

Industrial Urbanism: Typologies, Concepts and Prospects

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Due to global economic dynamics and rising labour and transportation costs, domestic urban-centred production is making a comeback. Seizing this opportunity has important implications for cities, which stand to benefit from new investments and increased employment opportunities. In looking at the spatial challenges associated with urban manufacturing this paper examines the evolution of spatial relationship between cities and industrial environments, as well as the mapping of existing industrial prototypes. The aim of analysing varied prototypes of the city–industry relationship is to increase understanding of city–industry dynamics and to promote manufacturing as a key to the development of future cities. The connection between cities and industries in contemporary times suggests that a major opportunity is emerging to redefine the role of industry in the city, making it as much a part of the urban fabric as housing or commerce.

Dramatic changes are now occurring in the manufacturing sector – a shift from large industrial-scale production and design to small-scale distributed systems; polluting and consumptive process have become clean and sustainable; the demand of unskilled labour has been supplanted by the need for a more educated and specialized workforce. Cities may see new investment and increased employment opportunities resulting from these shifts – but to reap these benefits will require a shift in our thinking about manufacturing. In addition to the technological and market forces that have pushed manufacturing outside of the urban core, firms in developed countries are facing both the challenges and opportunities of globalized markets. Industry and commerce are being reshaped by digital technologies and flexible borders that foster the flow of ideas, goods, and services; reduce barriers to international partnerships; and streamline the application of innovations in production and trade (MIT Taskforce on Innovation and Production, 2013, pp. 11–12).

Despite these apparent benefits, scholars note that globalization may also present certain risks to industry.¹ The opening of international trade and communications threatens copyrighted content, trade secrets, and other proprietary information; even more troublesome and less obvious, there is a danger that as companies shift production abroad, their capacity to continue to innovate may be diminished, as they give up crucial opportunities for learning in the development process. For example, in *Manufacturing Matters: The Myth of the Post-Industrial Economy*, Stephen Cohen and John Zysman (1987) argue that the movement towards post-industrialism is shortsighted, as it produces a one-dimensional service-based economy that will lose its ability to innovate. Their argument is at the core of today's reshoring movement as cited by Fred Zimmerman:

A flight offshore for cheap labor will not provide a winning long-term strategy; after a few rounds of product and process innovation it will just compound the problem. A strategy of trying to hold onto the high-value-added activities while

subcontracting production to foreign producers who have a manufacturing edge defines the fast track to disaster. (Zimmerman, 1991, p. 5)

Today, some post-industrial nations are beginning to initiate policies to promote domestic production (De Backer *et al.*, 2015: 29; Kotkin, 2012; Northam, 2014) partly because the economic drivers of offshore manufacturing, such as lower labour costs, are eroding as wages increase in developing economies. Concerns about intellectual property protection and rising energy costs are also contributing factors. This approach, after years of relative neglect as a topic of academic inquiry, has resulted in commentary, and research interest in the issues of manufacturing, people and cities.

Seizing this opportunity has important implications for cities, which stand to benefit from new investments and increased employment opportunities. However, consideration of cities' physical spaces is often missing from contemporary reports and policy recommendations. Cities are being presented with opportunities for revitalization and job creation, but progressive thought is necessary to break away from the *status quo* of big-box factories in the hinterlands. The premise of this paper is that manufacturing decline is much more than an economic challenge; it should be viewed as a complex socio-spatial challenge. In addressing this premise, the aim of this paper is twofold: first, to understand the evolving spatial relationship between cities and industrial environments and second, to map the existing industrial spatial prototypes and their effects on urban life dynamics. This mapping raises several key questions: Which of the prototypes is the most adaptive to environmental and social challenges? Which prototype best serves the twenty-first-century city? What is manufacturing going to look like in the city of tomorrow?

The paper comprises three parts. The first part provides a historical overview of the evolving dynamics between city and industry. The second part addresses the spatial prototypes of city–industry relationships – the inte-

grated, adjacent and autonomous – each of which is briefly explained and illustrated using examples. The paper ends with a discussion of the need to explore further the connection between cities and industries and suggests that planners and architects produce new research on the relationship between working and living.

The Evolving Dynamics between City and Industry

From a historical perspective, the primary mode of production up until the mid-eighteenth century was artisanal manufacturing in individual households; therefore, manufacturing activities were closely integrated with other parts of everyday life, specifically residential and commercial activities. The merchants' town that grew from the trade of goods and wholesale products became one of the most rapidly emerging patterns of urbanization in Western civilization. The industrial revolution spurred large-scale urbanization and dramatically changing the urban landscape as new technologies enabled the adoption of water wheels, coal-fired steam power, and intercity railways. From the 1750s on, three phases in the evolving spatial dynamic between city and industry have been identified.

The first phase is associated with the *emergence of the industrial city* (1750–1880). The evolution of textile manufacturing and steam engine technologies revolutionized production processes. Cities were the logical centres of production, and industrial cities quickly outgrew their older counterparts (Hoselitz, 1955). Industry also benefited from cities' labour pools, transportation hubs, and entrepreneurs (Rappaport, 2011). Consequently, cities experienced unprecedented population growth, with manufacturing driving urbanization and economic growth. However, the basic necessities of shelter, water, and waste disposal were not being met, and additional exacerbating matters such as pollution from coal gave rise to the need to reassess

the relations of industry with its adjacent surroundings. This reassessment resulted in numerous plans and models aimed at creating a balance between living and producing in cities.

The second phase can be viewed as *a search for an ideal industrial city* (1880–1970), that is, a planned city that might be able to absorb the needs of industrialists while providing liveable conditions. Towards the end of the 19th century, planning models included mill-towns and new sets of zoning regulations to handle the problem of factories' nuisance activities.² The attempt to provide healthier living conditions for factory workers materialized in the form of a garden city by Ebenezer Howard (1898). These models served as a prototype for many towns built after the end of World War I. Howard, who developed the idea of the garden city, perceived industry as a necessary part of the garden city economy. Industry was to be located within city limits, maximizing the utility of urban transportation systems, particularly rail transport. Countries such as Israel (Hatuka, 2011), Iran, Sweden, and Japan also implemented these principles in the construction of new towns, designating industrial lands as part of newly planned cities. These industrial spaces were typically situated to have the smallest possible effect on residential areas.

Another model was developed by architect Tony Garnier (1917) as a utopian form of living and was located between a mountain and a river to facilitate access to hydroelectric power. The core idea of functional separation was later adopted by the members of Congrès International d'Architecture Moderne (CIAM) and ultimately influenced the design of cities with industry. Another prominent model that reassessed the relations between city and industry was the company town, which offered an integration of industry and housing. Built by or around a single employer, company towns have enjoyed differing levels of success, depending on the character of the founding firm (Porteous, 1970). The first company

towns emerged in the eighteenth century as a way to house new factory workers for rapidly expanding industries. Often commissioned by a single employer, these towns included Lowell, New Hampshire (textiles), Pullman, Illinois (railroad cars), Essen, Germany (iron works), and Saltaire, England (woollen industry).

World War II had a tremendous impact on the spread of these models, with the growing dependence on the location of industrial production; a rapid increase in industrial demand led to the development of immense production facilities that could no longer be located within existing urban fabrics. This period is also characterized by environmental degradation and increased pollution resulting in the desire to separate industry and manufacturing from housing. It has also led to the establishment of stricter environment laws and regulations.

The third phase is linked to *the process of deindustrialization*, which occurred from the 1970s on. During this time, many countries, especially in the Western world, reduced their industrial capacities or activities and developed planning tools to segregate industry from other land uses (Lever, 1991). There are several explanations for this process. The first emphasizes the natural development of the economy and the gradual transition from agriculture and mining to mass production, services and increasingly knowledge-based industry. Another explanation is based on the concept of 'trade specialization' and highlights the comparative advantage of places that specialize in a particular economic activity. This approach explains the relation between wage economies that specialize in labour-intensive activities or technology and the geographical transition of production from west to east.

Another explanation relates to the process whereby industrialization dampens competitiveness in terms of failure and lack of investment from international companies that deploy geographically to take advantage of differences in production costs (Pike,

2009). Deindustrialization has been experienced unevenly in different countries, regions and localities as well as among different industries, firms, social groups, and individuals (Massey and Wield, 1992; Pike, 2009). The contraction and rationalization of the manufacturing industry – ‘deindustrialization’ – occupies a central role in the uneven geographical development of capitalism (Helper *et al.*, 2012). This trend towards disfavouring manufacturing, coupled with Euclidean zoning practices that essentially provided an advantage to residential uses of real estate above all others, especially manufacturing, resulted in a loss of industrial land to commercial and residential uses in many cities. In urban planning, this trend further increased the division between home and work, often implying that industrial uses gave way to other uses. More broadly, deindustrialization reshaped the geography of industry. For example, storage and distribution facilities were often located in the hinterlands, where land values are the lowest, whereas industrial parks tended to be located in the suburbs or on the periphery of the city (Harrington and Warf, 1995). What is left in the city are office parks (i.e. the service industry), which is less land intensive, and the legacy urban factories that exist within the city itself as a reminder of an era when city was a space of production.

This evolving spatial dynamic between city and industry does not occur in a vacuum; it is influenced by economic and political processes. However, today, policy debate has focused on the importance of manufacturing on economies, arguing that manufacturing remains vital to local, regional, and national economic growth and is seen as ‘the “flywheel of growth” because the rate of growth of manufacturing output tends to drive the rate of productivity growth in manufacturing and in services’ (Pike, 2009, p. 59). This approach is gaining recognition, particularly with the development of technology, which requires specialized and skilled labour (Pisano and Shih, 2012; Plant, 2014).

Industrial Prototypes and the Effect on Urban Life Dynamics

The evolving dynamics between city and industry have left spatial footprints. The reduced costs of automobile commuting and truck shipping, including subsidized highway infrastructure, contributed to the horizontal sprawl of industrial areas (Leigh and Hoelzel, 2012) and resulted in three key contemporary spatial prototypes of industrial spaces: the *integrated*, the *adjacent* and the *autonomous* (Hatuka *et al.*, 2014). The key questions are how each affects city life and which prototype best serves the twenty-first-century city.

The Integrated Industrial Space

The key feature of this prototype is symbiosis between living and working. Another feature is architectural: the impact of industry on the skyline and on the fabric of the city. Integrated industrial zones are often enclaves within the city, undergoing renewal and/or deliberate infrastructure neglect, with the goal of better exploiting land resources, yielding higher profits and raising taxes. The last feature, administrative, concerns the responsibility of the city to meet, simultaneously, the needs of businesses and residents and to resolve tensions related to their geographical proximity. The integrated prototype may generate varied benefits to diverse agents: residents enjoy nearby employment; businesses in the industrial area enjoy proximity to services (such as catering or office supplies) and existing infrastructure (public transportation); and municipalities strengthen the urban economy. However, this kinship may also induce problems and tensions, especially with regard to environmental pollution, noise, smell, and transport systems that are congested with trucks and private cars. In many cases, the evolution of this prototype evolution is not planned and sometimes creates intractable conflicts. However, the physical presence of the industrial area that is adjacent to

residential environments may serve as the main growth engine of the city.

An example of the integrated prototype is Munich, Germany (figure 1). Known for its electronics and advanced manufacturing, Munich is one of Germany's leading manufacturing regions, supporting a diverse range of activities, ranging from small crafts to innovative service and high-tech assembly. One of the city's most notable manufacturing plants, BMW Werk München, originally opened in the 1920s to produce aircraft engines and power units. The site was rural land, and the surrounding area remained undeveloped until after World War II when the city expanded; the plant gradually became delimited by housing and commercial developments. This pattern changed after 1972 when the Munich Olympic Park opened to the west of the factory, forming the final boundary for the site. Since then, the plant has expanded vertically rather than horizontally. Over the course of four decades, residential and commercial areas have gradually grown around the factory. Today, the campus is located south of a major train station and within a 15-minute drive of downtown Munich. Smaller manufacturing and related facilities surround the BMW plant. Their uses vary from automobile- to service-related firms. The figure-ground image (figure 2) illustrates the industrial and residential building footprints in and around the BMW plant. The plant, shown in the southwest corner of the image, is located at the intersection of two major roads. The plant and the industrial area surrounding it can be identified by the larger, irregularly shaped building footprints that reflect the nature and use of these specialized manufacturing facilities. The smaller residential buildings to the east are typical of German housing, which is known for its long, rectangular multi-family buildings. The residential neighbourhood and the manufacturing campus face each other, and trees, sidewalks, and two-lane streets help to maintain neighbourhood liveability.

Another example is the spatial spread of

industry in the city of Chicago. Chicago is home to 2.7 million residents, making it the third most populated city in the United States and part of the third-largest metropolitan area, after New York City and Los Angeles. Due to its location, the city became a major transportation hub and, consequently, a major

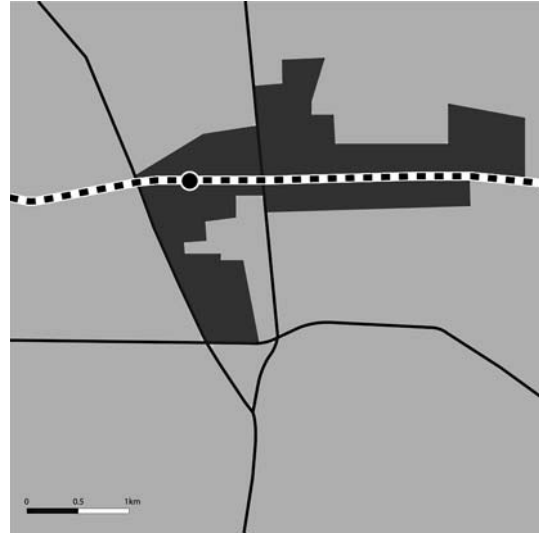


Figure 1. Munich, the combined area of the BMW plant (dark grey) and its neighbouring industrial districts (pale grey).



Figure 2. Munich, a figure-ground image illustrating the industrial (white) and residential building (grey) footprints.

centre for manufacturing, retail, and finance in the late nineteenth century. The city layout features a gridded street network with major diagonal arterial roads and railways radiating from the downtown centre (figure 3). In the 1980s, the city lost industrial jobs, partially due to increased foreign competition, along with residential and commercial development pressures. In 1988, the city created its first planned manufacturing district (PMD) to retain industrially zoned land and to prevent further job losses.³ As a result of Chicago's effort to protect manufacturing uses, there are now twenty-four industrial corridors, and most of the land with a manufacturing zoning designation is located within or adjacent to one of these industrial corridors (City of Chicago, 2013). The industrial corridors are tightly knit with residential and commercial land uses and are an important part of Chicago's urban landscape. PMDs are considered to have been effective in fostering manufacturing activities within Chicago, as they ensured long-term stability for industrial businesses looking to invest and expand within the city's districts. Figure 3 illustrates the relationship between Chicago's planned manufacturing districts (PMDs) and the rest of the city. PMDs are concentrated along major transportation networks, such as arterial roads, railroads and rivers, which results in a concentric, finger-shaped pattern that converges towards Lake Michigan and the downtown area. Such development patterns are consistent throughout Chicago's development history, which is also clearly illustrated in Chicago's 1904 Industry and Railroad Map and its 1965 comprehensive plan.

Figure 4 depicts the infrastructure network and the resulting city fabric around one of the PMDs. An extensive railroad system and a network of collector roads connect the PMDs with the larger transport system. The dense grid network of the local roads demonstrates the typical relationship between PMDs and Chicago's built areas. The PMDs are tightly integrated with the rest of the city fabric,

offering an urban pattern to accommodate industrial uses within a city. This figure-ground image demonstrates Chicago's complex infrastructure and city fabric around the PMDs. Rivers, arterial roads, and rail lines intersecting with manufacturing facilities are generally found around such transportation nodes. (Manufacturing facilities can be differ-



Figure 3. Chicago, twenty-four industrial corridors tightly knit with residential and commercial land uses.



Figure 4. Chicago's complex infrastructure and city fabric (grey) around the PMDs (white).

entiated from the residential fabric through their slightly larger footprints.)

The integrated prototype implies a fusion or close proximity between residential and industrial uses. Often an outcome of (unplanned) urban growth, this prototype places manufacturing as an integral part of the city's structure and grid; however, its parcelling may vary, creating larger lots and blocks for industrial uses. Aside from the recurring presence of walls and barriers surrounding the factories themselves, these areas usually do not have distinct borders and tend to dissolve into the urban environment. The prevalence of this prototype is gradually decreasing among Western cities. However, in some cities, small-scale manufacturing remains in residential neighbourhoods, preserving family-based ownership models and proximity between home and the workplace.

The Adjacent Industrial Space

The organizational outline of the adjacent prototype is based on zoning and the separation between living and working. Interurban roads, railway lines, and open spaces often enhance the division between the city and the industrial area. This prototype is associated with the implementation of the new urban models of the early twentieth century that sought to address the nuisances of industrialization by providing an ideal model of the industrial city. The key feature of this prototype is its geographical and administrative duality. The industrial area is located close to, and linked to, the city. Although the employment relationship between the residents and industry is not exclusive and employees arrive from other localities in the area, the geographical proximity plays a crucial role in the local employment market.

Architecturally, this prototype is manifested through a wide field and uneven structures that are often low in height, especially due to the prevalence of peripheral areas in which there is a larger inventory of land. In terms of management, although

industry has relative autonomy, it operates under the rule of the municipality. Despite the geographical proximity, in most cases, this model produces physical separation and contributes to cognitive disconnect from the city's industrial area. Today, this prototype is in the process of changing as it is affected by the dynamics of the market and competition. Factories and companies are leaving in favour of areas that provide services and infrastructure that offer better conditions in industrial parks.

One example of the adjacent prototype is Kiryat Gat, Israel. This small city is home to one of the largest manufacturing plants for Intel, one of many high-tech firms that is fuelling an industrial revival in the city. Production has played a vital role in the economy of this city since its beginnings as an Israeli new town in the 1950s. The threat of economic decline in the 1980s prompted government incentives to encourage foreign investment, shifting Kiryat Gat's manufacturing portfolio from sugar and textiles to advanced production, including companies such as Hitachi, Zenith Solar and HP-Indigo in addition to Intel. Despite its influence on the overall economy, industrial manufacturing remains spatially removed from the rest of the city. A pattern of single-purpose zoning reflects a distinct separation between residential neighbourhoods to the west and industrial development to the east (figure 5). Kiryat Gat's development pattern is bifurcated, with relatively dense, mostly residential neighbourhoods juxtaposed with a distinctly industrial zone.

This divide is also reflected in the city's socio-economic landscape. To the west, a variety of neighbourhoods are home to diverse communities that reflect a broad range of socio-economic conditions. However, these communities have benefited little from the amenities in the industrial zone. Many neighbourhoods face high unemployment, and a high proportion of residents receive public assistance. In the eastern half of the city, industrial employees lack a connection to

Kiryat Gat's city centre, and companies have relied on enclosed campuses to service employees. The majority of these workers live outside of Kiryat Gat and commute to the city by car.

Located 50 kilometres south of Tel Aviv and 40 kilometres north of Be'er Sheva, Kiryat

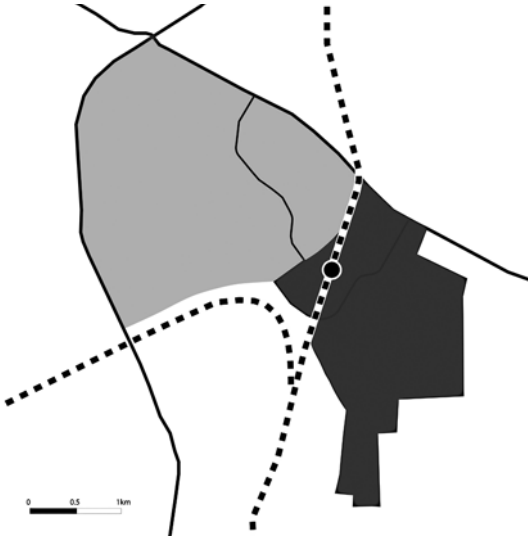


Figure 5. Kiryat Gat, a distinct separation between residential neighbourhoods to the west and industrial development to the east.

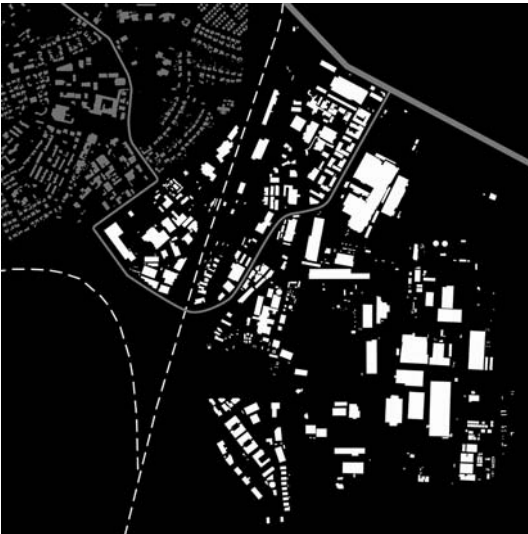


Figure 6. Kiryat Gat, a stark difference between the residential (grey) and industrial fabrics (white).

Gat is surrounded by open, arid land devoted to agricultural production and wildlife reserves. Despite these natural surroundings, the Lachish Stream, which traverses the town, and the highways to the north and west act as buffers that bar residents and workers from the immediate assets of the region. Currently, there is a single direct connection between downtown Kiryat Gat and the industrial zone, the Israel Polak Boulevard, with scant pedestrian activity between the two areas. Due to incremental development from the northwest towards the southeast, Kiryat Gat's industrial area consists of several manufacturing typologies, including traditional manufacturers, large plants and enclosed high-tech campuses. Figure 6 illustrates not only this spatial diversity but also the stark difference between the residential and industrial fabrics.

A very different example is Pohang in South Korea, which was originally incorporated in 1949 as a maritime city, although it traces its origins to settlements dating back two millennia. Until the late 1950s, Pohang was primarily a fishing port, with seafood processing and marine products as its main industries. The city underwent a major growth period following the 1960s when the Pohang Steel Company (POSCO) built Korea's first integrated steel mill, which was established with the help of a public subsidy and support from the Korean government. Today, POSCO is the world's fourth largest steelmaker. Given its long history of development and mountainous topography, Pohang's street network does not reflect an orderly pattern. Nevertheless, two distinctive areas have emerged in the inner city: a historic city centre to the north of the river and an industrial area to the south of the river (figure 7). The Hyeongsan River physically separates Pohang's southeastern industrial areas from the older residential and commercial parts of the city, partially mitigating the environmental impact of manufacturing activities. An arterial road and a railroad line cross the river. Newer residential enclaves that

developed in the 1980s and 1990s are spread around the southeastern periphery of the industrial zone. Surrounded by forest to the east and the East Sea to the west, the city's port access facilitates shipping to and from Pohang, making the location appealing to manufacturers.



Figure 7. Pohang, the historic city centre (north) and an industrial area (south).

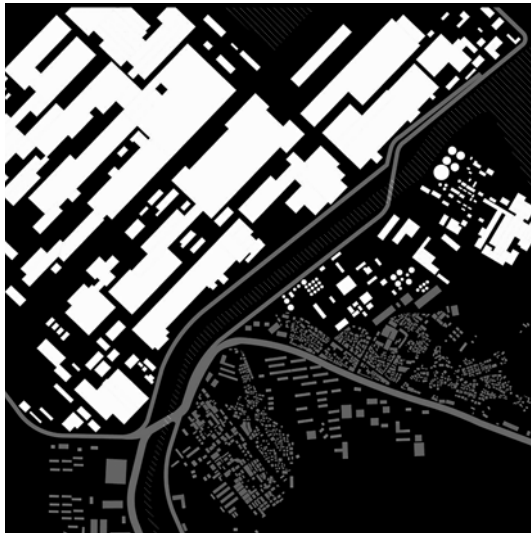


Figure 8. Pohang showing a stark difference in scale between the residential (grey) and industrial fabrics (white).

Pohang's industrial land is subdivided into a finer scale by a network of smaller roads. The largest steel manufacturing company, POSCO, occupies most of the territory within Pohang's industrial zone at the claw-shaped tip of the landmass. The smaller steel companies are all located to the south of POSCO. As shown in figure 8, the land for smaller companies is subdivided into relatively small parcels by the road network. Aside from the Hyundai Steel Company, which is the second-largest factory in the area, the smaller companies largely depend on POSCO's production processes, using scrap metals and other leftover resources. The figure-ground diagram of the east side of the POSCO campus illustrates the stark difference in scale between the industrial buildings and the residential buildings. A stream separates the two land uses. Residential buildings are located in the southeast corner, and POSCO's factories are located on the northeast side, where steel-rolling manufacturing processes are carried out.

The adjacent prototype implies planned segregation between the industrial and residential areas of the city through zoning (often via a physical barrier or natural elements) that aims to isolate incompatible land uses and prevent environmental hazards.

The Autonomous Industrial Space

This prototype is characterized by large-scale zones occupied by uniform industrial buildings and surrounded by various physical boundaries. These industrial areas (also known as 'industrial parks') are often located in high-accessibility sites in terms of transportation infrastructure, making it easy to transport goods across the country and to allow easy access to airports and seaports. The separation from the urban fabric often makes it difficult to establish an efficient mass transit system, and employees depend on private vehicles or buses operated by their employer. Although often located at the periphery, near natural or agricultural land,

in most cases, these features are not integrated into the industrial space. The streets are used primarily for vehicular traffic, and their width is determined by the trucks. Plots are relatively large so as to attract companies with high capital turnover, often including international companies that employ hundreds of workers. Although autonomous industrial areas often contribute to regional development in terms of infrastructure, such as the construction of roads, railway stations, and waste disposal systems, they also compete with old industrial zones within nearby cities and sometimes weaken their economy.

Lordstown is a village in northeastern Ohio, USA that is equidistant from Cleveland and Pittsburgh. The village is best known for Lordstown Assembly, a General Motors plant that started production in 1966. Most of the residents work at the plant. Despite the village's small size, it supports more industrial jobs than any other municipality in the Youngstown-Warren-Boardman metropolitan statistical area. Lordstown's layout is dominated by the presence of the assembly plant and the adjacent rail yard. A majority of the land area is sparsely populated residential zones with only a small downtown commercial zone. Lordstown Assembly and the rail lines occupy approximately one-quarter of the total land area (figure 9). The city can be characterized as dependent on the plant. Located in the middle of an agricultural area, the General Motors Lordstown complex essentially encompasses all of the town's industrial area. The plant is physically separated from the community, although many of the plant's employees live in Lordstown and use its services and amenities. Company housing exists across from the complex, with approximately 200 single-family homes housing the plant's employees. While multiple rail lines connect the plant to the rest of the country, the automobile is the primary mode of transportation for employees living in and commuting to the complex from other areas. The Lordstown site exists in physical isolation from surrounding land uses and is served

by its own infrastructure. The site includes a large parking lot, which is connected to Interstates 80 and 680. The highways cut through the surrounding farmland, linking the site to the greater Youngstown region. The figure-ground image (figure 10) shows Lordstown's two manufacturing facilities.



Figure 9. Lordstown's layout is dominated by the presence of the assembly plant and the adjacent rail yard.

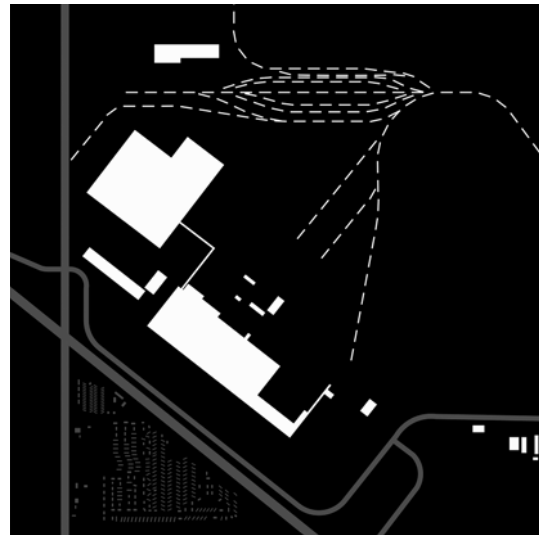


Figure 10. Lordstown's industrial facilities dominate the industrial zone and the surrounding agricultural region.

These facilities dominate not only the industrial zone but also the surrounding agricultural region. A smaller residential cluster is located southwest of the site.

Another example is the industrial district around Hartsfield-Jackson Atlanta International Airport in the USA (figure 11). Technically, these industrial sites are spread across three different municipalities: the city of Atlanta to the northeast of the airport, the city of Forest Park to the southeast, and the city of College Park to the west. Each municipality has a zoned cluster of industrial land, and suburban subdivisions surround these clusters. The industrial sites have excellent highway access and are also served by a large rail yard, which is located in Forest Park. The industrial land is adjacent to Atlanta International Airport and is surrounded by suburban developments. These industrial facilities range from food to car manufacturing.

The industrial area itself is part of three different municipalities: Atlanta's Southside Industrial District (SID), College Park and Forest Park. One of the planned manufacturing districts, Southside Industrial Park, was recently opened and developed on a former brownfield site. In general, smaller parcels define the SID, with an overall layout that reflects a separation of uses by level of intensity. The heavy industrial companies and highest traffic-generating uses can be found along the Browns Mill Road and Empire Boulevard. The Zip/Browns Mill/Empire area is less uniform, with smaller lots and irregular spacing between buildings. The new Southside Industrial Park contains newer and uniformly larger light industrial lots, while Zip Industrial Boulevard is lined with a mixture of offices and other smaller-scale businesses (Driemeier *et al.*, 2009, p. 12). Atlanta sits to the north of SID and is connected by heavily used highways, Interstates 75 and 258, as well as by rail and minor roads. The figure-ground image (figure 12) shows the diverse mix of manufacturing spaces being used in the SID. The airport to the northwest dominates

the industrial landscape, with a variety of industries hugging the site from the southeast corner. Major highways and rail lines traverse the site, strengthening Atlanta's position as a place where manufacturers are able to easily move goods by land and air.

The autonomous prototype refers to stand-alone industrial/business parks or large factories

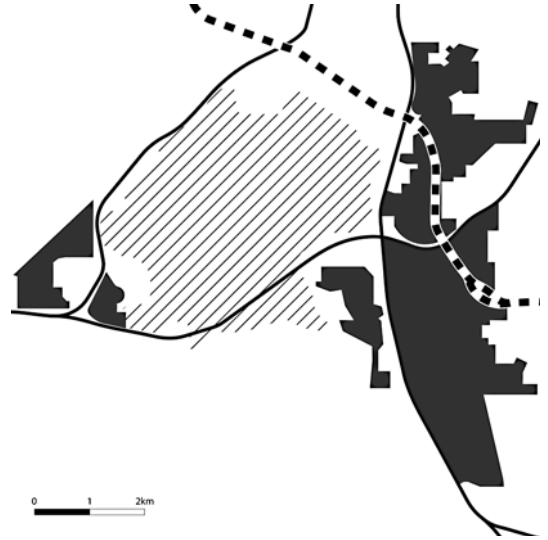


Figure 11. Atlanta, a zoned cluster of industrial land.



Figure 12. Atlanta, airport dominates the industrial landscape, with a variety of industries from the southeast corner.

working autonomously from both the spatial and managerial perspectives. Often functioning as independent campuses, these areas are frequently surrounded by open spaces and located in close proximity to major infrastructure such as railways, highways and airports. This allows workers to commute to and from work and facilitates the shipment of products and goods. To date, the industrial park typology is the preferred model for many countries and manufacturers that aspire to create a 'global' location. This preference has further contributed to the lack of consideration given to manufacturing in city planning.

These three prototypes – integrated, adjacent and autonomous – demonstrate the increasing separation of manufacturing from the city, the strengthening of the central management of industrial zones and the increasing influence of international companies on local economies and physical spaces (figure 13). This increased separation between city and industry is accompanied by programmatic and geographic changes in the city region.

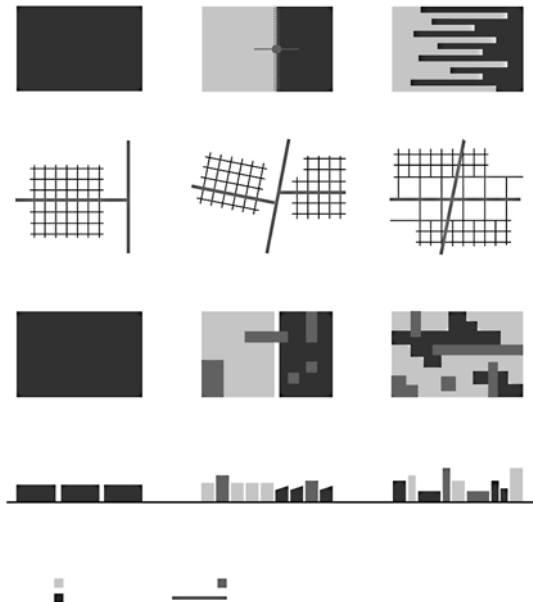


Figure 13. Prototypes of Industrial Spaces: infrastructure, programme, and skyline.

As a whole, these three spatial prototypes manifest economic development and the political and spatial relationship between city and industry highlighting three main trends. The most notable trend is a *shift away from the city*. This process began with the concept of strengthening the region at the beginning of the twentieth century. Following the models of the Garden City, the Industrial City and the Radiant City, this trend was reinforced by a strengthening global economy that favoured the autonomous model, which was centralized, not dependent on location. A second trend is the strengthening of the *centralized management* model, particularly the strengthening of international companies and their impact on local economies. This strengthening changed the typologies of industrial areas, enhancing the development of the supervised industrial park model, with its rustic traditional sense of academic-technological image. A third trend is the prioritizing the development of *specialized industrial environments* associated with the promotion of science that are 'innovative' and 'clean' and the desire to create a place that is 'out of place' and connected to the global environment.

The Way Forward: Which Prototype Best Serves the Twenty-First-Century City?

The relationship between city and industry is not very sophisticated, as the two have been kept separate for more than half a century. However, as the global sustainability movement has taken root, all sectors of society have come under scrutiny for their potential to reduce human-driven climate change. Private actors in industry are reacting strongly, not only complying with environmental regulations but also seeking opportunities to strengthen their corporate responsibility ethos while improving the bottom line. New thinking in supply chain management, especially in regard to local production, is beginning to take root, supplanting modernist concepts of separating production. Cities are recognizing the opportunities that industry can bring,

especially in terms of job creation. Technology is enabling the reintroduction of urban manufacturing (*The Economist*, 2012). In short, a major opportunity is emerging to redefine the role of industry in the city, making it as much a part of the urban fabric as housing or commerce.

The aim of analysing varied typologies of the city–industry relationship is to increase understanding of city–industry dynamics and to promote manufacturing as a key to the development of future cities. Which of the prototypes is the most adaptive to environmental and social challenges? What is manufacturing going to look like in the city of tomorrow? These questions consider the future of urban industrial land, which is an enormous challenge that the planning profession has barely begun to address. Physical planners and urban designers are, by and large, not tackling these questions. Left to its own devices, urban industrial land will not be redeveloped in a manner that supports manufacturing jobs. The near-term remediation costs and long-term competition from competing land uses are significant disincentives. Why should planners even care about urban manufacturing?

The first reason is *production*. Fundamentally, urban manufacturing provides production and job creation in cities that lack economic opportunity. When manufacturers began to move their operations from the city to the suburbs to reduce costs, they separated the factories from the city’s workforce, creating a ‘spatial mismatch’ between class and income. The commuting costs of the working class increased, which negatively impacted access.⁴ Bringing manufacturing jobs back to the core city could mitigate the harmful effects of industrial sprawl (i.e. the densification of existing fabrics) and integrate a variety of people into the labour market.

The second reason is *growth*. Urban manufacturing offers a chance to locate living-wage jobs where people live, something that has been overlooked by smart growth advocates who have concentrated on employment in

the ‘post-industrial’ economy (Leigh and Hoelzel, 2012). Measurable environmental benefits are associated with shortening commutes and reducing delivery distances among firms. Proximity can also bolster the strength of economic clusters due to the positive effects of knowledge spillover and a robust labour market. Manufacturing also has a multiplier that far exceeds that of service jobs (National Council for Urban Economic Development, 1994). For every job gained or lost, 2–3 supporting jobs are similarly affected. Promoting urban manufacturing is also good fiscal policy, as cities can generate additional revenue by allowing industrial land to be used efficiently.⁵

The third reason is *liveability*. There is a visceral quality to urban manufacturing that is essential to place making and civic pride in cities with an industrial core. Liveability is about connecting to the means of production and tapping into the city’s creative and constructive spirit. By implementing recycling models between plants and promoting a multi-dimensional resource management model, cities built on industry are celebrating their past, present, and future as centres of production. In addition, technology can help cities to face and tackle factories’ many nuisance activities.

In addressing these goals, planners should be concerned about, and investigate, the relationship between industrial cities’ contemporary contexts (i.e. changing labour markets, innovation and technological developments) and the regrowth of cities and metropolitan areas in an effort to enhance the image and redesign the role of industry in the city. Second, planners must sharpen the tools for industrial environment planning. A holistic view of city and industry is likely to produce a new understanding of the relationship between working and living. Finally, manufacturing is both the theme and the means by which future urbanism should be examined and developed. Thus, reevaluating manufacturing should be a primary goal of planners, urban designers and architects.

Awareness of this goal is critical to the future development of cities worldwide.

NOTES

1. Though most of the reports focus on the US, all of them are comparative, showing how economies such as China, India and Indonesia have risen into the top ranks of global manufacturing (competing with the US, Germany, Japan, France and Italy) and in the world's fifteen top manufacturing economies, the sector contributes from 10 to 33 percent of value added. See, for example, Atkinson *et al.* (2012); McKinsey Global Institute (2012); Pisano and Shih (2009; 2012).

2. The creation of model company towns was particularly evident in Britain in the latter half of the nineteenth century with the establishment of Saltaire (1888), Bournville (1895), Port Sunlight (1888), Creswell Model Village (1895), and New Earswick (1902). In the United States, one of the first company towns to be built was Pullman, Chicago (1880).

3. Summarized from the Initiative for a Competitive Inner City (blog). Available at: <http://www.icic.org/connection/blog-entry/bp-protecting-chicagos-industrial-through-pmds/bp>.

4. Sociologist William Julius Wilson reported that the exodus of manufacturing jobs from northern cities was especially detrimental to black men (Wilson, 1987).

5. A study conducted by the Initiative for a Competitive City showed that industrial land was a net positive proposition for the city of St. Paul, Minnesota. While gross property tax revenues are higher for residential uses, they are negated by the cost burden of additional services. This is not the case for industrial uses. Manufacturing is also an excellent choice for brownfield redevelopment, as its level of remediation is less extensive than that for other uses.

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