

UDC: 338.45:351.777.6:502.131.1(549.33)

DOI: 10.5379/urbani-izziv-en-2015-26-02-004

Received: 15 Apr. 2015

Accepted: 2 Oct. 2015

Mohammed Nawrose FATEMI

Tahmina RAHMAN

Regeneration of the Hazaribagh urban brownfield: An imperative for Dhaka's sustainable urban development

This study investigates the projected outcome of the Bangladesh government's decision to relocate the Hazaribagh tanneries outside Dhaka, the capital of Bangladesh. Ever since the early industrialisation of Bangladesh, leather processing industries have played a significant economic role. In Dhaka, these industries are mainly concentrated in Hazaribagh, an important area in the southwestern part of the city. Hazaribagh is a junction connecting the new township with the old one. However, the use of inferior technologies, coupled with the absence of proper industrial waste-management and waste-treatment facilities, have destroyed the ecology of the Hazaribagh area and badly impacted its surroundings. Conse-

quently, moving the tanneries from Hazaribagh and then redeveloping the area offers a unique opportunity in the country's sustainable urban regeneration. Regenerating the Hazaribagh urban brownfield can serve as a model for sustainable twenty-first-century neighbourhoods, incorporating contemporary facilities and environmentally friendly elements for healthy living. This study analyses the Hazaribagh area's potential as an example of a planned sustainable area for the entire city, free from the severe pollution that it is notorious for.

Keywords: urban brownfields, leather-tanning industries, regeneration, sustainable development

1 Introduction

Globally, most people live in urban areas; in 2014, 54% of the world's population resided in urban areas. In 1950, only 30% of the world's population was urban, and 66% of the world's population is projected to be urban by 2050. The urban population is projected to increase by 2.6 billion by 2050, rising from 3.9 billion in 2014 to 6.3 billion (United Nations, 2014). Such densification tendencies will also place pressure on large cities' infrastructure and facilities (see, e.g., Cheng, 2012; Obeng-Odoom, 2012; Xuan & Xun, 2012; Zhang et al., 2012; Shrestha, 2013). Most cities in the world have a significant amount of unused areas; such areas often occupy attractive land but are generally environmentally unfriendly and are often characterised by substantial contamination (see, e.g., Hiremath et al., 2012). However, because rapid urban growth has limited the quantity and size of buildable greenfield areas, municipal authorities are increasingly opting for regeneration of brownfield sites and are creating a variety of programs and strategies to restore them (Perovic & Folić, 2012; see also Stefanovska & Koželj, 2012). Ho et al. (2012) have emphasised the enormous challenges in planning and implementing these projects in a sustainable manner.

Dhaka is the eleventh-largest mega city and has a population of 16.98 million (United Nations, 2014). A 2014 United Nations report projected that Dhaka will become the sixth most crowded city by 2030, with a population of 27.37 million. The problems of urbanisation in all cities in developing countries, like Dhaka, are intensified by high population growth and rural-urban migration. For Dhaka, the problem is further aggravated by limited land supply, poor land utilisation and a lack of proper land-use policy and planning (Fatemi, 2014). Dhaka emerged and expanded from the bank of the Buriganga River, and the city's major industries also developed along this river, following the typical pattern (Hossain, 2008). Among these industries, the leather-processing industry (i.e., tannery) is one of the oldest and has been flourishing in the Hazaribagh area since the 1940s on just sixty-two acres of land (Biswas & Hamada, 2012). A total of 270 tanneries, which comprise 90% of the tanneries in Bangladesh (Blacksmith Institute, 2007), distinguish Hazaribagh as the country's principle leather-processing zone. However, the use of inferior technologies, coupled with the absence of proper industrial waste-management and waste-treatment facilities, have destroyed the ecology of this area and badly impacted the road network and built infrastructure in the surroundings. Consequently, moving the tanneries from Hazaribagh and then redeveloping the area offers a unique opportunity in the country's sustainable urban regeneration. This study investigates the Hazaribagh area's potential as an example of

a planned sustainable area for the entire city, free from the severe pollution that it is notorious for.

2 Theory and concept

2.1 Brownfields in context

The term *brownfield* was used for the first time by the United States Environmental Protection Agency (EPA) in 1992 (Mehdipour & Nia, 2013), which developed a definition of brownfields. According to that definition, they were "abandoned, idled or underused industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination" (United States Environmental Protection Agency, 1996: 1). Today, with policy evolution in United States, under the federal Small Business Liability Relief and Brownfields Revitalization Act of 2002, a "brownfield site" is now "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (Thornton et al., 2007: 117; Dixon, 2012: 103).

In the European context, there are many definitions and interpretations of the term *brownfield* (Alker et al., 2000; Oliver et al., 2005). The most widespread definition is the one proposed by the working group Contaminated Land Rehabilitation Network for Environmental Technologies (CLARINET; 2002: 9): "Brownfields are sites that have been affected by the former uses of the site and surrounding land, are derelict and underused, may have real or perceived contamination problems, are mainly developed in urban areas, and require intervention to bring them back to beneficial use." This definition was complemented by the European Expert Network, Concerted Action on Brownfield and Economic Regeneration Network (CABERNET; 2006: 12), according to which this term implies: "Surfaces that have been affected by former uses of the site or surrounding land, are derelict or underused, are mainly fully or partly developed urban areas, require intervention to bring them back to beneficial use, and may have real or perceived contamination problems" [sic].

Moreover, brownfields in Australia may be considered "urban sites which were large parcels of land, owned by a single party, usually government or an industry, currently unoccupied and depending on previous use, contaminated to some extent" [sic] (Newton, 2010: 7). To summarise, the basis of the above is an understanding of brownfield sites in the context of city regeneration or revitalisation. For the purpose of this study, brownfields are studied from the perspective of "inner-city sites with industry heritage e.g. contamination or other environmental problem which have been or are being rapidly developed or transformed into higher-density residential or commercial uses" [sic] (Wu & Chen, 2012: 2).

2.2 Global trends in brownfield regeneration and its significance

Brownfield regeneration (or brownfield redevelopment, brownfield reuse) is a strategy for dealing with the land described above and redeveloping it for suitable purposes through measures to overcome barriers to brownfield reuse. After redevelopment, these areas may be turned into residential neighbourhoods, retail centres, office blocks, light industrial facilities, parks, studios, recreation areas and so on (Kang & Hua, 2007). Inner urban brownfield redevelopment and management of contaminated sites are emerging issues in many Asian countries, especially in the metropolitan centres of mega-cities in countries such as Indonesia, Malaysia, the Philippines, Taiwan, Thailand and Singapore, where industrial production and strong demographic concentration have led to profound social and environmental impacts. Cities, towns and communities in the global North have historically enjoyed prosperity as a result of industrial activities. Large manufacturing facilities were commonly located in inner urban areas, particularly on valuable land near water because waterways were used as key transport routes. Some health problems associated with the “legacy” sites of polluting industries have caused public concern. The decline of heavy industries near populated residential areas has frequently led to abandoned and underutilised facilities, sometimes resulting in increased local crime and unemployment (International Economic Development Council, 2008, cited in Smith, 2008). In the global South, similar land use associated with urban growth is evident. However, with economic development, there is an opportunity to utilise brownfields as a tool in city growth (Smith, 2010).

More importantly, many success stories of urban regeneration in various developed cities and other parts of the world, such as the UK, the US, Australia, Canada, Sweden, Hong Kong, Singapore and South Korea, can serve as models for how concerted efforts have transformed and revitalised cities. In Hong Kong, the regeneration of Langham Place in the heart of the old Mongkok area has transformed a former red-light district into the thriving commercial and retail area of today through a joint venture between the Urban Renewal Authority (URA) of Hong Kong and a private developer (Rosly & Rashid, 2013). The revitalisation of the Yau Tong Bay brownfield site was encouraged by the government through planning studies and zoning plans. Public benefits from remediation and regeneration of the bay area include meeting community needs for schooling, open space and housing, and utilising formerly contaminated land for more environmentally sustainable and non-polluting productive uses. Brownfield sites such as Kai Tak Airport represent an opportunity, with appropriate planning regulation and public inclusion, for the Hong Kong Special Administrative Region to secure additional land for develop-

ment and to facilitate urban renewal through remediation of former industrial sites (Smith, 2008). Similarly, in Singapore, brownfield development exercises were carried out by Sime Darby Property Berhad on its properties. The Orion, originally an old serviced apartment with low building efficiency, was converted into a twenty-seven-storey high-end condominium with forty-six luxury units, and Petro Centre and Sime Darby Enterprise Centre (originally both were old factories) were converted into high-rise modern light industrial buildings. These have resulted in increased returns on investment of 63%, 36%, and 12% respectively (Rosly & Rashid, 2013). In the context of land scarcity, awareness of the effects of urban sprawl and the rise of environmental concerns, urban brownfield redevelopment and management of contaminated sites is a real challenge for the future of these cities. Indeed, the recovery of the land which is often located in the heart of cities, connected to major infrastructure, and close to services and public facilities offers real economic, social and environmental opportunities with rediscovered attractiveness for neighbourhoods left dormant (Fumeaux, 2014). In fact, all of these cases demonstrate the potentials and challenges of brownfield development in the Asian context and help set guidelines for such development in Dhaka.

2.3 Brownfield regeneration and sustainable development of cities

If sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs, then the presence of contaminated land and brownfields is a good example of how past activities have come to compromise this generation (De Sousa, 2008). This regeneration process involves turning insufficient land (brownfields that may or may not be contaminated) back to beneficial use. Through the journey of sustainability and by following the principles of a triple bottom line (comprising economic, social and environmental dimensions), the vision of brownfield regeneration should be sustainable for the long term (Far, 2011). For this, the concept of sustainable brownfield regeneration is predicated on the principles of recycling land for development in ways that are environmentally, socially, and economically sustainable (Dixon et al. 2006). Here, Michael Jacobs' (1999) six-fold schema was shown by Philip Catney et al. (2007) to be appropriate, and Tim Dixon (2007) later suggested it as core ideas for discourse on sustainable development:

- a. Environment-economy integration: ensuring that economic development and environmental protection are integrated into planning and implementation;
- b. Futurity: explicit concern about the impact of current activity on future generations;
- c. Environmental protection: commitment to reducing

Table 1: Paths towards sustainable brownfield regeneration

Core idea	Explanation
Contamination-related issues	Interdisciplinary long-term studies; more expertise yields more success, gradual regeneration reduces risks and increases accuracy
Political and institutional issues	A definite policy on brownfield regeneration; collaboration of administrative units; relations with brownfield consortiums both for technological support and financial strategies; administrative incentives
Legal issues	Framework legislation
Economic issues	Tax-based economic incentives
Plan/design-based issues	Decision-making about the regeneration of brownfields regarding planning hierarchy; guidelines for brownfield regeneration; a city-wide database system for brownfields
Communal issues	Participatory planning; balance of local and global; locally-culturally representative and globally attractive

Source: Başkaya (2010)

- pollution and environmental degradation and to more efficient use of resources;
- d. Equity: commitment to meeting at least the basic needs of the poor of the present generation (as well as equity between generations);
 - e. Quality of life: recognition that human wellbeing is constituted by more than just income growth;
 - f. Participation: recognition that sustainable development requires the political involvement of all groups or "stakeholders" in a society.

All of these ideas are also supported by Ayçim Türer Başkaya (2010), who distinguished paths towards sustainable brownfield regeneration under six main categories: contamination-related, political and institutional, legal, economic, plan/design-based and communal issues. The Hazaribagh brownfield regeneration in Dhaka has been studied and guidelines have been set in accordance with ideas (in Table 1) for regenerating it as a model of a sustainable twenty-first-century neighbourhood and an example for the entire city.

3 Methodology

Three linked components are used in this study: a literature review, existing case study data, and a practitioner workshop exercise. First, a literature review of social and environmental benefits and brownfield regeneration was performed using the internet and publication searches for brownfield, environmental, objectives, social, reclamation, regeneration and remediation in the domains of green space, development projects and brownfield regeneration. Second, project-specific documents, case studies, research and trade journals, brownfield regeneration and green space project delivery plans were examined. Finally, a workshop was convened in August 2014 to frame and set up topics to generate an expert narrative. A group of seventy experts, including twenty-five architects, five landscape architects, twelve urban planners, eight urban designers

and twenty engineers (specialising in transport, solid waste management and maritime engineering) participated in the workshop. The workshop exercise was developed to understand project planning, practice, experience and opinions from the perspective of those involved. This seven-day workshop was conducted through a seven-stage process: understanding the purpose and goal, understanding the area through a site visit, collecting local information and interviews with residents, analysis of the site area, investigation of the strategic design, preparing an effective urban planning policy and implementing a future vision. Some policies that were outlined in the workshop and are relevant for these topics are added in the discussion section of this paper.

4 Findings and analyses

4.1 Site context of the Hazaribagh brownfield

Hazaribagh is an urban brownfield in Dhaka that needs to be redeveloped as a planned sustainable area that can set an example for the entire city. The Hazaribagh neighbourhood lies southwest of the city centre and was absorbed as Dhaka expanded (Figure 1). It is surrounded by residential neighbourhoods (Dhanmondi and Mohammadpur) except to the west, where it is bordered by an embankment built in the late 1980s to protect the area from flooding. Beyond the western embankment is the flood plain of the Buriganga River; this is one of Dhaka's main rivers and it lies just one kilometre away (Human Rights Watch, 2012).

A global survey by the US-based environmental watchdog the Blacksmith Institute and Green Cross placed Hazaribagh in the top-ten list of the world's most polluted places (Blacksmith Institute, 2013). The tanneries process 220 metric tons of hides per day and use approximately 40 to 50 litres of liquid chemicals for each kilogram of hide (United Nations Industrial Development Organization, 2000) using the chrome tanning process. Most of these tanneries are thirty to thirty-five years

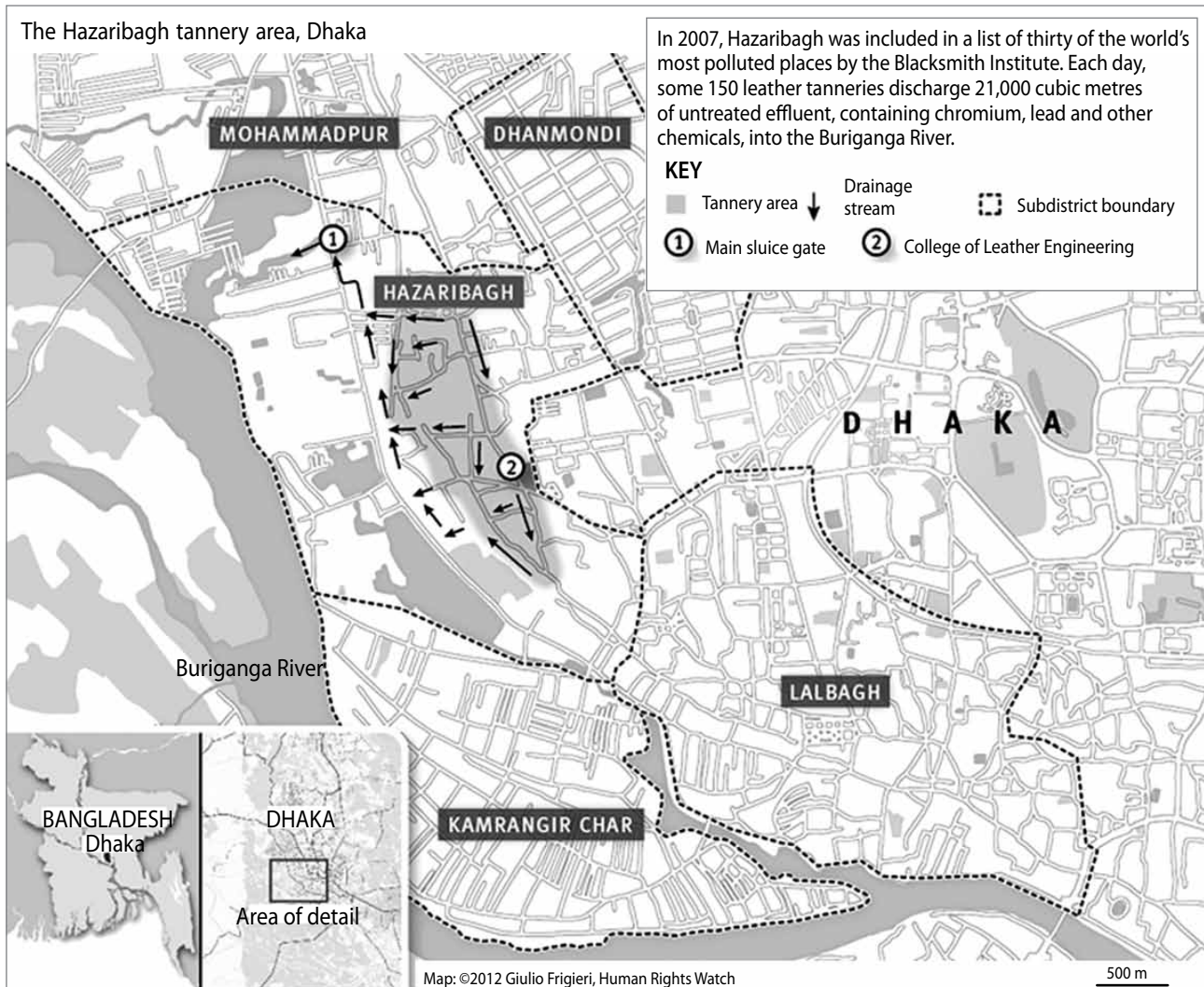


Figure 1: Location of the Hazaribagh brownfield in Dhaka (Human Rights Watch, 2012).

old and use mineral tanning processes, which discharge about 21,600 cubic meters of untreated effluent (Human Rights Watch, 2012) and ten tons of solid waste every day (Muhammad & Haque, 2012). The liquid waste discharged from these tanneries has the most detrimental effects on the environment of Dhaka. These wastes cause health hazards to people and affect aquatic life in the Buriganga River. Therefore, local people, various social and environmental movement bodies, the government and non-government organisations (NGO) have demanded that these industries be moved from this particular area.

4.2 Institutional framework and administrative policy

The government, NGOs, local people and various social and environment movements support relocating these tannery units from Hazaribagh, and so a redevelopment process needs to be planned. However, Hazaribagh is a Type B site according to

CABERNET's (2006) A-B-C categorisation, which requires cooperation between the public and private sector. The typical planning sequence for this type of brownfield redevelopment, developed and suggested by the US Environmental Protection Agency (Ionescu-Heroiu, 2010), is shown in Table 2. Table 3 presents the initial phases of the planning process in the context of Hazaribagh according to this planning sequence, and also assesses redevelopment aspects.

The planning sequence described above is also supported by the EU Soil Framework Directive (Ionescu-Heroiu, 2010) with some strict guidelines in terms of the policy and institutional context of brownfield redevelopment. First of all, it requires the formulation of environmental objectives and a regulatory framework along with strong brownfield legislation associated with national brownfield strategies. This should be followed by public and private actors and by public-private entities that act in line with future remediation and redevelopment objectives. Subsequently, in the context of Bangladesh,

Table 2: Typical planning sequence of brownfield redevelopment

Process	Redevelopment aspects	Remediation aspects
Data evaluation	Analysis of demands for further development;	Analysis of the actual situation;
	Analysis of the existing land-use plan	Evaluating available data (intensity and extent of contamination); Initial environmental assessment
Pre-feasibility	Developing of preliminary development concepts;	Risk assessment; Initial cost evaluation
	Evaluation of the viability of different development scenarios.	
Feasibility	Financing and investment possibilities for draft development concepts: detailed development appraisals	Remediation options and concept evaluation of the environmental impact assessment
Implementation	Implementation of site-development work	Implementing remediation activities;
		Monitoring results

Source: Ionescu-Heroiu (2010)

Table 3: Initial phases of the planning sequence assessed for Hazaribagh’s redevelopment

Process	Redevelopment aspects
Data evaluation	Ownership identification
	Pilot survey on demands for further development Proposal for land-use plan (Detailed Area Plan (DAP), 2005)
Pre-feasibility	Assessment of development potential
	Risk assessment (liability, social resistance, industrial heritage, negative market trends, etc.) Community engagement

Table 4: Development proposal for Hazaribagh

Problems	The area has very serious degradation of the physical, biological, social and economic environment.
	The immediate locality is extremely hazardous and highly inappropriate for residential or commercial purposes.
Opportunity	Relocation of industries as approved by the government will provide an extensive open space and opportunity for planned urban residential development, and will help improve the environment.
Recommended actions	After the shift, a significant amount of vacant land can be prepared for designing planned open space, parks and playgrounds. A proper strategy for outlining a detailed area plan is needed for this.
	This area should have a well-studied restoration program for applying proper mitigation measures to enhance the environment after its relocation. Careful implementation of this program will ensure a safe and clean environment in the future.
Land use proposals	This area requires sub-soil treatment for a healthy environment; this requires an in-depth study and land treatment with a recovery plan for dangerous chemicals.
	The area should be addressed as an environmental project area and the land use should be determined fifteen years later.

Source: DAP (2005)

the available environmental objectives, related legal acts and rules for redeveloping the Hazaribagh area are listed below.

In accordance with the Bangladesh Environment Conservation Act, 1995 (Bangladesh Gazette 1995, Statutory Instrument, no. 1/1995) and the Environment Conservation Rules, 1997 (Bangladesh Gazette 1997, Statutory Regulatory Order, no. 197-Law/97):

- No industrial unit included in the list categorised as “red” (i.e., heavily polluting) shall be allowed to be located in any residential area;
- Industrial units shall preferably be located in areas declared industrial zones or in areas where there is a concentration of industries or in vacant areas; and
- Industrial units likely to produce noise, smoke and odours beyond the permissible limit shall not be acceptable in commercial areas.

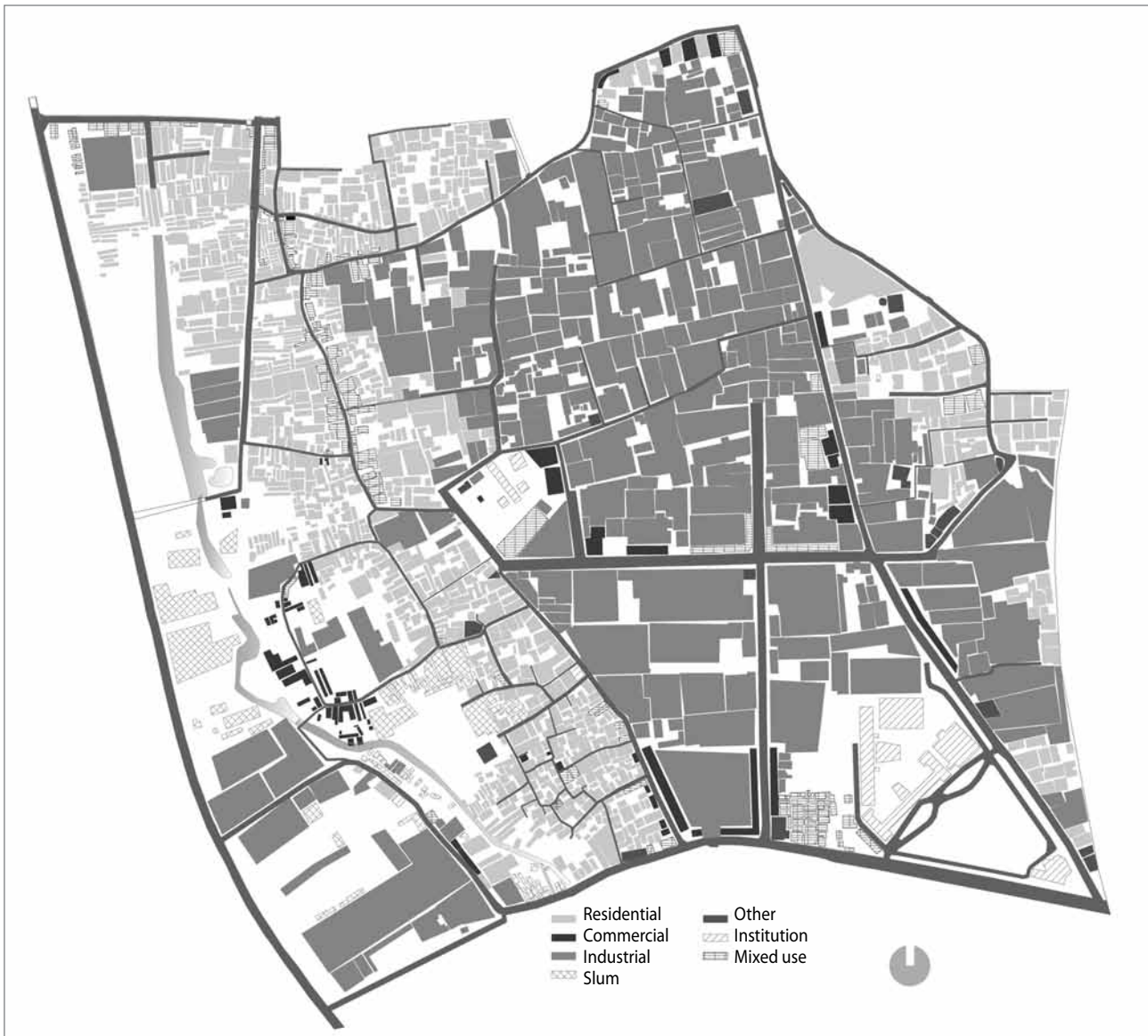


Figure 2: Existing land-use pattern of the Hazaribagh brownfield (illustration: Mohammed Nawrose Fatemi).

According to a Bangladeshi High Court ruling in 2001, the government should have ensured that the tanneries installed adequate means to treat their waste over a decade ago. The high court then ruled in 2009 that the government should ensure that the tanneries relocate outside of Dhaka or it should close them down.

Second, it is necessary to establish fluid and transparent land and property markets to support the change in ownership and conversion to new uses. In the context of Dhaka, the market demands and future land development opportunities after relocating the Hazaribagh tanneries are as follows:

- As stated by the DAP (2005), this area should undergo a “land readjustment scheme” with a 50% family relocation process. With this sort of scheme, the area might experience urban renewal, which will enhance the land’s value

and the physical quality of the area. Improving the land for residential neighbourhoods has also been proposed.

- The United Nations Industrial Development Organization (2006) stated that the land left after the relocation of the Hazaribagh tanneries to Savar will be in high demand for commercial office and residential development due to its unique location and transport access. The area’s demand has already been observed in the development of a site for high-rise residential buildings along the embankment road. Therefore, commercial office blocks, some housing, various schools, clinics, parks and open space (associated with a greenbelt program, as suggested in group-C land use proposals) should be planned for this tannery area after soil treatment. The crucial question is whether planned development such as housing, schools, commercial and office space and so on should

be promoted; if so, it should be borne in mind that several metres of topsoil in this area should be removed as remediation in order to ensure a healthy environment by removing dangerously contaminated soil (Asociación Cluster de Industrias de Medio Ambiente de Euskadi, ACLIMA, 2007, cited in Bhowmik, 2013).

Finally, effective urban planning must encourage putting idled and polluted land back into productive use. In addition, excerpts from the DAP (2005: 180) for Dhaka are included in order to review the proposal for land-use planning in the Hazaribagh area. This proposal (Table 4) states that the “Hazaribagh area harbours one of the most poisonous and obnoxious (tannery) industry amid residential quarters in Detailed Planning Zone (DPZ)-8, Western Suburb-south. It was mostly of slum type development with extremely dangerous environmental health hazard including high risk soil pollution due to tannery” [sic].

4.3 Current conditions and problems identified

4.3.1 Land-use and ownership pattern

The land-use pattern of the area clearly illustrates the chronological development of this area (Figure 2). The development of the area is an accumulation of mostly residential and industrial areas along with some transitional uses, such as mixed and commercial use. Many residential plots are very small. The industrial area has many plots where the majority of buildings are temporary structures with very few permanent ones. A small amount of supporting small and cottage industries for tanneries such as paint and glue industries, shoe manufacturers, shops and similar industries are also seen. Along the western embankment, there are several businesses for car repair, wood storage, carpentry, and repairing and producing metal products. A slum area has also developed with some rickshaw and compressed natural gas (CNG) vehicle storage, paper and metal recycling, and other commercial activity.

An interesting amalgamation of freehold, leasehold and government land is found in this area. Informal interviews with some tannery owners during the survey revealed ambiguity regarding ownership. According to them, this land is freehold, whereas the settlement history of this area indicates that this land is leasehold. Residential land is mostly freehold along with a belt of government land next to the western embankment road. During the workshop, while collecting local information and interviewing residents (a random sampling of one hundred), it was found that 73% of local residents want the tanneries relocated from Hazaribagh. In addition, about 90% of local residents suggested a mix of residential and commercial areas, and only a few people would like to include public recreation areas.

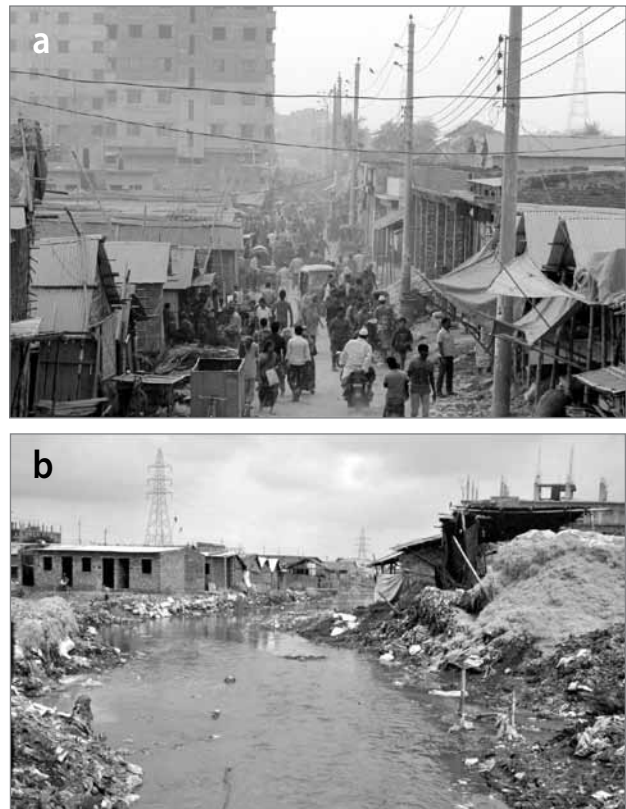


Figure 3: Slums and temporary structures: a) along the edge of the embankment road and b) along the edge of the river (photo: Mohammed Nawrose Fatemi).



Figure 4: a) Non-pedestrian-friendly walkways with a lack of footpaths and covered drains and b) no separate vehicular and pedestrian traffic (photo: Mohammed Nawrose Fatemi).

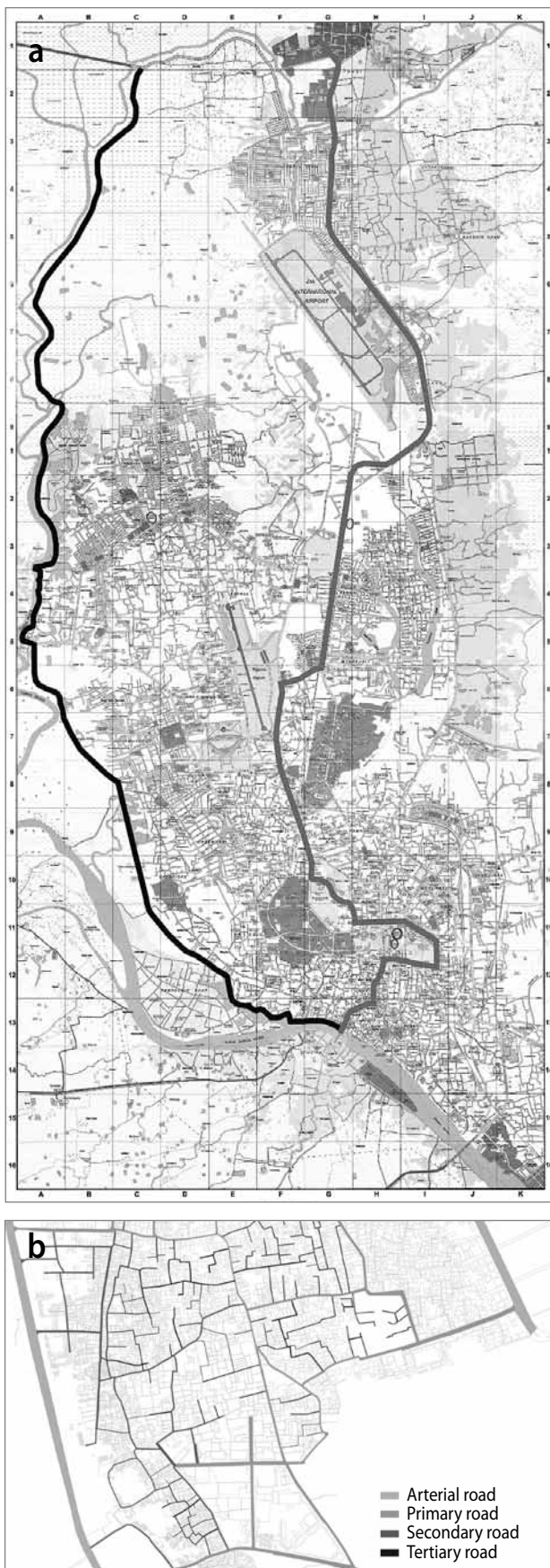


Figure 5: a) Potential east-west connection in the city and b) dilapidated and discontinuous sidewalks and weak connections with the embankment road (illustration: Mohammed Nawrose Fatemi).

4.3.2 Open space and surroundings

In Hazaribagh, a large portion of the land is either undeveloped or underdeveloped. An enormous area will be converted into vacant space, and later into “negative space,” which can create many social problems and also become a haven for anti-social elements. There are many sick industries in this area and, given the current value of land in Dhaka, unproductive use of these spaces will be a great loss for the city in the future. Like other neighbourhoods in Dhaka, planned open and green spaces are highly recommended for this area’s sustainable development and for improving the current compact living conditions.

Slums and temporary structures along the edge of the embankment road and the river have created an alarming situation (Figure 3). During the site survey, the people living nearby strongly complained about this slum. In addition, the natural flow of the canal is strongly affected by this illegal construction along the river. As a result, the role of this low-lying area in the city’s natural drainage system and flooding raise questions because the canal and its adjacent area are gradually deteriorating.

4.3.3 Road network and area layout

The road network and layout of the area developed organically, like in other parts of Dhaka. Area grids are non-existent or discontinuous, with many sharp turns and dead ends in the roads. Walkways are not pedestrian-friendly; there is a lack of footpaths and covered drains, and pedestrian and vehicular traffic are not separated (Figure 4). Weak vehicular and pedestrian connections with the embankment road obstruct potential east-west connections in the city (Figure 5). The DAP (2005) proposes improving the currently haphazardly developed area through a land pooling system, which includes better serviced plots, utilities, roads and other social infrastructure.

4.3.4 Environmental aspects

Soil contamination with organic metals and toxic heavy metals create an unliveable environment (Figure 6). Currently, waste disposal from the surrounding areas and tanneries is increasing the level of pollution. The collection of local information and interviews with residents show that 67% of residents have poor environmental knowledge and awareness. The results showed that the waste management system is also very poor in this area and most people throw solid waste into the streets, drains, canal and elsewhere, and only 33% of respondents dispose of their solid waste at a specific waste-collection point (Figure 6). Untreated waste in industrial areas causes serious water pollution and many environmental hazards along with air pollution. This severely interrupts the ecological balance of the site.

4.3.5 Socioeconomic and cultural aspects

In spite of its tannery and polluted environment, Hazaribagh has tight community bonds, inherited from old Dhaka. The most important physical quality of a space is enclosure, which creates a sense of place. Narrow, pedestrian-dominated streets bounded by adjacent buildings in Hazaribagh provide a feeling of intimate social spaces. These intimate spaces encourage and enhance community and cultural activities in the outdoor urban environment, which also sustains the community spirit. The spaces between and in front of the buildings are vibrant and provide many enclosed and small areas, making streets, alleys and other public spaces comfortable, satisfying and secure for assorted activities and for walking through (Mowla, 2002). In many parts of the streets, the original character of the neighbourhood has changed due to new construction of tall buildings, and also due to tanneries, which completely contrast with the spatial relationships of the area. At first glance, the settlement texture of Hazaribagh may look chaotic, but behind the chaos there is an order that developed in line with people's needs.

4.4 Challenges to brownfield regeneration in Hazaribagh

The overall scenario for Hazaribagh can be summarised by a SWOT analysis (Table 5) for determining the paths toward sustainable brownfield regeneration. Brownfield regeneration should result in economic, environmental and social benefits. However, several challenges to brownfield regeneration are hindering the process, including the following (Başkaya, 2010):

- a. Indefinite policies;
- b. Uncertainty about legal liability;
- c. Absence of a consistent regeneration framework;
- d. Insufficient practical knowledge;
- e. Absence of some plans within the planning hierarchy; and
- f. Difficulty in combining collective studies and residents' response.

The brownfield in Hazaribagh also faced these obstacles to regeneration (Table 5).

5 Discussion

As a brownfield, Hazaribagh has immense potential due to its strategically well-connected location within the city and its diverse socioeconomic, geographical and cultural features. Hence, the following proposal to regenerate Hazaribagh as a planned sustainable area is an option based on the core ideas and arranged as presented in Table 1.



Figure 6: a) water pollution due to poor wastewater management and b) soil contamination with organic metals and toxic heavy metals (photo: Mohammed Nawrose Fatemi).

5.1 Contamination-related issues

According to the DAP (2005), this site should be kept vacant for fifteen years for remediation. However, in the context of Dhaka, more precise legislation and regulations should be formulated to specify the suitable remediation techniques. In addition, clear guidelines should be prepared for development in phases, and the scope of work for each phase should be clearly defined. In the case of soil remediation and water remediation, it is very important to choose a correct method that will not turn into a liability for the future, such as soil excavation. Extensive remediation of soil and surface and ground water in Hazaribagh is required before implementing this redevelopment plan, which is currently being evaluated by ACLIMA in collaboration with Khulna University in Bangladesh. The project report (ACLIMA, 2007, cited in Bhowmik, 2013) recommended and preferred natural recovery of the brownfield over the proposed complicated and unaffordable technical recovery for a developing country like Bangladesh. Therefore, a comprehensive environmental clean-up strategy should be devised for Hazaribagh, prioritising surface ponds, large dumps of tannery waste and main drainage canals. A recent joint study by the World Bank and the Institute of Water Modelling (Roy, 2009) showed that the groundwater system is being contaminated

Table 5: SWOT Analysis for brownfield regeneration in Hazaribagh

Issues	Strength	Weakness	Opportunity	Threats
Contamination related		Need for intervention, interdisciplinary long-term studies	Worldwide technological developments	Difficulty forming interdisciplinary teams, absence of practical knowledge
Political and institutional			Central government's concern for economics-based scenarios	Requires great assistance from the government and long-term public cooperation
Legal		Failure to implement laws because owners' relocation demands are not satisfied by the government		No framework law, absence of a definite policy
Economic	Location within the city and surrounded by high-demand neighbourhoods	Financial risks due to environmental risks	High demand from investors and high land prices in the surrounding area	
Plan/design-based	Development proposal according to the DAP (2005)	All activities limited due to poor and narrow roads	Available open space due to relocation of tanneries, current environmental policies, impulse for regeneration	Highly polluted environment and unhealthy conditions, no guidelines for regenerating brownfields
Communal	Strong regional culture, dynamic environment with eagerness for future change	Lack of widespread environmental education and awareness	Hospitality and bonding of the community	Absence of participatory studies

in areas where aquifers are recharged from the riverbeds. The pollution is gradually creeping towards the central part of the city. That study also mentioned groundwater in Hazaribagh as the most affected. "It is quite likely that in the long run groundwater would be affected from the surface at solid waste or industrial effluent dumping ground" [sic], the report (Roy, 2009: 1) added. Because of this, Hazaribagh groundwater contamination should be monitored on an ongoing basis.

5.2 Political and institutional issues

All unauthorised ongoing development in Hazaribagh must be stopped immediately by the relevant authorities and no new development work should be permitted until a master plan or action area plan for the area is prepared and approved. Steps should be taken immediately to prepare the master plan, guided by principles that are environmentally friendly, friendly toward pedestrian and non-motorised transport, oriented toward public transport and based on mixed land use. Measures should be taken to retain the existing layout of the road network as much as possible. Valuable structures and assets should also be retained to the greatest extent possible. Hap-

azard and unplanned "developed areas" and "undeveloped areas" should be redistributed through a land pooling system to match the proposed DAP (2005). Therefore, a systematic inventory of vacant industrial buildings needs to be prepared to determine industrial heritage potential and liability issues. The authors of this paper strongly believe that sustainability issues should guide the decision on whether to preserve vacant industrial buildings. Therefore continuous sponsorship, intervention, strong political will and commitment, and necessary policy and financial support by the government are required to successfully regenerate the Hazaribagh area and thus set an example for the future regeneration of other unplanned old and fringe areas of Dhaka.

5.3 Legal issues

In June 2012, the chairman of the Bangladesh Finished Leather, Leather Goods and Footwear Exporters Association told Human Rights Watch (2012: 11) that, although the group was "hopeful" that the government would meet its demands, failure to do so would mean "it won't be possible to shift and this situation will be the government's liability." Afterwards,

on June 5th, 2014, while observing World Environment Day, the prime minister warned that the tanneries in Hazaribagh would be shut down if they failed to relocate their factories within the stipulated time. The Ministry of Industries threatened to cancel plot allocations for tannery owners unless they relocated their factories in time (Hossain, 2014). The minister added that the government would shut all tanneries in Hazaribagh after the expiry of the June 2016 deadline for the Tannery Industrial Estate project. Regardless of the status of the relocation plan, the provisions of Bangladesh's Environmental Conservation Act from 1995 and Environment Conservation Rules from 1997 (see Human Rights Watch, 2012) should be executed to monitor all the tanneries in Hazaribagh that were found to have pollution levels surpassing national standards. According to the existing legal framework, all the tanneries in Hazaribagh with pollution levels surpassing the national standards should be penalised. Above all, it is necessary to immediately formulate strong brownfield legislation associated with national brownfield strategies that is followed by public and private actors and by public-private entities that act in line with future remediation and redevelopment objectives.

5.4 Economic issues

In areas of Dhaka and its outskirts, land prices increased by more than 300% between 2000 and 2007, and developers estimate that they have increased by about 35% since then (Akter, 2010). The Hazaribagh area is surrounded by the residential neighbourhoods of Dhanmondi and Mohammadpur (Figure 1). According to Real Estate and Housing Association of Bangladesh (REHAB) data (Mahmud, 2015), the price of a *katha* (a local area measurement equal to 67 m²) of land rose by 331% in the Dhanmondi area. Thus, high demand from investors and high land prices (similar to the surrounding neighbourhood area) will be an obvious prediction for the Hazaribagh area after the tanneries are moved.

5.5 Plan/design-based issues

As already addressed in this paper, according to the DAP (2005) this area will be subject to a land readjustment scheme leading to possible urban renewal. Therefore, some current homeowners will have to be temporarily resettled in other areas until they are allocated plots in the regenerated area for developing their own residences. Improving the land for residential neighbourhoods has also been proposed. If necessary, land will be acquired for straightening and widening the connecting road to the peripheral primary city roads according to proposed DAP guidelines (2005). Regardless of the proposed road improvement, preserving sociocultural and economic trends and the essence of the existing community is of utmost importance for sustainable urban regeneration. Some of the unique features of

Hazaribagh that need to be preserved are the morphology of social spaces such as its pedestrian-dominated traffic network and social spaces within the narrow alleys. The DAP (2005) proposes that the canal be designated for proper change. For this, continuous flow of the canals (including the current one carrying wastewater) must be kept. A uniform cross-section must be ensured for the canal. Untreated effluent will no longer be discharged into the river, preventing further contamination. Establishing a green network along with public urban space will help create an environment that promotes health. Having green and open spaces everywhere is good because this reduces pollution, enhances aesthetics, may promote community pride and will transform the area into a beautiful liveable one.

5.6 Communal issues

The residents of Hazaribagh must be informed about the extent of environmental contamination in Hazaribagh and possible health consequences of contamination. Strong local public consultation will be required to build public opinion in favour of regeneration. The opportunity to transfer land development rights can be explored to gain ownership of land because large-scale land acquisition may be complex, if not impossible.

6 Conclusion

According to the Global Liveability Index, published by The Economist Intelligence Unit (2015), Dhaka was rated as the second least-liveable city in a survey of liveability of 140 cities. This study found Dhaka below average in five broad categories that city dwellers care about most: stability, healthcare, culture and environment, education and infrastructure. In fact, Dhaka has become unliveable mainly because of rapid urbanisation, high population growth, mismanagement in civic services and amenities, and inappropriate planning initiatives continuing over the years in an uninterrupted sequence (Hossain, 2015). All of these challenges have made Dhaka an extremely difficult place to live. Radical measures (e.g., limiting population and activity densities in Dhaka, rapid implementation of BRT (Bus Rapid Transit) and MRT (Mass Rapid Transit) projects, limiting the number of private cars and other smaller vehicles) and regenerating or improving different parts of the city with proper land use are essential for healthy living. Carrying out the project (DAP, 2005: 31) "to regenerate Hazaribagh as a sustainable neighbourhood" will be a vivid example of transforming the most neglected and environmentally degraded place into the most attractive part of Dhaka.

Mohammed Nawrose Fatemi
University of Asia Pacific, Department of Architecture, Dhaka, Bangladesh
E-mail: nawrose@uap-bd.edu

Tahmina Rahman
BDDL Housing LTD., Dhaka, Bangladesh
E-mail: ar.tahminarahman@gmail.com

References

- Akter, S. (2010) Behind soaring land prices. *The Daily Star*, 26 Dec. 2010, p. 32.
- Alker, S., Joy, V., Roberts, P. & Smith, N. (2000) The definition of brownfield. *Journal of Environmental Planning and Management*, 43(1), pp. 49–69. DOI: 10.1080/09640560010766
- Asociación Cluster de Industrias de Medio Ambiente de Euskadi (2007) *Site remediation and management guidelines for Hazaribagh*. Dhaka.
- Başkaya A. T. (2010) Ways to sustainable brownfield regeneration in Istanbul. *ITU A|Z- Journal of the Faculty of Architecture, Istanbul Technical University, Turkey*, 7(2), pp. 74–88.
- Bhowmik, A. K. (2013) Industries' location as jeopardy for sustainable urban development in Asia: A review of the Bangladesh leather processing industry relocation plan. *Environment and Urbanization Asia*, 4(1), p. 93. DOI: 10.1177/0975425313477749
- Biswas, B. & Hamada, T. (2012) Relation between Hazaribagh tannery industry development and Buriganga river pollution in Bangladesh. *International Journal of Environment*, 2(2), pp. 117–127.
- Blacksmith Institute (2007) *The world's worst polluted places: The top ten of the dirty thirty*. New York.
- Blacksmith Institute (2013) *The world's worst 2013: The top ten toxic threats*. New York.
- Catney, P., Lerner, D., Dixon, T. & Raco, M. (2007) Is brown the new green? In: Dixon, T., Raco, M., Catney, P. & Lerner, D. (eds.) *Sustainable brownfield regeneration*, pp. 352–372. Oxford, Blackwell. DOI: 10.1002/9780470692110.ch13
- Chen, G. (2012) State rescaling, contested space, and inequality in the globalizing city-regions of China: Conceptual issues and empirical evidence. *Urbani izziv*, 23(supplement 2), pp. S137–S149. DOI: 10.5379/urbani-izziv-en-2012-23-supplement-2-012
- Concerted Action on Brownfield and Economic Regeneration Network (2006) *Sustainable brownfield regeneration*. Nottingham, University of Nottingham.
- Contaminated Land Rehabilitation Network for Environmental Technologies (2002) *Brownfields and redevelopment of urban areas*. Research report. Vienna, Umweltbundesamt.
- De Sousa, C. (2008) Brownfields redevelopment and the quest for sustainability. In: Tiesdell, S. (ed.) *Current issues in urban and regional studies*, 3, pp. 51–77. London, Elsevier Science.
- Detailed Area Plan (2005) *Preparation of Detailed Area Plan (DAP) for DMDP area: Group-C*. Final report. Dhaka, Rajdhani unnayan katripakha (RAJUK).
- Dixon, T. (2007) The property development industry and sustainable urban brownfield regeneration in England: An analysis of case studies in Thames Gateway and Greater Manchester. *Urban Studies*, 44(12), pp. 2379–2400. DOI: 10.1080/00420980701540887
- Dixon, T. (2012) Brownfield development and housing supply. In: Smith, S. (ed.) *International encyclopaedia of housing and home*, pp. 103–109. Oxford, Elsevier. DOI: 10.1016/B978-0-08-047163-1.00705-0
- Dixon, T., Pocock, Y. & Waters, M. (2006) An analysis of the UK Development Industry's role in brownfield regeneration. *Journal of Property Investment and Finance*, 24(6), pp. 521–541. DOI: 10.1108/14635780610708310
- Economist Intelligence Unit, The (2015) *A summary of the liveability ranking and overview*. New York, The Economist.
- Environment Conservation Rules 1997*. Bangladesh Gazette 1997. Statutory Regulatory Order, no. 197-Law/97. Dhaka.
- Far, M. S. (2011) *An evaluation on sustainable brownfield regeneration opportunities in periphery area of Nicosia Buffer Zone*. Master's thesis. North Cyprus, Eastern Mediterranean University, Institute of Graduate Studies and Research.
- Fatemi, N. (2014) Urban green space in a high-density city: User expectations, accessibility and experience in context of Dhaka. In: Dayaratne, R. & Wijesundara, J. (eds.) *Proceedings of ICCPP-2014: International conference on cities, people and places*, pp. 234–244. Colombo, Sri Lanka.
- Fumeaux, L. (2014) *Best practices of brownfield depollution and urban regeneration*. Available at: <http://www.azocleantech.com/news.aspx?newsID=19902> (accessed 10 Mar. 2015).
- Hiremath, R. B., Kattumuri, R., Kumar, B., Khatri, V. N. & Patil, S. S. (2012) An integrated networking approach for a sustainable textile sector in Solapur, India. *Urbani izziv*, 23(2), pp. 114–121. DOI: 10.5379/urbani-izziv-en-2012-23-02-007.
- Ho, D. C. W., Yau, Y., Law, C. K., Poon, S. W., YIP, H. K. & Liusman, E. (2012) Social sustainability in urban renewal: An assessment of community aspirations. *Urbani izziv*, 23(1), pp. 125–139. DOI: 10.5379/urbani-izziv-en-2012-23-01-005
- Hossain, A. (2015) The city of joy and pain. *The Daily Sun*, 28 Jun. 2015, p. 6.
- Hossain, S. (2008) Rapid urban growth and poverty in Dhaka city. *Bangladesh e-Journal of Sociology*, 5(1), pp. 1–24.
- Hossain, S. (2014) Tannery relocation project still limps. *The New Age*, 11 Sept. 2014, p. 1.
- Human Rights Watch (2012) *Toxic tanneries: The health repercussions of Bangladesh's Hazaribagh Leather*. New York.
- International Economic Development Council (2008) *International brownfields redevelopment*. Washington, DC.
- Ionescu-Heroiu, M. (2010) *The management of brownfields redevelopment: A guidance note*. Brussels, World Bank.
- Jacobs, M. (1999) Sustainable development as a contested concept. In: Dobson, A. (ed.) *Fairness and futurity: Essays on environmental sustainability and social justice*, pp. 21–45. Oxford, Oxford University Press
- Scholarship Online Monographs. DOI: 10.1093/0198294891.003.0002
- Kang, C. & Hua, G. (2007) Brownfield redevelopment toward sustainable urban land use in China. *Chinese Geographical Science*, 17(2), pp. 127–134. DOI: 10.1007/s11769-007-0127-5
- Mahmud, F. (2015) Untouchable urban dreams. *The Independent*, 14 Jun. 2015, p. 9.
- Mehdipour, A. & Nia, H. R. (2013) The role of brownfield development in sustainable urban regeneration. *Journal of Sustainable Development Studies*, 4(2), pp. 78–87.
- Mowla, Q. A. (2002) Emergence of civic space in Dhaka. *Plan Plus: Annual Journal of Planning, Development, Urbanization & Environment*, 1(1), pp. 98–116.
- Muhammad, N. & Haque, M. A. (2012) Physical and mental health of tannery workers and residential people of Hazaribagh Area in Dhaka City. *ASA University Review*, 6(2), pp. 161–169.
- Newton, P. W. (2010) Beyond greenfield and brownfield: The challenge of regenerating Australia's greyfield suburbs. *Built Environment*, 36(1), pp. 81–104. DOI: 10.2148/benv.36.1.81

Obeng-Odoom, F. (2012) Political economic origins of Sekondi-Takoradi, West Africa's new oil city. *Urbani izziv*, 23(2), pp. 121–130. DOI: 10.5379/urbani-izziv-en-2012-23-02-005

Oliver, L., Ferber, U., Grimski, D., Millar, K. & Nathanail, P. (2005) The scale and nature of European brownfields. In: *Proceedings of CABERNET 2005: The International Conference on Managing Urban Land*, pp. 274–281. Nottingham.

Perović, S. & Folić, N. K. (2012) Brownfield regeneration Imperative for sustainable urban development, *Građevinar*, 64(5), pp. 373–383.

Rosly, D. & Rashid, A. A. (2013) Revitalizing urban development in Malaysia through the implementation of urban regeneration programme. In: *Proceedings of the 43rd annual conference of the Urban Affairs Association*, pp. 1–20. San Francisco.

Roy, P. (2009) Pollution gets to groundwater: Study finds Hazaribagh water most contaminated. *The Daily Star*, 26 Apr. 2009, p. 1.

Shrestha, B. K. (2013) Residential neighbourhoods in Kathmandu: Key design guidelines. *Urbani izziv*, 24(1), pp. 125–143. DOI: 10.5379/urbani-izziv-en-2013-24-01-003

Smith, G. (2008) Contributions of brownfield development to urban internal expansion and urban renewal in practice brownfields development. In: *Proceedings of 44th ISOCARP congress*, pp. 1–12. Dalian, China.

Smith, G. (2010) Brownfield planning: A tool for economically and socially effective sustainable urban development. In: *Proceedings of 46th ISOCARP congress 2010*, pp. 1–8. Nairobi.

Stefanovska, J. & Koželj, J. (2012) Urban planning and transitional development issues: The case of Skopje, Macedonia. *Urbani izziv*, 23(1), pp. 91–100. DOI: 10.5379/urbani-izziv-en-2012-23-01-002

Thornton, G., Franz M., Edwards, D., Pahlen, G & Nathanail, P. (2007) The challenge of sustainability: Incentives for brownfield regeneration in Europe. *Environmental Science & Policy*, 10(2), pp. 116–134. DOI: 10.1016/j.envsci.2006.08.008

United Nations (2014) *World urbanization prospects: The 2014 revision, highlights*. New York, Department of Economic and Social Affairs, Population Division.

United Nations Industrial Development Organization (2000) *Regional programme for pollution control in the tanning industry in South-East Asia: Chrome balance in leather processing*. Vienna.

United Nations Industrial Development Organization (2006) *Preparatory assistance in relocation of tanneries from Hazaribagh to Savar*. Dhaka.

United States Environmental Protection Agency (2003) *Brownfields definition*. Available at: <http://epa.gov/brownfields/index.html> (accessed 7 Mar. 2015).

United States Environmental Protection Agency (1996) *Support of regional efforts to negotiate Prospective Purchaser Agreements (PPAs) at Superfund sites and clarification of PPA guidance*. Available at: <http://www2.epa.gov/sites/production/files/2014-10/documents/neg-ppasuper-mem.pdf> (accessed 7 Mar. 2015).

Wu, H. & Chen, C. (2012) Urban "brownfields": An Australian perspective. In: Kupke, V. (ed.) *Proceedings of 18th annual Pacific-rim real estate society conference*, pp. 1–20. Adelaide.

Xuan, L. & Xun, L. (2012) Land Administration System structured land rent residuals and China's urban sprawl A case study of Dashi, Guangzhou. *Urbani izziv*, 23(supplement 2), pp. S150–S160. DOI: 10.5379/urbani-izziv-en-2012-23-supplement-2-013

Zhang, J., Kotze, N. & Yu, M. (2012) Living in a changing Chinese urban landscape: The Dalian case study. *Urbani izziv*, 23(2), pp. 93–102. DOI: 10.5379/urbani-izziv-en-2012-23-02-002