CITY AS THE WORK OF PUBLIC HEALTH:

Urban transformations through the lens of public health in Amsterdam.

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Abstract

These days the goals of urban and territorial transformation are being tailored to make cities safer, healthier, and more centred on people in both developed and developing countries worldwide. While being an integral part of urban fabric from ages, public health agendas were traditionally treated as standalone from other policy areas. Nonetheless, the Covid-19 Pandemic has brought attention to the necessity of considering human health and including it into the planning of future cities in order to make them a safe place to live and to combat future pandemic scenarios. Public health and urban planning have always been intertwined, with modern urban planning emerging in the 19th century as a response to issues with inadequate sanitation, poor water supply, and air pollution. Due to their high population density and status as the continent's most developed regions, metropolises have historically been the area's most severely impacted by epidemics and other instances of widespread disease.

Every new pandemic, epidemic, or outbreak of a contagious disease reveals and targets a unique element of urban planning and architecture. This thesis explores how public health has been present throughout the history of urban planning and changes, examining the relationship between them and how it has impacted the transformation of the City of Amsterdam.

1. Introduction

"Urban and territorial planning is a vehicle for health improvement and ultimately for achieving the New Urban Agenda and the many targets associated with urban health and the Sustainable Development Goals- applying a health 'lens' to this process ensures all the determinants of health are considered,"

- Shipra Narang Suri, UN-Habitat Chief of Urban Practices.[1]

The statement made by Shipra Narang Suri, describes the agendas of today's urban and territorial planning in developed and developing nations across the world. With the development of future city plans the concerns of urban health are continuously being catered making the cities more safe, healthy and human centric. The public health agendas are not new interventions in the urban planning processes, they have been part of these since early ages but were considered of secondary importance. They were seen as separate policy fields in most countries, with health entering the planning processes only through obligatory planning evaluations or restrictive environmental legislation. Verbeek, Thomas. (2014). Reconnecting urban planning and public health: an exploration of a more adaptive approach.[2] But with the recent event of Covid – 19 Pandemic which is considered a major catastrophic event in the history of epidemics, it is becoming a very important to look beyond these conventional settings. The deadly coronavirus which is being fought by every nation around the globe has not only impacted human health but also social structures and economics. With one variety emerging after another and a succession of waves that occasionally peak up with a high number of infections, this appears to be a reoccurring risk. Even the most developed nations of the world were not able to protect the people from the fast-spreading corona virus. The cities were not planned and designed to protect its citizens from this type of physically transmitted virus without imposing strict rules of curfew across the cities putting people's life on halt for almost a year. This created a major requirement of thinking in the direction of human health and implicating it in the designing of future cities, making them a safe place to live and to fight against future pandemic scenarios.

Historically public health and urban transformations were closely interlinked, with modern urban development originating in the unhealthy and overcrowded industrial cities of the 19th century, in response to problems of poor water supply, inadequate sanitation and air pollution.[2] Even though the public health was less of a concern in early centuries, but eventually with time and growth of science, public health issues and communicable illnesses have seen to have played effective role in changing how our physical environment is designed and developed. Many of the techniques used today in architecture and urban planning have developed from comparable actions done throughout the ages to protect city people's comfort, hygiene, and health.

Through the course of history, it is seen that the metropolis are the once most affected regions by these epidemics and public illness events. As metropolis are considered as the economic hubs of the countries and continents, they attract a lot of people residing in them making them comparatively unfit and highly vulnerable to these public health disasters. Even though these metropolises are the most developed regions of the continent they fail to encounter these health issues and fall prey to them, as each new epidemic, pandemic or public illness event unlocks and targets a different aspect of urban planning and design. These requires new reforms to tackle future events.

Amsterdam being the capital city of Netherlands, is one of the most populated and biggest cities of the country. Considerably it was also one of the worst hit cities during the course of corona pandemic.[3] As a result, we see a lot of researchers and planners studying and creating the new course plans for designing the healthy city of Amsterdam, but to completely understand the future reforms it becomes an important aspect to have a look into the history of urban transformations and study how public health played a role in determining them. This thesis investigates the presence of public health in the history of city planning and transformations. It studies and tries to answer the

1. World Health Organization. (2020, May 25). Urban planning crucial for Better Public Health in cities. Climate & Clean Air Coalition. Retrieved April 17, 2023, from https://www.ccacoalition.org/en/news/urban-planning-crucial-better-public-health-cities
2. Verbeek, T. (2014). Reconnecting Urban Planning and Public Health. https://doi.org/10.24306/aeprints.61
3. Stewart, C. (2023, January 18). Netherlands: Daily New Coronavirus cases 2023. Statista. Retrieved April 19, 2023, from https://www.statista.com/statistics/1101300/coronavirus-cases-in-netherlands/

very question of research – **What is the inter-relation of public health and urban planning and how have it influenced the historic transformation of the City of Amsterdam?** To understand these transformations the thesis elaborates the study based on different historic moments concerning public health how they were tackled and what transformations were brought into the urban fabric of Amsterdam as a safeguard against these problems. It will further be supported or compared with cases from cities of Palermo, Paris, London and Berlin, as a source of inspiration, and to understand the efficiency of the change. It will be further clarified using different maps, photographs, historical paintings, and newspaper archives to showcase these transformations. Few location maps have been created based on the information gathered from literature to understand its impact on city level. Study of External research papers and books to better understand the inter-relation and the historic implementations in the urban fabric, such as Town planning in the Netherlands since 1800 by Cor Wagenaar, The Routledge Handbook of Planning History (edited) by Carola Hein, Well Being sustainability and Social development- The Netherlands 1850-2050 by Harry Linsten, Frank Veraart, Jan Pieter Smits, and John Grin Title, Epidemic Urbanism : Contagious Diseases in Global Cities by Mohammad Gharipour and Caitlin DeClercq, 20th century urban design in the Netherlands by Fred Feddes and DH Mader.
The Thesis starts with the current scenario of Pandemic and public health which gave the purpose and motivation of research this question. The later chapters describing the influence of public health on urban transformation follows the timeline method where all the chapters unfold chronologically of their occurrence. It is mainly divided into 5 sections and each elaborates on specific events happened during that time frame.

1. Before 1800 - The first encounter
2. 1800-1860 - The struggle for clean water
3. 1860-1920 - The age of infectious diseases
4. 1920-2019 - The new era of public health

These time frames are supported by examples of major happenings in Amsterdam, trying to classify the influence of public health in the urban transformations. The thesis will conclude by providing a backdrop for the making of future development plans of the city. This will help people better understand and evaluate the design strategies used to achieve a sustainable built environment, by adding progressive layers of protection against epidemics and major health issues.

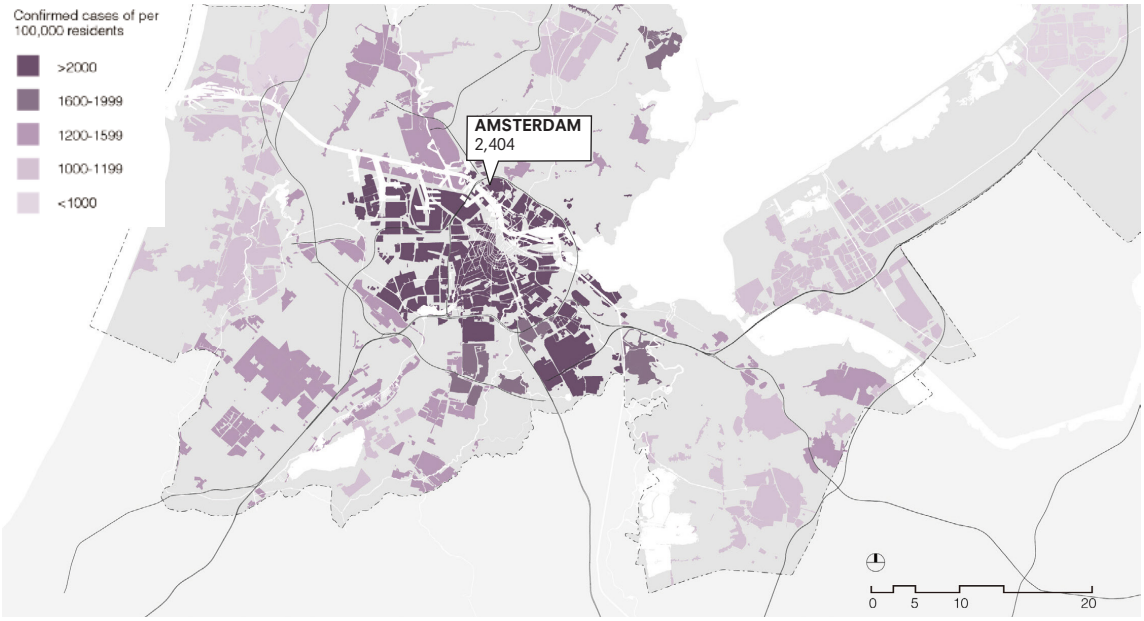
2. Covid-19 and the city of Amsterdam

The novel coronavirus SARS-CoV-2, which was discovered in Wuhan, China in 2019, is what causes COVID-19. It belongs to the large coronavirus family, which includes viruses that cause everything from the common cold to more serious epidemics like MERS and SARS (WHO, 2020). When a group of corona cases first emerged in Wuhan, China, in 2019, it quickly mutated into a pandemic that devastated many nations and cities via the extensive global network. On public health, COVID-19 had a disastrous effect. This appears to be a recurring risk with successive waves that occasionally peak up with a high number of infections and one variety emerging after another. Even though the virus is relatively less deadly now and is present in our environment, it will continue to have an impact for years to come. Along with the public health, it had an impact on the social cohesion and financial stability of cities all over the world. Cities are still coping with the effects of the pandemic's ravages today, nearly three years after it first began. Cities that offer inexpensive travel are attempting to increase their international connectivity, attract tourists, and grow their economies. Corona has created new concerns for global health reforms and urban transformation policies. Additionally, it was a well-established fact that the metropolitan areas of various nations were where corona spread the fastest. Amsterdam, for instance, was among the worst affected cities in the Netherlands by the corona pandemic. In Amsterdam, there have been 2,404 confirmed cases per 100,000 residents up until October 16th, 2020, as also seen in the fig-1.[4] Along with raising the death rate, it also negatively impacted the city's economy. It becomes necessary to learn about previous epidemics and the reforms that were implemented to combat them in order to develop a series of reforms for the city to combat this pandemic. The parks and green spaces that were abandoned as a result of historic urban planning reforms have now been transformed into important breakout areas that provide people with a place to unwind and clear their heads. In this case of COVID-19, many healthcare resources were being used, while others served no purpose at all. The city changed from the most frantic and glistening urban nodes to completely empty and silent nodes, as seen in the images below. In a way, Covid-19 has prompted questions about how urban transformations might go about reducing the impact of such pandemics in the future. Every few years, we learn about some new virus that has gotten out into the air and is now causing a variety of health problems. As a result, urban transformations must now take the lead in developing environments that could protect the city's residents from such catastrophes.

Fig 1 - Confirmed cases of Covid-19 per 100,000 residents in the MRA.
Wang, Y. (1970, January 1). Metropolitan virus: A strategic planning framework to improve the resilience of the metropolitan region amsterdam in the aftermath of the COVID-19 pandemic. TU Delft Repositories. Retrieved April 19, 2023, from http://resolver.tudelft.nl/uuid:d29fdb24-34d1-40e4-986c-dac85d43797a

Fig 2 - (upper) The Glowing city of Amsterdam
(lower) The silent city of Amsterdam
Wang, Y. (1970, January 1). Metropolitan virus: A strategic planning framework to improve the resilience of the metropolitan region amsterdam in the aftermath of the COVID-19 pandemic. TU Delft Repositories. Retrieved April 19, 2023, from http://resolver.tudelft.nl/uuid:d29fdb24-34d1-40e4-986c-dac85d43797a

4. Wang, Y. (1970, January 1). Metropolitan virus: A strategic planning framework to improve the resilience of the metropolitan region amsterdam in the aftermath of the COVID-19 pandemic. TU Delft Repositories. Retrieved April 19, 2023, from http://resolver.tudelft.nl/uuid:d29fdb24-34d1-40e4-986c-dac85d43797a

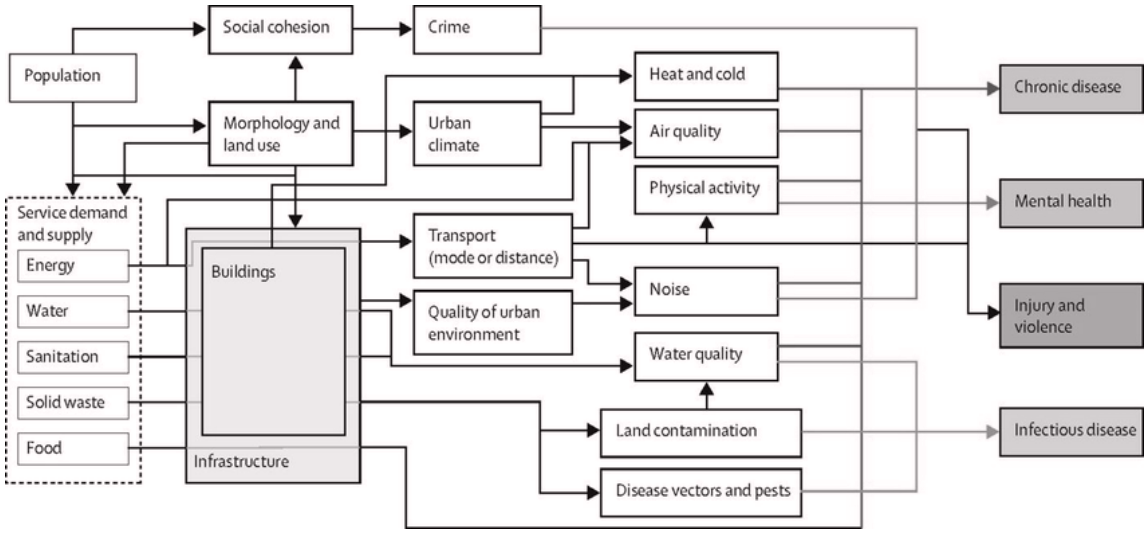

Confirmed cases of per 100,000 residents
>2000
1600-1999
1200-1599
1000-1199
<1000
AMSTERDAM
2,404
0
5
10
20

3. Inter-relation of public health and urban transformation

The way cities are changing, and the health of the public are connected in some ways. Both are predicated on the concept that people's lives can be improved through the adoption of precautionary measures and proactive policies over the course of a longer period. Both professions didn't get off the ground until the cities had stable economies to support them. The connection that exists between the two domains is analogous to a complicated dance, in which one partner takes the lead and then the other to determine how the two should collaborate with one another.[5] It is also possible to look at it in another way, which is that both fields have continuously affected the built environment of a city, either positively or negatively. Although public health has had some influence on urban transformations and served as a guide for the development of public spaces, housing, urban blocks, and cities, very few urban transformations have been responsible for directing the focus of public health programmes. Additionally, we can follow these interconnections through the diagram1. Both fields of study have been influenced by forces from the outside world, but they each serve distinct populations of people and are accountable for distinct sets of behaviours. Despite this, they have collaborated on several projects over the past almost 200 years, all of which have contributed to the formation of their modern forms. Throughout history, urban transformation and public health have been closely intertwined. In fact, the origins of modern urban planning can be traced back to the unhealthy and overcrowded industrial cities of the 19th century. These cities developed modern urban planning as a solution to the problems of inadequate water supply, inadequate sanitation, and air pollution. However, by the 20th century, the initial connection had largely been severed, and urban planning had shifted its attention to a more narrowly defined concept of what it meant to be an effective and practical city. We now see an institutional separation of both policy fields in most countries, with health only entering the planning processes through obligatory planning evaluations. Today, we see this institutional separation in most countries. Despite the fact that we cannot really see the connection between these two things, it is clear that they are inextricably linked. The most typical illustration of this is the fact that the effects of noise and air pollution caused by roads and other modes of transportation are visible in all directions around us. People who live very close to major roadways and who work alongside them are more likely to suffer from health problems like asthma. This is especially true of those who work alongside them. Even though the urban transformations that have already taken place in the past are still ongoing and are intended to protect people from similar problems, the beginning of the 21st century has brought with it a multitude of health problems that call for more comprehensive solutions. As it has been said, the world that we see today was formed by a series of changes in urban forms that occurred over the course of history. These shifts in urban forms are continuously affecting our day-to-day lives in some way or another. It is important to dive deeply into the history of these shifts and their influence in order to get a much better understanding of the relation in a much broader context.

Fig 3 - Urban connections between health outcomes and the urban environment
Reconnecting Urban Planning and Public Health: An exploration of a more ... (n.d.). Retrieved April 19, 2023, from https://www.researchgate.net/publication/288668035_Reconnecting_urban_planning_and_public_health_an_exploration_of_a_more_adaptive_approach

5. Hein, C. (Ed.). (2017). The routledge handbook of planning history. Taylor & Francis Group, Pg- 366


Social cohesion
Crime
Population
Heat and cold
Chronic disease
Morphology and land use
Urban climate
Air quality
Physical activity
Mental health
Service demand and supply
Energy
Water
Sanitation
Solid waste
Food
Buildings
Infrastructure
Transport (mode or distance)
Noise
Quality of urban environment
Injury and violence
Water quality
Land contamination
Infectious disease
Disease vectors and pests

4. Tracing the Inter-relation of public health and urban transformations

The history of any city in the globe can be used to trace the relationship between public health and urban developments. The research focuses on the city of Amsterdam, which is one of the few that was eventually built by people on and around water because of its position and geographical circumstances. A few factors, including water, population, climate, and a lack of research and technology, contribute to the spread of severe epidemics and other problems with public health. Amsterdam, one of the last European towns to experience industrialisation and having the bulk of its area covered by water, serves as the ideal comparison for this research among other European cities. Despite not being among the earliest Dutch settlements, Amsterdam is the biggest and most populous dutch city in the country. The history of Amsterdam, when seen through the lens of public health, can be broken down into four distinct eras, starting in the 17th and 18th century and continuing through the present day. Each part provides thorough supporting information from scientific studies and Amsterdam medical records to describe the changes that occurred over that time period and their effects on the public health. A brief summary of each area will be given in the paragraphs that follow.

Fig 4 - Cornelis Anthonisz, Bird's eye view of Amsterdam, 1538
Nadeya. (2021, March 16). History of Amsterdam: The golde age. Amsterdam Canal Cruises. Retrieved April 19, 2023, from https://amsterdamcanalcruises.nl/blog/history-of-amsterdam/

Before 1800: The first encounter

For cities like Amsterdam, the period before to 1800 was extremely important because it served as their first introduction to epidemics and public health. The components of urban growth that will have both positive and bad effects on Amsterdam residents' quality of life are further discussed in this section. The Bubonic plague, which kills 24,000 Amsterdamers, becomes the city's first lethal pandemic. The situation in Harlingen and Palermo, Italy, and its progress towards implementing measures made to promote public health are discussed in the chapter's second half.

1800 - 1860: The struggle for clean water

As the chapter's title suggests, it was challenging to avoid portraying Amsterdam's waterways to visitors as a major source of disease transmission and a filthy city because the city was built on water, as were most of its neighbourhoods. It appeared to be a logical outcome of improved access to sanitary sewers, clean drinking water, and knowledge of healthy eating habits and the value of hygiene. The life along the canals and how improving it through various urban reforms will affect the public health in the long run will continue to be the main points of discussion. However, it is during this time that the Dutch realise their water systems are the real source of their problems, and one of the main factors directly related to them is health.

1860 - 1920: The age of infectious diseases

The 1860–1920 era in Amsterdam's history of urban reforms and public health turned out to be a crucial period. The city is not only engulfed by numerous epidemics, but it is also dedicating all of its resources to enhancing the city's public health. As

a result, it became evident in the second half of the 19th century that streets are the so-called "backbone" of the city, improving people's living conditions without which the city could not function. As H. P. Berlage develops his vision plan for the south of Amsterdam, the city anticipates expanding even further into the south.

1920 - 2018: New Era of public health

In this new era, health issues were more often caused by technological advancements and inefficient ways of using them than by diseases. The city of Amsterdam adopts a similar development strategy after being inspired and impressed by these developments in Germany. These garden suburbs served as a major draw for residents, causing them to become more distant from the city and becoming a major cause of fatalities during this time. With the aid of historical lessons, the concepts of a compact city, a cyclable and walkable city, and a social city begin to take shape.

Before 1800 – The first encounter

"The Netherlands is a prize won by men from the sea; - it is an artificial, a 'made' land; - the Dutch made it; it exists because the Dutch defend it; - it would disappear if the Dutch left it."

- Edmondo de Amicis in his book Olanda [6]

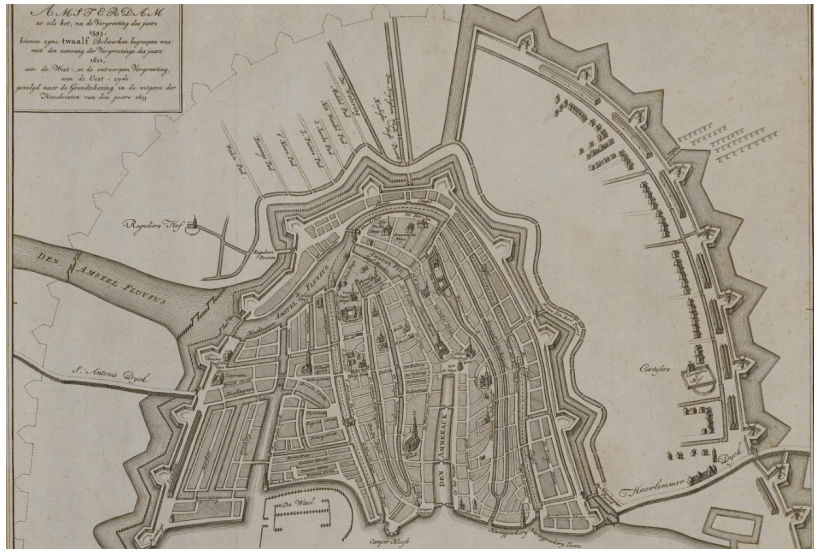
Edmonda and many others made the point that the Dutch lands were largely man-made. Most likely the best of all the cities built by humans near water is Amsterdam. Imagine yourself on the outskirts of the city in the early 17th century. You would see long stretches of a panoramic landscape that included canals, city squares, boats, farms, and bicycles that were parked. The idea of the founding of the city as one enormous theatrical gesture is alluring. The 17th and 18th centuries saw a dramatic increase in Amsterdam's population as word of the city's beauty and success spread over the years. According to estimates, there were 54,000 people in 1600, 105,000 in 1622, 175,000 in 1650, 219,00 in 1680, 235,000 in 1700, 243,000 in 1725, 234,000 in 1750, 241,000 in 1760, and 203,000 in 1800.[7] After London and Paris, it was the third-largest city in Europe by 1650, a position it held until the early nineteenth century. Within the mediaeval walls, there is a need for expansion of the city to accommodate the growing population. Due to the installation of semi-circular expansion plans in the 17th century, known as the Ring canals of Amsterdam, the city of Amsterdam was viewed as a spectacle of urban design after this expansion was realised. This was regarded for centuries as the height of urban development. "The most grandiose urban project that was designed and realised in 17th-century Europe," according to architecture historian Leonardo Benevolo. The ring canals were regarded as the most lovely places to spend an afternoon. You could take a boat through them while admiring the architecture along the way or you could ride a bike alongside them while taking in the pleasant and unspoiled beauty of the water. The development of these canals was primarily done to facilitate the movement of water barges and to use the water for various city-wide uses. There was no hard evidence to support the claim that these canals contributed significantly to the development of a healthy way of life in Amsterdam's more recent neighbourhoods, in addition to aiding in water transportation. They were most likely viewed as a piece of art at the time. Today, however, we are aware that the canals and the accompanying greenery would have been crucial in maintaining the health of the residents of Amsterdam. As history moves further back, it becomes clear that the early settlers of Amsterdam were actually shielded from floods by these ditches, canals, and dikes. But as the city's population increased, it was only a matter of time before things became chaotic and unruly. These canals will be perceived in the future as the origin of death.

The idea and belief of building country homes, castles and estates with lovely grounds also grew as a result of increasing population and the number of homes along the canals. These rural homes began to appear at the beginning of the 18th century, outside the city walls, away from the bustle of the city, in the midst of farms

Fig 5 - "AMSTERDAM as it was, after the Enlargement of the year 1593,
Isaak Tirion. (n.d.). Amsterdam zo als het, na de vergrooting des jaars 1593, Binnen Zijne Twaalf Bolwerken begreepen was; ... AMSTERDAM zo als het, na de Vergrooting des jaars 1593, binnen zijne twaalf Bolw :: TU Delft Beeldbank. Retrieved April 19, 2023, from https://repository.tudelft.nl/view/MMP/uuid%3A6da274f8-e5b5-4910-9e9b-f77acd12dff1

Fig 6 - Map showing regions with country estates near Amsterdam.
Map made by author based on information gathered from book Town planning in the Netherlands since 1800, By Cor Wagenaar

6. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-9
7. Amsterdam. Intoxicating Spaces. (2019, September 5). Retrieved April 19, 2023, from https://www.intoxicatingspaces.org/research/amsterdam/


Regulers Hof
DEN AMSTEL FLUVIUS
S. Antoni Dyck
DES AMSTELS
Haerlemmer Dyck


Heemskerk
Old city of Amsterdam
Noordwijk
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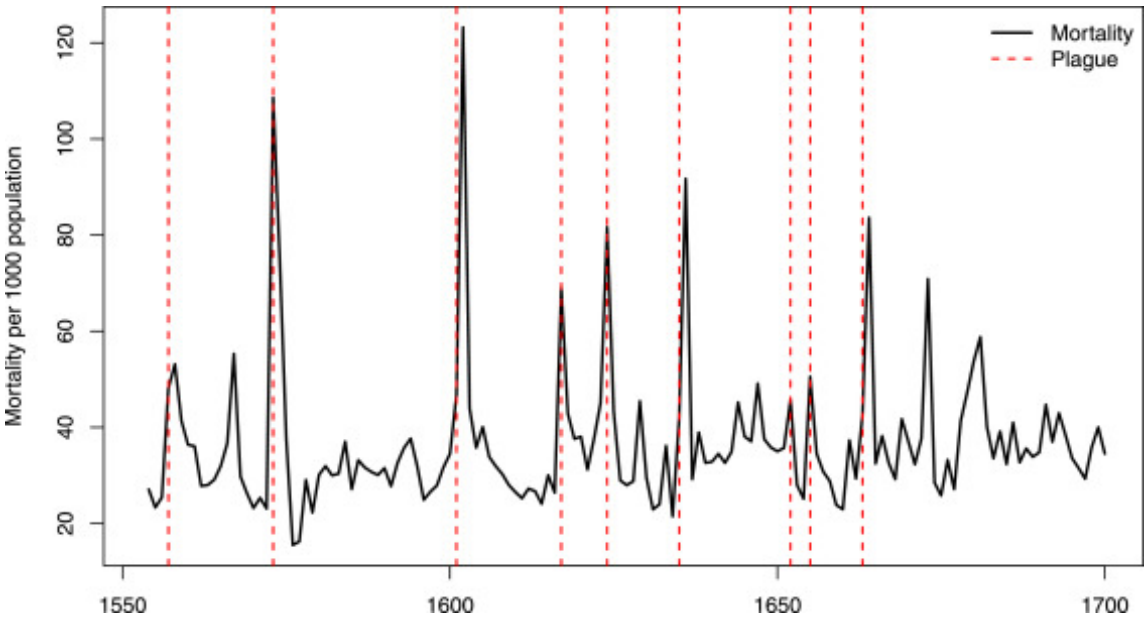
and greenery. According to Knoop, these estates were used in the summer, and the nobleman who lived there would only visit the city during the winter or when the government requested it. He also says that the Ancient Romans, who spent most of their time in the countryside rather than the cities, are the source of these notions of country living. The first ones belonged to the Orange family and their close friends.[8] At the time, this was only intended to provide a peaceful environment with all the possible pleasures that were not available to people in the city. But as time goes on, these estates will be required for the elite to leave the city in order to live in a safe and superior environment. Famous German baroque architect Balthasar Neumann visited the Netherlands in 1740 and wrote, "Whereas the Dutch architecture was not very spectacular, the gardens were well worth visiting."[9] When compared to the rich and elite, the death rates of the poor were clearly different. This allows a connection to be made, demonstrating how the transformation of the city in some way aided in enhancing the health of the affluent and elite populations. They gave people a safe place to live away from the canals' hazardous fumes and the spread of various diseases. The estates gave people the chance to cultivate their own food, enjoy clean air and water, and keep a sufficient social distance. The importance of maintaining privacy and owning a country estate in the future was not fully understood back then. Unaware of it, these country estates protected a large portion of Amsterdam's elite from airborne and difficult-to-trace diseases at the time. A statistic was also offered by an author in 1795 to support his claim: while one out of every forty people died annually in the country, only one out of every twenty-five did so in the city.[10]

Fig 7 - Mortality per 1000 Inhabitants in Amsterdam
Francke, M., & Korevaar, M. (2021). Housing markets in a pandemic: Evidence from historical outbreaks. Journal of Urban Economics, 123, 103333. https://doi.org/10.1016/j.jue.2021.103333

Beginning in the second half of the 17th century, the city experiences its first major public health catastrophe: the bubonic plague. The shock that Amsterdam felt back then feels very similar to the current Covid scenarios. Over the course of two years, the deadly Bubonic plague decimated the city, killing about 24,000 residents of Amsterdam. This is responsible for eradicating 10% of Amsterdam's entire population at the time.[11] A highly contagious illness that is causing the economy to stall, highlighting social inequality, and raising issues about urban living. As the plague spreads, people begin to practise the only method of social isolation they were aware of as a preventative measure. The only known treatment for this disease originated in London, where ships and their crews were quarantined for 30 days before entering the city. But due to a lack of science, they have been years away from the disease's true cause, which was rats and fleas breeding in the filthy streets of Amsterdam, which caused the disease to spread. Although there was a growing need for reforms to clean up the city, it would take years and possibly more pandemics for the state to understand how important public hygiene and cleanliness are. Despite the severity of the epidemic, the notions of seclusion and the wealthy moving to their country estate may have prevented the loss of a few lives. The fact that the disease-containment methods we use today are the same as those from the 17th and 18th centuries is so ironic.

Fig 8 - The Pesthuis or Buitengasthuis, seen from the Overtoom near the current Tweede Constantijn Huygensstraat
Het pesthuis of Buitengasthuis, Gezien vanaf de Overtoom ter Hoogte van de Huidige Tweede Constantijn Huygensstraat. Beeldbank. (n.d.). Retrieved April 19, 2023, from https://archief.amsterdam/beeldbank/detail/b475c2be-85a8-ebcd-f5b7-fac605e01d03

8. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 58
9. E.de Jong, Natuur en Kunst. Netherlandse tuin - en landschaps - architecture 1650-1740, Amsterdam 1993, pg-156
10. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 61
11. O'Sullivan, F. (2021, April 14). How Amsterdam recovered from bubonic plague. Bloomberg.com. Retrieved April 19, 2023, from https://www.bloomberg.com/news/features/2021-04-14/how-amsterdam-recovered-from-bubonic-plague


Mortality
Plague
Mortality per 1000 population
20
40
60
80
100
120
1550
1600
1650
1700


HET PEST-HUIS BUITEN AMSTERDAM.
R. Zeeman Inventer & Fecit.

Michael Hooper makes a comparison between the current and prior pandemic response situations. Rich European city dwellers frequently fled their homes during plagues in the late mediaeval era. Following a similar pattern, news reports have detailed wealthy people leaving cities for second homes or vacation properties in rural areas during the current Covid-19 pandemic.[12] Although the bubonic plague had no direct influence on urban changes, it did set up situations that led to notable changes in the city. The city opens its gate and tries to accommodate the illegal settlements outside the city wall to realise the third expansion of the city, giving rise to workers neighbourhoods like Jordaan, as well as to revive the economy and build new homes for the incoming migrants. Jordaan was intended to be fairly slick and roomy, with houses opening to courtyards. As the 19th century begins, house extensions will soon be built on these courts and wide streets to accommodate the expanding population. When France invaded Amsterdam in 1672 while it was still recovering from the plague, the republic was forced to flood the remaining portion of the expansion to defend the city.[13] Due to its spongy terrain and abundance of loose soil, the area remained undeveloped and uninhabited until the 19th century. If there are no buyers for that land, it is intended to convert the fourth quarter of the expansion into public parks and market gardens, which will increase the amount of greenery in Amsterdam's walled city. Even today, this area of the city is much more open and green than the rest of Amsterdam. The area was soon repurposed for the city's use as a vegetable farm and given the name Plantage. This war and plague outcome will help the city's residents become healthier by providing wholesome food and a greener area for them to exercise in and breathe clean air.

Fig 9 - City with explanation 1613 and plan of the new explanation
Andries van Damme. (1970, January 1). Nette aftekening Van D'OUDE en Nieuwe Roojingh der Stadt Amsterdam. TU Delft Beeldbank. Retrieved April 19, 2023, from https://repository.tudelft.nl/view/MMP/uuid:9e6b6d79-563c-4d41-815a-24c4e96f6737?fullscreen=1

Although these modifications were not as significant at the time as those made in the other European colonies, over time it became clear that the city's working class and poor valued these parks greatly. Up until the late 18th century, the Netherlands lacked the knowledge and science to link urban development and public health. When a deadly epidemic struck Harlingen in 1779, J. H. Knoop connected public health to living in accordance with natural laws and held that architecture had a direct impact on people's health.[14] The majority of Dutch cities, including Amsterdam, began to display signs of squalor and filth by the end of the 18th century. Despite the Dutch housewives' feverish efforts to keep the house and its surroundings clean, the city as a whole was unaffected. In his book *Geschiedkundig verslag van den ganschen loop der in 1779 te Harlingen geheerscht hebbende ziekten*, S. Stinstra[15] was the one who believed and demonstrated the relationship between the environment in which people spend their daily lives has a profound impact on their health and wellbeing. Even in the case of Harlingen, it was clear that the pandemic had the greatest impact on the city's poorer neighbourhood. The wealthy and elite who resided in country villas and relatively less cramped quarters were typically unaffected by the rapid spread of diseases. Along with the wealthy, Stinstra notes that Jews were also spared from this pandemic, and the only connection that could be made was not eating pork and maintaining a green, healthy diet. When considering how the

Fig 10 - Map showing location of plantage in the city walls of Amsterdam
Map made by author based on information gathered from Google, and historic maps of Amsterdam

12. Webcontent. (2020, September 25). Pandemics and the future of urban density: Michael Hooper on hygiene, public perception and the "urban penalty". Harvard Graduate School of Design. Retrieved April 19, 2023, from https://www.gsd.harvard.edu/2020/04/have-we-embraced-urban-density-to-our-own-peril-michael-hooper-on-hygiene-public-perception-and-the-urban-penalty-in-a-global-pandemic/
13. O'Sullivan, F. (2021, April 14). How Amsterdam recovered from bubonic plague. Bloomberg.com. Retrieved April 19, 2023, from https://www.bloomberg.com/news/features/2021-04-14/how-amsterdam-recovered-from-bubonic-plague

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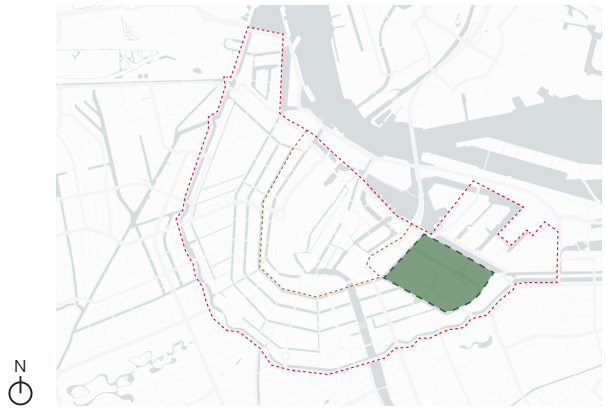


14. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 73
15. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 73

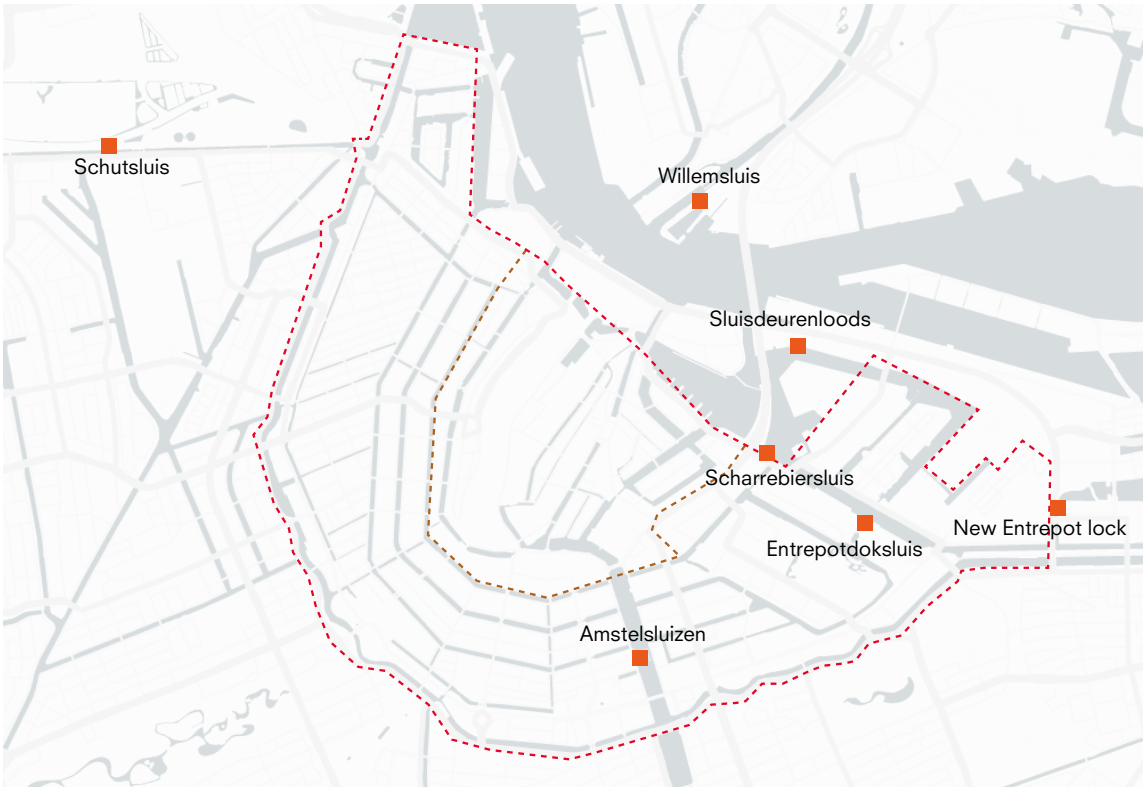

Schutsluis
Willemsluis
Sluisdeurenloods
Scharrebiersluis
Entrepotdoksluis
New Entrepot lock
Amstelsluizen

Fig 11 - Map showing multiple sluices along the canals of Amsterdam
Map made by author based on information gathered from Google, amsterdam-opdekaart.nl

disease spread, it becomes clear that urban changes made for the benefit of the waterways are directly responsible. It was thought that the presence of sluices in Harlingen's canals was responsible for the decrease in water levels, foul odours, and the significant spread of disease throughout the city.[16] The belief was confirmed by research showing that cities with completely full water canals and those that recently experienced flooding were not affected by the pandemic. To improve the flow of fresh water throughout the city, Amsterdam invested a lot in this intricate system of maintaining various water levels, but, like Harlingen, this only made things worse. The water quality in canals will suffer as a result, becoming unfit for human consumption. This could be regarded as the first instance of scientifically supported urban reforms and changing public health in Dutch cities.

The Italian city of Palermo, which experienced the deadly Bubonic plague in 1575–76, had long since developed an understanding of this relationship, whereas the Dutch were comparatively very slow to do so. In his book, Information del Pestifero et Contagioso Morbo, Giovan Filippo Ingrassia, one of the earliest forensic medicine theorists, investigated, documented, and developed theories about the urbanisation of the plague.[17] Ingrassia used urban planning as a tool to stop the spread of the plague. Lazzaretti (public clinics), the construction of villas and new homes outside the city walls as quarantine centres, the development of gardens, the cleaning of the streets and waterways, and the creation of a network for the removal of urban waste had all been practised for centuries in various parts of Europe. He intended to build new homes outside the city limits to give the families of those who died from the pandemic a high-quality life; later, this led to the growth of Palermo's northern region. He described his policies in terms of a military metaphor, saying that "castles and fortresses are prepared in times of peace to find themselves ready for the time of war." By doing this, he hoped to effectively demonstrate that a public health network was required at all times, not just during plague years.

Fig 12 - View of Amstelsluizen, built in 1674 to imoprove the flow water in the city canals.
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH.

16. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 74
17. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 73

1800 - 1860: The struggle for clean water

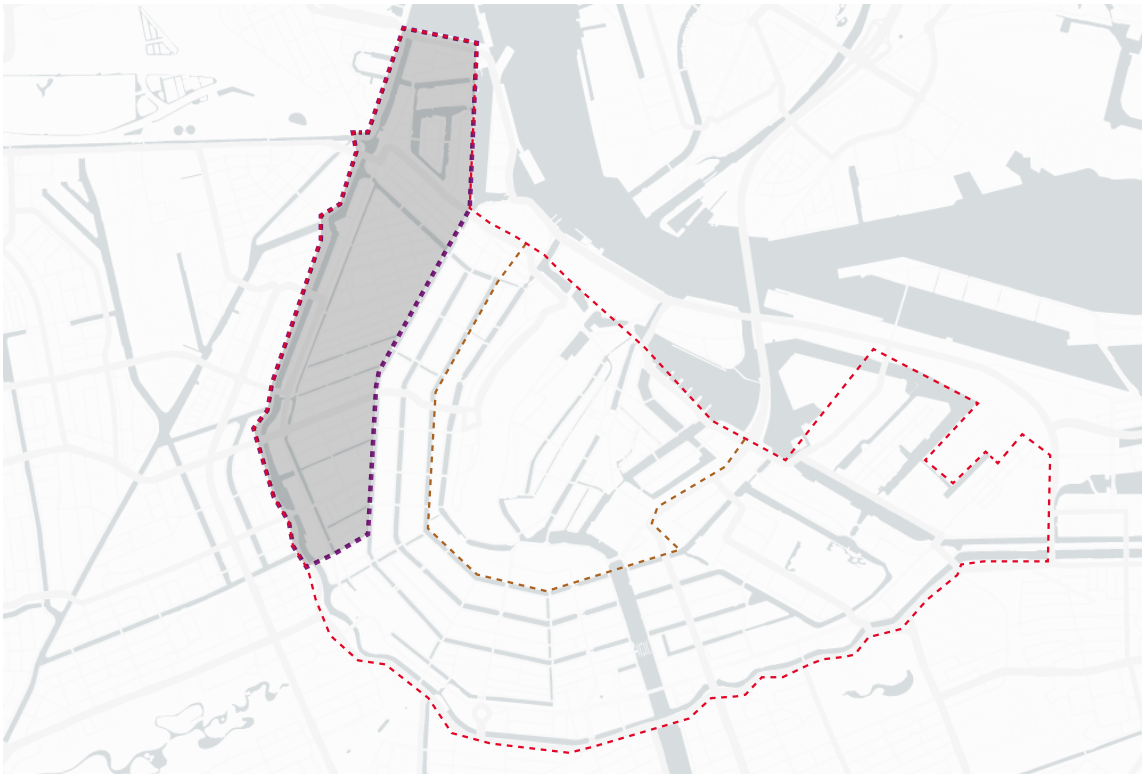
Amsterdam and Venice are frequently contrasted because both cities are commercial and have an abundance of islands connected by numerous bridges over their waterways. However, after its heyday, Amsterdam descended into a similar state as other Dutch cities, and during those times, a paradox that stuck to Amsterdam for centuries was born: "Water, water everywhere, and not a drop to drink."[18] After the fourth expansion of the city was finished, there was no significant expansion for about 150 years[19] because it was determined that Amsterdam had undergone all of its urban transformations by the end of the 17th century. The city serves as a visual reminder of how the city began to crumble under the weight of its expanding population as a result of stagnant urban reforms, resulting in the so-called "Landscape of Horrors."[20] The 1800s were thought to be just the beginning of the destructive era. Major epidemics and a wide range of public health problems were about to hit the Netherlands. Amsterdam was soon referred to as "A beautiful woman with bad breath." This water, which was incidentally also used in homes, was a breeding ground for rats and a source of disease. As a result, there was a noticeable increase in Weil's disease cases in the Amsterdam neighbourhoods, mostly in areas with dirty and unhygienic canals. At that point, it appears that there are as many rats in The Netherlands as people. The city began to decline in terms of unsanitary living conditions and poor quality of life along the canals by the end of the 18th century. Public housing quality was declining along with these canals. Due to the increased population, the city made the decision to densify the working-class neighbourhoods, while the wealthy and Jews moved towards the Plantage. To accommodate the growing working class population, Jordaan's planned neighbourhood with wide streets and courtyards was covered. Jordaan begins to resemble a jumble of houses as the 19th century goes on, and some of the streets were only about one metre wide. Fortress refers to homes constructed on public streets and courtyards.[21] Not only that, but the houses' quality was also very low and there was constant worry that something might fall apart due to improper construction methods and lack of maintenance. As a result, a vast coalition of medical professionals, engineers, and architects known as the "Hygienist"[22] formed to combat these issues. The city started to show signs of improvement after these groups arrived. They requested a redesign of the workers' housing in a report from 1854 that included the necessary amenities. It was untrue that the British society for improving the conditions of the working classes, founded in 1844, and the London World's Fair, held in 1851, served as inspiration for the report's authors.[23] In contrast to Amsterdam, which was struggling to add just 20,000 people to its population, London was adding 20,000 homes annually, and by 1851 the city had 2,223,600 residents.[24]

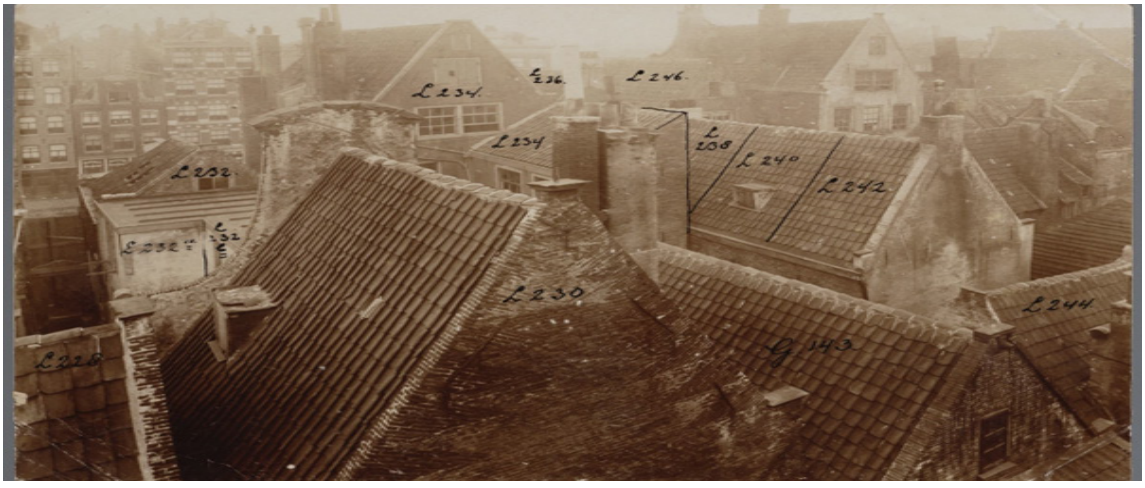
Fig 13 - Map showing Jordaan as the highlighted part
Map made by author based on information gathered from Google and Town planning in the netherlands, by Cor Wagenar

Fig 14 - Over crowded Jordaan
Het Harde Leven in de Jordaan - gemeente Amsterdam (no date). Available at: https://www.amsterdam.nl/nieuws/achtergrond/harde-leven-jordaan/ (Accessed: April 19, 2023).

The "Bear Bucket," which was used to collect and store human waste, was a very common item in the workers' housing in Amsterdam.[25] It was either stored until a cart arrived to collect it or thrown off the windows into the canals. The accumulation of this squalor would cause numerous respiratory issues as well as a breeding

18. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-114
19. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-99
20. The introduction is based on: H. Lintsen et al., Made in Holland. Een techniekgeschiedenis van Nederland [1800–2000] (Zutphen 2005), 23.
21. Het Harde Leven in de Jordaan - gemeente Amsterdam (no date). Available at: https://www.amsterdam.nl/nieuws/achtergrond/harde-leven-jordaan/ (Accessed: April 19, 2023).





22. Lintsen, H. and D., L.A.J. (2018) Well-being, sustainability and social development: The netherlands 1850-2050. Cham, Switzerland: Springer Open.
23. Lintsen, H. and D., L.A.J. (2018) Well-being, sustainability and social development: The netherlands 1850-2050. Cham, Switzerland: Springer Open.
24. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 144
25. Het Harde Leven in de Jordaan - gemeente Amsterdam (no date). Available at: https://www.amsterdam.nl/nieuws/achtergrond/harde-leven-jordaan/ (Accessed: April 19, 2023).

ground for bedbugs, fleas, and mosquitoes, which could spread diseases like malaria and cause severe skin conditions and itching all over the body. The wealthy neighborhood's homes had an underground pipe that opened up in the canals and dumped waste there. While Amsterdam was still in this stage, knowledge began to spread in cities like London and Paris that this waste could be very important and could be turned into ammonia-rich manure for the agricultural fields, in addition to helping to keep the city clean. Later, in 1858, Paris had already created a 168 km long underground sewage system.[26] Earlier, instead of collecting human waste from homes, these sewers carried rainwater and cleaning water from public fountains. Later, one of the civil engineers, Eguin Belgrand, created an egg-shaped sewer that was large enough for a man to enter and clean it as needed, increasing the waste's mobility through the pipes. In response to this, Haussmann stated his opinion, stating that "Subterranean galleries are the internal organs of the great city, and they function like those of the human body. Secretions are mysteriously performed, and public health is maintained without disturbing the running of the city or spoiling its beauty."[27]

Fig 15 - Egg shaped sewers of Paris
On (and in) the sewers (and sewage) that transformed Paris (2019) Literary Hub. Available at: https://lithub.com/on-and-in-the-sewers-and-sewage-that-transformed-paris/ (Accessed: April 19, 2023).

Amsterdam, lagging behind these cities, had his own methods for navigating these canals. The city council came up with the idea of filling those canals in response to the declining affection for the canals. Jordaan was completely covered in water during the first half of the 19th century, and the water channels that were then present there were more akin to ditches with banks than what we now recognise as environmentally friendly urban features. However, this solution covered many of the city's canals, creating new streets and public spaces. The need for these canals was diminishing as transportation slowly shifted to the road and rail. As can be seen on the map, many canals in the city were filled in to make room for roads and, in the case of Jordaan, public spaces. Goudsbloemgracht, later known as Willemsstraat, was one of the most well-known and the first to be covered.[28]

Fig 16 - Map showing closed canals in the city center
Map made by author based on information gathered from book - A millenium of Amsterdam, by Fred Feddes

Public health problems increased in the city despite very little improvement in urban reforms related to public health. The population graph reveals a sharp decline in population up until 1815, a period of negative migration brought on by a lack of employment and unhealthy living conditions. According to another claim, the infant mortality rate was higher in the city up until 1835 than there were births. In the first half of the 19th century, the water that runs through Amsterdam was directly responsible for all illnesses and health issues. The development of appropriate canal systems, maintaining constant water levels in the canals, and avoiding the dumping of household and human waste in the canals were the only things that could stop people in Amsterdam from covering its canals.

Old Dutch proverb: "He who procures clean water can mock the doctor."[29] Many actions were taken at that time in order to provide the populace with clean water. Early on, it was observed that only the wealthy had a system for collecting

26. Barles, S. (2007) "Urban metabolism and river systems: An historical perspective – paris and the Seine, 1790–1970," Hydrology and Earth System Sciences, 11(6), pp. 1757–1769. Available at: https://doi.org/10.5194/hess-11-1757-2007.
27. On (and in) the sewers (and sewage) that transformed Paris (2019) Literary Hub. Available at: https://lithub.com/on-and-in-the-sewers-and-sewage-that-transformed-paris/ (Accessed: April 19, 2023).
28. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-121.
29. TU Delft OpenCourseWare (2022) TU Delft OCW. Available at: https://ocw.tudelft.nl/wp-content/uploads/Appendices-1.pdf (Accessed: April 19, 2023).

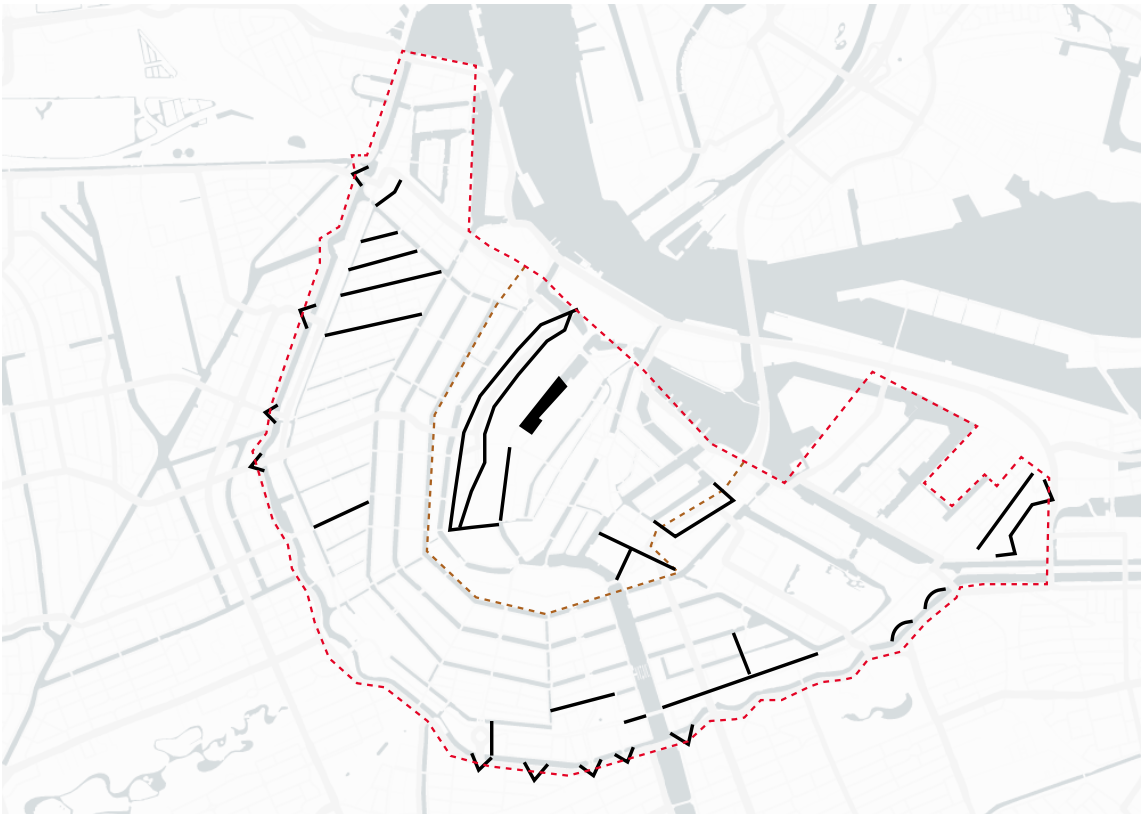


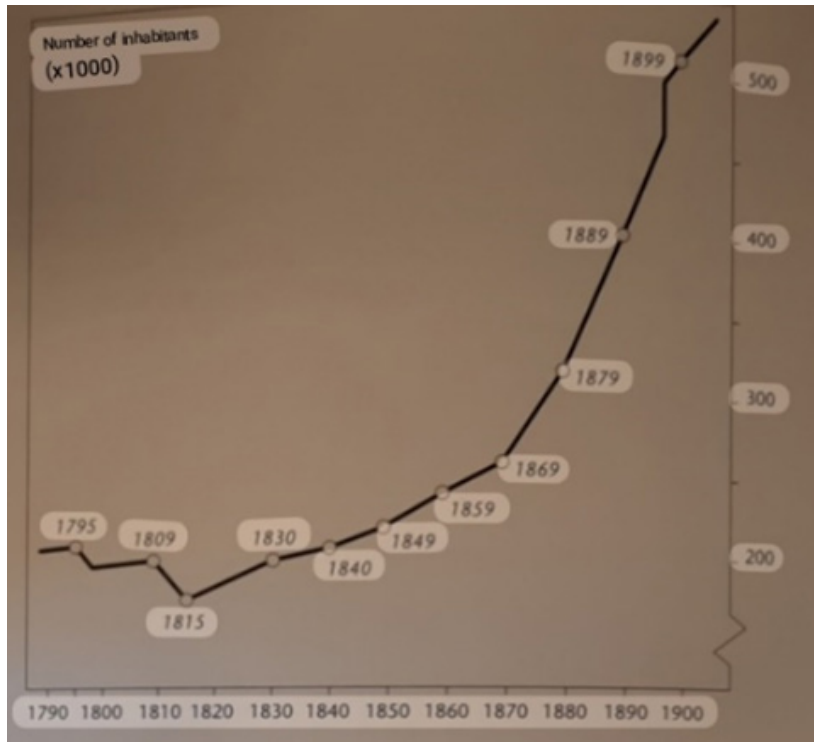
Fig 17 - (Top left) The ditch of Goudsbloemgracht
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-121.

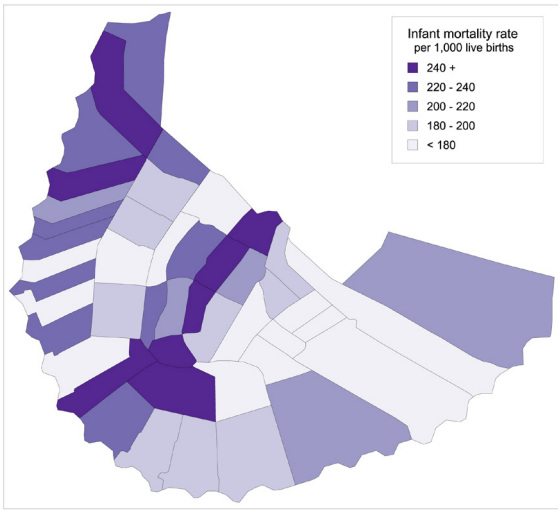
Fig 18 - (Bottom left) The ditch of Goudsbloemgracht after getting covered up as Williamstraat
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-130.

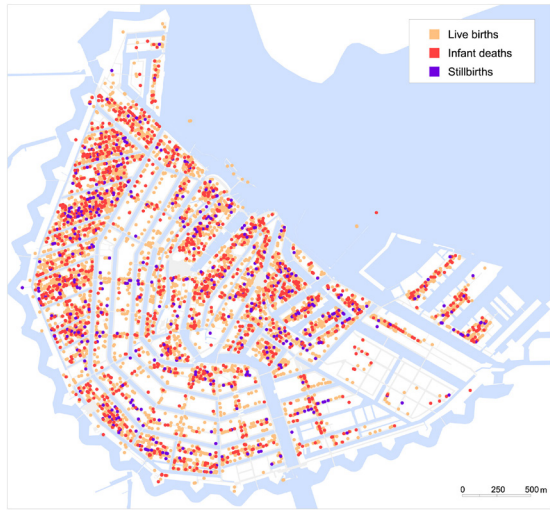
Fig 19 - (Top) Graph showing number of Residents in Amsterdam between 1790-1900
Aerts, R. A. M., Rooy, P. de, & Benthem, B. J. van. (2006). Geschiedenis van amsterdam (Vol. DI. 3, hoofdstad in aanbouw, 1813-1900 / onder red. van remieg aerts, piet de rooy ; met medew. van barend j. van benthem ... [et al.] ; eindred. marijke carasso-kok ; beeld hinke wiggers, ingrid oud ; [reg. remieg aerts ... et al. ; tekenwerk krt. uva-kaartenmakers]). SUN.

Fig 20 - (Bottom left) Infant mortality rates by neighbourhood, Amsterdam,1854–1859
Bureau van Statistiek der Gemeente Amsterdam 1854–1859

Fig 21 - (Bottom right) ive births, stillbirths, and infantdeaths by premises, Amsterdam, children bornin 1851
Source: Amsterdam population register1851–1853, Amsterdam civil registration1851–1852, and HISGIS Amsterdam







rainwater for their own needs, leaving the poor to rely on the contaminated water from the canals. In the 17th century, nine cisterns were built to collect and store rainwater, but as the population increased and they became more expensive to construct, they became ineffective and were mostly used for the benefit of the wealthy and industrialists. A beer brewer had the idea to install 52 freshwater cisterns around the city for use by locals and beer breweries, but that wasn't until the end of the 18th century. As a result, by the beginning of 1824, thirty-four freshwater cisterns had been built throughout the city, twelve of which were specifically designated for use by beer breweries. These public cisterns were constructed beneath city squares, substantial homes, governmental structures, churches, courtyards, harbours, and tanneries. The widely adopted strategy to harvest and store the usable water in the city was this expensive infrastructure, but over time it became clear that this made very little progress in the quest for cleaner drinking water. Due to the costly water from the cisterns, a large portion of the city had returned to its original source of water from wells, canals, and water ships by the year 1850. Additionally, a concern about lead poisoning arose because of the lead pipes and the subpar maintenance of those cisterns. Not all of the city's cisterns were filled by rainwater; some were instead filled with water transported by water ships run by private organisations. The idea to build open pipe channels to pump water from the dunes to the city was developed by C.D. Vaillant and engineer W.C. Brade, and their initiative, Duinwatermaatschappij, is credited with bringing about the greatest improvement.[30] On December 12, 1854, people for the first time gathered buckets of clean water from the Williamspoort fountain, which was supplied by water from the nearby coastal dunes, following the lead of Paris and London.[31] The first Dutch city to receive a piped water connection was Amsterdam on this day. The water was transported to the city via a natural slope after being pumped by steam engines in the Kennermer dunes.[32] Sand dunes along the western border of the North Sea were heavily exploited to obtain fresh water. To get the water below ground level, a sizable tank was dug along the dune and connected via two canals. The water was then transported to the city via pipes. The elite's homes, places of business, and other public buildings were soon connected by a complex network of these pipes, visible in the city. The public water taps were the only option for those who could not afford the connection. In order to transport these waters from the dunes to the city, more public water taps were soon installed throughout the city, along with additional pipes and new canals. Three thousand five hundred fifty metres of canals existed by 1854; seven thousand six hundred twenty metres existed by 1863. Amsterdam had 56 standpipes in use by 1866.[33]

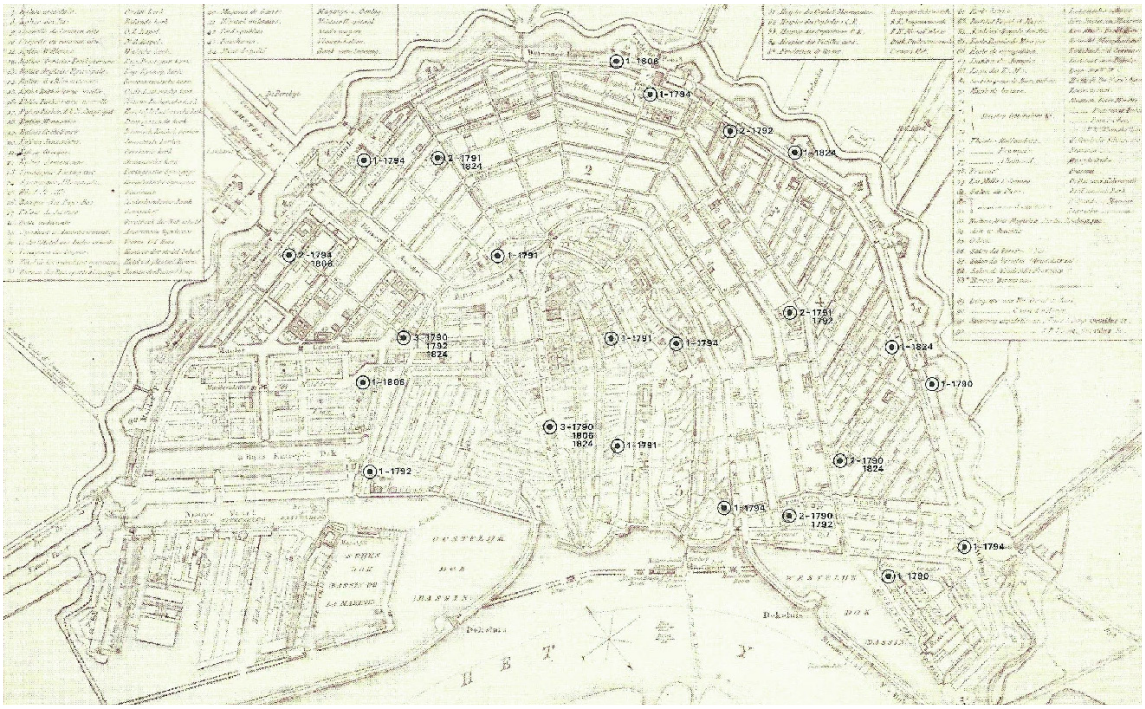
The deadly Cholera pandemic swept through the city as these reforms were being implemented. Thousands of residents of Amsterdam perished from cholera between 1832 and the end of the 19th century. The illness was particularly deadly and could strike at any time. Instances of healthy individuals dying quickly from cholera in the street have occurred. Death struck in a horrifying way: violent vomiting and

Fig 22 - Map with cisterns in the city of Amsterdam after the plan of beer brewer Isaac Deckers built between 1790 and 1824.
Loen, S. (1970) Thirsty Cities: Learning from Dutch Water Supply Heritage, SpringerLink. Springer International Publishing. Available at: https://link.springer.com/chapter/10.1007/978-3-030-00268-8_5#Fig3 (Accessed: April 19, 2023).

Fig 22 - (Right) Map showing location of fresh water source and location of fresh water pump stations
Map made by author based on information gathered from google, Sewage surveillance in Rotterdam-rijnmond 2020-2022 (no date) h2o. Available at: https://www.h2o-watermatters.com/ (Accessed: April 19, 2023).

Fig 23 - (Left) Modelled distribution of duneslacks in the Amsterdam Dunes in 1853
Geelen, L.H., Kamps, P.T. and Olsthoorn, T.N. (2016) "From overexploitation to sustainable use, an overview of 160 years of water extraction in the Amsterdam Dunes, the Netherlands," Journal of Coastal Conservation, 21(5), pp. 657–668. Available at: https://doi.org/10.1007/s11852-016-0452-x.

30. Aerts, R. A. M., Rooy, P. de, & Benthem, B. J. van. (2006). Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900 / onder red. van remieg aerts, piet de rooy ; met medew. van barend j. van benthem ... [et al.] ; eindred. marijke carasso-kok ; beeld hinke wiggers, ingrid oud ; [reg. remieg aerts ... et al. ; tekenwerk krt. uva-kaartenmakers]). SUN. Pg-225
31. Hein, C. (2020) Adaptive strategies for water heritage: Past, present and future. Cham: Springer Open. Pg-93
32. Aerts, R. A. M., Rooy, P. de, & Benthem, B. J. van. (2006). Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900 / onder red. van remieg aerts, piet de rooy ; met medew. van barend j. van benthem ... [et al.] ; eindred. marijke carasso-kok ; beeld hinke wiggers, ingrid oud ; [reg. remieg aerts ... et al. ; tekenwerk krt. uva-kaartenmakers]). SUN. Pg-225



33. Hein, C. (2020) Adaptive strategies for water heritage: Past, present and future. Cham: Springer Open. Pg-93


BUIKSLOTERHAM
BUIK-SLOOT
SLOTEN, SLOTERDIJK, OSDORP EN DE VAGE GEER
NIEUWER AMSTEL

Fig 24 - Map showing the spread of cholera and the number of deaths from this disease in each of the 50 neighborhoods of Amsterdam
Kaart aanwijzende de verspreiding der cholera en het aantal sterfgevallen aan deze ziekte in Elk der 50 Buurten van Amsterdam (no date) Gedigitaliseerde objecten van de Bijzondere Collecties Universiteitsbibliotheek Utrecht. Available at: https://objects.library.uu.nl/reader/share.php?obj=1874-13283&lan=nl&app=2&pagenum=1 (Accessed: April 19, 2023).

diarrhoea, convulsions, and blue skin. The city was plagued by paralysing fear for many years. Cholera had no known cause, and there was no effective treatment. The only known cure for such epidemics at the time was to place those who had it in quarantine, but this had no impact on the increase in cases. John Snow, an English physician, discovered the cholera virus spreads through water that has been contaminated by human excretions later in 1854. Because of the city's poor hygiene, approximately 1,200 Amsterdammers died from cholera in 1832, 2,273 in 1848, and another 1,100 in 1866.[34] A rumour that the city's wealthy class was deliberately wiping out the poor spread as cholera disproportionately affected the poorer areas of the city.[35] The spread of this epidemic hastened the delivery of safe drinking water to the city. The construction of freshwater cisterns and underground pipes has a significant positive impact on people's health. However, this was insufficient on its own, and the city needed a sewage system badly. The Dutch learned a valuable lesson from this epidemic, which was to improve their water infrastructure, but it was also the beginning of the era of infectious diseases.

34. Amsterdam in Tijden Van Cholera - gemeente Amsterdam (no date). Available at: https://www.amsterdam.nl/nieuws/achtergrond/amsterdam-tijden-cholera/ (Accessed: April 19, 2023).
35. Amsterdam in Tijden Van Cholera - gemeente Amsterdam (no date). Available at: https://www.amsterdam.nl/nieuws/achtergrond/amsterdam-tijden-cholera/ (Accessed: April 19, 2023).

1860 - 1920: The age of infectious diseases

The 1860–1920 era in Amsterdam's history of urban reforms and public health turned out to be a crucial period. Although this time period is known as the Age of infectious disease, it will also see significant changes in urban areas of the city.

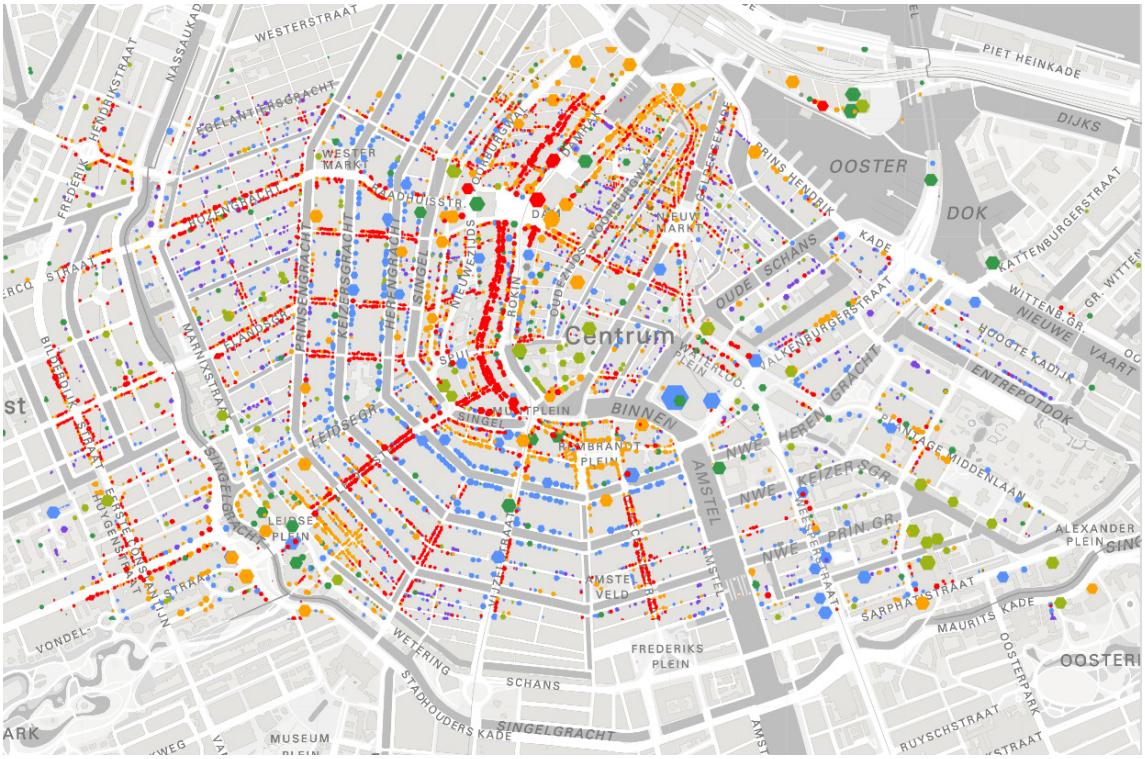
"In the whole country there is not a larger city that is not a disgrace to our people; not one that is not a crying shame." A Dutch medical journal wrote in 1875[36]

Fig 25 - Map showing the increase in non residential functions in the city center. Haan, G.A.K.-B.de (no date) Niet-Woonfuncties (functiekaart). Available at: https://maps.amsterdam.nl/functiekaart/?LANG=nl (Accessed: April 19, 2023).

The city was stench-filled even after S. Sarphati created the drinking water system and the garbage collection method. Around 1860, slum conditions were extremely bad in larger cities like Amsterdam, where up to 70% of the population of the Netherlands resided.[37] Beginning in 1860, the city joins the eagerly anticipated Industrial Revolution. The city sees its future in extending its boundaries in light of this. 224,000 people lived in the city in 1850; by 1880, that number had increased to 317,000.[38] Many technological advancements were brought to the city during the Industrial Revolution, but it also heralded the arrival of numerous epidemics. By 1860, when the city walls were demolished, the city had begun to expand beyond them. According to Sarphati's theories, the first city expansion happens after the 17th century expansion, just as it was mentioned in the previous chapter that the wealthy began to settle in the Plantage. The first public park, Vondelpark, is built, and later, homes for the city's elite are built around it. With this, the wealthy began to relocate to the city's outskirts, which were greener, healthier, and newly constructed. As Reinhard Baumister pointed out, offices and retail establishments have occupied these city centre homes. These were later referred to as "City vorming," where the most accessible space in the city centres were given over to other uses (city map showing more commercial shops in the city centre than houses).[39] Later, in the 1930s, the idea of city vorming was used as a key component of the general expansion to consider the reconstruction of various city regions as new residential districts or commercial regions. For access to cheap labour, a few factories began to establish themselves in the west of Amsterdam, close to working-class homes. As a result, there were many more houses built close to them, compacting the neighbourhood. People began residing in basements and attics. The Royal Institute of Engineers noted in 1853 that future proposals by Zocher, Rose, and Van Niftik addressed the significance of creating public housing. However, they were forced to turn to private investors because the city council's ineffective funding did not allow for the efficient construction of working-class housing. When J. Kalff later outlined his plans for the city, they included significantly less open space and more room for the expansion of private investors. As a result, between 1877 and 1920, a city expansion project that will add 100,000 new homes is currently underway.[40] These homes had wider streets and courtyards, and they were relatively well ventilated.

The city turns into a hub for new epidemics as these future expansions were being planned. After a break of 34 years, the cholera epidemic that was so dangerous for the city in the year 1832 returns in 1866. As was mentioned in the previous chapter,

36. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers.
37. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 206
38. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-136
39. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 179



40. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-193


PLAN
voor de uitbreiding van
AMSTERDAM

Fig 26 - (Left) Expansion plan of Amsterdam by J. Kalff in 1875
Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 152

Fig 27 - (Right) Amsterdam's smallpox epidemic of 1870-72 in five phases.
Muurling, S., Riswick, T. and Buzasi, K. (2022) "The last nationwide smallpox epidemic in the netherlands: Infectious disease and social inequalities in Amsterdam, 1870–1872," Social Science History, 47(2), pp. 189–216. Available at: https://doi.org/10.1017/ssh.2022.31.

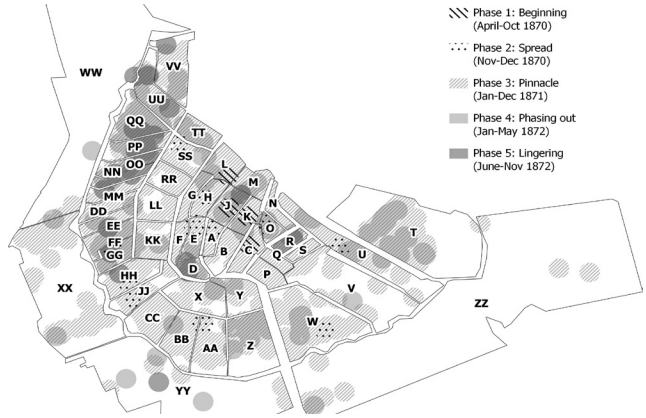
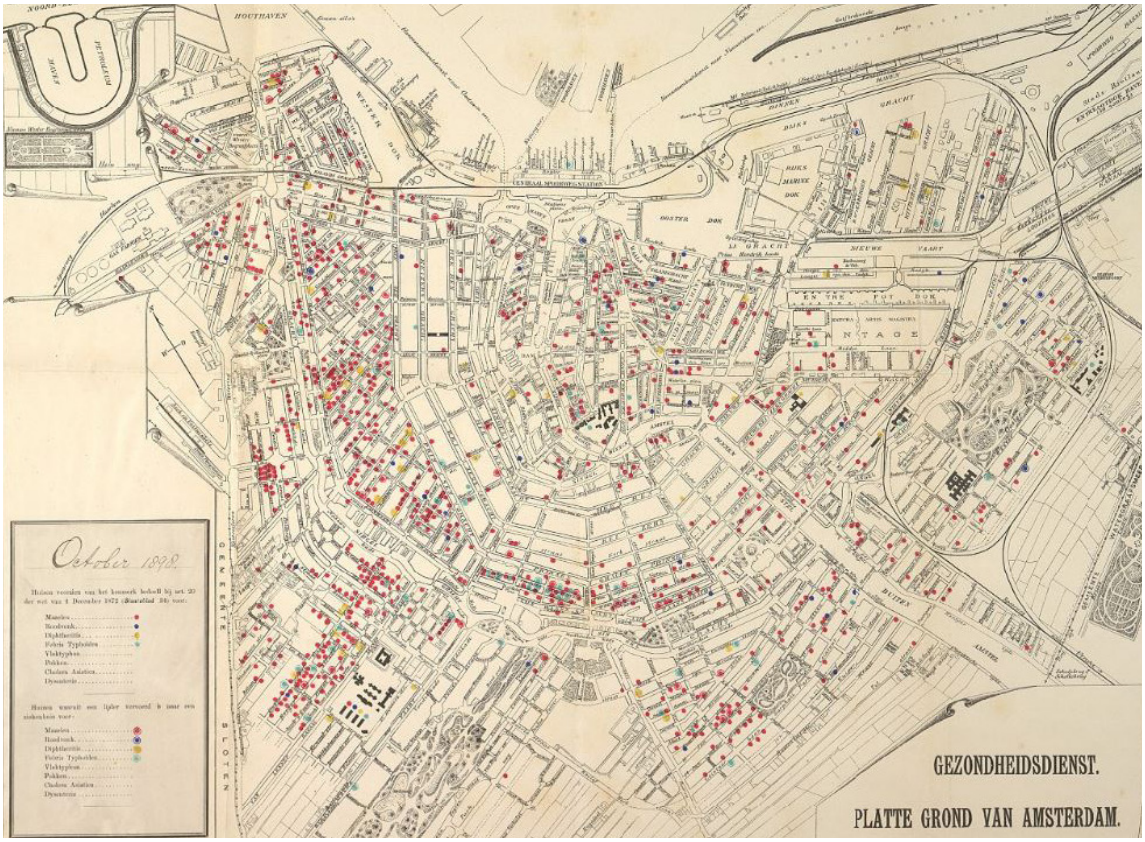


Fig 28 - (Bottom) Map showing the spread of infectious diseases in Amsterdam 1898,
made by the Health Service // Amsterdam City Archives



the city's terrible canal system played a major role in the spread of the disease. Even the city began receiving high-quality drinking water, but the subsequent cholera outbreak demonstrates that this was insufficient because people were still using the tainted water from the canals. When typhus and typhoid fever first appeared in the summer of 1846, among other diseases, these canals had already brought the city to its knees. End of August saw the emergence of a malaria epidemic. Due to the chilly winter that followed, the sick hardly had time to recover. Flu and bronchitis spread like wildfire and frequently resulted in fatalities. Malaria struck again in the following months, decimating the populace along with dysentery, measles, and other related diseases. The repeated fevers have severely weakened the sick, according to Amsterdam's Medical Commission. Major epidemics like cholera (1890 and 1859), smallpox (1866), measles (1871), and diphtheria (1880–1883) spread misery and death throughout the city as they hit the city back-to-back. The marked locations of various diseases throughout Amsterdam are displayed on the map.(Fig-28)[41]

Fig 29 - Map showing 4 regions with different sewage systems along with ring main of integrated sewer system
Map made by author based on information gathered from Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900)

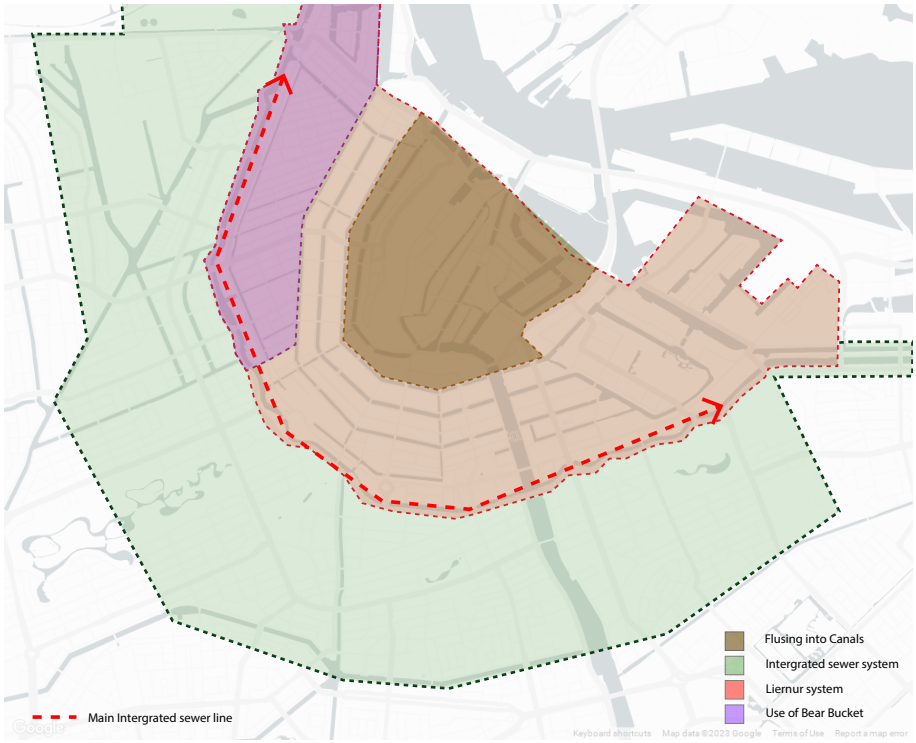
The map clearly shows that the working-class and poorer neighbourhoods of the city are the ones most affected by all of the epidemics. According to a scientific study, Jewish communities were comparatively less affected by epidemics like smallpox than were the richest communities.[42] This was primarily a result of their way of life and diet. They attempted to maintain a clean environment in their neighbourhood because there were many Jewish doctors and medical professionals involved in the hygienist movement. The mortality rate from smallpox in Amsterdam was significantly impacted by housing density. Additionally, areas with higher birth rates were more severely impacted because smallpox mortality was highest among children under the age of four.[42]

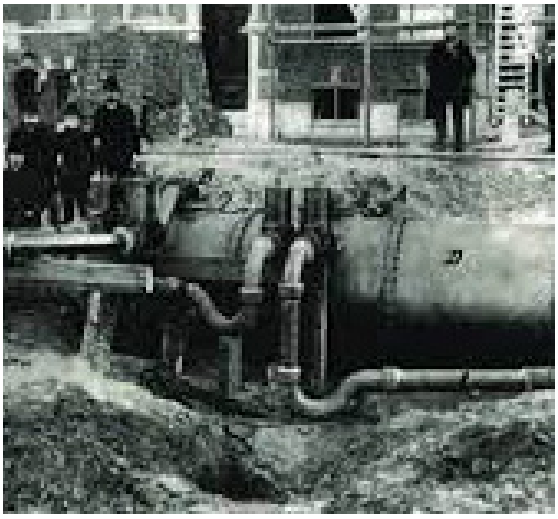
The idea of building the North Sea canal emerged as part of efforts to establish a connection with the sea; this not only helped to shorten the sea route and benefit international connections via sea route, but also helped to better flush the canals of Amsterdam. However, the city had to stop dumping waste into canals in order to remove them. A pipe system that removes waste from water using air pressure differences was designed by Charles Liernur.[43] As the city expanded, the newer areas were fitted with the Liernut system, which utilised various tubes to dispose of wastewater and faeces, which the 1870-founded Refreshment commission opposed despite their better integrated sewerage system proposal, in which all wastewater would be discharged simultaneously. Between 1908 and 1912, Integrated sewer system's construction was completed and made the process more efficient. The Singelgracht was the location of the main ring. Thanks to the development of the Steam engine during the industrialization phase, pumping water today is much simpler and is accomplished with great pressure. Along the sewerage line, new steam pumping stations were constructed, taking the place of the outdated man- and wind-powered stations.[44] At this time the city had four different sewer systems as demarcated in the fig-30.

Fig 30 - The construction of the Liernur system reservoir, 1895
Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900)

Fig 32 - Constrcution of integrated sewer system
Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900)

41. Source unknown
42. Muurling, S., Riswick, T. and Buzasi, K. (2022) "The last nationwide smallpox epidemic in the netherlands: Infectious disease and social inequalities in Amsterdam, 1870–1872," Social Science History, 47(2), pp. 189–216. Available at: https://doi.org/10.1017/ssh.2022.31.
43. Aerts, R. A. M., Rooy, P. de, & Benthem, B. J. van. (2006). Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900 / onder red. van remieg aerts, piet de rooy ; met medew. van barend j. van benthem ... [et al.] ; eindred. marijke carasso-kok ; beeld hinke wiggers, ingrid oud ; [reg. remieg aerts ... et al. ; tekenwerk krt. uva-kaartenmakers]). SUN. Pg-372





44. Aerts, R. A. M., Rooy, P. de, & Benthem, B. J. van. (2006). Geschiedenis van amsterdam (Vol. Dl. 3, hoofdstad in aanbouw, 1813-1900 / onder red. van remieg aerts, piet de rooy ; met medew. van barend j. van benthem ... [et al.] ; eindred. marijke carasso-kok ; beeld hinke wiggers, ingrid oud ; [reg. remieg aerts ... et al. ; tekenwerk krt. uva-kaartenmakers]). SUN. Pg-374

In an effort to make the city more hygienic, to ease the increasing traffic, and to lighten the city, which are all connected to the streets. The streets of Amsterdam grew significantly in significance and were considered the most significant development at the time. They not only offered space for transportation, but they also directed the sewage, gas and freshwater pipelines' underground tube systems. Today, we see that this was just the beginning of the use of these streets; they now all have various lines running through them, including cables for electricity, phones, Wi-Fi, and televisions. This wasn't sufficient, so we also added a parking system and an underground rail and metro system. In the latter half of the 19th century, it became increasingly obvious that streets are the so-called "backbone" of the city, improving people's living conditions without which the city could not function. The majority of these changes were considered after being inspired by more developed cities like Berlin and London.

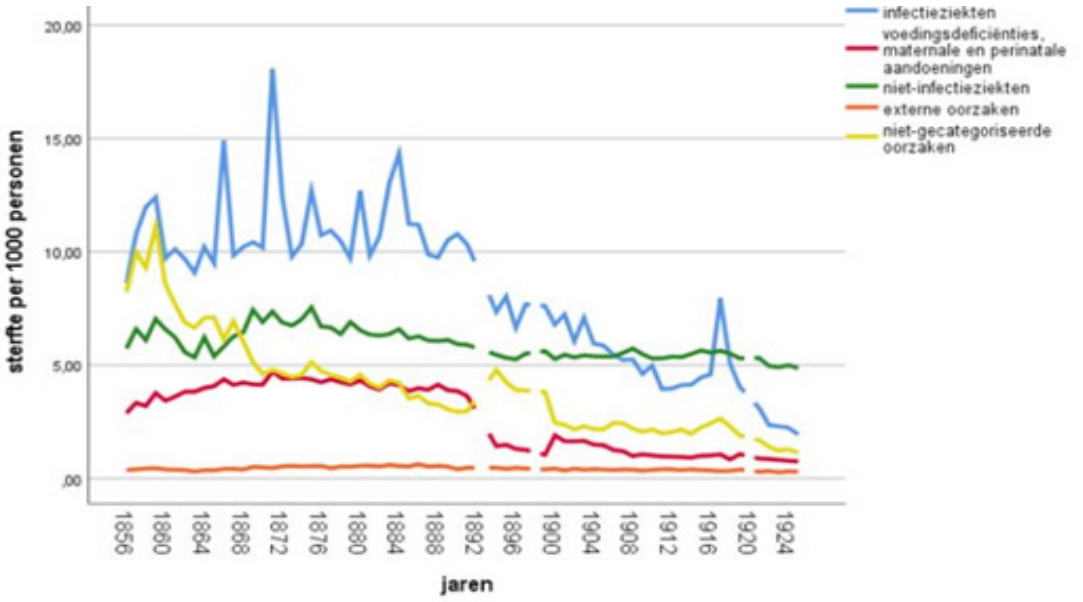
Fig 33 - A representation of the mortality rates of the Amsterdam population (1856-1926).
Dood in Amsterdam (2021) Wanneer overleden Amsterdammers Niet Meer Voornamelijk aan infectieziekten?, Dood in Amsterdam. Available at: https://doodinamsterdam.nl/wanneer-overleden-amsterdammers-niet-meer-voornamelijk-aan-infectieziekten/ (Accessed: April 19, 2023).

Along with investing in urban reforms, the government also built public hospitals to care for those who have already been ravaged by epidemics. The number of public hospitals in the Netherlands was significantly lower than in Germany. Instead, by the end of the 19th century, there were numerous hospitals and health clinics in and around Amsterdam that were run by private institutions. Thanks to Thorbecke's modernization campaign and political reforms, the city will have a cleaner and healthier future as a result of the success of the hygiene revolution and the implementation of various reforms, which were all combined to create the desperately needed public housing law and Public health law in 1901.[45] As inspired by various reforms taking place in abroad, America, London, Germany many architects and designers started getting attracted towards their work, after attending multiple Urban design and planning fairs in Berlin, Dusseldorf. Based on those theories, there are three possible perspectives on how cities will develop in the future: as works of engineering, as works of art, and as green cities. These ideals were the foundation upon which the city was to grow in the future. Looking at the mortality graph for Amsterdam, we can see that the number of people dying from infectious diseases has suddenly decreased. What is remarkable is that, especially when compared to the number of illnesses brought on by respiratory infections, the proportion of infectious diseases linked to tainted water and food drastically decreased after 1904. It appears to be a logical outcome of improved access to sanitary sewers, clean drinking water, and knowledge of healthy eating habits and the value of hygiene. When the Spanish flu hit the city in 1918, there was a slight increase once more, but because there had already been many precautions taken earlier, this flue's effects were not as terrifying as those of the earlier pandemics.

Fig 34 - H.P. Berlage, Birds eye view of Amsterdam- South, 1915
Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 229

H. P. Berlage creates his vision plan for the south of Amsterdam after taking into account the ideas of development and the city's future plans to expand into the south. "As the big cities have spread and in doing so sacrificed much of their appeal to the demands of modern life, so the tide of those who have moved hearth and

45. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 208


infectieziekten
voedingsdeficiënties, maternale en perinatale aandoeningen
niet-infectieziekten
externe oorzaken
niet-gecategoriseerde oorzaken
sterfte per 1000 personen
20,00
15,00
10,00
5,00
,00
1856
1860
1864
1868
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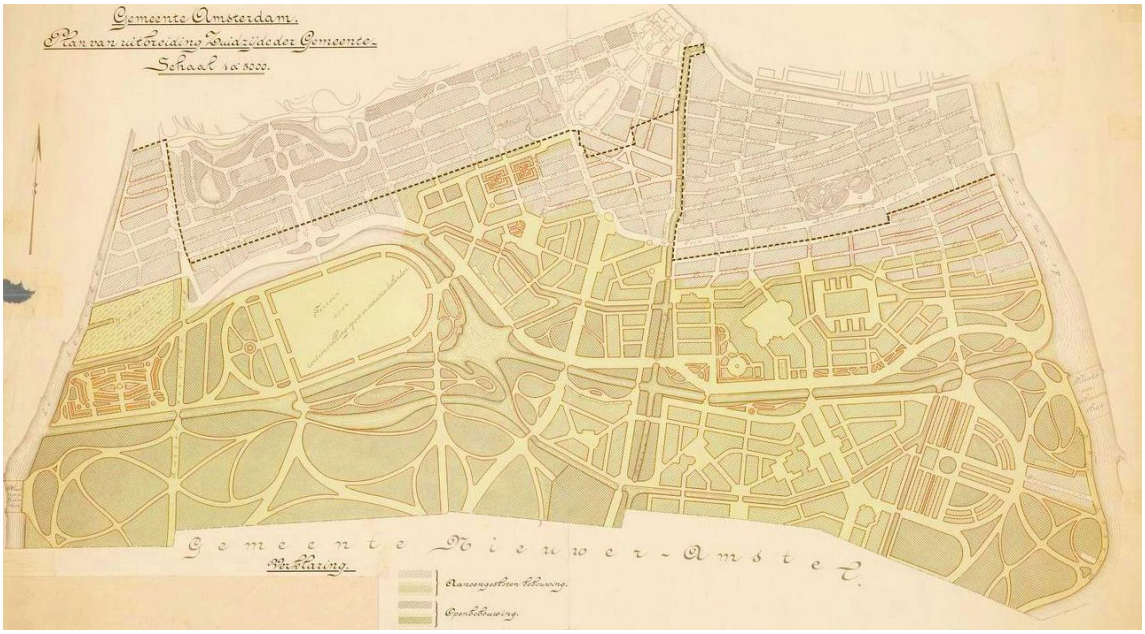

Gemeente Amsterdam.
Plan van uitbreiding Buiten der Gemeente.
Schaal 1:5000.
Gemeente Nieuwer-Amstel.
Verklaring.
Aangegeven Bebouwing.
Gem. Bebouwing.

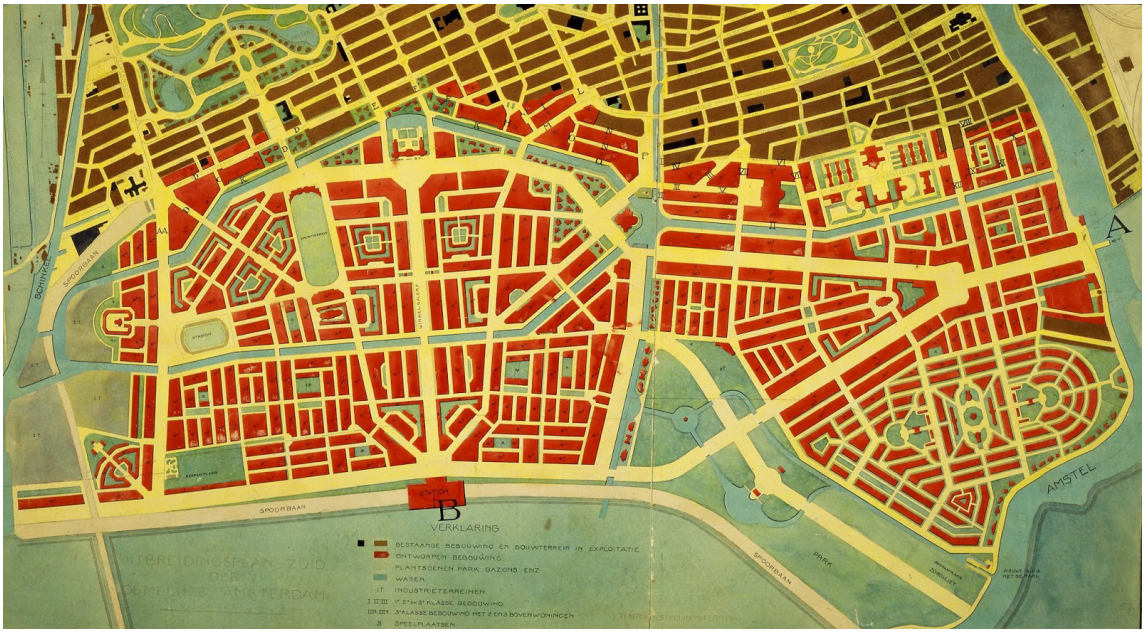

SPOORBAAN
STATION
B
VERKLARING
BESTAANDE BEBOUWING EN BOUWTERREIN IN EXPLOITATIE
ONTWORPEN BEBOUWING
PLANTSOENEN PARK GAZONS ENZ
WATER
I.T. INDUSTRIETERREINEN
I II III 1e 2e en 3e kl. ASSC. BEBOUWING
IIIA IIIB 3e KLASSE BEBOUWING MET 2 EN 3 BOVENWOHINGEN
S SPEELPLAATSEN
UITBREIDINGSPLAN ZUID
DER
GEMEENTE AMSTERDAM
PARK
AMSTEL
A

Fig 35 - H.P. Berlage, first plan for exoansion of Amsterdam south, 1904
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-229

home to places where the nerve-wracking urban bustle has not yet penetrated has grown," H. van der Kloot Meijburg said in 1906. The luxurious apartment buildings known as villa parks housed these green hearths. His work, which was greatly influenced by Sitte, utilised opulent estates and living spaces with lots of lush parks, which limited the potential for economic growth and prevented the project from being realised. In his second proposal, made in 1915, he attempted to concentrate on the similar features he created for the city of Hague,[46] creating smaller clusters of buildings, separated by partially symmetrical street patterns, and centred by public squares. To prevent crowding in a single large square with numerous monuments, these public squares would only be able to accommodate two public buildings. The concept of subdividing squares was a kind of historical lesson intended to stop the spread of disease through contact with people or the air. This is one of the key decisions in urban planning that will shield people from future flu strains and epidemics. In an effort to preserve the urban aesthetic, garden suburbs were being developed in the manner of Berlin and London.

Fig 24 - H.P. Berlage, Second plan of Amsterdam south which was later realised, 1915
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-229

46. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 225

1920 - 2019: The new era of public health

In earlier time there was no law or guide to specify the development regions of function. There used to be mix functional spaces, for example, there was no demarcated region for housing development and for industrial development. But with the passing of various laws, it became compulsory to divide the city in regions of different urban changes, because it was not leading a healthy lifestyle. As seen in the chapter – the age of infectious diseases the concept of city vorming which started initially on its own to facilitate economical support to the people living in the city centre, was later adopted by the general expansion plan and created deliberate strategies. With factories and housing next to each other it made the surrounding air unbreathable, lot of noise and fear of being attacked by some random passers-by. It also became unsafe for the children in the community to come and play. This practice is very commonly seen in today's world as majority of the developing cities tend to demarcate the zones of development and act accordingly to create a Secure, safe and sound living environment for the residents of the city. But during that period the only solution they saw was moving to the much-secured garden cities developing few kilometres away from the city.

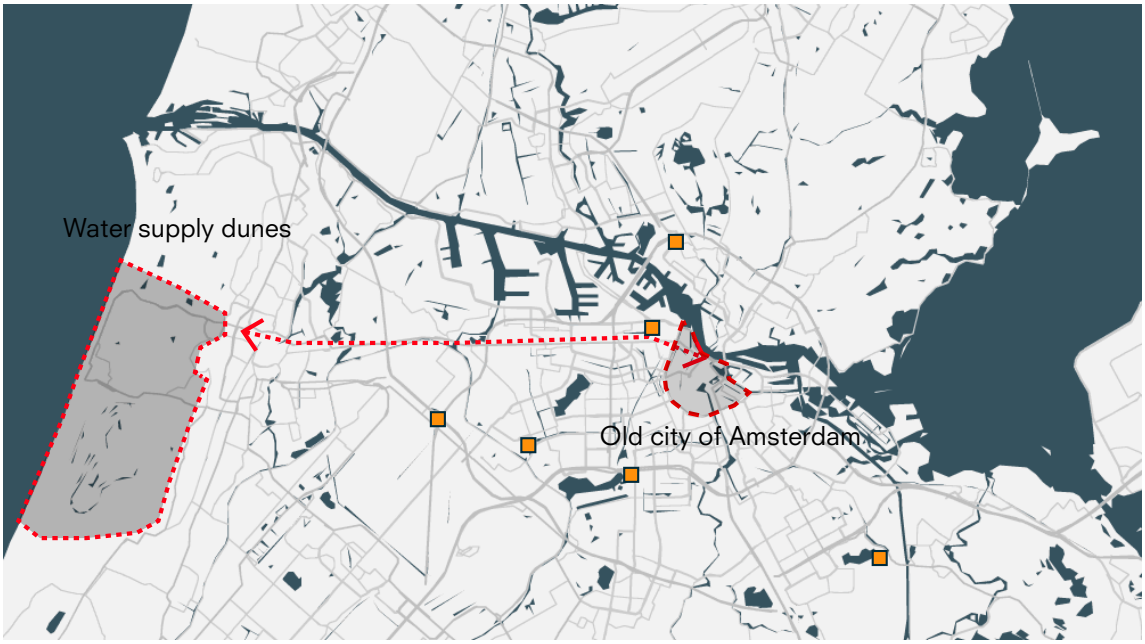
Fig 25 - Map showing the location fo various garden citites around Amsterdam
Map made by author based on information gathered from google, and book - A millenium of Amsterdam, by Fred Feddes

This journey of developing garden city started with Ebenezer Howard's 'Tomorrow: A peaceful path of Real reform', 1898 which was republished as 'The Garden cities of Tomorrow' in 1902,[47] which spread this artistic and healthier way of living. In Germany the garden city moment was celebrated as the victory over the past. Inspired and impressed by these developments in Germany, the city of Amsterdam follows a similar path of developing these garden suburbs.

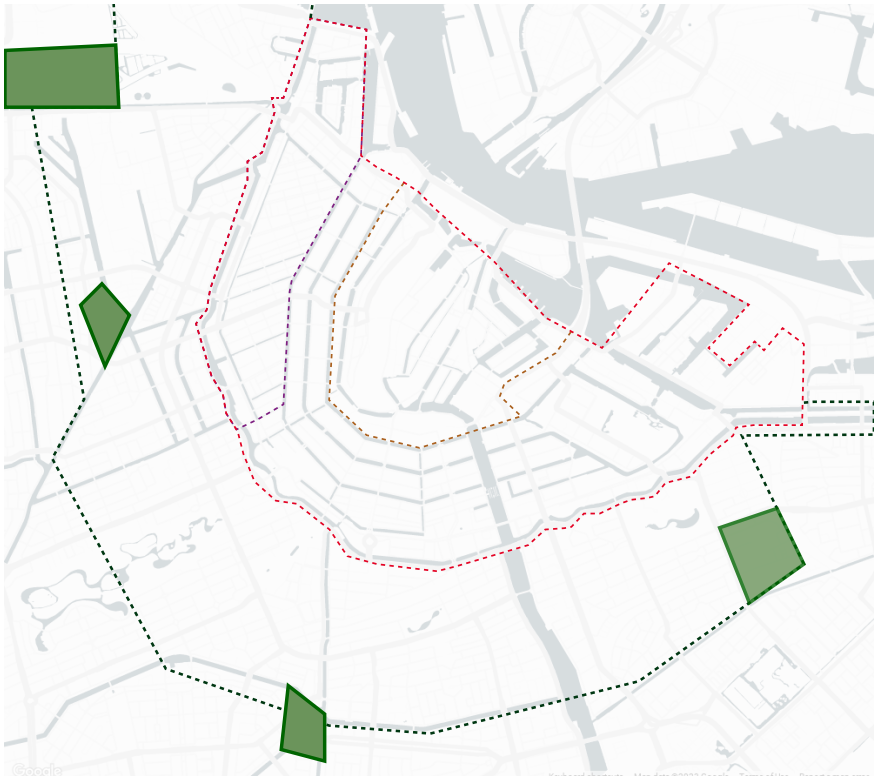
Fig 26 - Proposed plan of Gooi city
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-237

With the execution of housing act in 1901 there was a rapidly growing question on the cities degraded housing for the working-class people of the city, which are considered as the heart of the city and with their absence the working of the city is next to impossible. Out this arose the tradition of developing public housing which is currently well known across the world and Amsterdam is seen as city as developer of effective housing solutions. To increase the development of public housing under the housing act, in 1915 the municipal housing department was created. The main point of focus of the housing department was the individual and social wellbeing of the worker, his health, hygiene, and community spirit. The housing department had inclination towards single houses, garden city, garden neighbourhood and garden towns at an affordable rate. After the World War 1 in which the Netherlands remained neutral, the housing department gained a lot of attention and all funds were diverted towards its quick development, Amsterdam taking these opportunities and developed many green suburbs around the city of Amsterdam, accomplishing the dream of the municipal housing department. Between 1918 and 1932 many garden suburbs like Vogeldorp, Disteldorp, Osdorp, Slotermeer, Geuzenveld, Oostzaan, Nieuwwendam, Buiksloterham, Floradorp and Buiksloot[48] were successfully developed around the city. Based on the study of earlier parts of the history it could be assumed that the green city and walkable city

47. Wagenaar, C. (2015). Town Planning in the Netherlands since 1800: Responses to enlightenment ideas and geopolitical realities. nai010 Publishers. Pg - 200
48. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-239


Water supply dunes
Old city of Amsterdam


BUSSUM
BLARICUM
LAREN
ZUIDPOLDER
TE VEEN



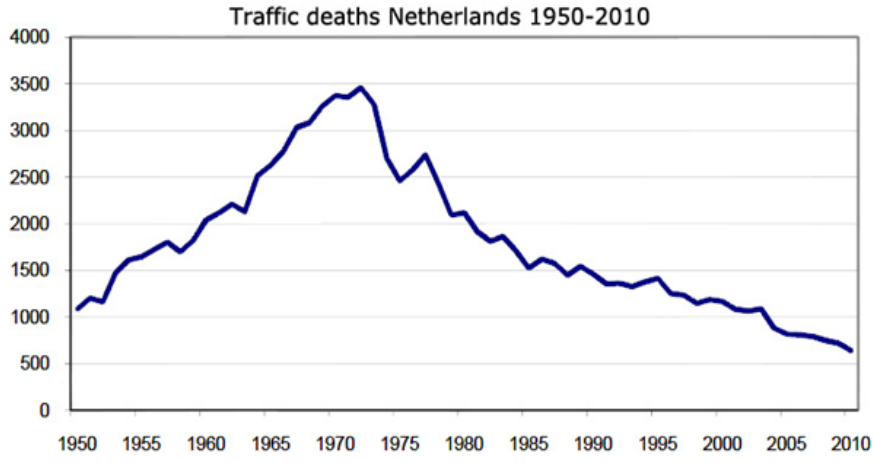

Traffic deaths Netherlands 1950-2010
4000
3500
3000
2500
2000
1500
1000
500
0
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

Fig 27 - Map showing the first allotment gardens in Amsterdam
Map made by author based on information gathered from google, Rent-a-garden in the twentieth century

have a major impact on the public health of the city. Generally green city functions on the ideas of providing a fresh environment and cleaner air to breathe, similarly to the country estates of the elites. Moreover, the placement of the houses in the green city and excessive open spaces around the buildings also in a way help people stay a bit scattered across the greens not forming crowds during daily life scenarios, preventing many contagious diseases from spreading. It is also said that the city greens were used as urban farms during the period of the great famine in Amsterdam. Mostly by the working-class people who did not have possibilities to grow food in their own backyards. Many city gardens were converted to create the allotment gardens for the working-class people. It was an idea that was adopted from the Germans. Mainly during the German occupation of World War 2, many allotment gardens were started.[49] During the great Dutch famine in 1944-1945, these gardens played a very important role in providing the people from economically weaker section with good quality of food.

With the movements of people shifting outside the city and the transformation of city centres as the commerce hub and increase in the number of private vehicles the next step was to make way and provide better connectivity to these areas. The close-grained fabric of the city centre was to be rudely disrupted by this new pattern of movement. Day by day the number of private vehicles in the city were increasing at a repaid pace. Seeing other cities like Berlin and London the Netherlands also tries to depict their advancements and brings in the idea of trams as an intra city public transport. Amsterdam being a city with narrow streets and canals on all sides was difficult it needed proper rules and infrastructure to make this technological advancement a safer option for the public health.

Fig 28 - 60 years of road deaths figures for the Netherlands.
Dutch, B. (2019, September 10). Netherlands' traffic deaths down again. BICYCLE DUTCH. Retrieved April 19, 2023, from https://bicycledutch.wordpress.com/2011/04/19/netherlands-traffic-deaths-down-again/

As seen in the graph-2 the number of deaths due to traffic accidents were highest in time between 1965 and 1975. With the idea of everyone willing to settle down in the outskirts of the city, Amsterdam started to drift in the phase of creating an open city with segregated settlements areas connected via dense network of rail and roads. The open city that resulted from the construction of spacious estates of open row hosing was ideally suited to motorized traffic. From relatively modest beginnings, the number private and commercial vehicles in the Netherlands tripled between 1950 and 1960 to over six hundred thousand. The expansion of the highway network kept pace with the increase, growing from 121km in 1950 to 351km in 1960. With this influx the roads were not designed to host the vehicular traffic leading to a lot of traffic accidents caused by collision of car and cycle, between tram and cycle and many others.

The rise in vehicular transport was not connected to road accidents but also had to deal with the pollution it produces. It was getting impossible to reside near a major road or train track due to excessive air and noise pollution. The city saw its solution in developing multiple concepts for regulating expansion, namely the compact city,

49. Wikimedia Foundation. (2023, April 10). Allotment (gardening). Wikipedia. Retrieved April 19, 2023, from https://en.wikipedia.org/wiki/Allotment_(gardening)

the walkable and cyclable city and the social city. These concepts were taken into considerations keeping in mind the main factor of its derivation, good public health. The general expansion plan of 1934 brought major chances in the way urban planning and design was seen till date. With this expansion, the process of planning and designing was more about research and understanding the needs of the locality and the problems to be catered sometimes also based on the learning from the past. But before the city could be brought into this more technical and research based urban planning, whereas the earlier expansion vision mostly focused on aesthetic criteria. This expansion explicitly focused on considering the concepts of compact, walkable and sociable city.

Fig 29 - Traffic accident at the Valkenweg. Collision of a truck with locomotive of the steam tram
Dood in Amsterdam. (2021, November 11). Gedood door de technologische vooruitgang in Vervoer. Dood in Amsterdam. Retrieved April 19, 2023, from https://doodinamsterdam.nl/gedood-door-de-technologische-vooruitgang-in-vervoer/

Netherlands being very flat in nature there was also a possibility of enhancing the usage of bicycles that were once used by lot of working-class people was seen as way of creating a more sustainable for of transport which is not very fast like cars and not as slow as walking and could cover an effective amount of distance. The combination of car, cycle and walk will create an iconic image which now famous all over the world. Apparently, there was no proof of whether the development of this 20- and 30-minutes cyclable city concept was based on improving the health of the people and engaging them in a sort of compulsive physical activity for the sake of transportation. This would have played a major role in regulating the physical health of Amsterdamers. The general expansion plan of 1934 made its main goal to develop this cycling network[50] and connecting workspaces with city centre and train station. With the making of cyclable and walkable city the street of the city of Amsterdam must be properly segregated to hold the rising car traffic and at the same time have walking and cycling movements. The green strip of land being used as the buffer between the tracks to promote safety, greenery and urban beauty.

Fig 30 - The map shows principle cycling routes in red with travel time to city center.
Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-266

Also, to develop the concept of compact city, the spreading out of the city was not going to work, and hence there was a need of rebuilding the existing working-class quarters with big, clean and apparently less crowded housing. With this idea supported by the history of Jordaan during various epidemics, the government decides to thoroughly renovate it in 1922. The place where 90,000 poor people lived in the 19th century, is now a place for 18,000 well to do Amsterdammers.[51] Followed by the reconstruction of De Pijp into high end modern living apartments. While the city was redeveloping healthy housing and street scape the city started calling itself the capital of sports. Even thought Amsterdam did not have a lot of sports facilities during that period but were some enthusiasts who wanted to keep sports alive in the city. They fought to keep the oldest Olympics stadium standing which were the part of the general expansion plan in 1928. It can be assumed that the consideration of hosting Olympics in Amsterdam and building a sports-oriented region in the expansion plan the main vision could be attracting people in indulging more and more sports activities. As recently we can see so many private and city owned sports facilities across the city. Being an outsider to the city of Amsterdam,

50. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-267
51. Het Harde Leven in de Jordaan - gemeente Amsterdam (no date). Available at: https://www.amsterdam.nl/nieuws/achtergrond/harde-leven-jordaan/ (Accessed: April 19, 2023).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CITY

I was shocked to see that 90 percent of the youth are involved in some or the other type of sports activity, also defying the age many middle aged and old age people are seen as sports persons in the city. This consideration of hosting Olympics and building stadiums somewhere motivated people towards it. As a result, the city plans to bid for the upcoming 2028 Olympics after the losing the bid the first time to host 1928 Olympics to Barcelona for not having appropriate facilities to host the Olympics.[52]

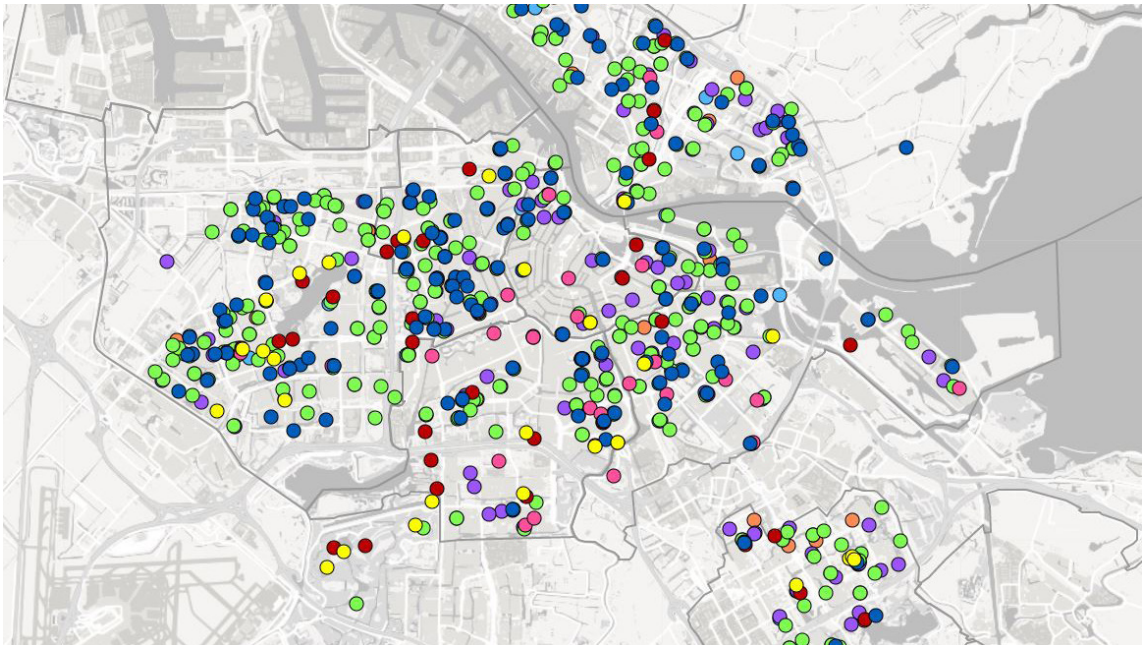
As the last set of development reforms before the city was struck by the famous Corona epidemic. With this modern world there are new health problems like stress, depression which existed from beginning but are getting very common these days in the 21st century. The Urban planning and designs proposal which earlier focused on developing big and famous mega structures across the city, were now seen as inhospitable cement and asphalt jungles. The already developed gardens which then helped in protecting people of Amsterdam from other health problems is now acting as a solution to these depressing and stressful neighbourhoods. With the creation of more garden cities and urban plazas across the city equipped with various socialising infrastructure could become a solution these mental health issues.

Fig 31 - Map showing current sports facilities in Amsterdam
Haan, G.A.K.-B.de (no date) Sportvoorzieningen. Available at: https://maps.amsterdam.nl/sport/?LANG=nl (Accessed: April 19, 2023).

Fig 32 - Olympic dreams,
A playful re proposal by an architecture dtudent Lukas Naruits.

Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-313

52. Feddes, F., & Mader, D. H. (2012). A millennium of amsterdam : spatial history of a marvellous city. THOTH, Pg-314



Summary and Conclusion

'Health concerns have always steered urban planning and the design of cities.'
- Moritz Maria Karl, architect, and researcher at Berlin's Technical University[53]

This statement by Moritz Maria Karl sums up this thesis' conclusion perfectly. In order to define a city's structure and establish a relationship between public health and urban transformations, research was conducted for the thesis. The next section will begin with a summary and end with a defence of the contribution of public health to urban transformations.

In conclusion, Amsterdam's history of public health and urban transformations begins in the 17th century, when the city experienced its first lethal epidemic. Since then, the city has worked to put preventative measures in place. Typically, it is observed that densely populated and central areas are most susceptible to the spread of infectious diseases. Making infected people live in isolated areas away from the rest of the population by introducing quarantine squares and homes was one of the first measures observed. However, the city was ignorant of the fact that their primary issue stems from the contaminated canal waters they use to dispose of their waste and use for various purposes. The most frequent finding in these instances of illness was that the wealthy and elite of the city were always protected from it because they had secure boundaries around their homes, gardens, adequate water supplies, and large, well-lit homes. This leads to the conclusion that in order to maintain the health of the city's population, the advantages enjoyed by the wealthy should be made available to everyone by developing urban level solutions to resolve these problems once and for all. The city begins to invest in a clean drinking water system after the so-called hygienists are introduced, as they help people understand the importance of clean waters. Water borne diseases are becoming less common as a result of this, but they are still present in places like Jordaan that were not fully equipped with this and required long walks to access cisterns for water. Upon the establishment of a private company, water will be taken from the sand dunes and supplied to the numerous cisterns that have been built throughout the city. The situation didn't start to get better until they realised they needed to set up a system of garbage collection and proper sewers that weren't emptied into the canals. As a result, the city soon experiences a death troll as the age of infectious diseases descends upon it. With this, they realised that creating a greener, more open city for people to breathe in and creating high-quality public housing with an emphasis on greenery, hygiene, and well-lit could be the answer to stopping the spread of these diseases. The public health and housing acts were passed in 1901, and the city now has a promising future. Public housing complexes are soon to be built in the newly expanded areas of the city. The death rates rapidly decreased after the city's sewer systems were installed, and infant mortality rates dropped to extremely low levels. This demonstrates that the improvement in public health was a result of these urban transformations. Despite all these changes, the city dwellers are still protected and given a safe haven by this structure. Due to technological advancements, a new era of public health has emerged with the turn of the 20th century and a sharp decline in the incidence of infectious disease. the rapid expansion of the road and rail networks, the increase in population in urban areas, and pollution brought on by the establishment of new industries. The planners and designers come up with the idea of separating areas of the city based on their functions, keeping the industrial areas apart from the residential regions, improving the quality of life for the populace. To lessen the effects of these vehicle advancements and to encourage people to participate in physical and social activities that will keep them in good physical and mental health, new concepts such as compact cities, walkable cities, and sociable cities quickly emerged.

But when the Corona pandemic hit recently, the city's entire way of life came to an abrupt halt. Somewhere, I think that all the changes that have already occurred in the past have contributed to the protection of people. During the pandemic, we observed a similar pattern of people relocating to their rural homes. Low-population areas of the cities

53. Covid-19 and the city: How past pandemics have shaped urban landscapes. Europe - All The Latest News. (n.d.). Retrieved April 19, 2023, from https://newseu.cgtn.com/news/2020-07-08/COVID-19-and-the-city-How-past-pandemics-have-shaped-urban-landscapes-QCFjZLBIxG/index.html

were not significantly impacted. After the locked-up and stressful years of the pandemic, all the green spaces that the city created in the past helped us feel refreshed today. To make the world pandemic-free, a lot of new research and designs are being developed. But one needs to look to the past to fully comprehend the effects of these changes. Even now, I believe that urban transformations like building public gardens, garden cities, segregated squares with one or two public icons, and allowing enough breathing room between numerous infrastructures act somewhat like a sponge, soaking up everything before letting it have an impact on the city's public health.

This thesis will serve as a foundation for understanding the urban forms we have today and the history that led to them, taking into account their positive or negative effects on the health and quality of life of city dwellers. It might also serve as a guide for other developing nations to comprehend the usefulness and functionality of the adjustments made over time. As a result, it is possible to draw the conclusion that public health always has an impact on the urban changes that are taking place all around us, and that this influence could have disastrous consequences if ignored.

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