Industrial Urbanism

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Industrial Urbanism
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This thesis presents the history of urbanism through the point of view of the evolution of the productive process history from the first Industrial Revolution (1760-1840) to today, as well as a proposal for a development of an area in Trelleborg, Sweden that includes also manufacturing, based on Europan Competition's 2017 theme of “Productive City”. In the first part it presents the history of the industrial era starting from the 18th century until today though a chronological diagram, including political, social and technological events, as well as important urban planning ideas and innovative factories. Then proceeds to a more extended presentation of industrial urbanism theory based on theoretical approaches and realized examples. The final part of the thesis presents a case study of the “productive city”, which includes the masterplan of the area, diagrams for the location of manufacturing and ideas for the types of manufacturing that could be included in the urban block. It concludes with final consideration about production and the role it can play for a better future.
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INTRODUCTION

Those wanting to find out about our past, should dig in the ruins of factories.  
Those wanting to find out about the present day should study present day factories.  
And those wanting to speculate on the future should ask questions about the factories of the future.  
(Vilem Flusser, 1999, p. 43)

The factory, the production process, their history and future can be considered as the basis of culture and human civilization since the first Industrial Revolution (1760-1840). Twentieth century Czech philosopher Vilem Flusser describes the mankind as “homo faber” instead of homo sapiens and claims that to look into factories is to look into human history from its core. The factory can be considered the driving force of the city, and it determines the city’s evolution and typologies since the economy based on production and power defines who controls and has power over the society.

Factories have contributed to the urbanization due to the need of human power that would run the productive processes and it is the factories’ allocation in space and their evolution through time that characterized society, politics and space for almost the last two centuries. For example, the transfer of factories away from the city centre delineated the idea of zoning, which was the epicentre of the modernistic urbanism, and such fact has also led to the expansion of the city’s limits and borders, creating the idea of “suburbia”. Later, the transfer of factories to countries with cheap labour power characterized the beginning of Globalization, leading to todays’ globalized culture, economy and urbanism, displaying new urban typologies for production and logistics areas in the export processing zones (EPZ) of the world.

The question about the production in the future is a question of the future of society itself. The technological advancements of last decades have opened the way to new forms of production, that could potentially lead to a new economical and societal system, where the individualized production to order, the open source material and the advancements to robotics are changing not only the forms of the factories but also the urban environment. Inspired by the theme of the latest European Competition “Productive cities”, this thesis examines briefly the history of industrialization through technological achievements, social changes, urban development theories and architectural forms, presenting urban theories from modernism to today, and finally it proposes ideas and examples of how the new production process could be included into the urban fabric.
Bernd Becher, Hilla Becher
Winding Towers
1966-97
CHRONOLOGICAL AXIS OF PRODUCTIVE CIVILIZATION
1700-1800 INDUSTRIAL REVOLUTION
Stream powered machinery allowed factories to be located anywhere, and were the driving force behind the Industrial Revolution

1776 ADAM SMITH, THE WEALTH OF NATIONS

1791 PANOPTICON
Semi circular structure, designed by Jeremy Bentham, allowed surveillance from a single point.

1800S FALL RIVER
A series of vertical stone mills contribute to the boomtown in Massachusetts

1809 ELECTRIC LIGHT

1810 PRINTING PRESS

1810 KRUPP STEEL, ESSEN GERMANY
A significant steel foundry expands to manufacturing weapons in WWII.

1817 8-HOUR WORK DAY
During the industrial revolution, factories had 10- to 16-hour workdays, six days a week. In 1817 Robert Owen establishes the slogan “Eight hours labor, eight hours recreation, eight hours rest”.

1820 LOWELL MASSACHUSETTS
The company town employing mainly female workers is the largest textile center in America

1830S STEAM-POWERED RAILROADS
ELEVATORS USED IN FACTORIES
DYNAMO, MICHAEL FARADAY

1834 TYPEWRITER

1840-1870 CAST IRON BUILDINGS
Cast iron is cheap mass produced, and is being used extendedly in cities.

1851 THE CRYSTAL PALACE, LONDON
Designed by Joseph Paxton, architect, with revolutionary use of glass and prefabricated elements

1859 JEAN BAPSTISTE GODIN’S FOUNDRY AND FALILISTERE, GUISE, FRANCE
A utopian industrial community with attention to the worker

1859 BIRTH OF PETROLEUM OIL

1867 DAS KAPITAL, KARL MARX AND FRIEDRICH ENGELS
1871. D. S. TAYLOR PLAN
Real estate developers made speculative subdivisions of land around the Calumet River. Slips and wharves along the Calumet River, as well as adjacent railroads, provided excellent transportation for industry and trade.

1882 FIRST LABOR DAY PARADE
First observed on September 5, 1882 by the central labor union in New York, labor day becomes a federal holiday in 1894 following the deaths of workers during the Pullman strike in Chicago.

1886 HAYMARKET AFFAIR
The growth of American industry gave birth to the unions. In Chicago, a riot supporting striking workers ends with a bomb blast and gunfire, killing civilians and officers.

1898 GARDEN CITY
Ebenezer Howard, author of Garden Cities of To-morrow, develops the idea of a utopian city where man lives in harmony with nature.

1901-1917 UNE CITE INDUSTRIELLE, TONY GARNIER
Garnier publishes his utopian vision for an industrial city with mixed uses in buildings, made of concrete.

1908-1909 AEG FACTORY, TURBINE HALL, BERLIN, GERMANY
Peter Behrens designs the monumental factory with repeating three pin arch steel frames.

1909-1917 UNE CITE INDUSTRIELLE, TONY GARNIER
Garnier publishes his utopian vision for an industrial city with mixed uses in buildings, made of concrete.

1910 FORD PLANT, HIGHLAND PARK, MI
Architect Albert Kahn designs the largest American factory, that uses a full assembly line.

1911 PRINCIPLES OF SCIENTIFIC MANAGEMENT, FREDERIK W. TAYLOR
Taylor publishes his theory “scientific management” with enforced standardization of methods for faster and more efficient work.

1914-1918 WWI EUROPE

1915 GROWTH OF DETROIT AS AUTOMOTIVE MANUFACTURING CENTER

1917 - 1927 OCTOBER REVOLUTION RUSSIA
Lenin, inspired by the marxist theory leads the revolution of the proletariat in Russia and establishes the Marxist-Leninist theory and the beginning of communism, changing the working conditions for the factories in Russia and other countries.

1923 VERS UNE ARCHITECTURE, LE CORBUSIER
Le Corbusier publishes his manifest about modern architecture influenced by industrial buildings’

1923-1939 BATA, ZLIN, CZECHOSLOVAKIA
A group of architects design a factory city for a shoe company with modern construction and technologies.
1925 BAUHAUS SCHOOL, DESSAU, GERMANY
The Bauhaus school (1919-33) founded by Walter Gropius connects art with mass production and industrial design and combines architecture with art and craftsmanship creating a total work of art.

1929 THE GREAT STOCK MARKET CRASH

1934 FOREIGN-TRADE ZONES ACT
Encourages foreign commerce in the US, where merchandise can be held in a zone without being taxed, lowering the costs of U.S.-based operations engaged in international trade.

1935 OLIVETTI, IVREA, ITALY
Beginning of construction of the factory city by Luigi Figini and Gino Pollini in Ivrea, Italy, which continued for 50 years.

1938 RENAULT FACTORY OCCUPATION, FRANCE
Workers strike due to cuts in hours and wages that led to new labor laws that include 40h week and social security benefits and paid holiday.

1940-1945 WWII

1940s FLUORESCENT LIGHTING
GE introduces fluorescent lighting in the world’s fair of 1939, which will allow factories to be independent from natural lighting, that led to deeper floor plates and longer workdays.

1941 PREFABRICATED HOUSES
Walter Gropius and Konrad Wachsmann design prefabricated houses for the General Panel Corporation.

1942 ROSIE THE RIVETER
An iconic cultural image of feminism representing women that replaced men in the factories during WWII.

1946-1951 USINE CLAUDE & DUVAL, SAINT-DIE, FRANCE
Le Corbusier designs concrete frame factory, exemplifying his modular system.

1947 GEODESIC DOME
Buckminster Fuller builds his first geodesic dome.

1948 COMPUTER ENIAC, FIRST DIGITAL COMPUTER PHILADELPHIA PA

1948 MECHANIZATION TAKES COMMAND, SIGFRIED GIDEON
Giedion influences history of society from the perspective of technology and mechanization.

1948 MARSHALL PLAN
The financial aid to help Europe recover post WWII and increase the reach of American capital in Europe was in place for four years.

1951 BRYNMAWR RUBBER FACTORY, BRYNMAWR, WALES
Designed by the Architect’s Co-op, covered by nine huge concrete shell domes with punctuated circular skylights, whereas the outer parts were roofed with concrete barrel vaulted shells.
1952 COMPUTER NUMERICALLY CONTROL (CNC) MILLING
MIT develops CNC machine which allows cuts with high precision.

1954 INDUSTRIAL ROBOT
George Devol invents the first digital and programmable robot, called Unimate, which sells to General Motors.

1956 CLEAN AIR ACT

1959 BACARDI RUM FACTORY, CARRETERA, MEXICO
Felix Candela, engineer creates thin shell concrete domes to span 24 meters, embodying Mexico’s rapid industrialization of the post war years. His firm completes over 800 factories in the 50s and 60s.

1960-1964 CARTIERA BURGO, MANTUA, ITALY
Pier Luigi Nervi, engineer, designs a paper mill with a cable supported structure suspended from two reinforced concrete trestles.

1960s - Present HONG KONG
The city begins large scale development of high rise factories in the center.

1961 FIRST MAN IN SPACE
Russian Cosmonaut Yuri Gagarin is the first man to orbit around earth, which pressure JFK to mobilize funding for the U.S. space program.

1962 JOBRA LABORATORY
Miguel Fisac, architect, designs an innovative concrete structure with rotating floor plans. Demolished.

1965 - Present MAQUILADORAS, MEXICO
Manufacturing facilities on the borders of Mexico, where materials are imported and products exported without duties.

1967 SHIPPING CONTAINER STANDARDIZATION
Standard sizes for containers were agreed upon among international shipping, railroad and trucking companies to make compatible systems.

1967-1970 OLIVETTI, HARRISBURG, PA
Luis Kahn and structural engineer design a flexible organizational system with 72 pre-stressed locking concrete units.

1969 BAR CODE SCANNER
Product data can be read as optical readable data by a machine, making information about a product irrelevant to its size.
## CHRONOLOGICAL AXIS OF PRODUCTIVE CIVILIZATION

**1970s**

**BENETTON RETAIL TO FACTORY**

**FEEDBACK LOOPS**

**JUST-IN-TIME PRODUCTION METHODS, TOYOTA**

**COMPUTER AIDED MANUFACTURING**

- **1971-1975 WILLIS FABER AND DUMAS, IPSWICH, ENGLAND**
  “High-tec” factory designed by Foster & Partners, where the center space in constructed from a grid of concrete pillars supporting cantilevered slab roofs.

- **1973 FIRST CELLPHONE USE**

- **1974 NANOTECHNOLOGY CONCEPT INTRODUCED**
  Nanio Taniguchi, scientist, introduces innovative ways to study the molecular scale.

- **LATE 1970s BUILDING INFORMATION MODELLING (BIM)**
  The process of organizing building data on linked computer platforms.

- **1977 APPLE II**
  First personal computer produced by Apple

## 1980s

**SILICON VALLEY**

A hub for innovation develops south of San Francisco.

**OUTSOURCING**

Subcontracting beyond national boundaries that led to the dispersal of manufacturing away from traditional production centers.

**INDUSTRIAL SYMBIOSIS, DENMARK**

Kalundborg Industrial Park exemplifies an early system of material exchange in an ecological industrial development.

**1989 REDESIGNING THE URBAN FACTORY, BERLIN INDUSTRIAL CULTURAL PROJECT**

- **1989- present VITRA CAMPUS, WEIL AM RHEIN, GERMANY**
  A campus that encourages interaction between workers, product and clients with buildings designed by famous architects, elevating the firma’s design image.

- **1990s**

**WWW/HTTP/HTML**

**NIKE SWEATSHOP INVESTIGATIONS**

In May 1998 NIKE promises to follow the U.S.A. OSHA standards to end child labor abuse and allow external monitoring of the facilities in Vietnam, Indonesia and China.

**INDUSTRY CLUSTERS**

Industry clusters for advanced productivity by concentrating interconnected businessmen and suppliers.

- **1993 WINKHAM ASSEMBLY HALL, BAD MUENDER, GERMANY**
  New standards for sustainable industrial architecture being set by Herzog & Partners.
1994 NORTH AMERICAN FREE TRADE AGREEMENT NAFTA
An agreement between Canada, Mexico and the U.S.A. to create a trade bloc.

1997 KYOTO PROTOCOL
UN Framework Convention on Climate Change establishes an environmental treaty between global industrialized nations.

2000 OPEN SOURCE MANUFACTURING
A system of manufacturing based on licence and royalties free designs accessible to the public, especially those who own 3d printers.

2002 SOCKS CITY, DATANG CHINA
Almost 75% of international market’s sock supply is produced there.

2002 GLOBALIZATION AND ITS DISCONTENTS, JOSEPH E. STIGLITZ

2005 35H WORKWEEK ABOLISHED IN FRANCE

2005 BMW FACTORY, LEIPZIG, GERMANY
By Zaha Hadid architects

2006 HIGH TECH ASSEMBLY
Workers in a high-tech assembly line of photodiodes, handle the receiving end of signal coming across an optical fiber.

2007-2008 R-O-B, MOBILE FABRICATION UNIT
A robot that can be used on construction sites

2008-2015 DUBAI INDUSTRIAL CITY
Renamed to industrial park it covers more than 500 hectares, and offers industrial land, labour villages, industrial land, warehousing facilities and offices.

2009 PAJU BOOK CITY
Paju Book City in South Korea as a cluster of book and media related trades with architects designing numerous of buildings, inspired by Wales’s famously bibliophilic market town of Hay-on-Wye.

2010 FOXCONN SUICIDES
18 attempts of suicide in a year linked to low pay at the so-called “Foxconn City” industrial park in Shenzhen, China, manufacturer of electronics for companies like Apple and HP

2011 SMALL-SCALE 3D PRINTERS
Companies like MakerBot develop small 3d printers for personal and industrial use.

2013 RANA PLAZA
Factory building, that produces products for big international clothing companies, collapses killing more than a thousand workers in Dhaka, Bangladesh. Raised consideration about working conditions.

2014 WASTE-TO-HEAT TRANSFER PLANT
BIG Architects design a mixed use infrastructural project in Amager, Denmark.

2014 HYBRID FACTORIES
Normal builds a hybrid factory show room designed by HWKN Architects in the Chelsea district in New York.
THEORITICAL ANALYSIS OF INDUSTRIAL URBANSIM
Urban theories and international literature rarely consider the position of the industry in the city, which can be ironic, since the existence of the urban is based on energy power, needing natural resources such as rivers, forests and seams of coal combined to the need of labour power, such as human labour, intellect, invention and consumption. Industry and commerce both led to the establishment of cities, and they determined the infrastructure and the networks that organize the distribution of materials and products. Finally, cities contained organized systems of dispersal of goods such as trade routes, marine ports, shipping networks and marketplaces. The Industrialization that led to rapid urban growth was ignored and set aside during the 20th century, although the resilience and the prosperity of the cities was dependent on the factories.

The historian Hubert Bourgin (1875-1955) defined four different types of productive spaces based on production growth; the first one was a cluster of workshops, the second was a series of workshops connected by process but dispersed, the third one was an organized, concentrated, and supervised form of manufacturing (the manufactory), and the fourth was factories. These stages of development of productive spaces existed simultaneously for many years. As Adam Smith (1723-1790) points out, the need for specialization in the production caused the formation of industrialized areas. At this point there are the development of theoretical models concerning the economy of capitalism and the spatial organization of the new system, for example Walter Christaller (German Geographer 1893-1969) developed the Central Place Theory, a system for creating a hexagonal based network that connected the cities, the marketplaces in order to reduce the transportation distance.

The technological and economic growth in the late nineteenth century has driven the development of urban factories and the necessary networks to support the
production, as well as to the growth of sectors of construction and commerce. The growth of industry impacted space and, as Henry Lefebvre (1991) emphasized that:

Therefore, we may justifiably speak of a transitional period between the mode of production of things in space, and the mode of production of space. The production of things was fostered by capitalism and controlled by the bourgeoisie and their political creation: The State. The production of space brought other conditions in its train, among them the withering-away of the private ownership of space, and, at the same time, of the political state that dominates the spaces. (Lefebvre, 1991)

What is essential for urban space in a capitalist environment is that it became a product itself, a commodity, subjected to the rules of the market and controlled by those in power. The factory and its negative side effects, that included pollution, noise, but also the poor people who came to the city looking for work, should be removed from the city, generated a process of removal, but also a process of development of utopian/visions of factory cities. Nina Rappaport categorizes these ideas for the factory city in two categories, the utopian factory city, which were essentially not able to be realized, the pragmatic utopias, which were realized. (Rappaport, 2015).

The utopian socialist vision for the new productive space was based on plans developed by industrialists, philosophers and architects to solve the social issues to
provide a space that would improve the working conditions, meeting the industrial goals. These plans included, besides the production unit, also housing, social places and amenities for the workers in order to accommodate the civic life. For example, Charles Fouriers (1772-1837) “Phalansterie” was a plan for a universal building, that could house 1620 people and combined urban and rural functions, including communal and educational facilities. The utopian factory city was a vision for a new city that had mostly clear limits, and combined work life with social life, creating an ideal society, using space and planning in order to impose a specific lifestyle.

Two of the most impressive plans were the futuristic "Cite Industrielle" designed by Tony Garnier (1896-1948), and “La Citta Nuova” by Antonio Sant’Elia. In a true modernistic way, those were inspired by the machine and technological progress of the era, they designed ideal cities were the industry was in focus incorporating the most advanced technical and social ideas. They were universal plans for what they considered what should be the typical future city. Despite their intentions, these plans were completely alienated from the familiar forms of the urban and they became the background to dystopic artistic expressions such as Fritz Lang’s 1927 movie “Metropolis”, were the workers were confined in a subterranean area of the city, juxtaposed to the luxurious life of the bourgeoisie. The utopic visions for the city and for a new society will remain being as a definition of “unbuilt”, but they will also inspire a lot of the realized plans for industrial complexes, that would be developed as complete cities by industrialists.

Removing all the experimental and futuristic elements of the utopian ideas for the industrial city, capitalists will have built new complexes that will include

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1. Phalanstery 1846, from French phalanstère, name for one of the socialistic communities of c.1,800 people, living together as family, proposed as the basic unit of society in the system of French social scientist François-Marie-Charles Fourier (1772-1837), coined by Fourier from phalange, properly “phalanx” (see phalanx) + ending after monastère “monastery.”
2. Città Nuova (“New City”) was displayed in May 1914 at an exhibition of the Nuove Tendenze group

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the factory, and they will provide also housing for the workers, and in many cases, they will create a microcosm, where they will control the life of the worker in a paternalistic way. Although the working and living conditions in these complexes were improved compared to previous situations, the realization of the workers that their life was under a microscope and controlled 24/7 will lead to organized protests in order to claim their rights.

The first plans for such complexes were likened to Bentham’s Panopticon (1791) allowing continuous surveillance and adopting a theatrical form, where the production was considered similar to a theatrical play where the audience was the consumer. As Foucault (1985, p.14) said: “the panoptic mechanism arranges spatial units that makes it possible to see constantly and to recognize immediately”. Examples of these type of designs are Royal Salt Works in Arc-et-Senans, France by Claude Nicolas Ledoux (1736-1806) and American Watch Company, Waltham, Massachusetts, early 1980s. The efforts to regulate workers life in order to, basically, increase productivity and avoid unsuccessfully uprisings will be evident in many factory cities no matter their layout is. For example, in the Merrimack Mills and Print Works, Lowell, Massachusetts factory, the workers will be young women “factory girls”, who came from the countryside and worked there until they were of marrying age.

One of the most influential planning concepts aimed to ameliorate the industrialized city was “Garden Cities of To-morrow” by Ebenezer Howard (1850-1928), based on Fourier’s philosophy. He envisioned a new town surrounded be commonly owned rural space with separated functions, where the commerce living where situated in the centre, whereas the unwanted uses, such as factories, were located in the periphery of this circular diagram in order to achieve the “Smokeless Slumless City”. His ideas inspired the designing of communities in England such as Port Sunlight for Lever and Bournville for Cadbury in 1983.

The process of removal of factories took place in order to remove the cause of pollution from the city centre raised the question for many cases of the inability to contain the smog in the area, thus questioning the effectiveness of the idea. Moving the factories away meant moving away the workers too and proceeding to a cleaning process of the central areas by removing the unwanted elements, such as people and low-quality housing areas. Many cities proceeded in the creation of industrial zones and regulations land-use rules that prohibited the development of factories in certain areas. As the industrial evolution required continuously more space with the development of new infrastructure, planned districts were created far from the central areas, taking advantage of existing infrastructure such as railroads by creating a network of industries of clusters of similar or complementing types that would share resources.

As Rappaport points out:

*Industrialists who abandoned urban land ultimately decreased the values of the*
The Depression enhanced that dichotomy between cities relying on industry versus their forms of development, de-emphasizing the integrated urban manufacturing that was the source of the economic growth in the early twentieth century and emphasizing the renewed physical heterotopia of the districted factory enclave (Rappaport, 2015, p. 91).

The worker who remained in the city centre had better options to advance and he was exposed to more opportunities, culture and education compared to the one that was living in the outskirts, isolated. The social injustice, the demand for faster and harder work, and the generally unliveable conditions of the factories led to a series of demonstrations and strikes in many factories, especially in the U.S.A where they contributed to the improvement of the working conditions and the establishment of basic working rights for the western world, social rights that today are taken away from the working force, particularly in factories in developing countries.

MODERN INDUSTRIAL URBANISM

The establishment of Modernism and Taylorism as a thought system affected modernistic urban planning, which focused on a pragmatic functionalism and the establishment of order in the chaotic urban environments. Although claiming to view the city as a machine and being inspired from the new spirit (Le Corbusier, 1925), the proposals for the modern city considered industries on a case to case basis, and supported zoning and further separation of production from the city. With industries continuously being removed from the urban centre, modernistic industrial urbanism was implemented in specific areas, where owners hired modern architects to design pragmatic utopias such as Bat’a’s Zlin, Olivetti’s Ivrea and Siemens’ Siemensstadt.

Olivetti

Olivetti’s industrial city in Ivrea was a complex of modernistic buildings that took more than fifty years to be developed and had over eleven thousand people working and living in it, producing the famous typewriters, the first Italian computer and machine tools that would later be used for gun and airplane parts during the world wars. Olivetti created a company identity based in elegant modern designs and the company will hire architects Luigi Figinni (1903-1984) and Gino Pollini (1903-1991) “to design a factory that would be suitable for human beings as well as machines, appearing hospitable and colourful both in its facade and its interior”. The company continued to hire many architects to design the various factories included in the city, but also various types of housing, school for the children, community service buildings, swimming pool and gardens, hospital, a cultural centre, and other facilities for leisure. The main idea was to combine high productivity with the worker’s well-being and social responsibility. The connection of Olivetti with modern architecture
will continue with commissions to famous architects for the development of factories also outside of Ivrea, and their belief in high quality design and social welfare made Olivetti's industrial city one of the best examples of pragmatic utopias.

The removal of the industries from the urban space and their relocation along main roads will create the idea of the Linear City, a concept originally devised by Arturo Soria y Mata (1844-1920) in 1882 in Madrid, and it will later reappear in Soviet Union in Nikolais Milyutin's (1898-1941) plan for Sotsgorod in 1930. In contrast to the circular development of the Garden City, the Linear city plan will place industry, housing and public buildings parallel to each other in close proximity. In the Soviet Union, the rapid industrialization will lead to development of such urban plans and the creation of cities based on modernistic ideas and, at the same time, these plans will even inspire Le Corbusier in his design of the Radiant City (Rappaport, 2015). Although the linear city plan was mimicking in a lot of ways the production line in the factory, the development of such plans further contributed to the de-urbanization of the factory.

The two world wars will also affect urban planning and intensified suburbanization and further removal of industry from the city. At these times, the industry, especially the factories that were part of the weapons and guns manufacturing, became part of critical infrastructure of the country as they could be targeted by the enemy. Subsequently, they were relocated into the country side and camouflaged in a way that reminds an early landscape urbanism. In other cases, the industry was moved either to the underground of the city or to the mountains, but one of the most interesting urban planning projects of WWII was the Manhattan

Olivetti Factory City in Ivrea, north-west Italy, Olivetti sought 'harmony between private and public life, between work and the home'.

project’s cities, like Oakridge, Tennessee. These industrial cities developed with high security standards, suburban plans, dispersed and low in density, will remain hidden from the rest of the world for many years.

During the years of rapid industrialization, the separation of living and working will be in the centre of urban planning and city regulations. The form of the urban environment even today will be determined by these ideals of suburbanization and social segregation, and the results of these decisions have been so far almost impossible to rectify. The industries will continue to grow for many years after WWII and their growth will be responsible for the phenomenon of urbanization, whereas the modern cities will be dependent on industry for the provision of jobs, goods and food. The factories were always pushed away to the limits of the cities, creating an alienation between production and consumption and a failure to recognize the importance of the productive process for the urban life, both economically and socially.

Gradually, the cities in the western world will be transformed from “production centres” to “consumption centres”, offering services instead of products. This new type of the society of the spectacle (Guy Debord, 1931-1994), where “all that once was directly lived has become mere representation.” (Debord, 1970) will exclude the factory from the urban discourse. The need for increased production in order to serve consumerism and the aspiration for maximum profits will finally relocate the industry further away from the developed urban western world into developing countries in the rest of world, creating a new era of globalization.

In the era of globalization and the third industrial revolution (Rifkin, 2011) the production process will change drastically and the economic, social and spatial consequences will affect cities in various dramatic ways. The industrial areas will continue to grow and new factories will continue to be built at the edges of the cities until at least the late 90s, expanding the limits of the city and creating new mono-functional usually areas. On the other hand, even as early as the mid-60s will begin the establishment of special economic zones in developing countries, which enabled the relocation of the factories away from their “hometowns”, a process that continues today. The quest for continuously rising profits, to which the workers’ rights and the general improvement of life conditions and expectations in the western world were a definite obstacle led to the idea of the “deterritorialization” of the factories. Factories were moved into countries with more “friendly conditions” and in extreme cases even in large ships. This process created both new urban and industrial areas around the world, but also left previous industrial areas open for development.

The ramifications of the “deinstraightization” of the western world led for the first time after the first industrial revolution to the phenomenon of shrinking cities, for example the case of Detroit in the U.S.A being one of the most shocking. Whereas, in the beginning of the removal of the factories of the city, provided with space for urban development and gave the opportunity for land speculation and the construction of new housing areas, after the real estate market crisis of 2008, the absence of the productive process of the city became obvious, in a way that cities had lost their basic support system for their economy and job market. The place of industrial ruins took abandoned housing areas and the abundance of available space became problematic for urban life for the first time in urban history. The idea of re-establishing the productive process in central urban areas, and the reuse of old industrial buildings for new types of manufacturing could possibly lead in the regeneration of these shrinking cities.

On the other hand, not all cities had the fate of Detroit, urbanization continues and people still move to cities with the dream of living a better life; cities that are the economical centres of the world, with a strong service/information sector, such as New York and London, continue to raise their population, which creates an almost constant demand for housing, and an inflation in land and housing prices. One example of a significant population raise is Stockholm, which is the fastest growing city in Europe with a prediction of 11% population growth (Stockholm Handelskammare, 2015), mostly due to the migration wave.
Stockholm

Industrialization in Sweden began late during the second half of the 19th century and, by the end of the century, the first multinational companies based on advanced technology had emerged in Stockholm. The result was a rapid urbanization, with people moving from the countryside to the city and, by the end of the 19th century, less than 40% percent of the population was born in Stockholm. Factories were situated mostly in areas outside of the city's limits and in the beginning, there were areas close to the water; but also in Södermalm, where most of the workers and poor immigrants were living since the beginning of the 18th century. Later industrial areas were designed on the outskirts of the city, for example:

- Hornsbergs strand 1750-00s;
- Årstadalshamnen (Liljeholmen today) (1840-00s);
- Norra Djurgårdsstaden (1880s-00s);
- Hammarby industriområde and Lugnets industriområde (1930 - 00s) (Hammarby sjöstad today);
- Slakthusområdet (1880s - today);
- Ulvsunda industriområde (1900s - today)
  and later;
- Högdalens industriområde 1950s – today;
- Eriksbergs industriområde 1970s;
- Västberga industriområde (first industries 1900s, first plan 1943-today).

In Stockholm, there have been three types of land management of the industrial areas, depending mainly on their proximity to the city centre. The first one is redevelopment, the second is preservation as industrial, and the third one is their evolution to mixed use zones. The de-industrialization of the cities and globalization contributed to the degradation of the industrial areas in Stockholm during the 90s.

The majority of the areas that were situated close to the city center was almost completely leveled and redesigned into areas where housing was the main use, together with a few shops and some public services. In these areas, there are today none or very little evidence of their industrial history. Usually, the remainder is one or two important buildings that were preserved; one of the most impressive recent ones is the gas power plant in the Norra Djurgårdsstaden area that is being converted into a cultural center, which is an international tactic for these type of spaces (e.g. Gazi Cultural Center, Athens). For the last twenty years, these industrial areas have been gone through a complete transformation, where the land value has risen through the development of mostly expensive housing.

The industrial areas that were designed later are now located further away from the center and the main residential areas. Although in a city that is constantly
1,2 Slakthusområdet, 1912 aerial foto and axonometric.

3. Aerial photo of the area as it exists today.

4. Plan for the area that should be completed around 2030

5. Industrial Buildings under preservation order

6. 3d visual of the area’s future plan, approved in 2017

source: 1,3,4,5,6. Stockholmskällan. Stockholms municipality webservice: https://vaxer.stockholm.se/omraden/soderstaden/smakthusomradet/?page-21-16032=2#page-21-16032

growing, such areas are gradually being surrounded by housing projects, which could compromise their position. On the other hand, they display different characteristics from the older areas, due to the fact that the industries are cleaner, as well as, that most of them include logistics, storage, high tech industrial companies and offices, and less of heavy industrial uses and big factories.

The third case is Slakthusområdet (trans: slaughterhouse area), which is an area close to the central area of Stockholm, that since the beginning of the 20th century has been the main distribution point for meat in Stockholm. Today it is an area with multiple functions, from slaughterhouses and distribution storages, to offices, restaurants and clubs and soon housing, which makes the area unique in Stockholm. The future plan is adding more housing, schools and sports centre, changing the character of the area to mainly residential and moving the food industry to Larsboda.

The majority of European cities managed the majority of their industrial areas in a similar way to Stockholm, by a complete removal of industries and their replacement by housing or in some cases parks. The symbiosis of industry and residential areas is still not being considered during the 00’s as the requirements for these land uses could be easily thought of as contradictory. On the other hand, in many cities, the meatpacking districts, that were always connected to the food culture and included restaurants, have been gaining popularity as an entertainment spot and include today also bars and clubs in an environment which creates an informal feeling. As far as the building stock is concerned, some of the important older industrial buildings has been renovated and reused as cultural centers, offices or housing. Contrary to them, important architectural factory buildings from the later stages of industrialization have been demolished.

Whilst, heavy manufacturing has been transferred far away from the urban environment, and there are still some new industrial buildings being constructed in Europe and the U.S. These new factories are designed by “star architects”, and they have impressive architectural forms and they are considered as part of the company’s marketing strategy and promotion. In such factories, some of them located in urban areas, the production becomes a spectacle for the consumer, a spectacle that includes high tech technology in a clean large well-designed space that could be associated more with a museum, where an elaborate art performance occurs rather than a factory. The new factory is environmentally sustainable, technologically advanced, both the building and its machinery and the manufacturing process itself are an image making tool for the company, that could be easily part of a residential area. As the industrial land use had been subtracted from the developed urban centres, it was added in territories in developing countries, through a specific set of international legislations and trade agreements, leading to the development of new cities (Shenzhen, China) and industrial areas that will enjoy a unique level of independence from the laws and regulations, and create a new typology of industrial urbanism.
Ever since the first commercial activities there were places in the world with special regulations for transactions for example, important ports that would allow them to become transit places for goods. In the last decades, the idea of zoning morphed into an international infrastructural city planning tool, which is being implemented worldwide, therefore, there are thousands of zones nowadays. One of the first cases was the Border Industrial Program (BIP) in Mexico, which allowed foreign companies to operate the maquiladoras (factories) while taking advantage of the cheap labor, which was mostly female. During the beginning of the 60s, the export processing zone would be established in Asia, mostly China and Taiwan.

The establishment of zones would be expanded and combined with more advanced planning tools would result to the development of new urban centers. One of the most advanced urban plans are called “Parks” for example, Dubai’s Industrial City that was renamed to Park. In such industrial parks, the free trade zones would be combined with container ports, offshore financial areas, tourist compounds, knowledge villages, IT campuses and even museums and universities. In some cases, the zones developed in cities added also housing to their land uses. For example, Shenzhen in China that evolved from a small fishing village close to Hong Kong to a megacity of nearly 14 million people and spread over 2000 sq. km that offers a number of tax reduction and exceptions, combined with low rent and cheap labor. It would also become a place of social activism initiated by a rising middle class, and also the creation of a research group in order to monitor the real estate activity in the area.

After the expansion of the zones worldwide, the idea of the zone as a place for international activities was used for the design of Dubai Humanitarian City as an outpost of relief agencies and NGOs. One of the most impressive examples is Abu Dhabi’s Masdar City, designed by Norman Foster is based on a square grid plan of an ideal multi-functional city.

An idea that was considered a temporary phenomenon in order to revamp economies evolved into a series of urban plans that are global, unrelated to the territory and that constitute an international network with specific characteristics, in a way that reminds a dystopian Ecumenopolis (Doxiadis1967), surpassing the physical world by being part of an evolved infrastructural space (Easterling, 2014).

The zone as an urban development tool is used also by cities in the U.S in order to invite high tech international companies to situate their offices there, by providing free infrastructure, cheap land, reduced taxes, entering a bidding competition with
other cities in order to solve social and economic problems.

What started as a temporary economical, administrative tool for the purpose of helping developing economies, and supposed to be absorbed by them after a series of mutations, became a planning theory and an epidemic that produced new cities as doubles to existing ones. As Keller Easterling notices:

For all its intentions to be tool of economic rationalization, it is often a perfect crucible of irrationality and fantasy. And while as spatial software, the zone is relatively dumb - the urban equivalent of MS-DOS - it has quickly spread around the world. Yet, for all these reasons, the zone is ripe for manipulation, and its popularity makes it a potential multiplier and carrier of alternative technologies, urbanities and politics (Easterling, 2014, p.27).
3. Plan for Abu Dhabi’s Masdar City, designed by Norman Foster

source: 1,2 Easterling K. ESC ZONE webside, http://extrastatecraft.net/Projects/Zone
3. https://masdar.ae/
The world is changing fast, the technological advancement has been so rapid, that the rest of the civilization struggles to keep on with all the new possibilities, creating a world where there is a substantial difference of what could have happened and what is actually happening. The world is experiencing not just an economical crisis, but also a societal and environmental, one could say also an existential crisis since we are failing to live up to our potential. The idea of a new democratic sustainable, inclusive and technologically advance civilization requires the reexamination of industrial urbanism as well as our consumption habits among other reconsiderations.

Facing the limited resources problem, both materialistic and spatial, we are facing the challenge of mixing living with production and creative alternative narratives of co-production, co-operatives, shared knowledge and circular local economies and environmentally friendly practices. The new urban production could be based on the latest technologies such as 3d printing in order to achieve high quality products. At the same time by taking advantage of creative commons licensing could reduce substantially the cost of production. The new urban factory could be developed vertically and be transparent and therefore a part of the social life of the city, but also provide a type of spectacle that could also be combined with tourism and touristic facilities. (Rappaport, 2015).

It is also important to take advantage of the existing infrastructure as well as designing additional infrastructure, especially transportation that could also accommodate the needs of production. Although the majority of the factories and

1. The evolution of the industrial process

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*Inclusive growth cannot be delivered by redistribution of benefits alone – it requires the democratisation of innovation and creating the distributed conditions for all of society to innovate and contribute to making the future.* (Indy Johan, 2016)
industrial areas in Europe have been replaced by residential areas, the remaining underused industrial sites could be redeveloped into mixed use areas for both living and working. These areas could become dense sustainable urban areas, where they provide with job opportunities and products not only for the local consumer.

The idea of mixed use cities and areas that include housing, commerce, offices, services and factories could be extended also to buildings, eliminating the need for exclusive industrial zones. We need to consider the size and location of the factory in the city. It is crucial to think about new productive units that use space efficiently, take advantage of the new technology, but also of how the productive process could broken down to smaller units that could be effectively included in the urban context. Going back to the first forms of industrialization the recreation of the cluster system and the dispersal of factories in the city could help us achieve multi-functioning resilient cities. The hybrid building is a building that includes a factory in flexible ground floor, office/commercial space in the floors above creating a buffer zone between the factory and the residencies on the top floors of the building. The building could also used advanced systems of heat distribution, taking advantage of the excess energy from the factory.

The experiment of the productive city could be a successful one if the cities develop the right regulations and legislations, that are flexible and allow experimentation in planning and designing new environments and can also lead to a truly sustainable city. The rethink of consumerism and production, of function and space, of the societal norms and economic systems is necessary for the future of cities and people alike. These new urban spaces could become incubators for a change that could affect the system in its core and achieve a paradigm shift in the human history similar to the one of the Industrial Revolution.
TRELLEBOX

EUROPEAN COMPETITION 2017
TRELLEBORG, SWEDEN
TEAM MEMBERS:
NEFELI MAKRYNIKOLA
JOAKIM LINDMAKER
IRO KALOGEROPOULOU
Reintroducing production into the city can't take the form of the functionally separated and hidden production of today, relying on ever-growing consumption, fuel for transport and space for special economic zones in low-wage countries.

Nor is the solution the spectacular production, which reduces manufacturing to an amusement, yet another commodity in the service economy.

No, the aim for both the city and the economy must be the everyday production. Economically speaking, this means focusing on the real needs and knowledge of the community at a local level, rather than trusting the whims of a de-localised economy and uncertain perpetual economic growth. This is not to say shun knowledge economy, it's just saying focus on the needs when deciding on how to develop the business climate.

Do this by involving the community in construction, production and shaping the city. Bring production closer to people. Use the street to transport, collaborate, market, sell and exchange goods and ideas. Future-proof the setup by making spaces and buildings flexible enough to be fitted out both as homes and as production spaces.

1. Main Principles

   FROM: TRELLEBORG

   TO: TRELLEBORG

   Involve community in construction.

   Involve community in production.

   Involve community in shaping public space.

2. The loop - idea for a lightweight tram

   Production: manufacture

   Production: agriculture

   Trellebox

   Sustainable mobility: tram

   Water culture

   Co-creating culture

   City life: see and be seen

   City life: swim on lunch break
The Trellebox is formed from the current Logistikcentrum and Spannmåslager, which are kept and transformed. In the first stages, they mainly act as a centre for logistics, storage, development and offers a good opportunity to make citizens part of the building process in a safe way. As more and more of the area is developed, the space is gradually used by community initiatives, production spaces etc. A tram station is put within, allowing integrated sustainable mobility services for business located within.

A track running in a loop connects the new district with the central station and the city centre, as well as industrial areas and with a possible branch to the new logistics centre.

The focus of the municipality, along with the continuation of the planning process, should be on identifying and encouraging local actors that could become producers of/in the new area.

Make the beachfront a series of spaces - all of it accessible to all, but not all of it looking or working the same. The western basin is a valuable asset, which is divided to serve several purposes. The inner part is closed off by means of a dam and the water is pumped out to make room for a parking garage, as well as filtrations pools for daywater. Atop the garage the cleaned daywater creates a swimmable shallow lake. The eastern part could be used for small scale clam and/or algae farms.

3. The Trellebox

< In the loop
A track running in a loop connects the new district with the central station and the city centre, as well as industrial areas and with a possible branch to the new logistics centre. The track is mainly intended for driverless pods for small cargo and passengers, but has large enough curve radii to accommodate occasional freight and passenger trains at low speed.
SCALES OF PRODUCTION IN THE URBAN BLOCK

**XXS - household handicraft**
Production in one's home
- weaving, a simple app, etc
- for own use and for others
- no employees
- 10 sq.m. shared space
- transport by carrying
- no noise or pollution
- contribution to street when selling at market and interacting with neighbours

**XS - street side temporary**
Very small scale production
- handicraft at market, summertime bicycle repair stop
- 1-2 people
- 20 sq.m. shared space
- transport by cargo bike
- almost no noise or pollution
- temporary contribution to street as eyes on street and activation

**One-size - City production**
Building construction
- at times several hundred people
- changing spatial needs
- transport by lorry, train and ship
- considerable noise and pollution
- could contribute to street as eyes on street, meeting points, community hub
S - standard shop setup
Small scale production
- carpenter, bakery
- 2-3 people
- 50 sq.m. space
- may have special requirements in terms of space and fittings
- contribution to street as meeting point, orientation, eyes on street
- transport by small vehicle
- limited noise and pollution

M - more machinery
Medium scale Production
- micro-brewery, small subcontractor
- 4-10 people
- 200 sq.m. space
- contribution to street as focus point, meeting point, orientation
but also need to regulate safety measures
- will have special requirements in terms of space and fittings
- some noise and possibly pollution
- transport by van
Keep it local
Capitalise on and enhance existing production flows. This means influencing the flows of goods within the municipality to keep things as local as possible. Both in spatial and economic/socio-cultural terms, the highly productive countryside needs to find an urban equivalent in refining and marketing - a Marketplace 2.0.

Everyday production
Bring production closer to people. The main axis of the production line - the main street - should be an integrated part of the production processes of micro, small and medium sized enterprises. Appreciate and develop more scales of production throughout the whole area.

Integrate street and production
Use the street to transport, collaborate, market, sell and exchange goods and ideas.

Constructive production
The long time frame of the project makes it important to make the city production (i.e. constructing houses) part of the productive city by localising parts of the prefabrication, employing and involving the community and using the Trellebox as a hub already in the first construction phase. Maybe in my back yard Allow for single housing units, but not towards main streets, parks, squares or waterfronts.

Work now and tomorrow
Future-proof the setup by making spaces and buildings flexible enough to be fitted out both as homes and as larger scale production spaces.
a productive city approach for Sjöstad in Trelleborg, Sweden.
We live in an era of urbanization, where 70% of the world’s population is predicted to end up living in cities. As a world society, we are facing pressing issues like the environmental problems, high consumerism and social inequality, among others. These issues have created a crisis that affects people and economy in a global and local scale with phenomena like migration, poverty, pollution, extreme weather conditions and war; all taking place every day. On the other hand, the technological progress is fast and not yet integrated into the contemporary civilization, which means that we are not living up to our potential. Such conditions point towards a change, a radical paradigm shift, that is necessary in order to improve life conditions and create a sustainable civilization with respect for human life and the environment. As planners and designers, we should think about the future, our proposals should provide solutions and include alternative narratives to the established way of designing and planning.

As pointed out in the historical analysis, urbanization has been historically linked to industrialization from the time of the first Industrial Revolution to the fourth (Digital Revolution), as production is the main reason for people’s migration to urban environments. Therefore, urbanism is also connected to the factory, as the location and manipulation of the industrial areas and of the working force is still being the main consideration of planning. While the western world cities went through a circle of industrialization and de-industrialization, we face today the role of the industrial areas as being overtaken by technological campuses for example (Google or Amazon), whereas in the developing countries, industrialization started essentially during the 60s and continues until today with the development of industrial areas being based on the zone, a set of rules and regulations that surpass the local ones, introducing the age of globalization. Contemporary production is international and globalized as the production of one single product like a shoe is spread in factories around the world.

Production in the globalization era created serious ramifications for human rights and the environment alike. The rise of consumerism demanded a lot of resources, but also the need for cheap labor, and the abolishment of workers’ rights, since Globalization has also two sides, the consumerism and the production side, where the population that produces is unable to consume. Still, the consumerist side of the world is going through an extended economic crisis, that manifests in high unemployment rates, migration, declining cities and states and inflated land and property values. The advancement in technology and the raise in productivity just
led to longer workdays and lower salaries and technology is being used mostly for entertainment reasons instead of being a force for improvement of living conditions.

The future goal for urbanism is to develop dense, multi-functional and sustainable cities, and to achieve that goal we need to consider also production by finding a way to reintroduce it as a usage in the urban environment. By rebuilding the connection between production and consumerism, we could achieve sustainability on many levels and create inclusive and resilient cities, especially in the case of declining cities. During the planning process, it is very important to consider the size of production, to take advantage of the technology, to design transportation infrastructure that could accommodate the production and the location of the new factories, as well as to solve creatively the clashes between the production usage and other land uses, especially housing. In conclusion, the reconsideration and insertion of the production in the city is necessary for a socially, economically and environmentally sustainable future.

“Vertical factories in future megacities received the second place in evolo’s skyscraper competition 2017. The design investigates the benefits of moving factories back to megacities. The proposal calls for a series of alternating architectural layers—factories and recreational areas stacked together to create a vertical structure. Each recreational layer would feed from the waste and resources of these factories.

By Tianshu Liu, Linshen Xie
United States
Bernd Becher and Hilla Becher
Aufbereitungsanlagen (Preparation Plants)
1977


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Cartographer: Unknown
Source: Chicago Historical Society (ICHi-37479)

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