Section 1.2.5).

Before turning to the case study, it is instructive to describe the prevailing situation regarding urban amenities and services in the region. In this respect, the situation of the urbanising area of Delhi stands out favourably. Subsequently, the description narrows in on environmental problems, treating pollution, congestion and pressure on amenities. These adverse effects, which economists call *negative externalities*, usually go uncompensated; e.g. a factory is not held directly responsible to pay compensation to nearby residents who suffer from its pollution (Pearce 1981). A discussion of externalities belongs to a more economic approach. In contrast, this study attempts to measure both the positive and the adverse effects in terms of residential quality, availability of services and amenities, and health indicators. The treatment of these issues remains on a descriptive level. Sometimes, the only aim is to formulate hypotheses, since tracing the causality between environmental factors and health is an extremely complicated and tricky issue (Geddes 1997, Wildavski 1995, de Lepper et al. 1995).

6.1 Positive effects: better amenities, housing and health awareness

Over the past few decades, the urban amenities and infrastructure in the villages in Delhi's rural-urban fringe have been expanded and improved. As a consequence, the villagers generally refer to their settlements as being 'more developed' in comparison with villages beyond the boundaries of the NCT. At the same time, they complain about the remaining gap in the level of amenities and the quality of infrastructure compared to middle-class urban neighbourhoods. The difference is increasingly relevant to their self-perception and their degree of satisfaction.

Figure 6.1 Level of amenity in rural Delhi compared, 1981-91



Source: Bose 1996, pp. 184-196, according to data from the census of 1981 and 1991

Figure 6.1 shows the difference in housing conditions. *Pucca* is a local term for permanent material such as bricks and concrete; *katcha* refers to mud, straw, cardboard, plastic and other traditional and provisional construction material. In rural Delhi, the housing conditions and amenities are significantly better than in rural Haryana and the rest of rural India. Rural Delhi was even catching up with urban Delhi from 1981 to 1991, if one looks at the physical aspects of urbanisation in the villages in Delhi. The situation in urban Delhi has hardly been improving, which means that many households in Delhi are housed very poorly. Unfortunately, the figures for 1971 are not available. But even compared to 1981, the pace of change is striking. For example, Samaipur was still rural in 1981, but urban in 1991 (Census of India 1991).

The municipal authorities, in most cases the MCD, have the responsibility of providing infrastructure and amenities to the villages within their territory. The infrastructure is much better compared to that provided elsewhere, e.g. in adjacent rural Haryana, with the exception of electrification. In terms of households connected with electricity, rural Haryana scores better. This discrepancy might also be caused by a bias in the data, which does not take the many households with an illegal connection into account.

Even within villages, there are very wide differences between the level of amenity and infrastructure in certain parts of the built-up area. The difference is due to the fact that new unauthorised colonies start off without amenities. In terms of the provision of infrastructure, the villages lag behind urban middle-class colonies, but there are signs of substantial improvement. All villages in Alipur Block are connected to tarmac roads. Bus service has started running to all the villages. Both electricity and tap water supply are available in all but one village, although some households have to resort to illegal connections. Especially in the fast-growing villages, the provision of municipal services for recently established streets and houses is slow and faulty.

The provision of amenities and infrastructure by municipal authorities clearly depends on whether or not the settlement has an 'authorised' status (see Chapter 4). Unauthorised parts of the village outside the *lal dora* or 'colonies' usually do not have paved roads and a cemented sewerage system, unless the residents and/or the colonisers have put in these features themselves.

Most streets in the villages are paved, although this provision lags behind the fast growth of the settlements. A simple open sewerage system, made of bricks and cement, is constructed in most villages. In contrast, many of the villages across the border in Haryana still have muddy ditches. It is debatable whether rural villages with small populations really need a closed sewerage system. At least, the residents of such places hardly complain about not having one, and an open sewer is easier to clear when it is clogged. In urban villages, the municipal authorities usually construct a closed sewer, but happens only after many years of problems with an inappropriate open sewer. Overall, 9.7 per cent of the households in Delhi still have no drainage arrangement. Furthermore, 15.1 per cent are exposed to the risk of waterlogging, partly due to insufficient drainage (Visaria 1997, reporting on the basis of 1988-9 data from the 44th round of the National Sample Survey).

An important advantage of incorporation into the urban area is the widespread presence of hospitals and other services related to health care. Along with the rising economic standard, access to health-care facilities is one of the main explanatory factors of the higher average life expectancy in urban and peri-urban areas compared to rural areas (Bose 1993). The government runs a few large hospitals in Alipur Block. The quality of these government hospitals is not always very good, but it is better than the care available in remote areas. Even in urban areas, the access of the poor to government hospitals is a problem (Drèze and Sen 1996). Therefore, the private sector plays a major role in health care in urban areas, even in the poorest slums. Although the quality of care available through private doctors, clinics and pharmacies varies enormously, the private sector does ensure relatively easy access to medicines, basic care in case of emergencies, and the distribution of information on diseases and hygiene.

In the villages, all traditional *katcha* houses have disappeared in favour of *pucca* houses. This definitely meant an improvement in the housing conditions for the villagers, although elderly people have complained occasionally that the original mud-wall houses stay cooler in summer. Even if this is the case, the widespread availability of fans and water coolers (and nowadays even air-conditioning) brings relief from the scorching heat of the North-Indian summer. The remaining *katcha* houses (around 15 per cent in rural Delhi according to Figure 6.1) are found mostly in slums and unauthorised colonies.

There is one more indirect positive effect on the health conditions of villagers that should not be ignored. It is the increased knowledge about hygiene and disease that comes from education and exposure to urban lifestyles.

6.2 The adverse effects of environmental stress

6.2.1 Pollution

There are three main types of pollution in the rural-urban fringe: air, water and solid waste. Though less noxious, noise and odour complete the picture.

Air pollution is particularly noticeable in rapidly urbanising villages, where industry tends to be located within or adjacent to the settlements. There, enforcement of environmental legislation is almost non-existent. In the absence of a (reliable) supply of industrial electricity, low-grade coal is used to fire the furnaces, which causes many factories to emit black smoke. Similarly, brick kilns generate considerable air pollution as well. But, because they are dispersed in the fields, they create less nuisance for the residents of the settlements, except for those living in the adjacent labour quarters. However, at some locations, brick kilns emit so much smoke that the laundry turns foul and villagers can no longer sleep on the roof during the summers. Most villagers do not link any of their health problems to the smoke from brick kilns. However, some people with asthma say their situation certainly worsens when and where factories and brick kilns emit smoke. It should be noted that at the metropolitan level, traffic is considered the most important source of air pollution, accounting for approximately 60 to 65 per cent of the total (Centre for Science and Environment 1989, United Nations 1995). At the micro level, traffic pollution varies enormously; in the rural-urban fringe, smog is considerably less common. Nonetheless, many villages experience increasing levels of through traffic, although congestion is less than in urban areas. A frequently heard complaint voiced by people living along busy roads is that the dust created by traffic, especially trucks transporting bricks and sand, causes respiratory problems. Whether or not this problem arises depends on the exact location of a person's dwelling and workplace.

Most *water pollution* is caused by industry and households, as the examples provided in Section 6.3.4 show. It is mainly a problem where a good sewerage system is lacking. Some villages still have open sewerage drains, even though the population densities are becoming very high. The newspapers frequently report cases of pollution of surface waters and groundwater in the urban area (Hindustan Times 16-9-1998, Times of India 5-5-1998). The quality of groundwater used for drinking is alarming in some industrial areas, e.g. around the villages Nangli Poona and Samaipur. Generally, increased population densities generate more human waste and domestic discharge, which are said to seep into the shallow groundwater. Since almost all villages have access to drinking water on tap, this problem has largely been overcome. The low pressure in the municipal water supply pipes is still a major problem, though.

Farmers in the study area do not complain of an alleged reduction in the quality of irrigation water due to water pollution. Salinity of the groundwater is still a problem. But

this has been an issue as long as anyone can remember and therefore could not be related to industry or urban development. Besides, soil salinity caused by inadequate drainage facilities has gradually decreased since the Green Revolution started (see Section 3.1).

Now, the collection of *solid wastes* is the responsibility of the municipal authorities (mainly the MCD). But at the city's fringes, its capacity often falls short, particularly in the peripheral unauthorised colonies and village extensions. The places that usually become littered with trash are vacant land owned by the government, unused village common lands, and the village pond.

6.2.2 Congestion

Many households in villages have to cope with increasingly crowded conditions, although this is certainly not true for everyone. The housing conditions improve when villagers build high buildings, sometimes up to five storeys, increasing the amount of available indoor floor surface. Many villages have very high population densities because numerous rooms are rented out to migrants. Poor migrants live under the most crowded conditions. They do not have access to ancestral residential land. Therefore, they depend on rented accommodation, which they often share with many others to save money. Some poor households of the original population also live in very crowded dwellings for two other reasons. First, many families expand and split up into multiple households, while the land available for construction becomes unaffordable. They are thus forced to fit more people into the same space or house or else to split up existing plots and dwellings to accommodate a new household. Second, in the absence of sufficient income from other sources, some households are inclined to rent out a portion of their living space or cattle sheds to tenants. The original dominant castes are traditionally endowed with the most residential space, so they normally have fewer problems. The wealthiest, who traditionally live in the central part of the village, often acquire a larger plot outside the village to construct a new home, often competing with the other rich families to construct the highest house. Nowadays, the strict spatial separation of caste groups is no longer considered essential.

In urbanising villages, the access to indoor toilets connected to the sewerage system has become a necessity, since the open fields are no longer available for sanitary purposes. For the poor people who do not have access to this facility, the situation is becoming problematic. As a result, very unsanitary conditions prevail at the remaining few plots of vacant land.

Through traffic often still takes the main village road. That road is simply not wide enough to let the trucks, cars, buses and many other road users pass in both directions. Widening the street is a difficult affair. Not only are the houses built very close to the road, but commercial encroachments are inevitable, due to the high profitability of running a shop or other business along the main road. Demolition is a politically sensitive issue. Construction of by-pass roads is often planned after the built-up area already surrounds the village, when it is more difficult to clear land. Therefore, (urban) villages are important nodes of congestion in Delhi, with traffic literally plying at people's doorstep.

An key factor in the emergence of environmental problems is the practice of mixing residential and industrial land uses in industrial villages. Consequently, factories are located very near the dwellings. In villages like Nangli Poona and Pehlادpur Bangar, more and more residents have to cope with a factory as their neighbour. These problems are elaborated in the description of Samaipur village, in Section 6.3.

6.2.3 Stress on amenities

Stress on amenities is most visible in rapidly urbanising villages. The electricity supply is certainly more reliable in the villages within the NCT than outside it. Nonetheless, power cuts are a frequent source of irritation and discomfort among the increasing share of households that own electrical appliances. Consequently, diesel generators are widely found among factories as well as residents, causing a great deal of smoke and noise. Chapter 4 describes the complexity of servicing (unauthorised) urban areas. While the presence of large consumers of electricity such as factories cause many power breakdowns, the factory owners also successfully lobby the authorities for a better supply. On the other hand, many households in the village as well as those of most unauthorised colonies nearby have illegal connections. The result is an unforeseen high demand in electricity, exceeding the capacity of the local transformers. Regarding the supply of piped water, similar mechanisms are at work. Illegally tapped water decreases the pressure in the pipes, so that water is only available for a few hours per day. The process of urbanisation is usually accompanied by an extended period of disruptions of the water supply. The wealthier households can overcome this problem by storing in water tanks on the roofs of their houses. The poor households have to improvise in simpler ways, storing water in jerry cans and earthen pots.

In rapidly urbanising villages, people complain about the insufficient capacity of the sewerage system. The authorities designed the sewerage systems to serve a smaller population than is currently living in the villages; the higher utilisation overburdens the system.

6.3 Samaipur: how urbanisation encompassed a village

This case study is an attempt to elucidate the complex local historical and geographical aspects of urban development. It does not claim that the environmental impact at one place is exactly the same at other places. But it does argue that the same mechanisms are at work all over Delhi's urbanising and industrialising fringes. Samaipur is chosen to illustrate these mechanisms because this formerly rural village is now very congested and highly industrialised. When visiting Samaipur, the smoke, the garbage, the filthy water in the open drains and stagnant pools, the noise level and the enormous number of people overwhelm the outsider. But the first impression does not tell the whole story. Studying the settlement for a longer time allows one to unravel the mechanisms to some extent and put many of the environmental problems in perspective¹.

¹ This case study was done for a joint paper of the author of this thesis together with V. Katariya and S.K. Aggarwal (Katariya et al. 1997).

Figure 6.2 shows the location of Samaipur and its setting. Figure 6.3 depicts the surveyed part, where the respondents were selected from the population of industrial owners, residents, doctors, pharmacists, and some other key informants. As the maps indicate, the residential, commercial, and industrial land uses are highly mixed as a result of unplanned settlement of both industries and new settlers.

6.3.1 The village: prosperity at high cost

According to census figures, Samaipur became fully urbanised in the 1980s. In 1971, it was classified as a rural village; in 1981, it fell into in the category of Census Town (part of rural Delhi); and in 1991, it was fully incorporated into urban Delhi. By now, all agricultural fields have disappeared in favour of commercial, residential and industrial uses. This study focuses on the village and its direct vicinity: the village; the squatter settlement Sanjay Colony, located east of the village; and the industrial area lying in between (Figure 6.3).

The *Yadav* caste comprises the dominant original community in Samaipur. The Yadavs make up the great majority of the original households (80 per cent). According to the definition given in Chapter 5, fall into Group I. Previously, they were cultivators, similar to the *Jats* in other villages in Alipur Block, though the Yadavs placed particular emphasis on keeping cattle. Now even fewer cattle are left in Samaipur than in other urban villages, due to the lack of space and the presence of more rewarding income-generating opportunities and different types of land use. There are just about as many migrants (Group III) in the village as members of the original population. The migrants rent rooms and houses in the village or sleep in shops, factories and storehouses. The other indigenous households (Group II) are mostly from Scheduled Castes (SCs) and Other Backward Castes (OBCs).

At present, the village itself has over 15,000 inhabitants. Besides, numerous 'colonies' have sprung up on what was formerly Samaipur's agricultural land (see Figure 6.2). The structure of occupations and other sources of income in Samaipur is similar to the livelihood situation described in Chapter 5, with the difference that the agricultural sector has nearly disappeared. Government service is common, and there is a wide variety of private commercial occupations. Many businesses are located in the village itself, more so than in the rural villages of Alipur Block. Rarely are original villagers directly involved in manufacturing. Instead, they provide many services to factories (transportation, repair shops, other shops, etc.). The presence of industries generates a high demand for housing for the workers. Renting out accommodation contributes significantly to the income of the original villagers. Consequently, many village households have spectacularly high incomes. Group II households derived less benefit from the sale and lease of land. Because they did not own agricultural land, they could not obtain compensation for government acquisition, nor could they take part in the subsequent private transactions of agricultural land. They also have less space for housing that they could rent out. But their income position has improved over the past 25 years, mainly because of holding a government job and being involved in the booming local commercial sector.

Figure 6.2 The location of Samaipur at the urban fringe of Delhi

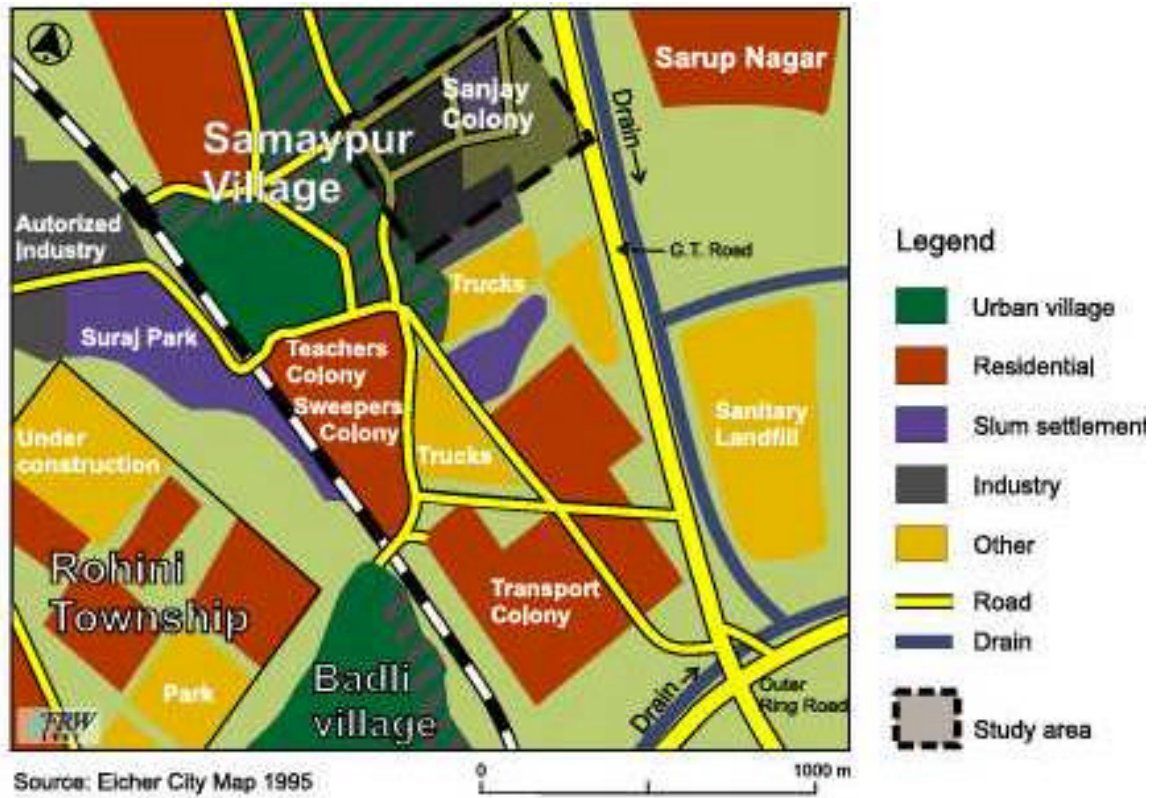
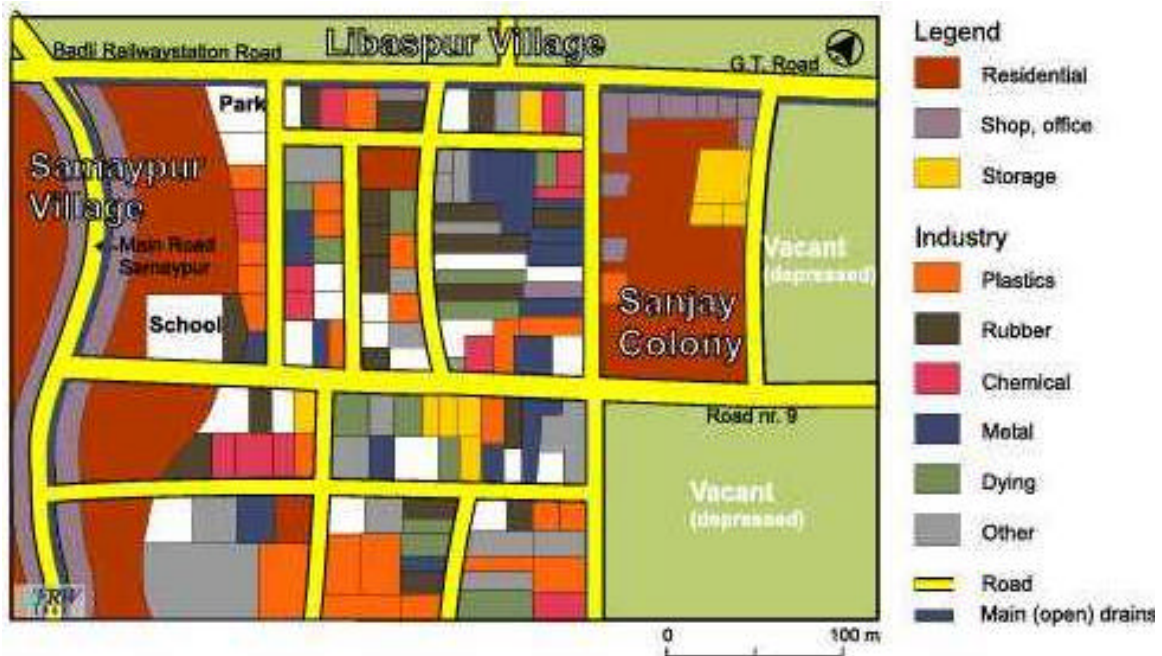


Figure 6.3 Land use in Samaipur, the industrial area and Sanjay Colony



Two factors – the rising living standard and the increasing number of urban amenities – have improved the villagers’ housing conditions over the past 25 years. Although their situation is better in general, the congested and polluted environment has had considerable side effects. Factories have entered the village, while the morphology of the village has hardly changed. Its streets are narrow lanes, and many villagers reside adjacent to or near a factory. Numerous flour mills and workshops are located in the village, creating a lot of noise. Other factories cause water and air pollution, even within the village settlement. For this reason, Figure 6.2 classifies a large part of the village as mixed residential and industrial. The interviews evoked a very mixed response when local residents were asked about pollution. This may be explained by three main situations. First, the impact varies enormously between the place of residence and the place of work, depending on the proximity to factories. Second, some villagers have high financial stakes in the industry and would prefer to avoid any criticism of their own source of income. Third, pollution has not yet been fully recognised as a (potential) threat to health.

6.3.2 The slum: an environmental basket case

The slum settlement of Sanjay Colony houses around 6,000 people in 1,200 huts and small brick structures. Some are so small that not all of the residents can lie down to sleep at the same time. The one acre on which Sanjay Colony is built had been vacant land owned by the government until it was squatted by a small group of factory workers in 1985. By now, the population has grown so much that it is virtually impossible for the authorities to remove the settlement. Sanjay Colony ‘benefits’ from the kind of political patronage described in Section 4.3. The name of the colony refers to Sanjay Gandhi, the deceased son of Indira Gandhi and member of the Congress Party. The choice of this name implies that the colony banks on that party for political backing. (Ironically, as part of the Indira Gandhi administration, Sanjay was a notorious ‘demolisher’ of slums.)

The lower-lying land adjacent to Sanjay Colony is left unused while two different government authorities, the Transport Department and the MCD, dispute the responsibility of levelling it. The impasse creates a precarious situation, jeopardising the health of nearby residents. Dirty water frequently collects there; factories and households dump garbage in this area; and it is used for ‘nightsoil’ by the slum population in the absence of toilets in the settlement. Insects breed there especially in the monsoon time.

Waterlogging is also a problem within the settlement itself, where some slums are below ‘street’ level. More and more residents take steps to raise the ground level of their dwellings. Consequently, the situation for the remaining low-lying huts becomes even worse. Sanitary conditions are still poor, although the MCD, supporting a local initiative, provided a simple half-closed sewer. The main problem is that during monsoon the sewerage flows into houses and into the stagnant pools. Water taps are present, but not in the huts themselves. There are still too few of public water faucets, and people have to line up to use this facility. The hand-pumped water is of too poor quality to drink but can be used for washing. Electricity is illegally tapped from nearby wires. The continuing uncertainty about the legal status of Sanjay Colony does not give people much incentive to improve their housing conditions. Nevertheless, people keep constructing provisional

second storeys on their huts, mainly to accommodate newly arrived family members and acquaintances.

All the residents are migrants: the majority of them are young workers and their families from eastern Uttar Pradesh and Bihar. Generally, a male worker is the first to arrive; if there is more work, he calls other male relatives and acquaintances. When he has built up some job security and has saved some money, he sends for his wife and children. Most of these migrants are industrial labourers, some are into petty trade, and some others ply rickshaws.

6.3.3 Industry: small, dirty and hazardous

The first industries settled in Samaipur in the mid-1970s. There are now 500 establishments, mostly small units, within the Samaipur village area and around 100 in the surveyed area depicted in Figure 6.3. Samaipur is part of a larger industrial area, comprising Badli (which has an unauthorised as well as authorised industrial area), adjacent Libaspur and Siraspur (see Figure 6.2). In the total area, there are more than 1,200 manufacturing units, employing approximately 25,000 workers. Most industries produce relatively low-value goods for the domestic market. The location at the crossing of the GT Road and the outer ring road makes the location attractive to factories that are closely linked with the many storehouses and transportation companies.

The flour and lentil mills are among the earliest industries that settled in Samaipur itself. Most of the initial agro-based factories still remain in the village. Adjacent to the village towards Sanjay Colony, there are many types of industry, though factories handling plastics (PVC and acrylics), rubber and metal predominate. There are two types of industry that deal with plastics. One type recycles used material (Which is sometimes even imported from industrialised countries) and turns it into grains that are used for making new plastic goods. The other type makes plastic products and often uses the same grains for e.g. household bags. Some factories make rubber products such as auto parts, slippers and mats. Factories working with metals include iron foundries and producers of small metal parts, usually made of iron and copper. There is a wide range of products: metal sheets, metal boxes, tools, nails, car parts and other engine parts. Some factories combine metal and plastic in manufacturing electric wires and cables. There are a few factories making asbestos roof sheeting. Other industries include textile dyeing, manufacture of paints and other chemicals, soap, wax, construction materials, and assembly of cardboard boxes. In addition, numerous workshops and repair services are scattered throughout the area, mostly run by local villagers. These are very closely linked with industries since they supply the required repair services.

The industries are owned exclusively by urban-based industrialists. But in about half of all cases, the compound is still owned by the original villagers who rent out the land. The intricate structure of the local economy gives wide scope to the informal sector. In reality, it is hard to distinguish between a formal- and an informal-sector activity. Even factories themselves might be counted as informal industrial activity. Since their activities are largely unauthorised, the capital intensity is much lower than in 'formal' industry. Moreover, the machinery is old and much of the work is done manually by large pools of non-unionised labour. This mode of operation is in stark contrast with the large-scale

(semi-)government-owned companies, the production facilities of large private companies in India, and multinationals. In spare parts for cars, scooters and machinery, consumers in India have a choice; they can buy the original parts or locally manufactured (copied) parts. The original parts are usually much more expensive, but the quality is higher. The local parts are produced in areas such as Samaipur. The machinery used by the factories is often second-hand and outdated, already written off by formal industry from many places around the world. Most production processes require a large input of labour. Even in very small factories, workers are employed in day and night shifts. Another clear aspect of the informal sector is the way it involves many rag pickers who bring waste plastics to the factories and individuals with hand carts who provide transport services.

There are plans to force the industries in areas such as Samaipur to move to special industrial sites further from the city. This is a difficult issue. At present, the factories take advantage of the large labour reserves in nearby slum areas and congested quarters of the villages. The alternative locations farther from the city may not offer the same locational and labour-market advantages as the companies enjoy at their current sites. Representatives from the local 'Rural Area Manufacturers Association' as well as individual industrialists complained that the plans to relocate the industries at a more peripheral location do not include provisions to house labourers and their families. A social action group from Delhi is criticising the indifference shown towards their labourers by the few factories that have already moved (Delhi Janwadi Adhikar Manch 1997). Besides, the services provided in the village are of crucial importance. In the slum area, the relocation measures meant to improve local environmental conditions are met with very little enthusiasm, since the policy introduces further insecurity into people's already troublesome livelihood. All the above reasons make the relocation of industry a complicated issue.

The most recent state of affairs is that a large area is being developed near Bawana for relocating industries originating from so-called 'non-conforming areas' in Delhi (Hindustan Times 16-9-1998). Although a Supreme Court decision ordering acute relocation makes their situation even less certain, most industries still remain where they are. Even where factories have been removed, the existing factory premises are often used for industry again. This is a logical consequence of the expanding industrial sector and the shortage of space. Another question is where the new labourers will live at the new sites; the allocation of industrial land is not accompanied by plans for appropriate housing. The emergence of new slum areas near the new industrial site seems therefore inevitable. There is also a possibility that along with the newly authorised industry, unauthorised industries will settle in these sites as well. In that light, it remains to be seen whether enforcement of the legislation based on verdicts of the Supreme Court will have a positive effect on the urban environment. The insecure legal status of industry in Samaipur is clearly a disincentive to investment in additional machinery and newer production technologies.

6.3.4 Environmental conditions and the health of residents and workers

Air pollution

There are three main sources of air pollution in Samaipur: first, combustion of fossil fuels and wastes in factories; second, emission during the process of manufacturing; and third, road traffic. The most serious air pollutants were identified as particulate matter (SPM), sulphur dioxide, suspended nitrates and carbon monoxide. Although the concentrations are different depending on season and place, the measurements taken by Katariya et al. (1997) indicate that pollution levels are certainly higher than allowed by Indian environmental legislation. Climatic and seasonal factors strongly influence the concentration of pollutants. Air quality is worse during winter evenings and nights, when inversion keeps foul air low to the ground. The dominant wind direction carries the smoke to the east and northeast towards Sanjay Colony. Consequently, air pollution is worst in and near the factories and in Sanjay Colony, which means that the industrial labourers living in Sanjay Colony receive double exposure.

Indigenous villagers and migrant households alike complain that they cannot hang their laundry to dry outside because it turns black from the soot no time. People find it hard to estimate the effect of pollution beyond such visible effects, although they realise that their breathing problems may have something to do with it as well. As was formerly also the case in Western countries, smoke seems to be regarded as a by-product of economic activity and progress. Members of the well-educated middle class in the village, especially those who do not have a stake in local industry, express their concern about air pollution. The owners of the factories cannot deny that their factories cause pollution. Yet they are evasive, blaming it on corruption and ineffective government regulations. To deflect criticism, they point at studies that identify road traffic as the most important air pollutant. Of course, this argument is only valid for smog formation. At the micro level, industrial pollution can be much worse than vehicular emissions. The factory owners also claim that they cannot do anything about without the provision of proper facilities by the government. They say they can only introduce emission control individually when the government gives them a legal status that ensures that their investments will not go waste.

Water pollution

Factories also cause the most serious water pollution. Dyeing of textiles, rolling and pickling units (washing of steel), acid baths and the production of many types of chemicals generate a discharge of fluid waste that has not been treated. The dyeing factories cause the most spectacular-looking water pollution. Not only is the waste water reported to be acidic; but it contains high concentrations of (heavy) metals such as chromium, copper, iron, cadmium, nickel and lead (Katariya 1997). Sulphate concentrations are high as well. Households produce considerable sewerage water, but this is limited to organic wastes and some nitrates from the use of soaps and detergents. The main problem arises from leaks and overflows of the sewerage system. This leaves stagnant pools, creating environments for disease-breeding insects and other organisms. Both industrial and household waste water get mixed up in the area's open drains. During the monsoon, the drains frequently overflow and cause the polluted water to spread. Industrial wastewater seeps into the groundwater, polluting the water from hand pumps.

As with air pollution, the problem of water pollution is worst for the people working in factories and residing in Sanjay Colony. The industrial area slopes down towards Sanjay Colony and is surrounded by low-lying vacant land where the (polluted) water collects. Especially during the monsoon, the rainwater occasionally flushes the pollutants into the homes of the slum residents.

Solid waste problems

Households and industries generate different types of solid wastes. Household wastes are mostly organic and contain few toxic substances; industrial wastes are more dangerous. There is a garbage landfill site very nearby (see Figure 6.2), but not all garbage from Samaipur actually reaches that dump. There is no municipal collection of industrial waste. Consequently, all kinds of waste materials are swept out on the roads, heaping up on vacant plots. The exact contents of the industrial solid wastes are not known, but the many chemical factories as well as the use of asbestos make it likely that harmful contents are present.

The collection of the municipal waste by the authorities (the MCD) falls short of demand. Since both industry and the slum are unauthorised, the authorities feel only partially responsible for the sanitation in those areas. In the village, waste collection is relatively well organised. The residents pay individual garbage collectors who bring the rubbish to a place where the MCD picks it up. In Sanjay Colony, much waste tends to end up on the vacant land surrounding the settlement. This is clearly a threat to the health of the residents. It attracts flies and other insects, which breed in the organic waste. Especially children are vulnerable to diseases transmitted by uncollected waste, because they play out in the open.

Other problems

In the village, almost every resident has access to a toilet connected to the sewerage system, of which some parts are still open. The number of tenants exceeds the size of the local original population. Therefore, the pressure on the system is very high. Sewerage breakdowns and overflows are commonplace. The sewers are frequently dug out. But since this sludge is not always immediately removed, it can provide breeding places for flies and mosquitos. Similar problems occur as a result of absence of toilet facilities in Sanjay Colony; people have no choice but to defecate on nearby vacant land.

To an outsider, the noise level around the industries is maddening; it is also experienced as such by many of the local residents. A large part of the noise comes from the many industries that rely on power generators in case the electricity supply fails. Other machines also produce noise as well, notably those in the sheet-metal factories, in plants manufacturing tools and construction materials, and in the repair shops. The noise caused by the flour and lentil mills, which keep running day and night, is particularly bad inside the village. It has even been claimed that vibrations caused by machines are so severe that cracks are showing up in the walls of houses.

The odour of industrial emissions and materials is obvious. Yet in view of the response of the local population, they have apparently become used to it.

6.3.5 Health concerns among the population and workers in the settlements

Because of its industrial setting, the health situation in Sanjay Colony is even more precarious than in 'normal' slums in developing countries. However, one should be cautious about supposing a direct link between the health of the residents and the state of pollution, congestion, and civic amenities. Numerous discussions, an analysis of health records, and observations in Samaipur suggest that one should be aware of the following complications:

1. Living conditions are only one of many factors that influence health. Lifestyle effects, such as smoking, drinking and drug use, are important factors as well; all of these behaviours are common among the study population.
2. The residents of Sanjay Colony are extremely mobile. Some workers live in different places, depending on the current availability of work. The labours and their families frequently move to other places in pursuit of new opportunities. Therefore, the individuals who lived there last year are not the same as those living there now. Furthermore, many migrants go back to their area of origin during the summer, possibly contracting diseases there. More than occasionally, migrants have relatives stay over to receive medical treatment in Delhi, causing bias in the records of the local clinics.
3. The level of preventive health care is very important to local patterns of disease. It is also pertinent to individual household hygiene. These kinds of circumstances play an unknown role in the disease pattern and are not related to the environmental setting.
4. Some diseases have a very long period of incubation or long evade diagnosis. A good example is cancer, which can appear after many decades. Although a person harbouring this disease may show no symptoms, it may later turn out to be caused by living conditions.
5. Poverty, especially among the migrants, causes malnutrition and low standards of medical care. This leads to illness independent of environmental circumstances, or in which the living conditions play a contributing role.

The rather strong claim made by Hardoy et al. (1992) and numerous activist sources (e.g. Centre for Science and Environment 1991) – that urbanisation directly causes environmental peril for poor city dwellers – seems a little preliminary. In light of the above complications, the health implications of living conditions appear to be an extremely difficult subject. Finding a control population with similar socio-economic conditions but without this particular industrial setting would be one way to verify the environmental effects. Such a place is difficult to find, however, and such an approach is very time-consuming. The following brief account of the health situation is therefore largely based on what local doctors, pharmacists and quacks identify as the main diseases.

Respiratory diseases are rampant, although it is feared that they often go undiagnosed. Respiratory disorders are commonly connected with air pollution. Doctors and pharmacists identify *tuberculosis* as a major threat to health, especially among the migrant workers and their families. Air pollution and congestion are expected to be partly to blame. Tuberculosis is a highly contagious disease that is easily spread at places with a high density of population. Climatic factors are also important; cold weather is unfavourable for (potential) tuberculosis patients. Notably, migrants often come from

warmer places and are used to the local climate. Bad ventilation in the dwellings and industries adds to the problem. It is confirmed that tuberculosis occurs most during the winter. The housing conditions in Sanjay Colony are such that the huts offer insufficient protection against the chilly weather in Delhi. During a one-time check up of the children of Sanjay Colony, half of all children were found to be infected during the winter of 1997. *Asthmatic problems* are reported to be on the rise as well. This is a phenomenon found in the whole of Delhi, but it is particularly serious where there are high concentrations of dust and pollution. *Bronchitis and silicosis* are also reported frequently; these diseases have known links to inhalation of fine dust particles from fly-ash (burnt coal), fine sand particles and suspended particulate matter (SPM). In the houses of factory workers, a relatively high incidence of respiratory diseases was encountered.

Skin diseases are found especially during the monsoon, coinciding with high humidity. Some chemicals are identified as causing problems to the skin of feet and legs when the sewerage overflows. Labourers who handle chemicals and are exposed to much heat are especially vulnerable to exposure to chemicals that are harmful to the skin.

Digestive disorders occur frequently, particularly among the poorer sections. The causes are varied, but to some extent they are linked to the unhygienic conditions that prevail in Sanjay Colony. Stomach infections are normally caused by contaminated food, but work stress, exposure to chemicals and drinking of polluted water are other important contributing factors. Regarding food, problems have been reported among people who are habituated to eating fish. Fish is not usual in the food tradition of Delhi, and its quality is poor.

(Viral) fevers are very common and often linked to contaminated water. *Dengue fever* – a rare disease transmitted by mosquitos that breed in clear stagnant water, though it reached epidemic proportions in Delhi during 1996 and 1997 – made a disproportionately high number of people ill and caused a few fatalities, both in Samaipur village and in Sanjay Colony.

Other types of disease are of a more diverse nature. *Decay of teeth*, especially among factory labourers, is mentioned as one of the consequences of exposure to heat and chemicals such as acids, alkalis, nickel and silver. Similarly, *eye problems* are also frequently mentioned, sometimes as a result of accidents leading to blindness. In addition, heat-related diseases such as *nasopharyngitis* and noise-related afflictions such as *deafness* also occur among factory labourers.

One would not immediately think of *psychological troubles, psychiatric diseases* or *depression* as obvious health hazards. Nevertheless, they are very widespread. Doctors mentioned mental problems as one of the main and fastest-growing complaints. They could be related to the environment through the effects of noise and extreme population density and congestion. It is possible that pollution takes its toll on the mental condition of people who are subjected to high levels of exposure. Another cause is the inability of rural people to adapt to extreme urban conditions. This may apply to migrants as well as to the original population.

Finally, accidents occur causing *physical injuries* of many kinds. They take place, especially in factories. Injuries can cause permanent disabilities; fatal accidents are certainly not rare. Safety measures in the factories are not given any priority. The steel rolling mills are particularly hazardous. Injuries include burns, concussions, fractures and wounds.

There are certainly many serious diseases and health problems that have been overlooked. On a positive note, strangely enough, sick relatives from remote areas frequently visit their kin in Sanjay Colony or Samaipur to recover from disease! The explanation for this paradoxical situation is that health care is available there for every market segment, also for the poor. For the rich, Delhi has many top-class hospitals. The poor are served by the numerous small clinics, doctors (ranging from competent licensed doctors to quacks) and pharmacies (ranging from official shops to illegal off-the-street sales of medicines to cheats). Besides, numerous government programmes and NGOs (occasionally) serve the urban poor for little or no cost. Apparently, people reason that if you are sick in a remote place where health care is not available or accessible, the clean environment does not help much.

6.4 Environmental conditions caused by spatial legislation and policy

Samaipur has an extremely congested mix of residential and industrial land use, high pollution levels, an absence of investments in pollution reduction, and a range of consequent problems for the living conditions and for the health of the residents. The question arises how this situation could occur here, as it does in many other places with similar concerns. Basically, it comes down to the chaotic supply of land as examined in Chapter 4, which inevitably leads to the creation of slums. Another important factor is the administrative status of the *lal dora* in the villages. Within this boundary, the administration allows almost all types of land use and provides amenities. Consequently, unauthorised factories are actually semi-legal inside village settlements. In addition, in case the *lal dora* is being officially extended, it is always located adjacent to the village, thereby preventing proper zoning to separate between industrial and residential land use. This policy originated from the idea that villagers should be stimulated to set up small (cottage) industries, while the agricultural fields should be protected from excessive and unnecessary urban land use. Instead of the villagers setting up their own industries, as was intended by the policy, outsiders rent or buy the space to set up any type of factory. The results presented in Chapter 5 also show that very few villagers go into industrial activity themselves, preferring government service and (local) trade and commerce. Because the factories established by outsiders include many polluting units, the policies of the administration indirectly lead to an (unintended) unfavourable situation regarding living conditions in urbanising villages.

The Supreme Court has recently banned all industries from operating in so-called 'non-conforming areas', including (urban) villages. This decision was reached by Judge Kuldeep Singh on a public petition by lawyer M.C. Mehta (Hindustan Times 16-9-98, The Hindu 5-4-98). However, it is doubtful whether the situation will actually change for the better. The relocations have been limited to a few so far, although it may be a little early to judge. Before strict enforcement of the verdict is possible, the government needs to develop new industrial sites that conform with the directions of the judiciary. A large industrial area is now planned near Bawana (see Figure 2.2). There, the infrastructure is going to be better, the plots will be larger, and joint pollution control devices are to be installed. The environmental situation will no doubt be more favourable there than in Samaipur, but many questions remain. The first signs suggest that industries that had

moved away from Samaipur are being replaced by (similar) factories in the same compound. The ongoing expansion of the industrial sector in Delhi continues to put pressure on the available sites. In an area like Samaipur, all unwanted factories will have to be moved in a short period of time and an alternative use should be sought for the vacated land. Another concern is the enormous loss of revenue from rents and jobs for the villagers.

In planning the relocation of industry, there seems to be too little awareness on the part of the authorities of the enormous demand of such industries for (housing for) labour and ancillary services. As shown in this study, a village proves to be an attractive location for small-scale labour-intensive manufacturing. The labourers have little choice but to live close to the factory, due to the low wages and irregular working hours, including frequent night shifts. Government land is always an easy target for squatting, whereby the urban village becomes congested with tenants as well as with ancillary services such as repair shops, transportation and retail. This can be quite favourable for the economic opportunities for the population. At the same time, however, it creates adverse living conditions, leading to problems in the areas of health, infrastructure and urban planning.

6.5 Samaipur and the literature on urbanisation and the environment

Many other authors have written about areas like Samaipur, commenting for instance that “sub-urbanisation leads to problems in the older built-up area, urban decay, economic decline, pollution, neglect of conservation, traffic congestion and inadequate housing” (Ramachandran 1989, p. 47). However, very few empirical studies have been done on the relation between environmental health and urbanisation. In view of the complications mentioned in Section 6.3.5, research in this field is certainly not guaranteed of success. Nor does this limited study provide definitive answers. The description of the development of Samaipur does offer insight into the local circumstances that can lead to environmental problems. The enormous heterogeneity in settlement types underlines the importance of micro-level analyses to policy making. Understanding the micro level is crucial when strategies must be designed to improve current situations and to develop an approach to urban planning that prevents negative effects of spontaneous industrialisation.

Hardoy et al. (1992) focus on living conditions and public health. When describing many different known situations, they identify many of the environmental problems that occur in cities and that are also found in Delhi. Studying the environmentally sensitive activities in the rural-urban fringe, they also consider pollution, congestion, solid wastes, water depletion and pressure on civic amenities. Douglass (1991) identifies several policy challenges based on circumstances he observed in Jakarta: “It is already evident that land use management within the region must be dramatically improved if the negative impacts of land use changes and conflicts are to be reduced to allow for an environmentally sustainable development process.” (Ibid., p. 112). What is actually meant by an environmentally sustainable development process remains to be seen. This question brings up all kinds of dilemmas. The main one is how to reconcile economic progress with protection of environmentally sensitive situations? This dilemma emerges in

numerous places around the world. The policy challenge is to identify and change unnecessary and inappropriate land policies and administrative structures.

Samaipur provides a striking example of what happens when government-level actors clash. The administrative disputes can have severe consequences for the living conditions. The ongoing legal conflict about who should take responsibility for the vacant land around Sanjay Colony allows stagnant pools to become 'environments for pests and disease' (in the words of Ramachandran 1989, p. 317). Urbanising villages exist in an administrative twilight zone where the health of the residents is in jeopardy. It is the poor slum dwellers who often live closest to the factories but have the least capacity to protect themselves from the environmental impact of the industries. Yet the better-off groups suffer the consequences as well (e.g. as found in the case of Rithala, mentioned in Figure 4.5). It is therefore evident that the realm of policy and administration fails to recognise the rural-urban fringe as an area with unique features that need specific policy measures (as claimed by Hill 1986 and Ginsburg et al. 1991). The information systems, land records, and revenue systems are inappropriate and outdated remnants of a rural past. For example, the village *Patwari* is trained to register rural land titles and crop patterns, not factories and unauthorised colonies. This creates opportunity for polluting as well as non-polluting industry in the over-bureaucratised Indian society.

Mohan (1996), considering ways to stimulate the development of industry, criticises the excessive focus on national-level policies and the lack of solutions at the micro level. He points out that the forced decentralisation of industry, a strategy frequently advocated by planners, has some serious disadvantages. "If industries do locate outside town and city limits, the infrastructure service lines are stretched prematurely and excessive expenditures are incurred. Labour also encounters considerable transport difficulty along with housing problems. The experience of the industrial estates programme provides enough evidence that the objective of locating industries away from urban areas seldom succeeds." (p. 314).

The problems that have been encountered in the course of establishing the relation between the type of settlement, living conditions, and health call attention to the need for more place-specific approaches to research. The limitations of the present study reflect the lack of specific input from the fields of medical science and engineering. More interdisciplinary research is needed geared to the analysis of the spatial course of urbanisation. The insights it could yield should initiate the development of realistic strategies to prevent very unhealthy situations from arising though without jeopardising the economic livelihood of the people living and working in the settlements in question.