October 2018

CITY PORTRAIT

Pittsburgh

From industrial city to innovation hub

Delphine Lacroix
Chloë Voisin-Bormuth

La Fabrique de la Cité

Pittsburgh

From industrial city
to innovation hub

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City fact sheet

Population	Metropolitan area (2016): 2.3 million[1] City of Pittsburgh (2016): 303,625
Density (2016)	2,117 inhabitants/km^2
Median household income (2016)	$56,063[2] National average: $57,617
Poverty (2016)	22.3% of the population below the poverty line National average: 12.7%[3]
Unemployment (2017)	Pittsburgh (Pennsylvania): 4.3% Cleveland (Ohio): 6% Detroit (Michigan): 7.8% State of Pennsylvania: 4.7% National average: 4.1%

Gross domestic product (GDP) (2016)	$138,187 million[4]
GDP per capita (2016)	Metropolitan area: $54,076[5]
Average age	33 years
Higher education	38.2% of the population has obtained a college degree[6]
Carnegie Mellon University	24th in the Times Higher Education World University Rankings in 2018[7] 3rd place for computer science programs[8]

University of Pittsburgh

100th worldwide
in the Times Higher Education World University Rankings in 2018[9]

36th worldwide
in medicine[10]

1st worldwide
in philosophy[11]

Quality of life

Most liveable city
(2014) in The Economist's ranking[12]

Largest employers in Pittsburgh[13]

Healthcare, health services and healthcare funding:

no. 1: UPMC Presbyterian Shadyside
46,480 employees

no. 2: Highmark Health
20,497 employees

Government:

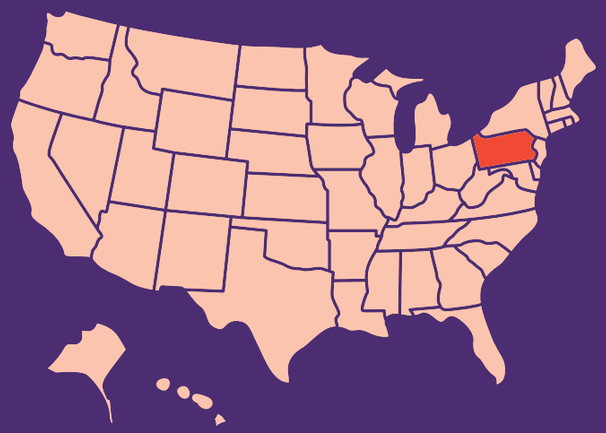
no. 3: Federal government
18,199 employees

no. 4: Commonwealth of Pennsylvania
16,580 employees

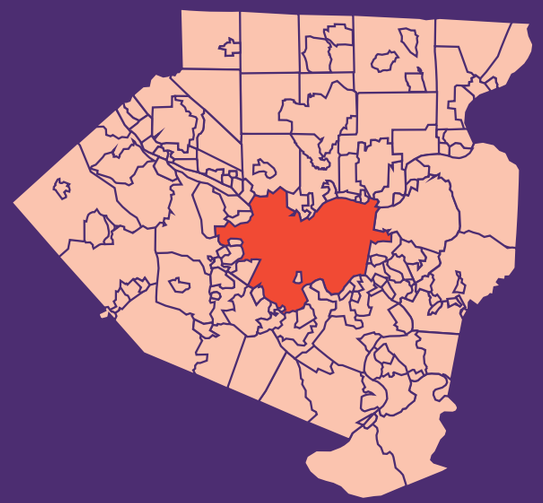
Higher education:

no. 5: University of Pittsburgh
12,047 employees

Pennsylvania on a map of the United States[14]



Map of Allegheny County and Pittsburgh's city limits



Understanding Pittsburgh in a few key dates

1754 British settlers build Fort Prince George on the present-day site of Pittsburgh. Its strategic position at the confluence of two rivers (Monongahela, Allegheny) which join to form the Ohio River, fans the flames of rivalry and becomes one of the theaters of the Seven Years' War fought between the French and British.

1758 Fort Duquesne, built by French settlers during the Seven Years' War, is destroyed and replaced by the nearby Fort Pitt, held by the British and named by General John Forbes after British statesman William Pitt. The fort's growing population soon gives rise to a borough: Pittsborough[15].

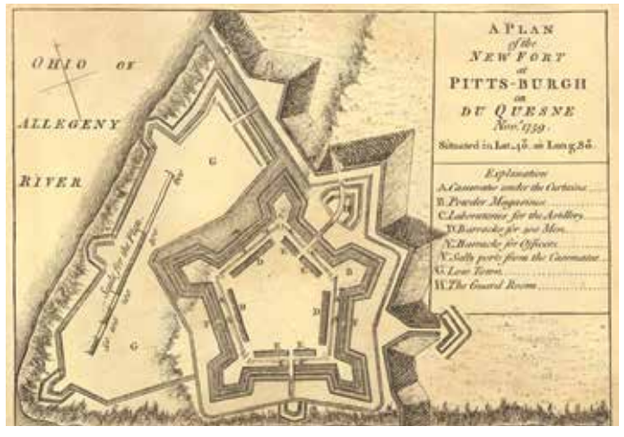


Fig. 2: Fort Duquesne in 1759.

1800-1850 Development of Pittsburgh's manufacturing economy with iron, steel, brick, glass, and coal factories. Its population reaches 10,000 in 1816[16]. The first bridges are built to connect the city's banks, and a portion of the population migrates to the adjacent hills to escape the pollution emitted by downtown's industrial activities.

1845 A great fire destroys a third of the city, forcing it to rethink the location of its residents and industries.

Fig. 3: Construction of Pittsburgh's first bridges in 1900.

1944 On the initiative of a public-private consortium (grouping the city of Pittsburgh and industrial companies of the time), creation of the Allegheny Conference on Community Development during the Second World War. Dedicated to redeveloping the city, promoting its economic development and improving local living conditions, the organization allies the public and private sectors to advance the city's interests[17].

1946-1973 The first revitalization program, known as Renaissance I, which demolished many aging buildings and public spaces in downtown to promote clean air and make room for new green spaces and modern buildings. Point State Park is rebuilt as a verdant public space.

1948 A dramatic smog event occurs in the city of Donora, located 30 km south of Pittsburgh. A thick wall of smog, produced from coal mining and steel, iron and glass manufacturing, blankets the city day and night.

Fig. 4: Postcard promoting the new Point State Park, a fully renovated public space built for residents and visitors.

1970-present Renaissance II program, focused on implementing and developing strategic activities in finance, high tech and robotics, computer science, and medicine. The region's share of jobs in research and development in sectors like robotics, medicine, artificial intelligence and software development is well above the industry and national average (from 200% to over 400% of jobs in R&D, varying by sector).

1978 Shutdown of the Carrie Furnace blast furnace at Homestead Steel Works, owned by Andrew Carnegie and U.S. Steel. At its peak, the plant produced nearly 1,250 metric tons of iron per day and employed 15,000 workers, many of Eastern European descent. Ten years later, in 1988, the site was sold to Park Corporation, and then to Allegheny County in 2005 for $5.75 million, thus becoming a regional asset.

2009 Pittsburgh hosts the G20.

2012 Creation of Cultural Heritage and Historic Preservation Planning, a city program promoting Pittsburgh's industrial legacy and infrastructure (bridges, buildings, former factories), as well as the character of the city and its neighborhoods, with the aim of preparing its new image. In the same year, creation of the PGH 2030 Districts, a strategic initiative launched by Green Building Alliance and outlining ambitious efficiency goals for 506 buildings in terms of their energy use, water use and indoor air quality, etc.

2015 Creation of p4 (People, Planet, Place, Performance), a program dedicated to analyzing Pittsburgh's resilience challenges through an annual p4 Conference, which brings together local and international experts to review completed and upcoming actions in Pittsburgh.

2017 Publication of the ONEPGH, a white paper on Pittsburgh's resilience strategy commissioned by Pittsburgh's City Hall.

Fig. 5: Opening speech by Pittsburgh's mayor, William Peduto, in April 2018 at the p4 conference.

Glory and decline of an emblematic Rust Belt city

1.

The golden age of American industry

The Eastern United States conceals a wealth of strategic natural resources needed to produce steel beneath its surface. Iron ore and coal, combined with timber, ample waterways and cheap labor provided from prisons, transformed the region into an empire of industry and steel in the early 20th century (cf. figure 6).

A pivotal invention behind the expansion of heavy industry in the United States

At the origin of America's dominance in the steel industry there stands a single inventor, Henry Bessemer (cf. figure 7). His 1855 invention of an innovative industrial process for refining molten iron in order to manufacture high-resistance steel enabled the mass production of this metal alloy, putting the United States on the path to becoming one of the world's largest steel producers.

From 1875 to 1920, Bessemer's invention helped American steel production grow from 380,000 metric tons a year to 60 million, or **40% of global steel production at the time**. Major steel corporations emerged all along the Rust Belt, stretching from Chicago to the Atlantic Ocean along the Great Lakes and the Canadian border. Their mastery of every step in the steel manufacturing process fueled the country's rapid industrial boom. Carnegie Steel Company, U.S Steel, Bethlehem Steel, and Tennessee Coal became emblems of America's golden age of heavy industry and the expansion of its railroad network, beginning in 1850 (cf. figure 8).

Fig. 7:
Henry Bessemer in the 1890s.

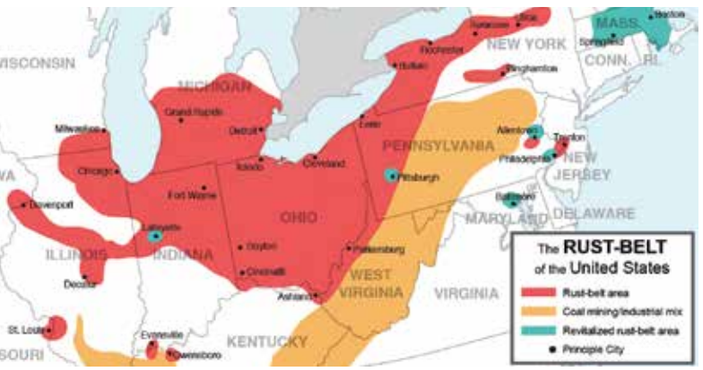


Fig. 6:
Extent of the Rust Belt and its chief manufacturing cities.

Market fluctuations lead to the decline of heavy industry

In 1929, the United States produced some 57 million metric tons of steel, or 47% of the world's total steel production (122 million metric tons). In this same year, Germany produced 13%, or 16 million metric tons of steel, Great Britain and France each produced 8% (about 10 million metric tons) and the Belgium-Luxembourg economic union nearly 5% (6 million metric tons)[18].

Already at that time, the sector's growth had begun to slow down as steel's profitability fell due to overproduction, with demand unable to keep pace with rising production capacities. The steel recession impacted all major steel producing countries: by 1933, global steel production had fallen to 68 million metric tons. Thanks to the development of the automobile industry in the 1920s, steel production found a new equilibrium, buoyed by increased demand from European and domestic markets.

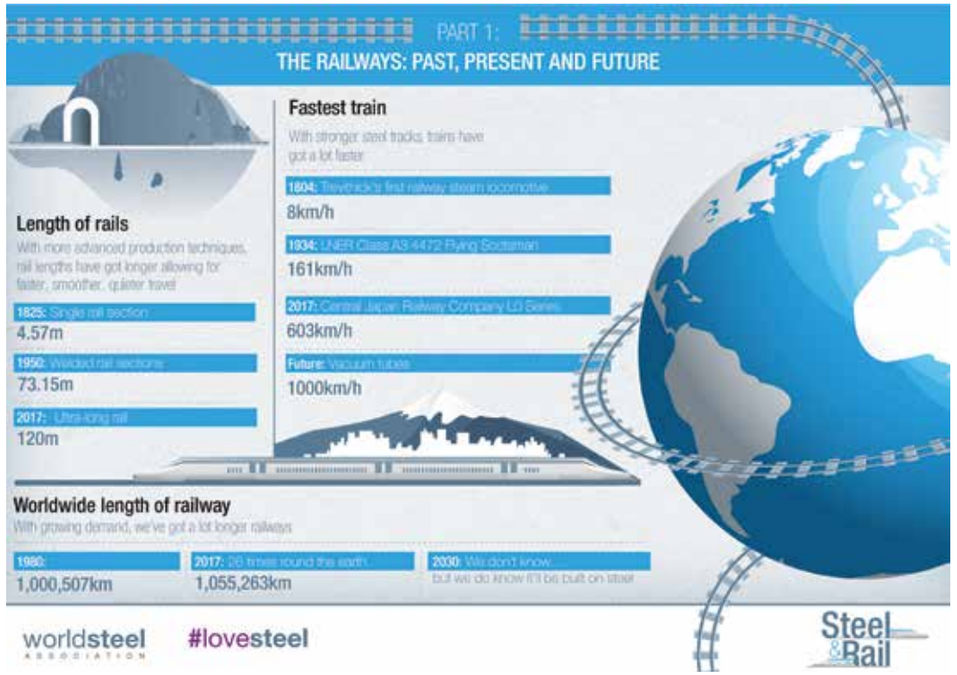
From 1933 to present, production in Europe's top steel producing countries, as well as the United States, vacillated between growth and decline.

The postwar economic recovery helped give the steel industry a second wind, notably in the United States, but the increased supply once again saturated the global steel market, devaluing steel prices for a second time. The 1973 oil crisis also exerted a negative impact on the industry, just as it shrank all industry and business worldwide. In addition, increased competition arising from cheaper labor and the outsourcing of steel supply and demand towards countries outside the United States and Europe combined to strip the United States of its top spot in global steel production[19]. Finally, the crash of the real estate and automotive industries in 2008, as well as the broader 2008 financial crisis, had major consequences on the American steel industry by triggering a collapse in global steel demand.

Producing 2.1 million metric tons of steel in 2016, the United States is now the world's 6th largest steel producer. The country has fallen behind China (6.4 million metric tons of steel in 2016), Japan (4.6 million metric tons in 2016) and India (2.5 million metric tons through its Tata Group) in terms of production and exports, while it was also forced to outsource a portion of its domestic steel production.

As a result of this slowdown, the United States lost nearly 40% of its labor force in the steel industry between 1979 and 2011, leading the country to pivot from an industrial to a service economy over this period[20].

Fig. 8:
Evolution of railroad construction techniques enabled by innovative steel production techniques in the United States.



2. Pittsburgh, the former Golden Triangle of steel in the Eastern United States

Fig. 9:
Pittsburgh in 1902, at the confluence of the Monongahela and Allegheny Rivers.

Pittsburgh's subsoil wealth – iron, coal, natural gas, oil – its forests providing an abundance of timber and its waterways serving as transport routes for inexpensive raw materials provided the foundation on which Pittsburgh built its economic growth and subsequent wealth. The region played host to hundreds of collieries, coal mines and natural gas deposits, while the local glass industry expanded to represent 80% of the country's total production within a century[22]. The nearby Appalachian Mountains supplied the city with timber to power one of the United States' first blast furnaces, built in 1701 to refine natural iron resources extracted from the region's subsoils. Over the course of the following decades, blast furnaces sprung up across the entire Allegheny Valley (cf. figure 10) while the region emerged as America's steel empire, guided by the enterprising and innovative spirit of the era's great industrialists, foremost among whom was Andrew Carnegie.

A remarkable site, abundant natural resources and visionary industrialists at the origin of Pittsburgh's prosperity

Already in 1774, George Washington grasped the strategic potential of Pittsburgh's future site at the nexus of three waterways: the Monongahela and Allegheny Rivers which, at their confluence, form the Ohio River, whose drainage basin spans nearly 490,600 km² before flowing into the Mississippi in Wickliffe (Kentucky). This location has earned it the **nickname of the "Golden Triangle"**. In addition, much like the rest of the Eastern United States, the city benefits from subsoils and a natural environment that are exceptionally rich in natural resources, which fueled its rapid and bountiful rise beginning in the 19th century. Pittsburgh soon capitalized on its position and its subsoil to become a river hub for the transport of mineral ore and a strategic junction at the gateway to the Midwest[21] (cf. figure 9).

Fig. 10:
Example of a former blast furnace at the Carrie Furnace site, 2018.

Fig. 10

Steel magnate Andrew Carnegie is widely considered to be the father of Pittsburgh's steel industry (cf. figure 11). This Scottish-American from a modest background climbed the ranks of the railroad industry and shrewdly anticipated the spike in steel demand sparked by the United States railroad boom of the 1850s. This strategic vision prompted him to invest in metallurgy and also found his own steelworks in 1870. By supplying steel to his own businesses, he was able to expand his factory's activities to manufacture metal bridges, girders and tracks for the railroad industry. In 1875, he founded the Edgar Thomson Steel Works, famous for employing the innovative "Bessemer" steel manufacturing process, a revolutionary process used to produce rails with an exceptionally high resistance to abrasion from passing trains.

In this way, natural gas, coal, steel and glass industries along the banks of the Monongahela and Allegheny Rivers gave birth to Pittsburgh's international reputation.

In 1882, the merger of the Carnegie Steel Company with Frick & Company, a manufacturer of coke (a necessary component in steel production) located just a few kilometers outside Pittsburgh, gave rise to the largest steel empire in the United States and sparked the city's booming growth[23].

In 1909, Pittsburgh manufactured half of all steel produced in the United States, stimulated by the need to supply guns and ammunition to Northern troops in the U.S. Civil War (1861-1865), as well as the expansion of international sea routes and the steel needs of shipyards, which gave the city access to numerous export markets.

As the country's most prosperous city, with a metals industry employing up to 90,000 people, Pittsburgh experienced a period of explosive demographic and economic growth. From just under 4,700 residents in 1810, its population rocketed to 676,800 residents in 1950, at the height of metal production in the city and its surrounding region[24].

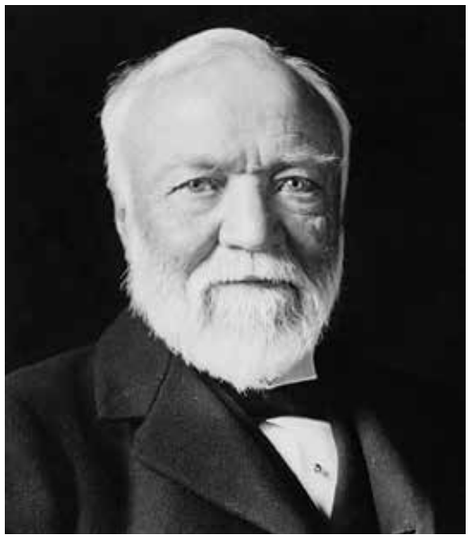


Fig. 11:
Andrew Carnegie in 1913.

Pittsburgh's urban expansion: a story of river crossings and connections

Fig. 12:
Demographic and spatial expansion of Pittsburgh.

Established in 1758 on the current site of Point State Park, where the Monongahela and Allegheny Rivers join to form the Ohio, Pittsburgh steadily expanded through the end of the 19th century in a northeast direction along the river valley (cf. figure 12). Between 1850 and 1940, the valley's population grew rapidly, climbing from 46,600 to 671,660 residents[25] as new workers arrived in search of jobs at the region's fast-growing coal plants, glass factories and shipyards.

The historic downtown (currently the Central Business District) rapidly filled up with polluting industrial activities and working-class housing. Pittsburgh, a forerunner of things to come in the United States, enacted an urban planning policy aiming to relieve overcrowding in downtown and facilitate access to the surrounding hills. From 1905 to 1915, the plan conceived by Frederick Law Olmsted Jr. (son of the famous developer of New York's Central Park) was carried out, enabling Pittsburgh to reduce the density of its downtown district, create parks and public spaces to cut pollution tied to the era's industrial activities and build roads and bridges[26]. The first of these bridges, Rœbling's Smithfield Street Bridge, connects downtown Pittsburgh to the Mount Washington neighborhood.

Building these river crossings laid the foundation for Pittsburgh's urban development in two crucial ways: on the one hand, connecting the city's valleys enabled the rapid urbanization of these areas; on the other hand, building funiculars and stairways facilitated worker's commutes from home to the factory, while allowing the city to expand without compromising the accessibility of its factories. (cf. figure 13).

Fig. 13:
Stairs connecting homes to factories in the former industrial district of Hazelwood, in 1940.

As a city of immigrants, Pittsburgh saw each of its various neighborhoods (cf. figure 14) develop a strong sense of local identity, illustrated through architectural designs that vary based on the origin and socioeconomic status of its residents[27]. The unique character of each neighborhood adds to the city's current charm and continues to influence the specific directions taken in the city's urban development, as seen in Lawrenceville (cf. figure 15), a neighborhood located on the banks of the Allegheny, which has grown from its origins as a working-class district to become one of Pittsburgh's trendiest neighborhoods.

Fig. 14:
Pittsburgh's 90 neighborhoods form a patchwork across the region.

Fig. 15:
The Lawrenceville neighborhood in northeast Pittsburgh.

Lawrenceville: a former working-class district turned one of the most sought-after neighborhoods in Pittsburgh

Long overlooked by recent graduates of the local universities in favor of the larger cities on the East Coast, Pittsburgh has now gained a new allure among this demographic. Several reasons explain this shift: the transformation and new dynamism of its job market, as well as the high quality of life ensured notably by the city's affordable housing market. The Lawrenceville neighborhood is a clear example of this new trend. Located in northeast Pittsburgh, this former working-class and industrial district is now regularly featured in rankings of the "coolest" and best neighborhoods in the United States, along with the nearby East Liberty neighborhood. A new neighborhood dynamic has come to life, with new restaurants popping up and affordable home prices drawing in young families[28], couples with children, new local businesses and the creative class[29].

"The Smoky City": an environmental challenge across centuries

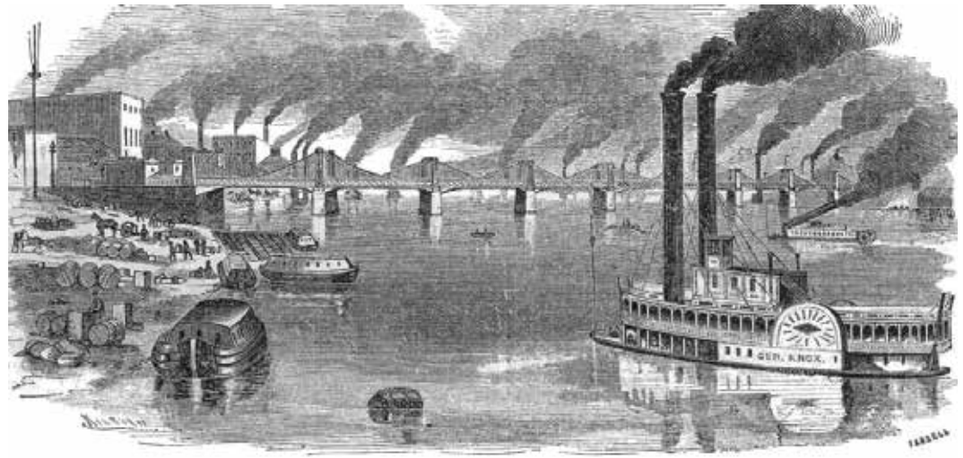
As early as 1868, the press had already coined a telling nickname for Pittsburgh: "**The Smoky City**". Caused by the mass combustion of coal and other mineral ores needed for steel manufacturing, a thick smog blanketed the city to such an extent that the sun remained veiled behind clouds of smoke on windless days, as daytime remained nearly as dark as night. Every spike in steel production – during the two world wars for example – brought about an accompanying spike in air and water pollution in cities like Pittsburgh, as well as Chicago and Saint Louis.

One dramatic smog event – which occurred in October 1948 in the city of Donora, located south of Pittsburgh – killed twenty people by suffocation and caused respiratory problems in nearly half the population (cf. figures 16 and 17).

Following the example of Saint Louis, Pittsburgh voted in 1941 to pass a law aiming to reduce air pollution caused by coal – while limiting the negative impact on this crucial pillar of its economy. In spite of these efforts (construction of natural gas pipelines, replacing coal with diesel in locomotives, treating coal, etc.), it was not until the economic recession and the shuttering of its factories in the 1980s that the city was able to rapidly improve its air quality.

However, despite laudable efforts to clean up pollution undertaken by the city's mayors over the past four decades, Pittsburgh's industrial legacy and its vulnerable and crumbling infrastructure continue to plague its water and air quality. Surveys and polls (livestrong.com[30], CBS News[31]) regularly place Pittsburgh among the most polluted cities in the United States. Rail transport activities along the banks of the Monongahela and the Allegheny Rivers and the activities of nearly 300 coal-fired electric power plants spread across fifteen states throughout the region lead to spikes in particulate pollution in the city. Other world cities also experience regular smog events, such as Beijing, Sarajevo, Rome, and Delhi in recent years[32].

Fig. 16: The Pittsburgh smog, induced by the many steel mills along the Monongahela and Allegheny rivers.



BRIDGE OVER THE MONONGAHELA RIVER, PITTSBURG, PENN.

Similar to other major American cities like Los Angeles (cf. figure 18), Pittsburgh has taken strong commitments to reduce air and water pollution[33]. The city's current mayor, William Peduto, has made it one of the main issues of his mandate, together with sustainable construction, reducing road traffic and developing alternative transportation methods and the concept of "complete streets" (collaboration between mobility authorities and engineers to redesign streets so as to accommodate all modes of transport and all users[34]).

Fig. 18:
Smog over Los Angeles in November 2010.

Fig. 17:
Smog awaits drivers and residents at the end of Pittsburgh's Liberty Tunnel, in 1947.

3. The repercussions of Pittsburgh's industrial crisis

Hit with the full brunt of the global industrial crisis in 1970, Pittsburgh and its region were forced to reduce steel production by closing some of their most famous steelworks, such as Republic Steel (merged in 1884 with an iron manufacturing company to ward off bankruptcy), Bethlehem Steel Corporation (shut down in 2001) and the Carrie Furnace Steel Mill, abandoned in 1978 (cf. figure 19).

Pittsburgh lost approximately half of its population.

Home to some 670,000 people between 1940 and 1950, its population dropped to 300,000 in 2010, a figure that has not risen since. Currently, the city has a population of 303,625, while 2.35 million (2016)[35] live in the metropolitan area.

Unemployment increased rapidly throughout the city: the number of people without work jumped from 88,500 in 1981 to 212,400 in January 1983. Unemployment reached 17.1%, a rate well above the national average of 10.8%[36] but on par with other metro areas in the Rust Belt[37] (17.1% for the Detroit-Warren-Livonia (Michigan) metro area and 11.3% for the Cleveland-Elyria-Mentor (Ohio) metro area).

After a period of improvement, Pittsburgh saw its unemployment spike once again to 9.2% in 2010 (near the national average of 10%), as a result of the 2008 financial crisis and recession across the entire United States. Since 2010, and especially since 2013, unemployment has dipped to a steady rate of around 4.3% as of November 2017[38].

Fig. 19:
The Carrie Furnace plant in Pittsburgh, abandoned in 1978 following the crisis in the United States steel industry.

Pittsburgh's urban, economic and social renaissance

1. Revitalizing the city:
an early concern supported by ambitious programs

"In the 21st century, we have an opportunity to create a whole new economic theory. And it's not going to happen at an international level, but rather in places around the world where cities and regions gather."

William Peduto
Mayor of Pittsburgh,
April 2018

Renaissance I program: the start of an initial turning point

Just as Pittsburgh experienced a period of renewed prosperity after the Second World War, when it became the center of "the arsenal of democracy" and produced munitions to support the Allied war effort, its mayor, David L. Lawrence, with the city's vulnerabilities in mind (notably pollution and a lack of economic diversification) decided to implement an ambitious urban renewal program called **Renaissance I** (1946 – 1973).

Fig. 20:
Point State Park, a symbol of Pittsburgh's modern regeneration.

This program aimed to improve Pittsburgh's quality of life by pursuing four main goals:

1 **Pollution reduction:**
Pittsburgh was one of the first American cities to enact measures designed to control industrial pollution and to sign the Clean Air Act, which set federal emissions standards for vehicles and industries.

2 **Relieving congestion in downtown and developing the suburbs:** one of the first efforts carried out through the Renaissance I program was to demolish over 133 buildings across 24 hectares in order to relieve congestion in the area around Point State Park. Moreover, new bridges and roads were built to facilitate access to the valleys surrounding the dense city center, while new tax incentives encouraged new building along the adjacent riverbanks rather than in the polluted downtown[39] (cf. figure 20).

3 **Redevelopment and modernization of the dense city center:** iconic new skyscrapers were built (U.S Steel Tower, completed in 1970) and several new public spaces were created, transforming the city's downtown.

4 **Diversification of the city's economic base:** the city of Pittsburgh teamed up with the private sector, notably Richard K. Mellon, the city's first entrepreneur and founder of the Allegheny Conference on Community Development in 1944 (private non-profit organization). This long-term program was intended to promote regional economic development actions to benefit the city and its residents, as well as transportation and the environment, through public-private partnerships intended to boost the region's economy and quality of life in its urban areas.

Fig. 21:
PPG (Pittsburgh Plate Glass) Place, built between 1981 and 1984 in Pittsburgh.

Next, a new urban renewal program continued the modernization efforts by renovating or converting old buildings. This period also saw the construction of the city's most iconic buildings, produced using innovative construction techniques, such as Pittsburgh Plate Glass Place, hearkening back to the city's historic glass factories (cf. figure 21), as well as Fifth Avenue Place (cf. figure 22).

The Renaissance II program: a decisive turning point

The second phase of this program, called **Renaissance II (1970s-present)**, coincided with the crisis and decline of heavy industry in the United States, compounded in 1973 by a global oil crisis. It enabled the city to mark a decisive turning point by accelerating the transformations initiated by the Renaissance I program.

First, it set about converting Pittsburgh's economy by **positioning the city as a strategic center of financial activities, high-tech and research in robotics, computer science and medicine**. In this context, the city endeavored to **strengthen its higher education institutes**, such as the University of Pittsburgh and Carnegie Mellon University, while supporting the **development of leading departments in the sciences, technology and medicine to revitalize the regional economy**.

Fig. 22:
Pittsburgh's iconic Fifth Avenue Place built in 1988.

Fig. 23:
Phipps Conservatory entrance pavilion.

A product of the Renaissance II program, Pittsburgh's blend of new construction and preserved historic buildings, now converted to other uses, imbues the city with its unique character and contributes to its current renown. One example of this is the Distrikt Hotel, whose entrance hall and main bar sit on the site of a former church.

Finally, the city continued its actions to fight pollution, notably by conducting clean-up efforts in the Monongahela and Allegheny Rivers. From convenient routes for transporting mineral ores, the rivers have now become aquatic recreation areas, adding yet another aspect to Pittsburgh's new allure.

The city also launched a program to build sustainable and eco-friendly buildings, including Phipps Conservatory (cf. figure 23). Chosen to host the G20 in 2009, this building has obtained many certifications, including LEED[40] Silver for its entrance pavilion. In addition, the Center for Sustainable Landscapes (or CSL, opened in 2012) received LEED Platinum certification, the highest level awarded for this label. It produces 100% of the energy it needs to operate, while treating all of its storm and sanitary waters captured on site for reuse in its activities and to water its gardens and greenhouses.

This economic recovery and urban renewal project, supported by exemplary policy choices, empowered Pittsburgh to bounce back from the crisis that reigned for many long years in the city, while also putting the city back on the path towards strategic and innovative economic development.

The Energy Innovation Center:

creating an ecosystem to favor clean new energies

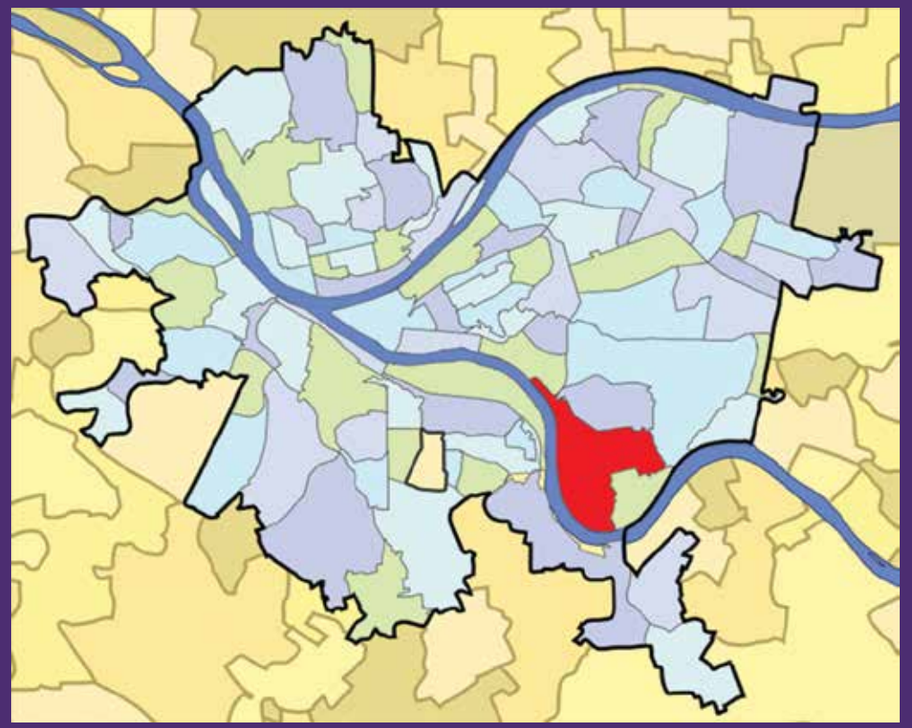
The Energy Innovation Center (cf. figure 24) is a non-profit organization that works to create a favorable ecosystem for developing clean energy innovations. To pursue this goal, its efforts focus equally on raising awareness among company leaders concerning energy and sustainability issues, providing training and building skills to support the transition to clean energies, hosting new companies working on advanced technologies and, finally, developing and testing new technologies. Its eco-building headquarters also stands as a clear demonstration of its efforts: the building received the highest level of LEED certification (Platinum) and meets the goal of cutting energy use by 50% as outlined by the 2030 Districts program[41]. It also instated an exemplary set of practices in terms of preserving historic assets by reusing as many existing materials as possible from the original building dating back to 1930. Finally, it includes systems for collecting, treating and reusing storm water, which also keeps this untreated water from flowing into adjacent rivers and streams. Its interior renovation process notably sought to improve indoor air quality (use of eco-friendly paints and solvents[42]) and lighting (attention paid to openings such as windows).

Fig. 24:
Facade of the Energy Innovation Center, located in the Crawford-Roberts neighborhood of central Pittsburgh.

Conversion of industrial brownfield to benefit the digital economy: Hazelwood Green

The former industrial site of Almono, which housed the steel empire of Jones & Laughlin on the banks of the Monongahela since 1883, accommodated more than 12,000 employees at its peak in 1960, as well as a neighboring population of 13,000 residents. Purchased by a private company in 1974 and abandoned in 1997 following the global industrial slowdown, the Almono site, as the last of the city's vast industrial brownfields (72 ha), was designated in the 2000s as possessing an immense conversion potential by the Riverlife Task Force (public-private NGO created to advise and plan the conversion of Pittsburgh's riverbanks with a masterplan). Two years later, the Almono site was acquired for 10 million dollars after its owner filed for bankruptcy. Owned since then by three foundations (Richard King Mellon, Benedum Foundations, and The Heinz Endowments), the site is scheduled for redevelopment to become a hub of innovation and testing to advance Pittsburgh's economic renewal and support companies in the digital economy. Uber became the first company to set up shop by developing its self-driving vehicle testing ground on site. Renamed Hazelwood Green in 2017, the platform will host sustainable and eco-friendly buildings. The site's latest masterplan, overseen by ReMake Group and Perkins + Will, will be approved by the city in 2018. Terms of the plan include meeting LEED certification criteria, creating residential areas and designating zones for research and development by startups. The Hazelwood Green site (cf. figure 25) received 60 million dollars through grants, equity, and public and private loans. Renovation of the Almono former industrial site illustrates the power of public-private partnerships, a characteristic feature of the approach taken by Pittsburgh.

Fig. 25:
Hazelwood district.
The former Almono site, renamed Hazelwood Green, is located on the banks of the Monongahela River.



2.

Universities and industries:

two interlinked histories and a combined engine of the economy

"I think universities have been a fundamental part of the turnaround in Pittsburgh, [really for two reasons]. First, there has been bold leadership at the universities themselves to have major strategies to dominate in emerging technologies, both in healthcare at the University of Pittsburgh, and in areas like artificial intelligence and robotics and computer science at Carnegie Mellon. [...] The second key factor is the enormous support we have received from across the Pittsburgh region and the city of Pittsburgh to support the universities' ambitions to be leaders in innovation and technology."

Tim McNulty
Associate Vice President
for Government Relations,
Carnegie Mellon University

Top universities born from industry

Pittsburgh's industrial boom between the 19th and 20th centuries and the economic benefits of its steel manufacturing activities also led to the creation of universities. These institutions were notably financed through a system of patronage and sponsorship led by non-profit organizations, steel magnates (such as Andrew Carnegie) or intellectuals and philanthropists like Hugh Henry Brackenridge, then a member of Pennsylvania's Supreme Court, and Richard King Mellon, grandson of Thomas Mellon (founder of Mellon bank) and nephew of Andrew Mellon, then Secretary of the Treasury known for his role on the Board of Directors of the University of Pittsburgh and his commitment in favor of the urban renewal policies undertaken by David L. Lawrence.

Fig. 26:
Carnegie Mellon University.

Fig. 27:
The Cathedral of Learning.

In 1900, Andrew Carnegie, the father of steel, founded the Carnegie Technical School, the forerunner of today's Carnegie Mellon University, created in 1967 from the merger of the Carnegie Technical School and the Mellon Institute of Industrial Research (cf. figure 27). Operating on the principle that "*a man who dies rich thus dies disgraced*[43]", Andrew Carnegie devoted half of his fortune to philanthropic work focused primarily on the arts, education and research in order to expand access to culture to the masses (through the global network of 2,500 Carnegie libraries, for example). Andrew Carnegie saw access to culture as a powerful vector of social mobility. He even believed he owed his own success to books.

Carnegie Mellon University is now home to internationally renowned research centers. Ranked 24th among the world's top universities in 2018 and 20th among American universities[44] (for all departments), Carnegie Mellon University boasts an excellent computer science department (3rd place worldwide in 2017[45], 1st place in the United States in 2018 alongside M.I.T. and Stanford University[46]), robotics (already in 1999 The Wall Street Journal nicknamed Pittsburgh "Roboburgh"[47]) and statistics (9th place nationally[48]), which have sealed its reputation alongside its political science and theater programs[49]. Famous alumni and professors of the university include twenty Nobel Prize laureates and twelve winners of the Turing Prize. The university attracts a great many international students to its doctoral programs; hailing from 109 different countries, they represent 63% of its total staff. The excellence of the university and its research laboratories delivers a convincing argument to attract companies to the city, notably in digital technologies, as they seek to form research partnerships or recruit from a breeding ground of top innovation talent. That is the case of Uber, Google, Intel and Disney, notably drawn in by the region's advanced skills in artificial intelligence and robotics.

The University of Pittsburgh

A public university, the University of Pittsburgh was founded in 1787 by the philanthropist and patron of learning Hugh Henry Brackenridge. Its campus is distinguished by the Cathedral of Learning, one of Pittsburgh's iconic towers rising to a height of over 160 meters and added to the National Register of Historic Places in 1975 (cf. figure 27), as well as the "Nationality Rooms", a series of classrooms reflecting the culture of 30 countries and intended to symbolize Pittsburgh as a melting pot of different nationalities. Ranked 75th nationally and 100th worldwide[50], it is particularly renowned for its medical school (University of Pittsburgh School of Medicine), which was ranked the 14th best medical school in the country for the quality of its research and primary care in 2018[51].

Today, Pittsburgh's excellent universities and research form the backbone of its rich and varied advantages.

Robotics and advanced medicine: two sectors of excellence and symbols of Pittsburgh's success in R&D

Compared with other Rust Belt cities impacted by the industrial recession of the 1970s (Detroit, Cleveland, Buffalo, etc.), **Pittsburgh boasts the advantage of possessing excellent universities**, which it has always counted on to develop and restructure its economy. The excellence of the University of Pittsburgh's education and research laboratories, as well as the spirit of innovation driving their work, has attracted leading companies and talents, who have found a fertile ground in the city for nurturing research partnerships on the cutting-edge of innovation, while breathing new life into the region's economy. Today, this turning point is embodied particularly by two sectors: medicine and robotics.

Medicine

Pittsburgh is now world renowned for the quality of its hospitals: UPMC Presbyterian Shadyside is notably ranked 14th among the best hospitals in the United States for its adult care in 2018[52], while Children's Hospital of Pittsburgh of UPMC was ranked among the top 10 children's hospitals in the United States in 2017[53]. With nearly 80,000 employees, 39 hospitals and 17 billion dollars in annual revenue in 2017, UPMC is the largest employer in western Pennsylvania. Its close ties with the University of Pittsburgh and its research laboratories have earned the hospital its long-standing reputation at the cutting-edge of medical innovation (from discovering the polio vaccine to the first double organ transplant). The city of Pittsburgh regularly invests in the hospital to maintain the quality of its healthcare services. In November 2017, UPMC allocated 2 billion dollars to create three new hospitals specialized in oncology, cardiology and organ transplantation in downtown Pittsburgh[54].

Robotics

Where can companies recruit from a breeding ground of top talent working at the cutting-edge of innovation? This is the crucial question behind the location strategies of the new digital giants. Uber, Google and Intel all chose Pittsburgh, lured notably by the artificial intelligence and robotics expertise developed at Carnegie Mellon University. For example, in 2015, Uber hired 40 researchers from the Computer Science School to create its own Advanced Technologies Center. Andrew Moore's career path offers a clear illustration of the porous relationship between the university and digital companies, with each side gaining valuable resources through the exchange. Andrew Moore, then a professor at the Computer Science School, was hired by Google in 2006 before returning to Carnegie Mellon University to head up his former institute in 2014. This intimate collaboration between the university and the private sector has notably enabled Pittsburgh to become one of the major hubs for self-driving vehicles.

Pittsburgh: a laboratory for self-driving vehicles

Uber, Argo AI, Aptiv, ZipCar: all these companies decided to open offices in Pittsburgh to harness the power of the innovation ecosystem that has sprung up around the Computer Science School at Carnegie Mellon University. The vast urban development project of Hazelwood Green embodies Pittsburgh's ambition to become one of the major testing centers for self-driving vehicles. Uber, the first company to move into Hazelwood Green, installed its own testing grounds, on the heels of Google and Waymo's facility in California, nicknamed the "Castle". Spread across 16 hectares, the artificial city of Almono, named after the former industrial district that once occupied the site, features ersatz buildings made from containers and imitation streets traversed by mannequins moving in erratic patterns, allowing Uber to train vehicle safety operators using simulations of real-life driving situations. Pittsburgh's mayor, William Peduto, even authorized Uber to test driverless cars in the city. For its part, Carnegie Mellon University plans to develop the dilapidated Mill 19 into a new innovation center, called the Carnegie Mellon University's Advanced Robotics for Manufacturing (ARM) Institute, with the aim of providing a central home for university research with industrial applications, notably in the field of autonomous robotics. The project has received 250 million dollars of public and private funding raised by the CMU and 20 million dollars through a donation from the Richard K. Mellon Foundation.

3. Pittsburgh's renewal: a successful experiment?

"So we have to run two tracks. One track is continuing to see the economy of this region grow, and the second track is making sure that we're building it for everyone, and we can only do that by partnering with the same institutions that we've worked with in the past, our non-profits, our foundations, our corporate community".

William Peduto
Mayor of Pittsburgh

Pittsburgh in 2030: an innovative job generator or a "could have been"[55]?

This question posed in the Brookings Institution's 2017 report on Pittsburgh's innovation economy highlights the crossroads the city is currently facing. **Will it succeed in overcoming the challenge of making the city's new growth dynamic more inclusive? If it fails to do so, it runs the risk, according to the Brookings Institution and TEConomy[56], of degrading the very foundation of this economic renewal and setting off a new crisis.**

Pittsburgh has carried out a spectacular conversion of its economy by attracting the digital economy's biggest names and forging a completely new image of the city. It now boasts a low unemployment rate that has stabilized around 4.3% in 2017. **Quality of life has improved in the city and, notably, across the metro area**: from $44,195 in 2001, per-capita GDP rose to $54,076 in 2016. Median household income settled at $42,450 in Pittsburgh in 2016, compared with $26,300 in Detroit and Cleveland.

Despite these improvements, the report by the Brookings Institution and TEConomy points out three major weaknesses in Pittsburgh's economy:

1 **The difficulty of transforming scientific research and innovation prowess (input) into potential local jobs (output).**

The share of jobs created in research activities (pharmaceuticals and medicine, computer science and IT, robotics, artificial intelligence, etc.) largely outpaces industrial jobs in these same fields. The Brookings Institution and TEConomy cite the example of Pittsburgh offering 225% more jobs than the national average in computational science, but 36% fewer jobs in software development and 59% fewer in data processing.

2 **The failure of Pittsburgh's many startups to scale up and thereby serve as engines of the local job market.**

Also of note is the fact that the arrival of the new economy's giants has not led to any substantial rise in the number of jobs: Argo AI employs between 200-500 people, Google's satellite in Pittsburgh has 500 employees, Uber and its self-driving vehicle research center combine to employ 400 people, Duolingo has just 100 employees.

3 **Pittsburgh's demographic stagnation, if not decline, which offers a stark contrast to the dynamic growth seen in other major innovation cities, as well as its aging population (250,000 people expected to retire in the next decade) threaten to cause a skills shortage in coming years.**

One figure, however, seems to offer new promise: the number of Pittsburgh's new graduates choosing to remain in the city has increased by 29% over the past decade[57].

In addition to its job opportunities, the city's dynamic cultural life and low cost of living compared to major coastal cities like Boston and New York have convinced more of Pittsburgh's recent graduates to stay put.

However, even as the region's dynamic job market retains more and more highly skilled workers, these benefits have not transferred over to less skilled workers. **The biggest challenge facing the city is still education**, especially undergraduate education. As noted by the Brookings Institution and TEConomy, many companies, both in IT and healthcare, require only a bachelor's degree. As these companies develop, they struggle to find the pool of skills they need to support their growth. In order to develop the job market, the most pressing challenge today is to improve the skills of the general population, and not just among those with advanced degrees. And that is just a start: those facing long-term unemployment also require additional support in terms of employment and innovation.

Fig. 28:
Lawrenceville neighborhood in Pittsburgh.

The city has grasped the full scale of this challenge. In response, it has set up special support and inclusion programs in which national institutes like PolicyLink[58] and city advisors like Majestic Lane, Deputy Chief of Neighborhood Empowerment in Pittsburgh, have invested in order to facilitate education and workforce reentry and halt the spread of inequality. The city's ambition is to give its entire population, and notably its most vulnerable members, an active role to play in society and civic projects by pursuing a policy of empowerment, a concept seen as one of the central pillars of Pittsburgh's social resilience[59] (cf. part 3).

Pittsburgh for all? Concerns sparked by ongoing gentrification

"We're really beginning to see new economic development in pockets of the city of Pittsburgh, which then puts a crunch on affordability. There are residents who cannot afford to keep up with the taxes, and there are other residents that simply cannot afford some of the new development taking place. […] Ensuring that there is affordable housing that really matches up income with housing opportunities so that everyone can live within the city of Pittsburgh has become critical."

Robert Daniel Lavelle
Councilman, District 6,
City of Pittsburgh

Following the arrival of the digital economy's heavyweights, Pittsburgh has seen a **rapid spike in rents**: an increase of 59% in Allegheny County between 2000 and 2014, including an enormous jump of 369% in the Lawrenceville neighborhood[60], which became one of the city's trendiest neighborhoods in a matter of a few years (cf. figure 28). Rising rents have impacted other neighborhoods like Oakland and East Liberty, with the latter now home to tech giants like Google, giving it a new centrality within Pittsburgh and making it one of the most sought-after neighborhoods to live in.

The arrival of these major companies led to a revaluation of land and property, enabling vast renovation, demolition and rebuilding projects to improve building standards and quality in these neighborhoods. **This revaluation has also brought about a process of gentrification**: existing residents in these working-class neighborhoods, unable to afford the rise in rent or shop in local retail suited to the upscale new clientele, have been forced to move; some were even relocated to other neighborhoods following renovation work. Those who remain often say they **no longer feel at home within the new identity of these neighborhoods[61]**, as underlined by Pittsburgh City Councilman Robert Daniel Lavelle: *"If you want to cash in and sell your home because the value has doubled in the last four years, that should be a choice you have. But if you want to be able to stay in your neighborhood and grow, then you should be able to do that as well. What we don't want is mandatory displacement. What we don't want to see is taxes rising so high or the affordability of homes decreasing so quickly that those long-term residents can't afford to be there, or that individuals who need to live closest to where the job centers are can't afford to do so".*

Fig. 29:
The East Liberty neighborhood in Pittsburgh.

Pittsburgh is characterized by a pronounced socio-spatial segregation, in which wealth and poverty exist side by side without ever interacting. The innovation neighborhoods of Oakland and East Liberty (cf. figure 29) are surrounded by neighborhoods with high unemployment, such as Larimer (15.9%[62] unemployment) and Garfield (8.2%[63] unemployment). Pittsburgh was ranked the 17th most ethnically segregated city in the United States[64], a legacy of the city's former policies barring black families from buying property in certain neighborhoods. These neighborhoods remain scarred by high social inequality and a diminished quality of life.

Amazon: accelerator of gentrification?

Pittsburgh is one of twenty cities under consideration for the location of Amazon's second headquarters, nicknamed "HQ2". At stake is Amazon's promise to create 50,000 jobs and invest 5 billion dollars for its headquarters in the city. Running counter to the hopes raised by the potential coming of Amazon, other voices have spoken out against the web giant's arrival, notably due to concerns that it could accelerate gentrification in the city (cf. figure 30).

Fig. 30:
Protest against the potential arrival of Amazon during the p4 conference in Pittsburgh in April 2018.

Pittsburgh, resilient city?

1. One Pittsburgh

> “Pittsburgh will be a resilient city when the entire community shares the same opportunities for prosperity, and when all residents are well cared for and prepared to face potential risks and adversities."
>
> **ONEPGH**

From renaissance to resilience

Pittsburgh: a resilient city? In light of its history, the answer is a resounding yes. However, it is interesting to observe how the terminology has shifted in recent years: where people once spoke of a renaissance, now they refer to resilience. Of course, the concept of resilience has become much more fashionable of late, which means it is often thrown around baselessly[65]. Such is not the case in Pittsburgh.

Pittsburgh applied in 2014 to join the **100 Resilient Cities** network, created the previous year by the Rockefeller Foundation. In this way, it was able to establish a resilience strategy led by Grant Ervin, the new Chief Resilience Officer appointed in December 2017, and Dan Gilman, the Chief of Staff for Mayor William Peduto, and whose objectives were outlined in the white paper on the city's resilience strategy published in March 2018 ("ONEPGH Report"[66]).

The shift in terminology used to refer to Pittsburgh (speaking of resilience instead of renaissance) is no accident. It expresses the three new paradigms that guide the city's actions:

1 Residents at the center of the strategy

Pittsburgh's residents lie at the center of its strategy: they are the determining factors for each action (the reason an action is taken), as well as the drivers and agents of the strategy ("empowerment" strategy). That means that all measures taken, whether in terms of economic development, environmental protection, mobility or infrastructure, must systematically pursue a common goal: to encourage social resilience, meaning the capacity of society – and all individuals that make it up – to cope with shocks and stresses, react to events and regain their footing. Integrating everyone into a society built upon solid foundations is the main focus of Pittsburgh's strategy, as expressed by its name: "One Pittsburgh".

> “We recognize that one of the shortcomings in our past was that we walked separately, along differing paths. Today, we have the opportunity to walk with intent and purpose as a community towards a brighter future."
>
> **William Peduto**
> Mayor of Pittsburgh[68]

100 Resilient Cities

The 100 Resilient Cities program was created in 2013 on the initiative of the Rockefeller Foundation with the aim of helping cities enact an urban, social, economic and climate resilience strategy. Upon its launch, the program included 32 cities, quickly adding 68 other cities selected from over 330 applications, submitted from 94 countries.

Its efforts focus on four priorities:

1. Logistics and financial aid with creating and defining the tasks of a Chief Resilience Officer.
2. Access to an expert in defining a resilience strategy scaled to the city.
3. Facilitating interaction and supporting the public, private and nonprofit sectors to enact the defined resilience strategy.
4. Support and feedback from a network of 100 cities confronting similar issues: obsolete infrastructure in Vancouver, Saint Louis, Oakland and Bangkok; landslides in Seoul, Mexico City and Seattle; and air quality in London, Barcelona and Tulsa[67].

2 Promoting a holistic approach

The goal of the resilience strategy is to break down silos inhibiting the city's actions and to open up pathways towards multidisciplinary efforts – without degrading each department's core skills, but instead helping them to achieve a common goal. For example, it was for this purpose that the city created the new Department of Mobility and Infrastructure headed by Karina Ricks.

> "Resilience is a holistic approach to urban systems management that demonstrates interrelationships between sectors. The resilience strategy is intended as a guide for city plans and initiatives to achieve maximum community impact by addressing the root causes of systemic challenges[69]."

ONEPGH
White paper on Pittsburgh's resilience strategy

3 The strategy relies on clear-sighted analysis of the city's vulnerabilities and the risks it confronts

Taking a good hard look at the problems facing the city and recognizing its past mistakes: that is the basis of Pittsburgh's resilience, which it sees as a long-term strategy nourished by its heritage in order to overcome its weaknesses and harness its strengths to prepare for its future. The nature of this iterative process between past, present and future, which Pittsburgh mayor William Peduto describes as a "*journey*"[70], is what sets the new resilience strategy apart from the previous Renaissance programs.

> "Pittsburgh's resilience strategy is based upon the idea of what's called preliminary resilience assessment, which I call the 7AM look in the mirror of your city. It allows you to look at some of the things that maybe you're not so happy to look at first thing in the morning. We do that from a citywide context."

Grant Ervin,
Chief Resilience Officer,
City of Pittsburgh

Fig. 31:
Healthy Ride, Pittsburgh's first public bike share service created by nextbike, included 175 docks and 700 bikes in 2018.

People, Planet, Place, Performance

> "The main pillars of Pittsburgh's resilience strategy are based upon a value set that we've created called P4, or People, Planet, Place, and Performance. It is upon those four values that we ground the decision-making that we do within the resilience strategy, which is known as ONEPGH."

Grant Ervin,
Chief Resilience Officer,
City of Pittsburgh

Four central pillars organize Pittsburgh's strategy, also known as **p4, for People, Place, Planet and Performance**. Every two years, the city holds a conference under this same name to bring together all local stakeholders in resilience, the social and solidarity economy, as well as entrepreneurs and public and private organizations working towards the structured and inclusive development of the city[71].

These four pillars convey the holistic approach taken by Pittsburgh:

1. **People**: this pillar aims to empower the population, ensure that basic needs are met for all communities, guarantee equal access to resources for all and celebrate the city's diverse and multicultural nature.
2. **Place**: the goal of this pillar is to use land and infrastructure to benefit everyone, promote social inclusion and protect people and assets from climate risks (cf. figure 31).
3. **Planet**: a new way of using resources and producing energy to improve environmental health (local scale) and reduce Pittsburgh's carbon footprint (global scale).
4. **Performance**: the key to a successful strategy relies on cooperation between various stakeholders and regions on various scales.

These four pillars aim to cover the different vulnerability factors confronting Pittsburgh, which consist less in shocks (sudden events, usually climate-related) than in long-term issues or chronic stresses that impact the social and urban system. The extent of the stresses and shocks identified by the strategy conveys its complex and holistic approach, in which environmental, social and environmental issues are seen as interconnected.

Stresses and shocks

Pittsburgh's resilience strategy has identified the following primary stresses:

- fragmentation of effort between public bodies and non-profits, which play a major role in Pittsburgh's social efforts
- industrial legacy
- aging population, particularly among the working population
- crumbling infrastructure
- environmental pollution
- socio-spatial and gender-based inequality
- opioid use
- rise in invasive species

Its primary shocks include:

- climate change (flooding, extreme precipitation, landslides)
- economic collapse
- industrial accidents

Two fields of action are particularly eye-opening in regard to Pittsburgh's approach to resilience: the new take on transportation policy, now referred to as a mobility policy, as well as its efforts to combat environmental pollution and climate change, illustrate Pittsburgh's focus on interconnection between stakeholders at every level and at every stage in its efforts.

Fig. 32: Western Pennsylvania has experienced an unprecedented rise in opioid consumption in recent years. Pittsburgh is not spared by this trend.

Fig. 32 :

2. Promoting mobility:
a central pillar of the resilience strategy and a pathway out of poverty

"The public infrastructure of the city of Pittsburgh takes up about 1/5th of the total land area of the city, and this is typical for many cities. This means that the city is actually the largest landowner in the city, but it also means that we have the largest responsibility, so we really have to consider how this infrastructure is managed, how it is used, what are those conditions?"

Karina Ricks
Director, Department of Mobility and Infrastructure,
City of Pittsburgh.

Fig. 33:
Promoting non-vehicle mobility in Pittsburgh.

Shifting from transportation to mobility to promote social resilience

What role should a department of transportation play within an administration? Is it to transport people and maintain transportation infrastructure in good working order? Of course, and this challenge takes on a massive scale in Pittsburgh due to the city's aging and crumbling infrastructure. But Karina Ricks, the new director of the Department of Mobility and Infrastructure in Pittsburgh, adds that pursuing this goal is not enough: **the most urgent challenge is to shift from a transportation policy to a mobility policy, which means shifting from issues of managing transport flows to reflecting on the role mobility plays in promoting social cohesion and resilience.**

In fact, Karina Ricks bases her thinking on the following observation made by Raj Chetty and Nathaniel Hendren from Harvard University: "*commute time is the single strongest factor influencing the odds of escaping poverty*"[72]. Promoting mobility, and more specifically high-quality mobility accessible to all, is thus a powerful way to encourage social integration. In fact, the concept of mobility refers equally to the ability to move from one place to another, as well as the possibility of moving from one sphere of society to another (cf. figure 33).

However, Pittsburgh presents two major vulnerability factors: a substantial portion of the population faces underemployment or unemployment, as well as social and spatial segregation; the city shows a high degree of urban sprawl and spatial discontinuities caused by Pittsburgh's specific topography (a rolling plateau with steep valleys) and the urban degrowth experienced by Pittsburgh, as well as a phenomenon of urban perforation (the city has not lost population evenly, but instead in such a way that has left "holes" in its urban fabric). The dual challenge faced by the city is to ensure mobility for all its residents while remedying the impact of distance and discontinuities. Karina Ricks thus intends to develop an **exemplary mobility strategy rooted in a global approach to ending isolation.**

This mobility strategy pursues five goals which guide the concrete efforts put in place by the Department of Mobility and Infrastructure:

1. No one dies or is seriously injured while traveling on city streets and streets must be organized so that even a child can navigate them safely.
2. Every household in Pittsburgh can access fresh fruits and vegetables within 20 minutes travel of home, without the requirement of a private vehicle.
3. All trips less than 1 mile (or 1.6 km) are easily and enjoyably achieved by non-vehicle travel.
4. The combined cost of transportation, housing and energy dœs not exceed 45% of household income for any income group.
5. Finally, all roads, bridges and stairways are safe.

Accessibility, equal access and safety are the key concepts of this strategy, which seeks to reinforce social resilience through mobility.

The challenge of ensuring resilient transport infrastructure

Pittsburgh comprises 446 bridges, infrastructure assets that require improvements and 8,283 km² of road infrastructure.

This infrastructure is exposed to several shocks and long-term difficulties (stresses), which determine the actions taken by the city.

1 Aging infrastructure (stress)

Most of the city's transportation infrastructure was built in the 1950s, when Pittsburgh saw its demographic boom coincide with the economic growth driven by its steel plants. The average date of last repair for the city's bridges is 1966, while 16% of its bridges open to vehicle traffic were considered structurally deficient or dangerous in 2017.

A report by the American Road and Transportation Builders Association (ARTBA) ranked Pennsylvania second among U.S. states with the most bridges in bad shape (4,173 bad bridges among a total of 22,779 bridges), just behind Iowa; more than 20% of these bridges require maintenance[73] (national average: 9.4%[74]). A study conducted in 2017 found that more than 55,000 bridges in the United States were in need of repair, revealing the massive extent of the task on the national level[75]. In 2017, the cost of maintenance on 13,000 bridges nationwide was estimated at 7.7 billion dollars. This is an even more urgent matter in Pittsburgh, where 60% of commutes are made by car.

Pittsburgh's ambition is to ensure maintenance and repairs for this infrastructure and include it within an urban development plan. One of the major challenges arises from the variety of maintenance approaches required by different structures within a metro area facing stagnation, degrowth or perforation: different parts of the network require different forms of maintenance. For this reason, the first task is to establish an order of priority, while determining whether some infrastructure should be abandoned or rescaled, depending on the actual traffic it carries. Some roads may even become simple paths or be transformed for non-vehicle traffic.

2 Air quality (stress)

In terms of resilience, Karina Ricks plans to reduce vehicle emissions by 50% between now and 2030, and 80% by 2050, which means reducing the distances traveled by car, notably by favoring non-vehicle mobility and a diversified and multimodal array of safe and enjoyable modes of transport.

3 Extreme weather events (shock)

Climate change has made extreme weather events both more frequent and more severe, damaging its road infrastructure and other mobility networks. In fact, these networks lie within the floodplains of the city's two rivers, along with many of its homes and businesses. That has made devastating floods more common, while straining the capacity of the city's storm water management system. The most recent flash flood in August 2016 caused massive damages along one of the city's main thoroughfares, Washington Boulevard, which remained closed for several days. A flash flood in 2014 even became fatal. Pittsburgh also experiences regular snowstorms (about five times a year), which also cause substantial damages. Finally, landslides are a common and highly dangerous phenomenon, due to the city's urban sprawl throughout the adjacent hills. Its long history of coal extraction and subsequent erosion, combined with the specific nature of Pittsburgh's soil, place additional stress on land, which the Department of Mobility and Infrastructure has made attempts to analyze and secure. **900 structures and establishments within the city are now considered to be in areas facing a high risk of landslides**. For example, in the first half of 2018, William Street suffered through four different landslides. According to conservative estimates announced by city hall, the latest round of landslides in 2018 could cost the city nearly 12 million dollars, well above the budget of 1 million dollars allocated for this purpose. Chief of Staff Dan Gilman even indicated a probable cost of 40 to 50 million dollars needed to take adequate prevention measures[77]. Discussions are currently underway to request financial assistance from Pennsylvania's statehouse and the federal government in order to patch these budget gaps[78].

Pittsburgh is now working to find solutions to prepare for extreme weather events and keep weather from stranding residents in hilly areas and shutting down its main transportation routes (road, rail, etc.), which are crucial for maintaining the continuity of the city's economic activities and the movement of people and goods (cf. figure 34).

Fig. 34:
Streets closed by snow in Pittsburgh.

Bike Pittsburgh, promoting non-vehicle mobility within a sprawling city

A local group promoting bikes and non-vehicle mobility, Bike Pittsburgh is committed to turning the city's streets into safe and enjoyable spaces that promote social ties by favoring walking and biking. The working group (non-profit organization created in 2002), supported by Pittsburgh's Department of Mobility and Infrastructure, has implemented a strategic plan for the 2016-2019 period to increase biking and walking in the city. Pittsburgh currently includes 112 km of bike paths, compared with just 16 km 15 years ago. It reached a turning point in 2007, when the city created many of its bike paths (doubling the number of bikers) and published its first bike map (cf. figure 34). In 2016, 13.4% of working adults did not own a personal vehicle and 14% made their home-work commutes by walking or biking, one of the highest shares in the United States. To learn more about the behaviors and practices of its residents, the city is taking a data-centric approach in coming years by investing in data collection and processing methods[76].

3. The perennial challenge of environmental pollution:
a matter of metropolitan governance

"We have to look back and understand what we did to our environment. We destroyed our air and our water in the pursuit of that industry. We made mistakes and that is part of our history. Today, we do not just have to minimize the environmental impacts, but also to maximize the opportunities for sustainability."

William Peduto
Mayor of Pittsburgh

Fig. 35 :
Fog of pollution over Pittsburgh, in May 1973.

The persistence of severe environmental pollution

Despite the efforts carried out through the Renaissance programs, Pittsburgh still struggles to improve the quality of its air, rivers and soils, while continuing to suffer the negative impact of its industrial legacy (cf. figure 36). This environmental pollution constitutes one of the stresses that the city's resilience strategy aims to address.

Allegheny County, ranked by the American Lung Association as the region in the United States with the worst air quality in terms of ozone and daily and annual volumes of fine particle pollution, received the lowest grade, "F", in a report published by the association in 2018 ("State of the Air 2018"), with 21 "orange" days indicating elevated ozone levels, and 21 days of elevated fine particle levels. Nearly 1.2 million people are "at risk" due to pollution across the city and region, with 249 days of air quality considered "Not Good" by the Breathe Project (cf. page 54). Outlying counties like Beaver and Washington earned 13 and 10 "orange" days respectively[79].

"Clean energy can serve as a catalyst to rebuild the economy[81]."

William Peduto
Mayor of Pittsburgh

Two primary reasons explain Pittsburgh's current pollution troubles: the states surrounding the city remain industrialized and produce large volumes of pollution, such as Ohio, Indiana and Michigan. In addition, Pittsburgh's geographic location in a valley serves to trap pollutants above the city, notably including emissions from the Clairton steel complex, "Mon Valley Works", located 31 km south of Pittsburgh on the banks of the Monongahela (cf. figure 37). This industrial complex, comprising the Clairton, Edgar Thomson, Irvin and Fairless plants, produces 4.3 million metric tons of coke annually and constitutes one of the most productive industrial complexes in the United States[80].

Industrial activities produce over 58% of pollutant emissions observed in Pittsburgh (industry, electricity generation, waste management). Transportation and residential each account for 22% respectively, caused by cars, trucks, buses, burning wood in homes and other home emissions.

Action on the local, regional and global levels

In order to contain the public health issue represented by pollution, Pittsburgh's resilience strategy plans not only to remedy problems arising from its industrial legacy (repair approach), but also to redesign its infrastructure system to minimize the city's ecological footprint. Targeted actions taken in this direction tend to favor the circular economy so as to limit the number of inputs, develop local production and improve waste management (goal of zero waste), develop a smart and multimodal transportation system enabling residents to limit their use of cars, develop a power grid system (District Energy Pittsburgh), improve indoor and outdoor air quality notably by mapping and learning more about pollution (cf. text box) and, finally, encouraging green building. Pursuing these objectives is also expected to serve as a new engine for developing the local economy.

Breathe Project

Fig. 36: In spite of its remarkable regeneration, Pittsburgh's air quality continues to suffer from its industrial past. The city is among the most polluted in the U.S. according to One PGH Resilient Pittsburgh.

The Breathe Project is housed on the premises of the Energy Innovation Center. Designed as a clearinghouse for information and transparency on air quality in Pittsburgh, Allegheny County and Pennsylvania, it unites public and private entities, associations, locals and researchers, including the American Lung Association, Allegheny County Clean Air Now, Carnegie Mellon University Center for Atmospheric Particle Studies and the Clean Air Council[81]. The project consists in collecting, monitoring and mapping pollution data, available in open-data format on the project platform. For example, Smell Pittsburgh indicates the most polluted spots on a map, Speck calculates indoor pollutant emissions and the Breathe Meter makes it possible to compare Pittsburgh's pollution with nearby cities.

However, this local action is not enough on its own to solve the problem of environmental pollution, much less climate change, because the issues occur across regions and borders. For this reason, they raise the question of cooperation between communities, across the region – for the portion of environmental pollution generated elsewhere but impacting Pittsburgh – and on the global level in terms of climate change, which requires concerted efforts across the planet.

The ONEPGH resilience strategy accounts for the interconnection between each level in the process and the need for cooperation between regional stakeholders. It devotes one of its four pillars, performance, which consists in leading a series of actions across the region to formulate a common strategy on shared challenges, such as education, empowerment, innovation and data sharing.

> "As Mayor of Pittsburgh, I can assure you that we will follow the guidelines of the Paris Agreement for our citizens, economy and future."
>
> **William Peduto**
> Mayor of Pittsburgh

With this tweet, William Peduto offered a response on June 1, 2017 to the U.S. President Donald J. Trump, who justified the country's withdrawal from the Paris Climate Agreement signed in 2015 during COP21 by claiming he was elected to represent Pittsburgh, not Paris. Also with this tweet, William Peduto underscored the fact that fighting climate change is a global challenge that no one can ignore or escape, while also highlighting the need to establish common guidelines for action on a global level and to apply them locally, since cities are the relevant and effective level to fight against climate change. "*It is now up to cities to take the reins*", he stated, and to organize networks for sharing experience and to amplify the impact of efforts put in place.

Today, the biggest challenge facing cities like Pittsburgh is to coordinate every level involved in efforts to promote environmental and climate resilience.

Endnotes

City fact sheet

1. https://www.opendatanetwork.com/entity/310M200US38300/Pittsburgh__Metro__Area__PA/demographics.population.count?ref=suggestentity&year=2016
2. https://www.deptofnumbers.com/income/pennsylvania/pittsburgh/
3. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk
4. https://fred.stlouisfed.org/series/NGMP38300
5. https://www.opendatanetwork.com/entity/310M200US38300/Pittsburgh__Metro__Area__PA/economy.gdp.per__capita__gdp?year=2016
6. https://www.brookings.edu/research/redefining-global-cities/
7. https://www.timeshighereducation.com/world-university-rankings/carnegie-mellon-university
8. https://www.topuniversities.com/university-rankings/university-subject-rankings/2018/computer-science-information-systems
9. https://www.timeshighereducation.com/world-university-rankings/university-pittsburgh#ranking-dataset/629337
10. https://www.topuniversities.com/universities/university-pittsburgh
11. ibidem
12. https://www.nextpittsburgh.com/business-tech-news/economist-names-pittsburgh-livable-city/
13. https://www.bizjournals.com/pittsburgh/subscriber-only/2017/07/07/employers.html
14. https://upload.wikimedia.org/wikipedia/commons/thumb/9/90/Map_of_USA_highlighting_OCA_Diocese_of_Eastern_Pennsylvania.svg/2000px-Map_of_USA_highlighting_OCA_Diocese_of_Eastern_Pennsylvania.svg.png

Understanding Pittsburgh in a few key dates

13. https://www.herodote.net/1756_1763-synthese-86.php
14. http://apps.pittsburghpa.gov/dcp/PRESERVEPGH_-_Adopted_07-24-2012_(Library_Version).pdf
15. https://www.alleghenyconference.org/wp-content/uploads/2016/08/AlleghenyConferenceHistory.pdf

Glory and decline of an emblematic Rust Belt city

16. Françoise Berger. La France, l'Allemagne et l'acier (1932-1952). De la stratégie des cartels à l'élaboration de la CECA. Histoire. Université Panthéon-Sorbonne - Paris I, 2000. Français.
17. https://www.lesechos.fr/26/01/2010/lesechos.fr/300411456_production-d-acier---les-etats-unis-marginalises.htm
18. http://www.nber.org/chapters/c5960.pdf
19. http://www.u-s-history.com/pages/h2801.html
20. http://wesa.fm/post/glass-city-pittsburghs-history-center-us-glass-business#stream/0
21. https://www.lesechos.fr/04/08/2015/LesEchos/21993-029-ECH_frick-et-carnegie--une-haine-d-acier.htm
22. http://worldpopulationreview.com/us-cities/pittsburgh-population/
23. http://worldpopulationreview.com/us-cities/pittsburgh-population/
24. http://www.olmsted.org/olmsted-legacy/frederick-law-olmsted-jr
25. http://apps.pittsburghpa.gov/dcp/PRESERVEPGH_-_Adopted_07-24-2012_(Library_Version).pdf
26. http://time.com/money/4967393/the-10-coolest-neighborhoods-in-america-right-now/
27. http://www.pittsburghcityliving.com/neighborhoodProfile.php?neighborhood=Lawrenceville
28. https://www.livestrong.com/slideshow/1011202-50-worst-cities-ranked-air-quality/#slide=44
29. https://www.cbsnews.com/pictures/air-pollution-worst-us-cities/10/
30. http://www.liberation.fr/planete/2015/12/25/la-pollution-enfume-plusieurs-grandes-villes-dans-le-monde_1422875
31. https://grist.org/cities/pittsburghs-new-mayor-to-be-sees-a-green-future-for-the-smoky-city/
32. https://grist.org/urbanism/2011-05-10-not-just-better-for-bikes-new-york-completes-its-streets/
33. https://datausa.io/profile/geo/pittsburgh-pa-metro-area/
34. https://ucsur.pitt.edu/files/peq/peq_2008-12.pdf
35. http://www.ledgerdata.com/unemployment/cleveland-elyria-mentor-oh-metropolitan-statistical-area/
36. https://data.bls.gov/timeseries/LAUMT423830000000005?amp%253bdata_tool=XGtable&output_view=data&include_graphs=tru

Pittsburgh's urban, economic and social renaissance

37. http://apps.pittsburghpa.gov/dcp/PRESERVEPGH_-_Adopted_07-24-2012_(Library_Version).pdf
38. Leadership in Energy and Environmental Design, certification créée en 2000 par l'US Green Building Council.
39. This program, joined by 19 cities in the United States and the result of a partnership between the private builders, associations and municipalities sharing the same vision of sustainable development and fair growth, aims to reduce energy and water use as well as pollution in urban areas and commercial buildings.
40. https://issuu.com/evolveea/docs/eic-slides
41. https://www.hazelwoodgreen.com/history/
42. Andrew Carnegie (1885) "The Gospel of Wealth" North American Review https://www.carnegie.org/about/our-history/gospelofwealth/
43. https://www.timeshighereducation.com/world-university-rankings/carnegie-mellon-university
44. https://www.topuniversities.com/university-rankings/university-subject-rankings/2017/computer-science-information-systems
45. https://www.usnews.com/best-graduate-schools/top-science-schools/computer-science-rankings
46. https://www.roboticsbusinessreview.com/manufacturing/pittsburgh-ideal-robotics-businesses/
47. https://www.usnews.com/best-graduate-schools/top-science-schools/statistics-rankings
48. https://www.hollywoodreporter.com/lists/5-best-undergrad-drama-schools-an-acting-degree-1007389/item/carnegie-mellon-top-undergrad-drama-schools-2017-1007350
49. https://www.timeshighereducation.com/world-university-rankings/university-pittsburgh
50. https://www.usnews.com/best-graduate-schools/top-medical-schools/university-of-pittsburgh-04101
51. https://health.usnews.com/health-care/best-hospitals/articles/best-hospitals-honor-roll-and-overview
52. https://health.usnews.com/best-hospitals/area/pa/childrens-hospital-of-pittsburgh-of-upmc-6232430
53. https://www.usnews.com/news/best-states/pennsylvania/articles/2017-11-03/upmc-to-spend-2b-on-3-new-specialty-hospitals-in-pittsburgh
54. Scott Andes, Mitch Horowitz, Ryan T. Helwig, et Bruce Katz (2017) Capturing the next economy: Pittsburgh's rise as a global innovation city. Brookings et TEConomy
55. ibidem
56. http://www.100resilientcities.org/wp-content/uploads/2017/07/Pittsburgh_-_Resilience_Strategy.pdf
57. http://www.policylink.org/
58. http://pittsburghpa.gov/onepgh/index.html
59. http://pittsburghpa.gov/onepgh/index.html
60. https://www.citylab.com/equity/2017/10/filmmaker-shows-unlivable-pittsburgh/542901/
61. http://www.areavibes.com/pittsburgh-pa/larimer/employment/
62. http://www.areavibes.com/pittsburgh-pa/garfield/employment/
63. The ranking compares 50 metropolitan areas with the largest black communities in the United States. http://www.100resilientcities.org/wp-content/uploads/2017/07/Pittsburgh_-_Resilience_Strategy.pdf

Pittsburgh: a resilient city?

64. Chloë Voisin-Bormuth (2018) " Résilience un nouvel impératif ?
" La Fabrique de la Cité https://medium.com/la-fabrique-de-la-cit%C3%A9/r%C3%A9silience-un-nouvel-imp%C3%A9ratif-f12fb7289d4c
65. http://www.100resilientcities.org/wp-content/uploads/2017/07/Pittsburgh_-_Resilience_Strategy.pdf
66. http://www.100resilientcities.org/about-us/#section-2
67. Ibid. p.4
68. Ibid. p.3
69. Ibid. p.4
70. http://p4pittsburgh.org/pages/2018-p4-conference
71. Raj Chetty and Nathaniel Hendren (2015) "The impacts of neighborhoods on intergenerational mobility; Childhood exposure effects and county-level estimates" Université de Harvard, http://www.equality-of-opportunity.org/images/nbhds_exec_summary.pdf
72. https://www.artba.org/wp-content/deficient_bridge/ARTBA_State_Ranking_2018.pdf
73. https://www.washingtonpost.com/graphics/national/structurally-deficient-bridges/#42003
74. http://www.chicagotribune.com/news/nationworld/ct-bridges-need-repair-20170215-story.html
75. https://bikepgh.org/wp-content/uploads/2016/05/StragicPlan-2016-Booklet-24pgs-Take2.pdf
76. http://pittsburgh.cbslocal.com/2018/04/18/scramble-to-fill-budget-holes-from-landslides/
77. http://www.post-gazette.com/local/city/2018/04/14/Pittsburgh-landslides-remediation-budget-2018-Dan-Gilman-Bill-Peduto-state-aid-Karina-Ricks-Maura-Kennedy-Theresa-Kail-Smith/stories/201804140018
78. Assessments based on data from 2014, 2015 and 2016 http://www.lung.org/our-initiatives/healthy-air/sota/city-rankings/states/pennsylvania/
79. https://www.ussteel.com/locations/mon-valley-works-clairton-plant
80. La Fabrique de la Cité (2017) Beyond Borders and Boundaries. Great Metropolitan Issues Today p. 106 https://www.thecityfactory.com/fabrique-de-la-cite/data.nsf/201FA7E704163D59C12581B7003194DC/$file/beyond_borders_and_boundaries.pdf
81. https://breatheproject.org/about/

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La Fabrique de la Cité is a think tank dedicated to urban innovation and forecasting. Its interdisciplinary approach brings together French and international experts to reflect on best practices in urban development and propose new ways to build and renovate cities. Its work revolves around five key topics: mobility, urban development and construction, energy, digital revolution, and new practices. Created in 2010 by the VINCI Group, its chief sponsor, *La Fabrique de la Cité* is an endowment fund that fulfils a public service mission. Its work is available to the public through a Creative Commons license on its website, Twitter account and Medium publication.

Authors
Delphine Lacroix
Chloë Voisin-Bormuth
Editor
Marie Baléo
Communications
Matthieu Lerondeau
Laure Blanchard

Graphic design
Elsa Antoine
Formatting
Loïs Bayard
Printed at
Impression Jaurès

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William Peduto, Mayor of Pittsburgh

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Tim McNulty, Associate Vice President for Government Relations, Carnegie Mellon University

Richard A. DiClaudio, President and CEO, Energy Innovation Center

Robert Daniel Lavelle, Councilman, District 6, City of Pittsburgh

Ray Gastil, City Planning Director, City of Pittsburgh

Grant Ervin, Chief Resilience Officer and Assistant Director for the Department of City Planning, City of Pittsburgh

Karina Ricks, Director of Mobility and Infrastructure, Department of Mobility and Infrastructure, City of Pittsburgh

Pr. Cynthia Ghorra-Gobin, Research Director, CNRS-CREDA, Paris III Sorbonne Nouvelle University

Armelle Langlois, Deputy Director of Sustainable Building, VINCI Construction France

La Fabrique de la Cité
6, place du colonel Bourgoin
75012 Paris - France
contact@lafabriquedelacite.com

www.lafabriquedelacite.com

twitter.com/fabriquelacite