

A stylized black and white icon of a sewer pipe. The pipe is a solid black rectangle on the left, with a vertical line extending downwards from its bottom edge. From the bottom-left corner of the pipe, two curved lines represent water flowing out, with small dots above them indicating splashing or bubbles. Below the pipe, there are three wavy lines representing water.

# Financing Sewers in 19<sup>th</sup> Century: A Prequel for African Cities?

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The World Bank/GWU Urban Conference  
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# I. Why Examine Sewer Financing in the 19th Century's Largest Cities?

- A complicated innovation that transformed the way cities work, one that links finance to expenditures in interesting ways; and...
- While the history obviously doesn't provide a prequel for African cities, it does provide some prospective.



# 19<sup>th</sup> Century Sewers as Interesting Innovations

- Use of the steam engine, filtration, and steel made cities able to support industrialization, without them density was deadly;
- But, investments in city-wide systems cost more than the cities' annual budget, sewers were a disruptive technology.



NORTHERN OUTFALL SEWER IN COURSE OF CONSTRUCTION, SHOWING CAST-IRON SEWERS OVER ABBEY CREEK AND CHANNELSEA RIVER. 1902-06.

# Was the High Cost of Sewers was Like the High Cost of Waging War with New More Costly Technologies

- The Expense of War Technology Made Financing Important. Indeed, it was Financing that led to the Creation of Modern European National States – Charles Tilly;
- Tilly’s Aphorism: “States Make War; Wars Make States.” Can it be Applied to Cities?
  - That is...

# Was the High Cost of Sewers Like the High Cost of Waging War with New More Costly Technologies

- Did the High Cost of Sewers Make the Financing of Cities a main Factor in the Creation of Modern Cities?
- As in warfare, was the Financing Mechanism rather than the Cost of the Innovation that was the Important Factor?
  - If it was, then how it was financed matters greatly.

# Why 19th Century's Experience as a Prequel?

- Might be relevant to African Cities today since few in SSA urban population have sewers, and conditions are not improving; and
- There is a policy question based on interpretations of history about how it should be done -- Self-Financing or Not?



# Why 19th Century's Experience as a Prequel?

- Besides the Effects of Sewers on Health, there is also What North and Wallis referred to as an Institutional Transformation;
- Financing Sewers Certainly Changed Cities from Individually-Oriented Places to ones with Interlocking Planning Concerns;
- The share of GDP expended by Local Governments Expanded Greatly.

# The Point of the Presentation

- Examine the experience of the largest 19 Century cities;
- Use that history to try answer the question: How did these cities finance their sewers? And then,
- Suggest what, if anything, the experience might imply for financing sewers in SSA.

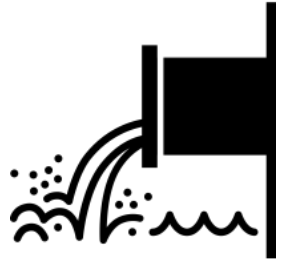


# The Point of the Presentation

- First: briefly describe how Berlin, Chicago, London, New York, and Paris financed their sewers, Hamburg as well;
- Then, show some of the effects these investments had on health and city institutions; and
- Finally, answer the Historical Question on self-financing with a sense of what it might imply for SSA Cities.

## II. 19<sup>th</sup> Century Sewer Finance took Three Forms

1. ***Top-Down Finance***, with distinct Bonapartist and Social Darwinist models – London and Paris;
2. ***Cajoled Finance***: Political Machines and Financial Tricks – Chicago and New York; and
3. ***Windfall Finance***: War Reparations and Insurance Payouts – Berlin and Hamburg.

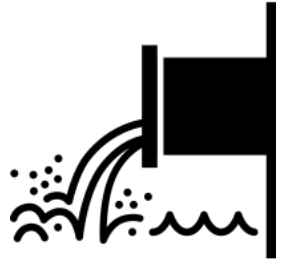


# Types of Finance:

## 1. Top-Down Finance in London

- In London, financing a response to what is known as “The Big Stink.”  
Thames was so foul that Parliament couldn’t function





# Types of Finance:

## 1. Top-Down Finance in London

Central Government was main financier and decision-maker.

Policy followed a market-oriented approach: relied upon but constrained local government so that central government could function.

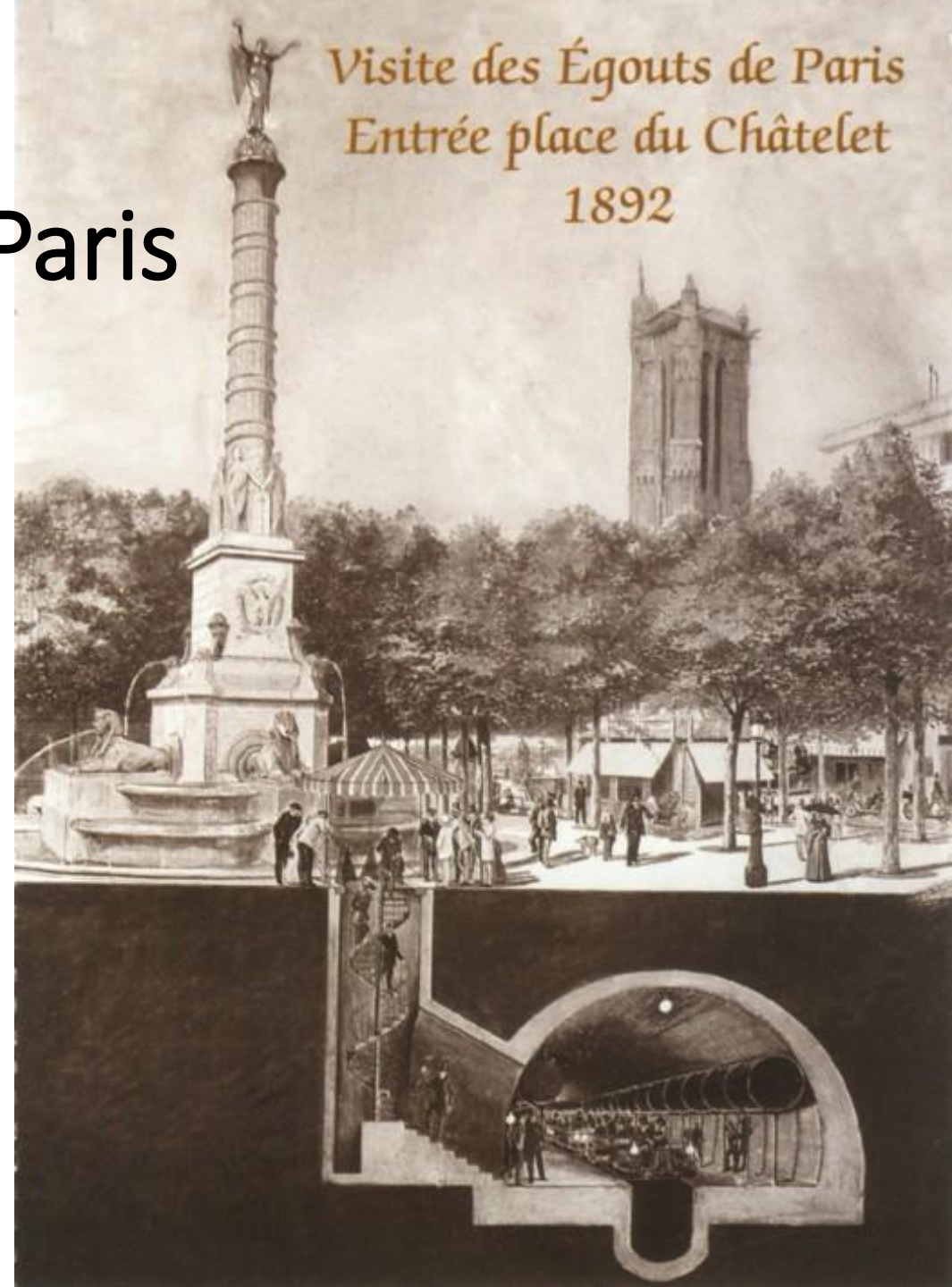


# Types of Finance:

## 1. Top-Down Finance in Paris

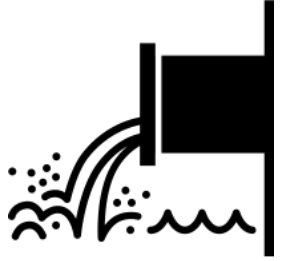
Again, the Central Government Drove Events.

- But, in Paris, Haussmann carried out Emperor Napoleon III's designs including four-fold sewer expansion;
- Sewers expanded more rapidly than his famous boulevards.



# Paris' Sewer as Spectacle...

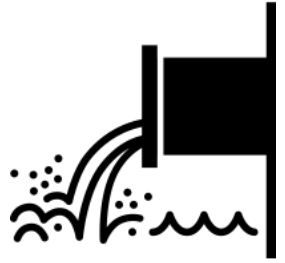




# Types of Finance:

## 1. Top-Down Finance in Paris

- In Paris, Haussmann carried out Emperor Napoleon III's designs including four-fold sewer expansion.
- Sewers expanded more rapidly than his famous boulevards;
- Eventually Haussmann resigns under financial cloud related to unbudgeted contingent liabilities.



## Types of Finance:

### 2. Cajoled Finance in Chicago and New York

Financing was Cajoled from state and central government, or through illegal financial manipulations; and

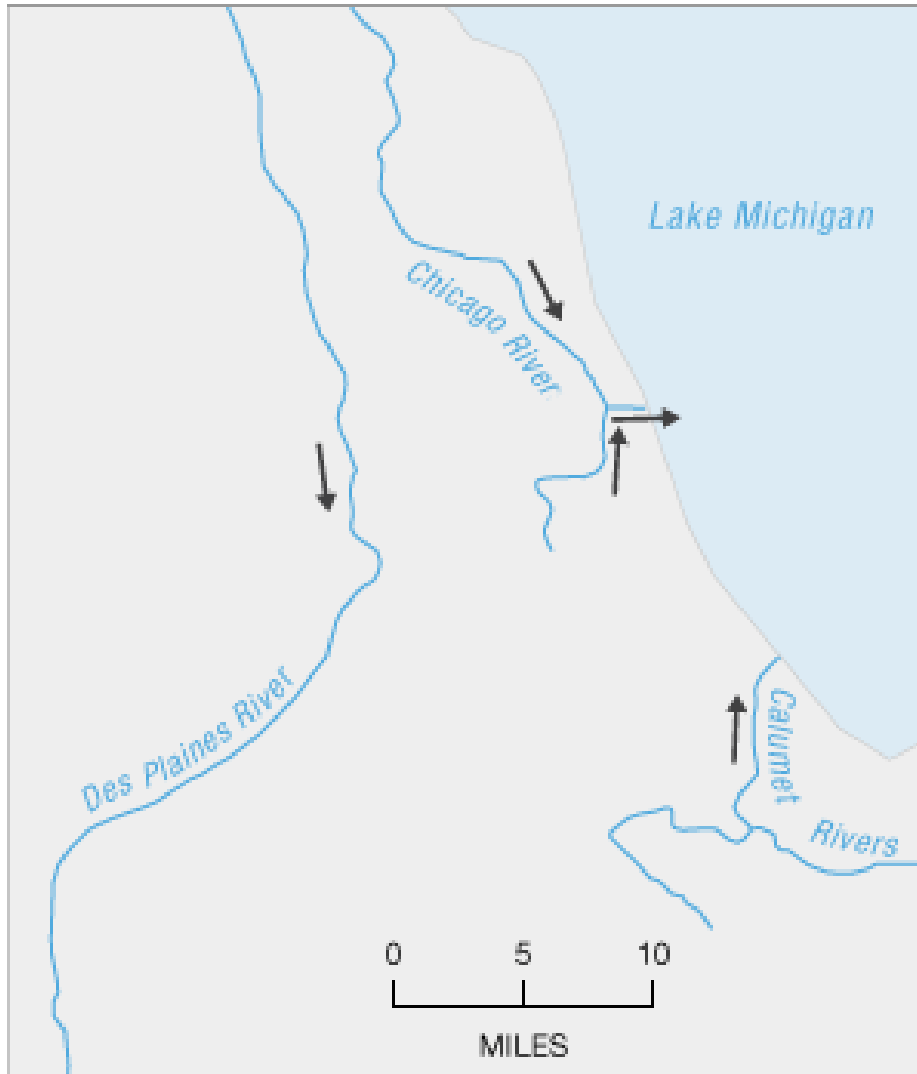
- **Chicago** waited until state and then federal financing was available to drain Lake Michigan into the Mississippi in massive public works projects;



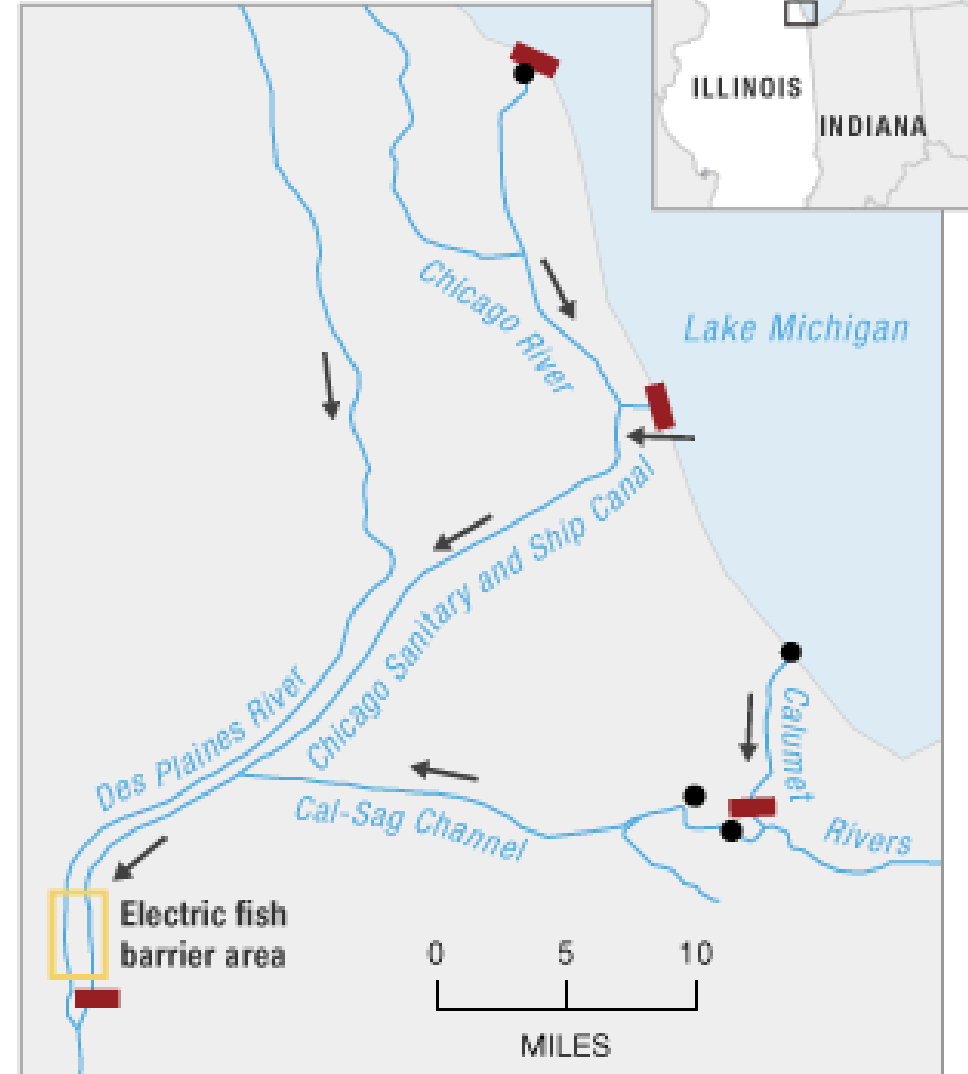
# ... and Flushed the City by Reversing Chicago River Flow

← Direction of flow    ■ Locks    ● Sites testing positive for Asian carp and DNA

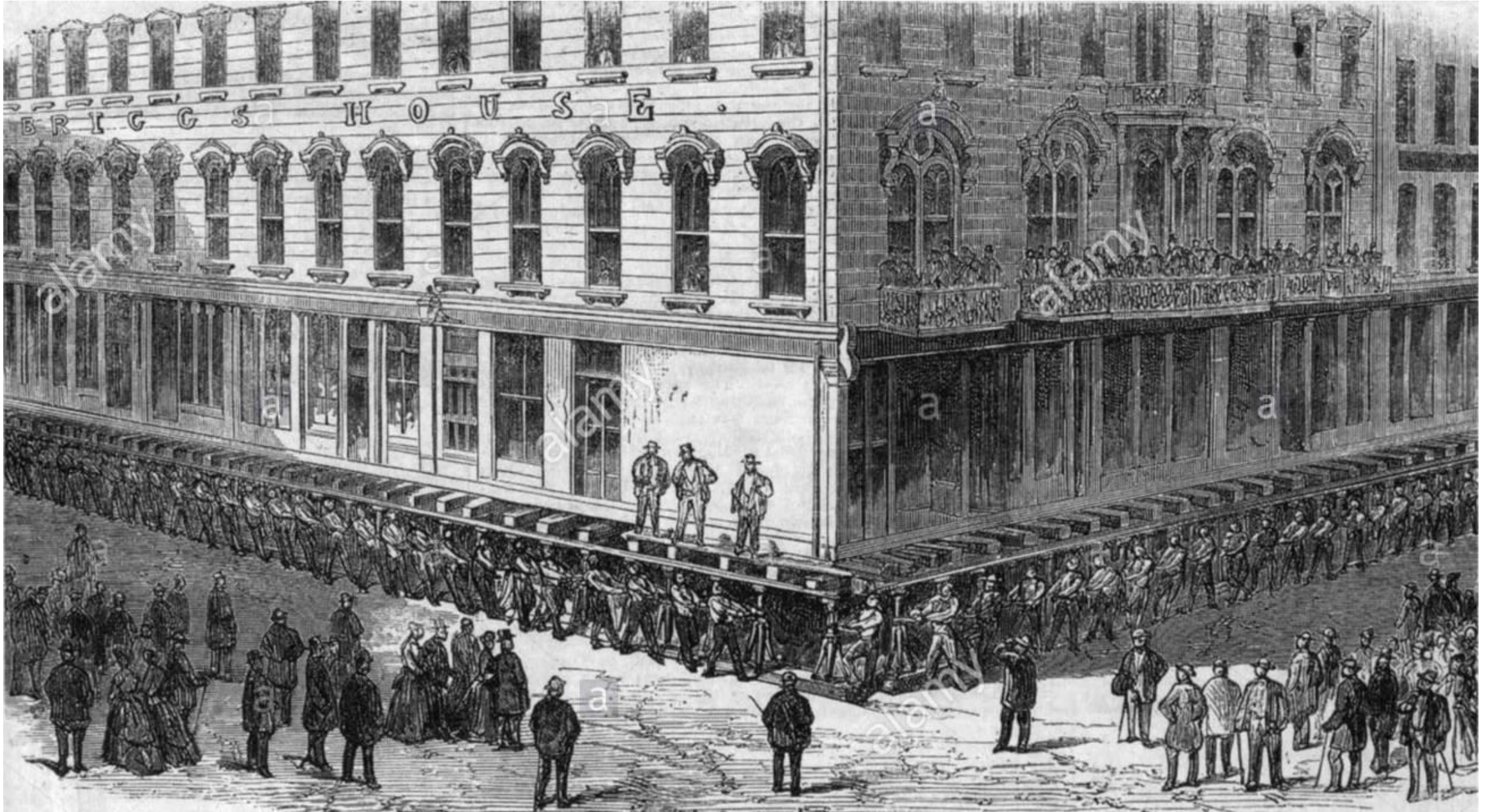
### Before Diversion



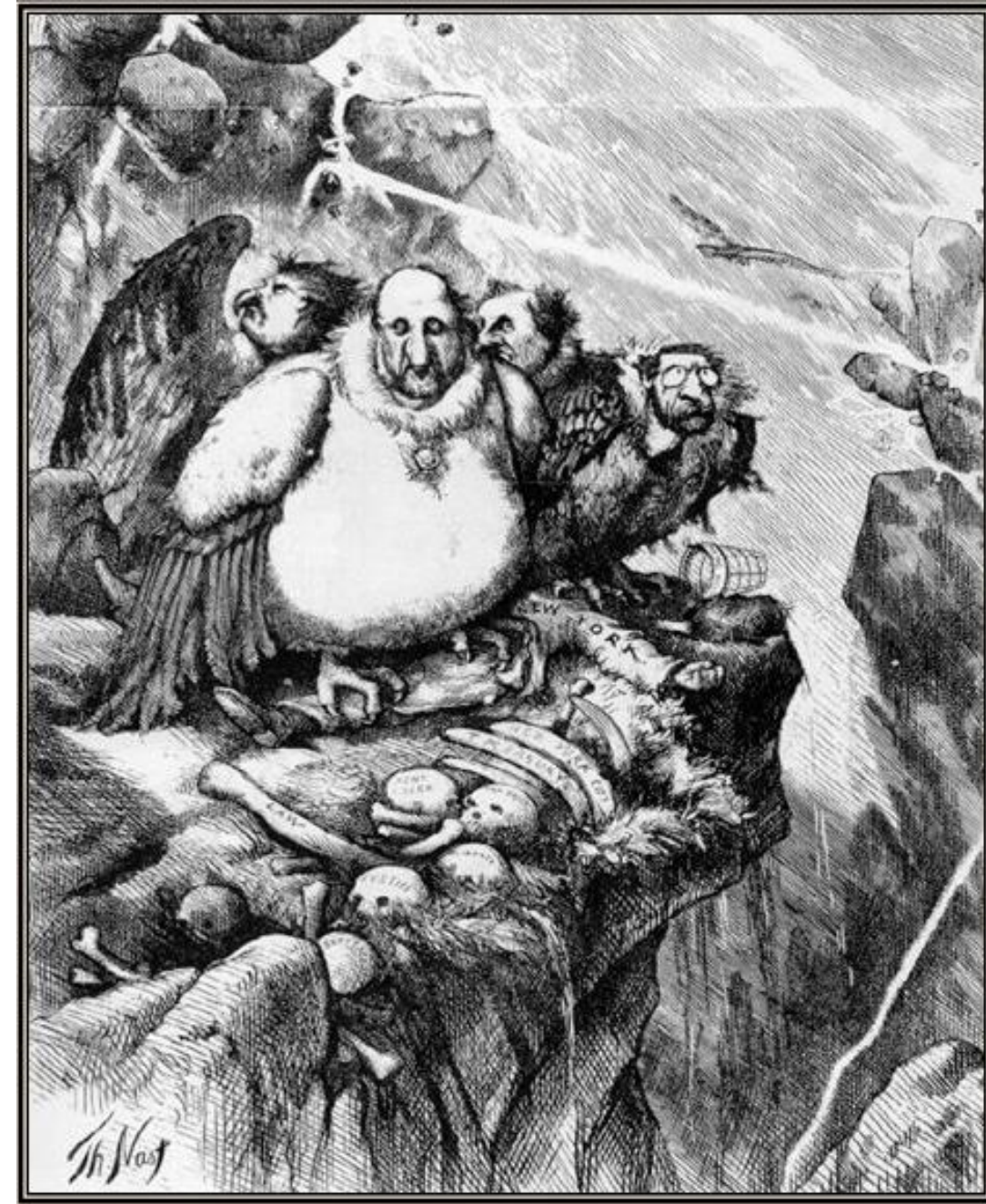
### After Diversion



Had to Raise Chicago Four Feet to Build the Sewers...

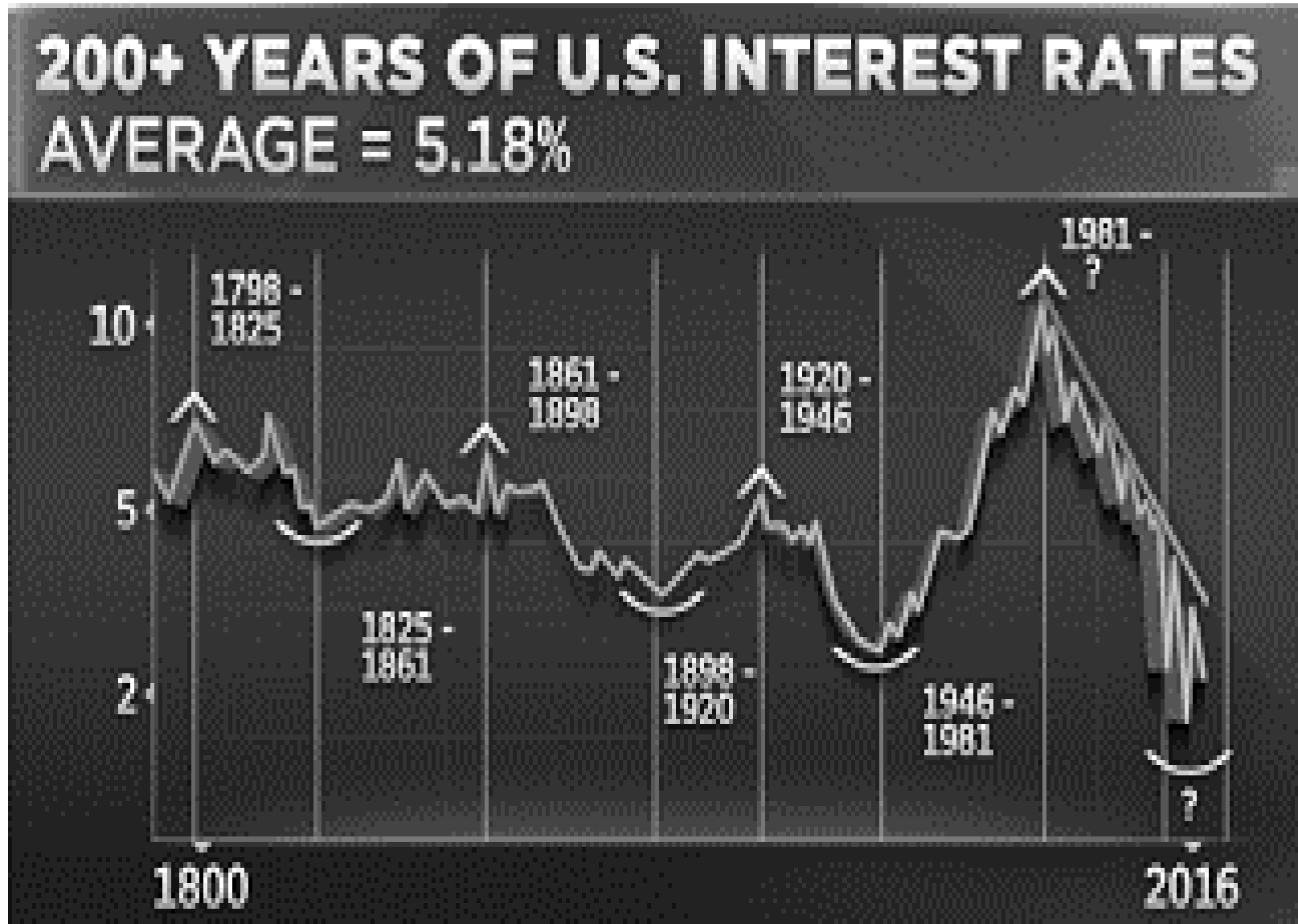


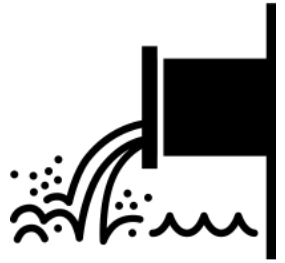
- In **New York**, Boss Tweed used the support of five banks to finance sewers to properties he owned. The banks failed; he was imprisoned;
- NYC saved from prolific debt issuance because prolonged recession halved interest rates and it refinanced.



Boss Tweed exposed for his corruption by cartoonist and editor Thomas Nast

# U.S. Interest Rates





## Types of Finance:

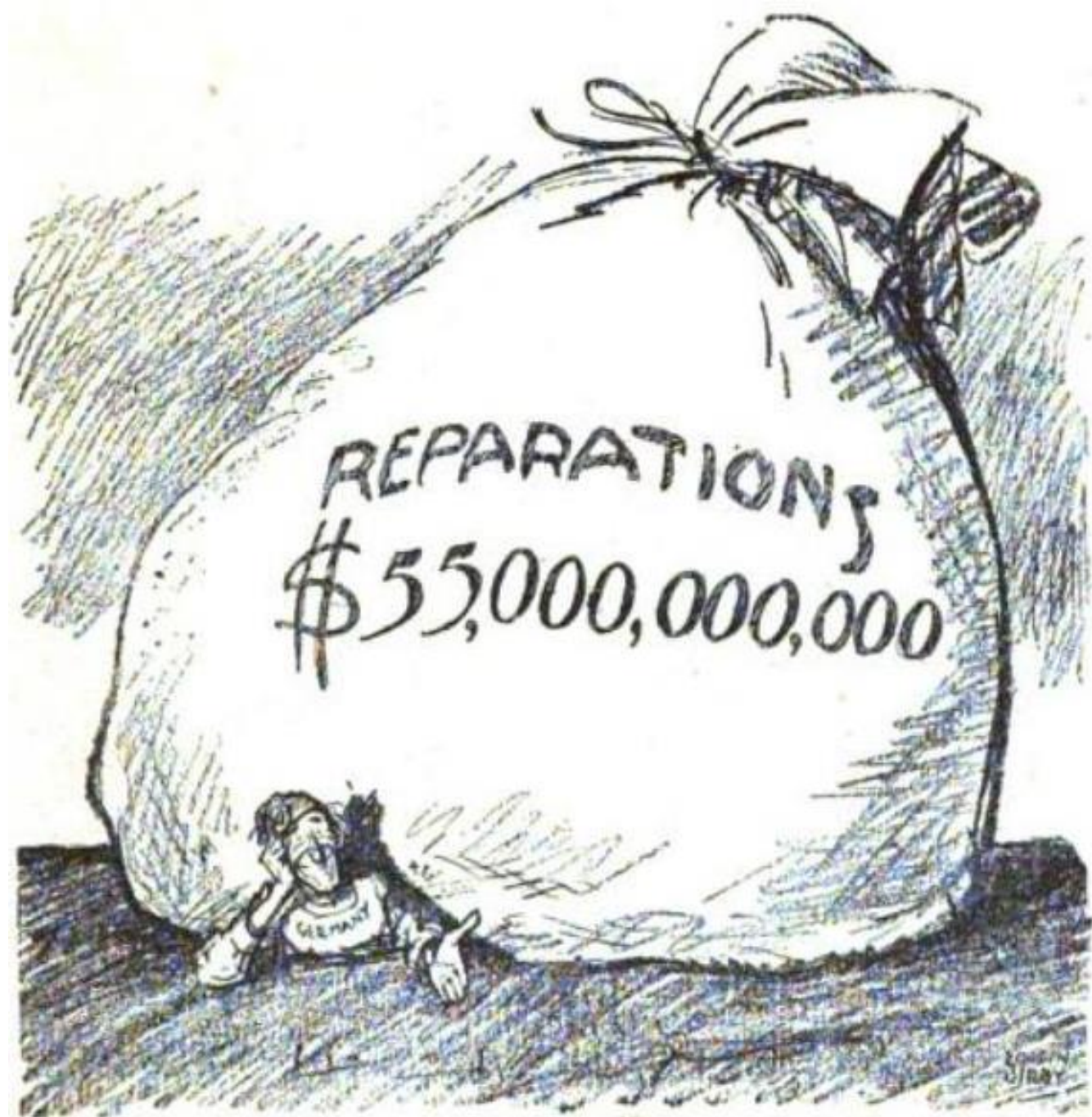
### 3. Windfall Finance in Berlin and Hamburg

- Force Majeure events were necessary – war and city-wide fire – but not sufficient. Windfalls following the events were necessary;
- **Berlin's** emergence as great city was paid for by French reparations from the Franco-Prussian War – 22 % of French GDP.

# Windfall Finance: Berlin's Funding

Force majeure events were necessary – war, and city-wide fire – but not sufficient.

Windfalls following the events were necessary;



# Windfall Finance: Hamburg's Fire Insurance Funding

- **Hamburg's** reconstruction paid by an Insurance from one of the first fire insurance policies – premia paid for more than 100 years – and which caused the industry to be restructured.



# III. Effects of Investments on the Cities

Fundamentally Changed Cities:

- From Dickens' London to the Prince of Wales celebrating the opening a beautiful Victorian system;



THE PRINCE OF WALES OPENING THE METROPOLITAN MAIN-DRAINAGE WORKS AT CROSSNESS: THE UNDERGROUND RESERVOIR ILLUMINATED.—MR PAGE 311.





London's New System: An Architectural Beauty

# III. Effects of Investments on Cities

## Changed Urban Institutions:

- In England the Sanitarians, with central government assistance, spread the investments to other more deadly cities;
- Paris, and other French cities continued Haussmann's centrally-supported work after his fall;
- Berlin, sewers helped it become an industrial powerhouse and central grants spread sewers more rapidly;
- New York and Chicago, with external help, sewers shaped the cities of today.

# *Will Places, like Kibera, Remain Like mid-19<sup>th</sup> century Paris?*

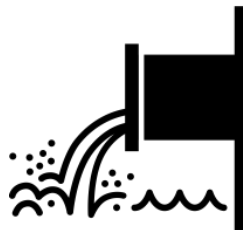


*Will the SSA Cities Remain the Large Urban Villages They were 100 Years Ago?*



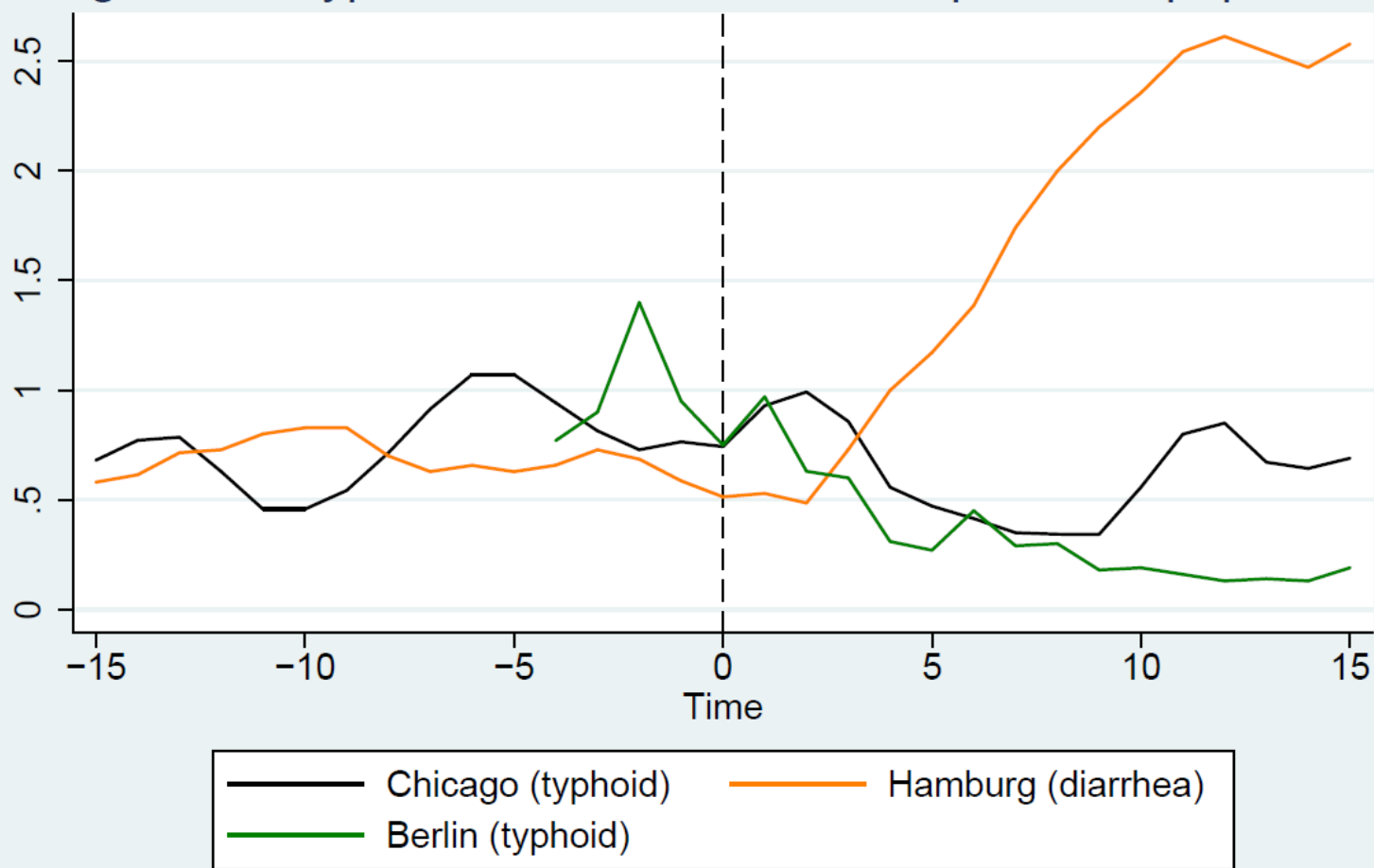
# III. Effects of Investments on Cities

- Cities underwent an Institutional Transformation.
- Decision-making changed from being done on a piecemeal, individual basis to one with large-scale planning of involved interlocking problems.
  - How did it affect health?

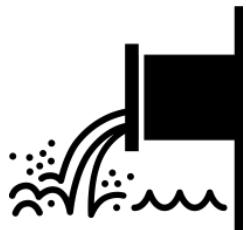


## Effects of the Sewer Investments on Health: Consider Hamburg, the Outlier

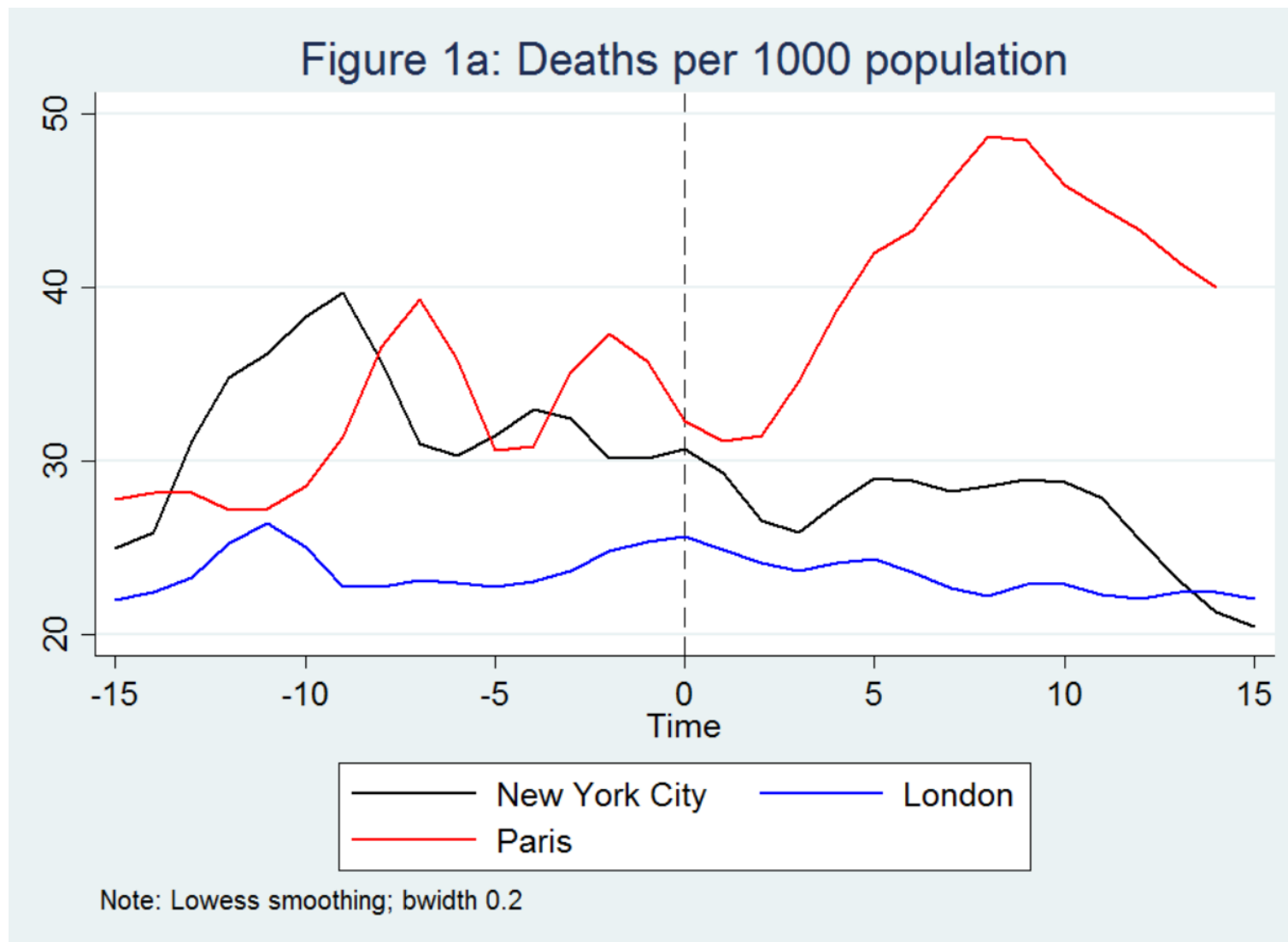
Figure 1b: Typhoid and diarrhea deaths per 1000 population



Note: Lowess smoothing; bwidth 0.2



# Effects of the Sewer Investments on Health: Consider Paris

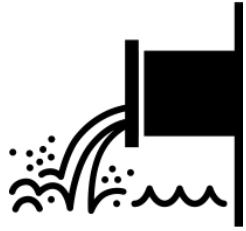


# The Health Experience

While the investments didn't always work as well as might be expected:

- Hamburg didn't serve the poor – result was Europe's last Cholera epidemic;
- Haussmann wanted sewers for drainage not waste – result was a belated “Big Stink” in Paris in 1880s.





## A Summing Up on the Effects: Sewers Provided Extraordinary Gains

- Enormous Health gains, particularly after water treatment undertaken;
  - Hundreds of thousands of lives saved; and
- Institutional Change. Cities became places with engineers, urban planners, with larger budgets and property tax systems.

## IV. The Historical Question: Self-financed or not?

In no case was it just self-financing. Szreter had it right when he said:

...the history of mortality decline shows that committed local government, ... can have quite considerable potential and scope as an agency to promote health improvements and general social change, if led by appropriate exhortatory but flexible central administration.”

# In no case were Sewers self-financed.

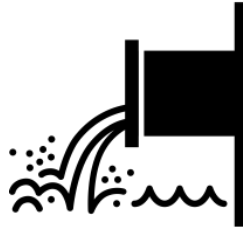
But the experience suggests that more than Finance as a basis for policy is involved.

- Large externalities stemming from lack of effective sanitation; and
- Even where subsidies were given it was not enough. Needed to proscribe the externality generating process as well.

# V. Is the Early Experience a Prequel for African Cities?

In most respects of course the answer is no, enormous differences:

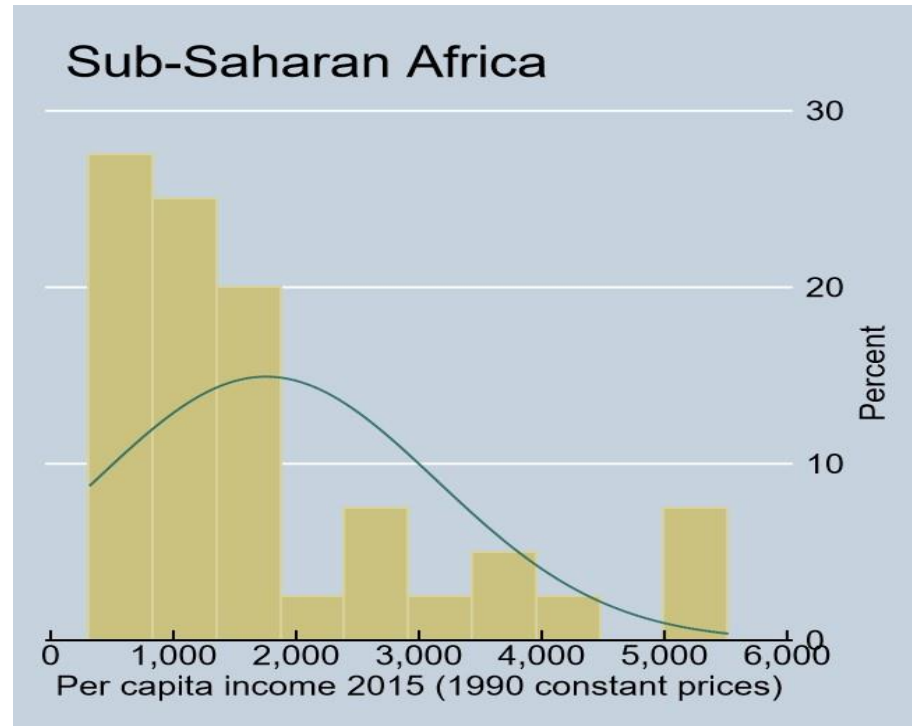
- Income and governance levels are lower today and technology is very different;



## Some Context on Differences in 19<sup>th</sup> Century Versus SSA Today: Income Differences

- Per Capita Income at time of Initial Investment
  - Berlin \$2379
  - Chicago 1967
  - Hamburg 1272
  - London 4201
  - New York 2812
  - Paris 3558
  - SSA 1040

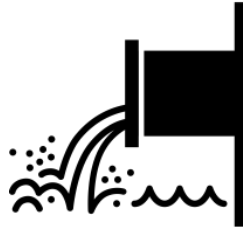
# Distribution of SSA Countries by Per Capita Income.



# More Per Capita Income Levels of Early Installers

Country	Year Installed	Per Capita Income (1990 dollars)
Australia	1916	4878
Austria	1891	2506
Belgium	1892	3442
Canada	1910	4066
Denmark	1893	2629
Finland	1888	1302
France	1857	1779
Germany	1863	1749
Great Britain	1866	3023
Hungary	1890	1473
Italy	1885	1671
Netherlands	1900	3229
Spain	1860	1236
Sweden	1865	1225
U.S.	1871	2503

*Notes:* GDP per capita data from the Maddison Project database. Average income per capita for these 11 countries: 2447.4



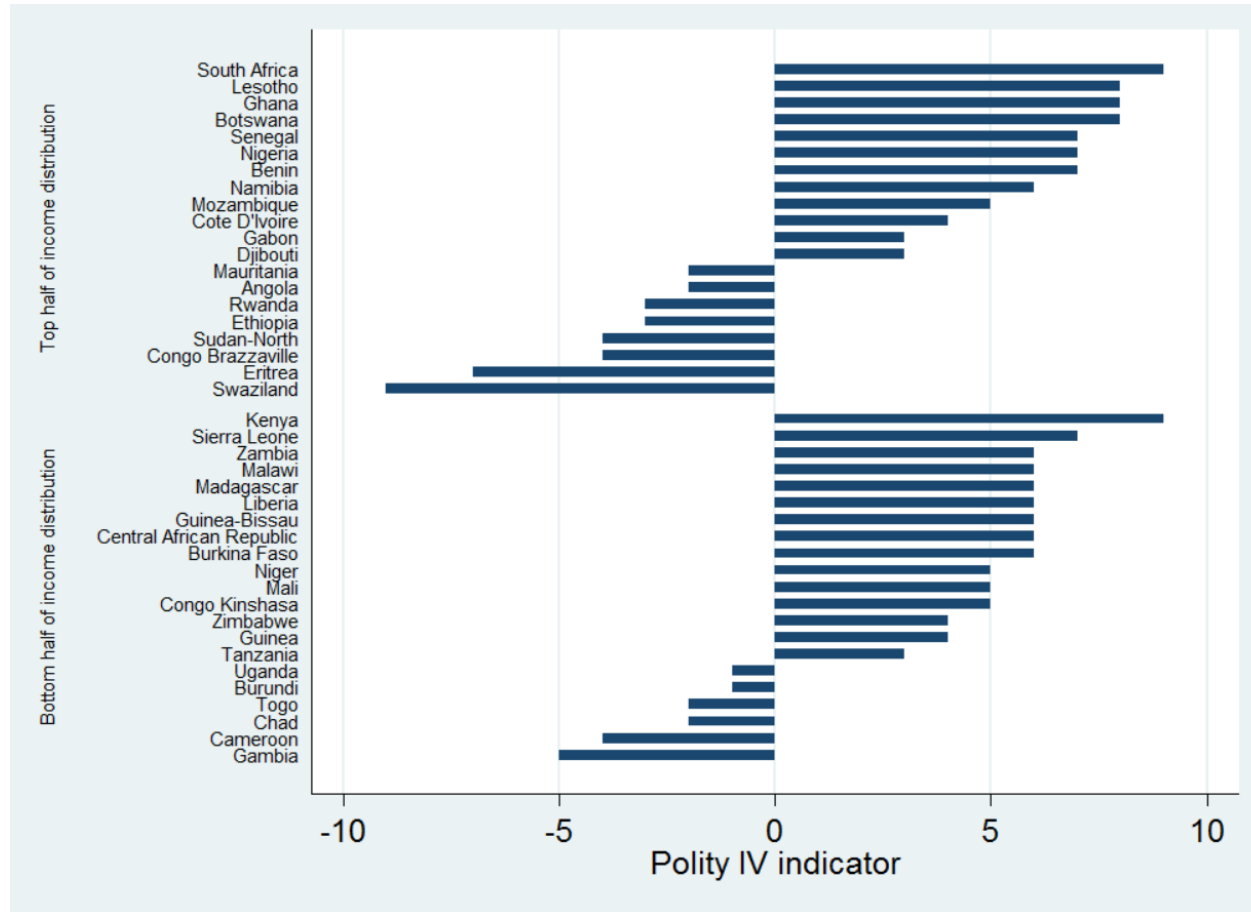
# Do the 19<sup>th</sup> century cities serve as a Prequel for African Cities?

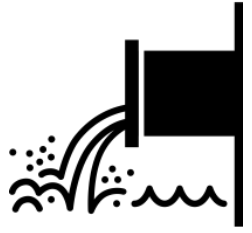
In most respects no, enormous differences:

- Income and governance levels suggest systems are affordable today in many SSA Cities; but
  - Demands are different: Disease vectors are distinct, as are the industrial demanders for water.



# Polity IV Ratings SSA Countries, 2016

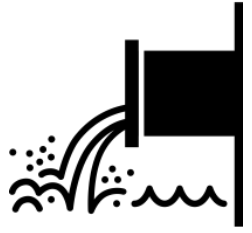




## Some Context on SSA versus 19<sup>th</sup> Century Cities: Politics of Supply.

While lack of access to sanitation is more deadly today in SSA, local political support for such large investments is much lower:

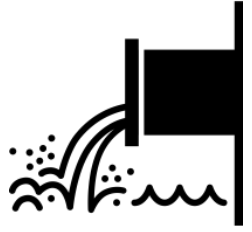
- The health treat is different.
  - Disease vectors are localized in slums today;
  - Versus 19<sup>th</sup> century, cholera terrorized all.
- Private Industrialists were important demander of water services, which made old systems increasingly obsolete. Present in SSA?



# Do the 19<sup>th</sup> century cities serve as a Prequel for African Cities?

In most respects no, enormous differences:

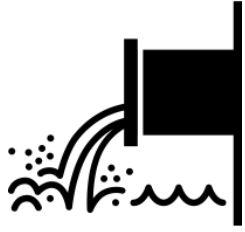
- There less the water availability in SSA's much bigger
  - cities; and
- Finally, the fiscal, financial and accountability circumstances are much more austere in SSA.
- But, in some ways they do serve as a prequel....



# 19th Century Cities as a Prequel for African Cities?

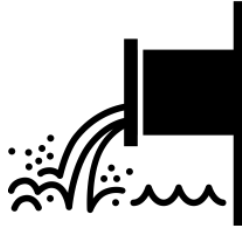
## Prequel-like Conditions:

- Health Concerns. Even though infant mortality is much lower in African Cities today it remains high;



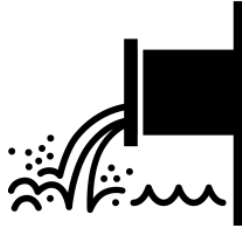
## 19<sup>th</sup> Century Cities as a Prequel for African Cities : Heath Concerns.

- Infant mortality rate (IMR) today much lower than in 19<sup>th</sup> century;
- IMR decline in SSA has followed, but lagged, the enormous gains from medical innovations in the 20<sup>th</sup> century; BUT
- IMR remains 20 times higher than Europe and is much higher in slums.



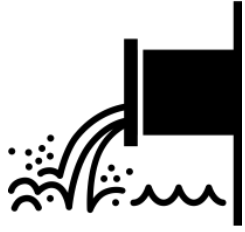
# 19th Century Cities as a Prequel for African Cities? Prequel-like Conditions

- Health Concerns. Even though infant mortality is much lower in African Cities today it remains high; and
- Urban growth rates. Coping with the demographics requires greater local government responsiveness because...



## 19th Century Cities a Prequel: Rapid Urbanization combined with Deteriorating Conditions.

- Only 40 percent of SSA urban population now have with access to improved sanitation; no gains since 1990;
  - Most SSA urban population live in slums; and
- Urban population in SSA forecast to double over the next 25 years, adding 400 million people;



## 19th Century Cities as a Prequel for African Cities? Prequel-like Conditions.

- Health Concerns. Even though infant mortality is much lower today than 19<sup>th</sup> Century, still many times the level of developed countries;
- Urban growth rates. Coping with the demographics requires greater local government responsiveness; and
- Fiscal and Financial Challenges. Today, these conditions, like those in the 19<sup>th</sup> century, are of unprecedented scale.



**Table 1: Dates of Installation of City-Wide Sewer Systems**

Country	Year Installed	Per Capita Income (1990 dollars)
Australia	1916	4878
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*Notes:* GDP per capita data from the Maddison Project database. Average income per capita for these 11 countries: 2447.4

# VI. Main Policy Implication

- Recognize that lack of sanitation in SSA is a problem that cannot be dealt with by current urban institutional structures;
- Determine the priority of this function within the scope of alternative urban investments. Many, for instance, argue that land reform is a greater priority, but that will take longer than a generation;
  - What happens to health in the meantime?

# VI. Main Policy Implication

Urban reforms, including sewers, may take a generation to realize, what happens to health in the meantime?

- What other expedient policies exist to address the “next generation” problem?
- In most places, not sewer systems. But, Improved Sanitation Provision is Essential for both Health and Institutional Transformation.

# VI. Main Policy Implication

Because there is little in the way of Long-Term Finance, and often Little in the way of Local Government Autonomy and Responsiveness;

- The Most Effective Alternative is Local Community Organizations as Providers;
  - Funded by International Financial Institutions.