Legacies and lessons from Berlin's history of district heating

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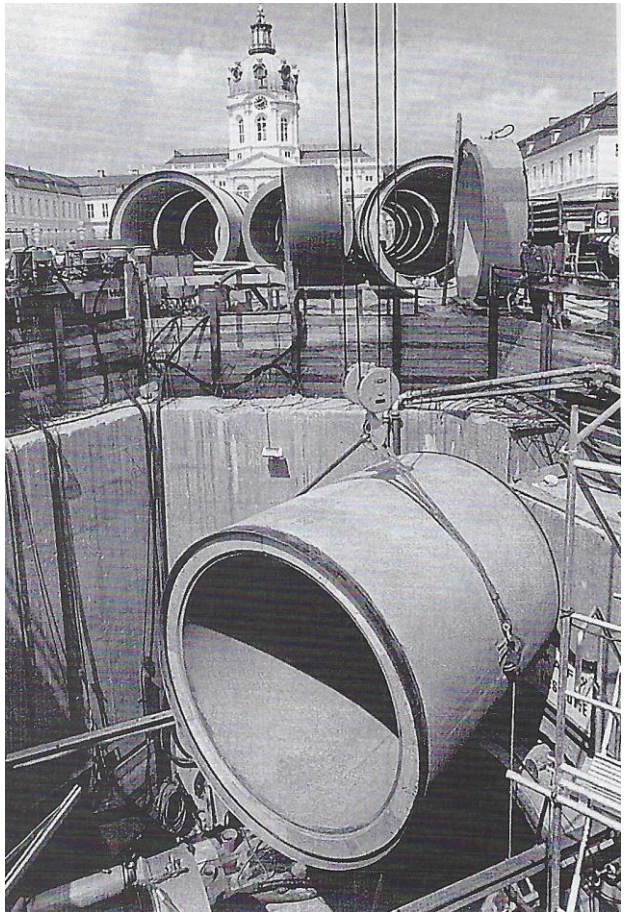
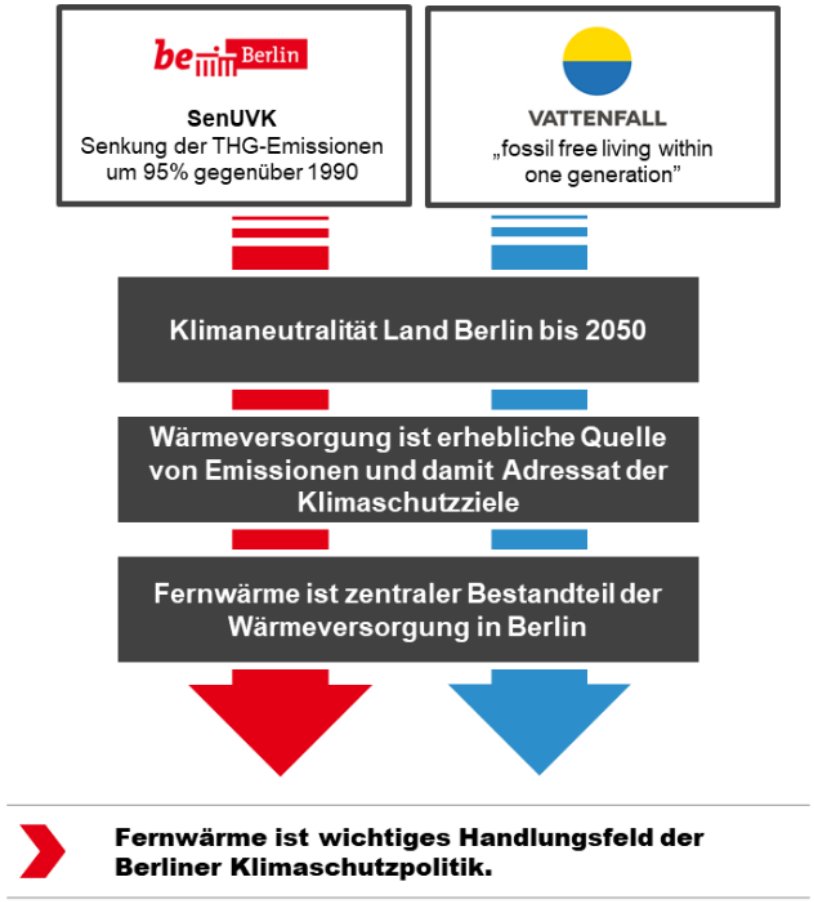


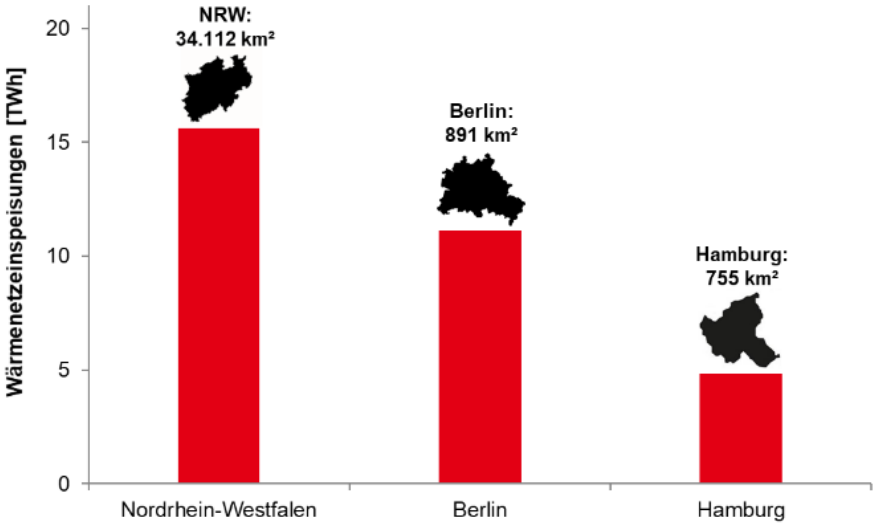
Bärthel (2006). "Anlagen und Bauten der Fernwärmeversorgung", p.300

Today‘s renaissance of district heating

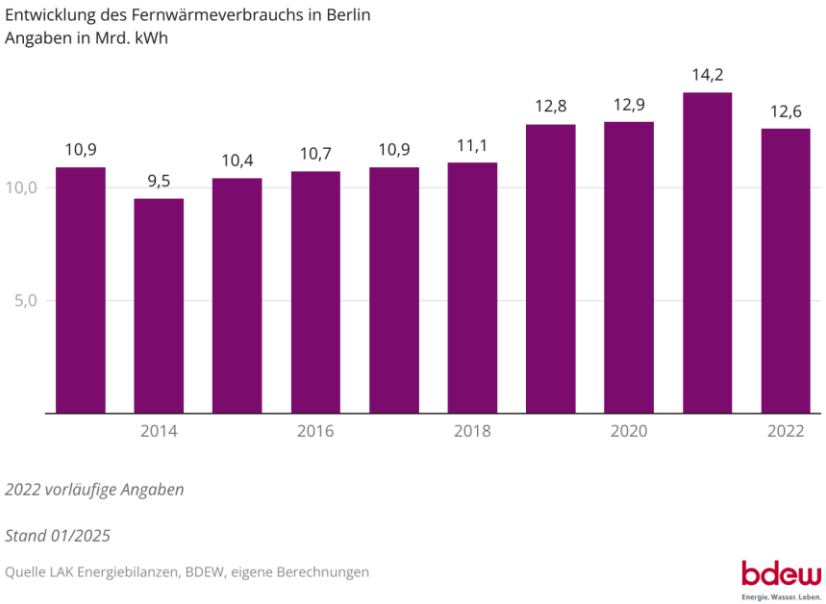


BET (2019). Machbarkeitsstudie. Kohleausstieg und nachhaltige Fernwärmeversorgung Berlin 2030 p.2

Huge potential in Berlin



BET (2019). Machbarkeitsstudie. Kohleausstieg und nachhaltige Fernwärmeversorgung Berlin 2030 p.6



A deeper, non-linear history

1. Early origins of district heating and its diverse functions
2. Pioneers in Berlin and their initial reluctance
3. Expansion and its critics in the insular West Berlin
4. Socialist heating and its limitations in East Berlin
5. Adapting in the reunited city
6. Conclusion: the value of real histories

1. Early origins of district heating

Modern steam distribution systems began in USA in late 1870s

- First steam systems not for heating but to generate electricity in connected buildings – in absence of electricity networks
- Systems built to heat high-rise buildings in US cities since 1878. By 1925, 300-350 such heating plants

Europe:

- First district heating system in Dresden, 1901
- Power station at Bloom St, Manchester, supplied steam to heat nearby warehouses and factories from 1911
- Large district heating networks built in 1920s: Hamburg and Kiel (1921/22), Leipzig (1923), Leningrad (1924), Rotterdam and Utrecht (1927), Paris (1929)
- Divergent pathways: UK shift to individual boiler heating; DK, SWE, USSR to district heating

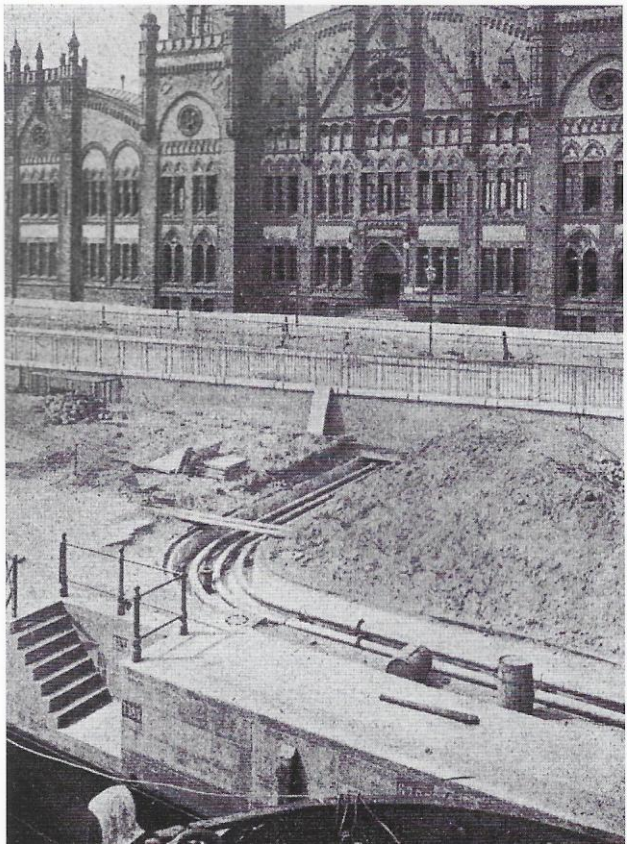
2. Pioneers in Berlin

First plant to provide heat for external use: 1912 from Charlottenburg power station to city hall

First networks for heating homes in 1926:

- Charlottenburg: supplied 33 buildings with steam from cogeneration along 2.5 km pipe
- Steglitz: heating network of 2.18 km using hot water, extended to 7 km by 1939

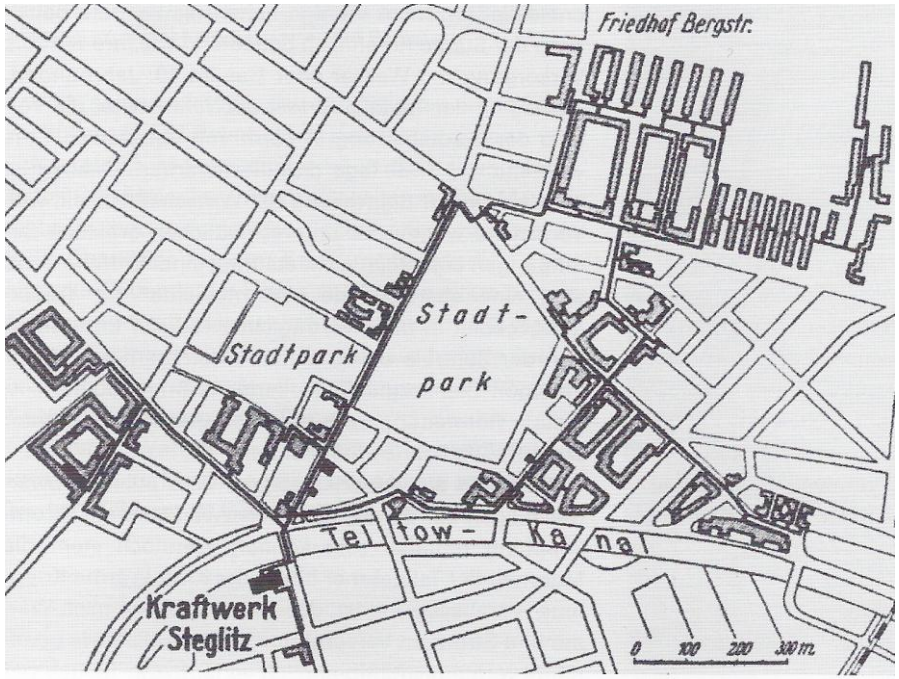
By WWII, Berlin had district heating network of 18.1 km



Tepasse (2006). *Stadttechnik im Städtebau Berlins*. p.82

Initial motive in 1920s: to combat smoke pollution in the city

- much-acclaimed "Siedlung ohne Feuer und Rauch" served by district heating in Steglitz, 1932



Tepasse (2006). *Stadttechnik im Städtebau Berlins*. p.84

Congress of urban heating engineers, October 1925 in Berlin, attracted 500 participants

- Most attendees favoured CHP, but only if demand for power and heat could be balanced – in quantity and timing - in supply area
- Many power plant operators sceptical of DH

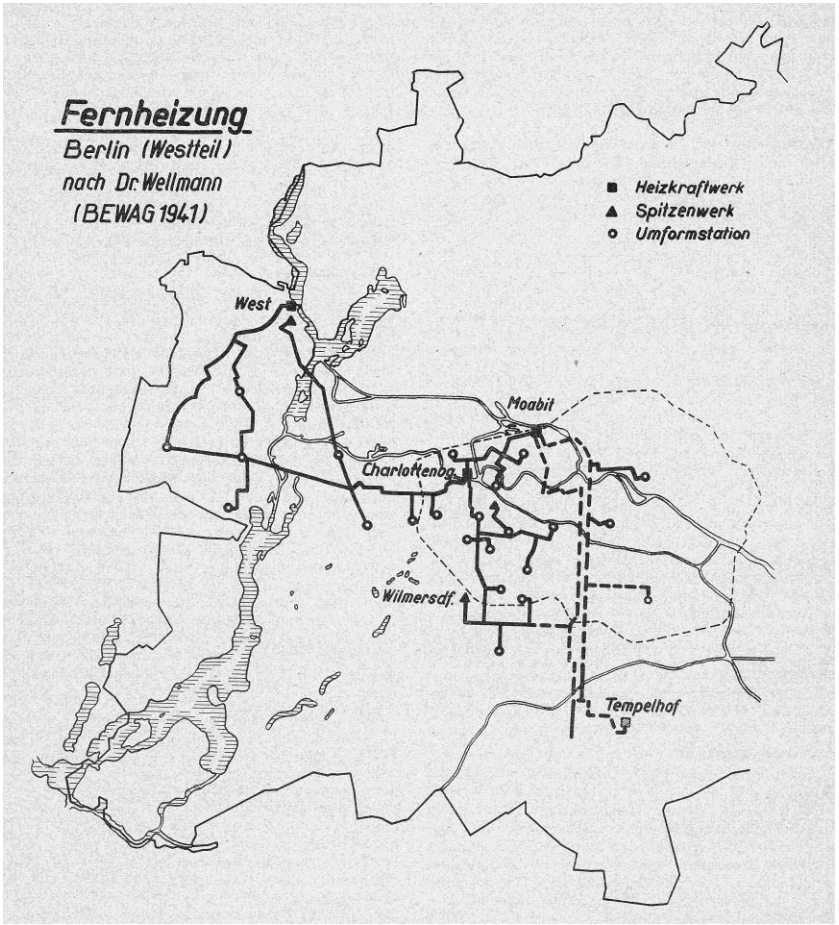
District heating proving uneconomical:

- Poor correlation between demand for electricity and heat in CHP
- Electricity demand growing faster than for heat
- Laying pipes for heating more expensive than power cables
- Heat losses considerable >>> only nearby buildings viable

Utility Bewag: shift from sceptic to proponent of DH, 1927-1930

- loss-making DH subsidized by profitable electricity sales
- Bewag actively promotes DH with “propaganda”

Berlin’s district heating network in 1941



Randzio (1951).
Unterirdischer Städtebau.
p.84

District heating for industry in Berlin

1930s:

- New power station of Klingenberg provided heat from 1931 to Aceta-Chemie and to labour office in Rummelsburg via a 1.3 km pipe
- Power stations in Rummelsburg and Wilmersdorf also supplied heat to individual industrial users from 1935

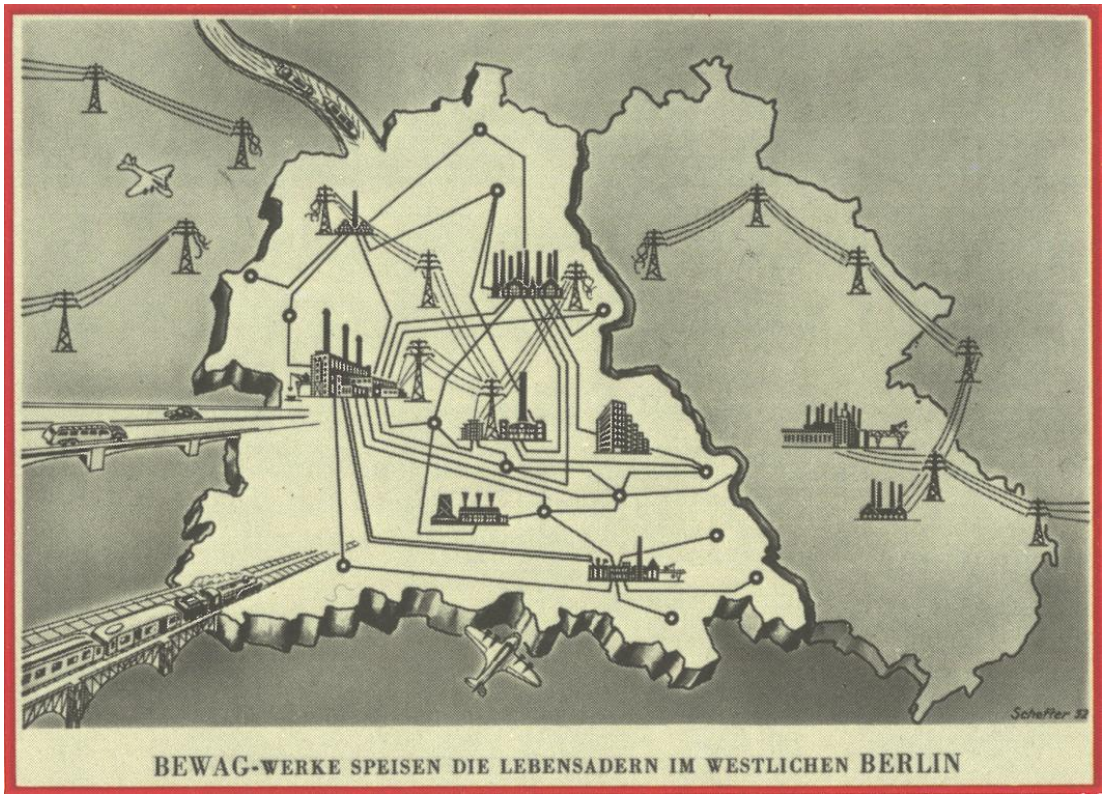
1950s:

- Kraftwerk West started supplying process heat to Osram-West from 1951, the paper mill Gottwald from 1953 and Siemens factory from 1956

Motive: to improve the use of summer DH capacity

3. Expansion in the insular West Berlin

1949-1989: Divided city – divided infrastructures



Bewag (1984). *100 Jahre Strom für Berlin*. 1952

Territorial insularity and self-generation of West Berlin's electricity strengthen logic for extending district heating in CHP

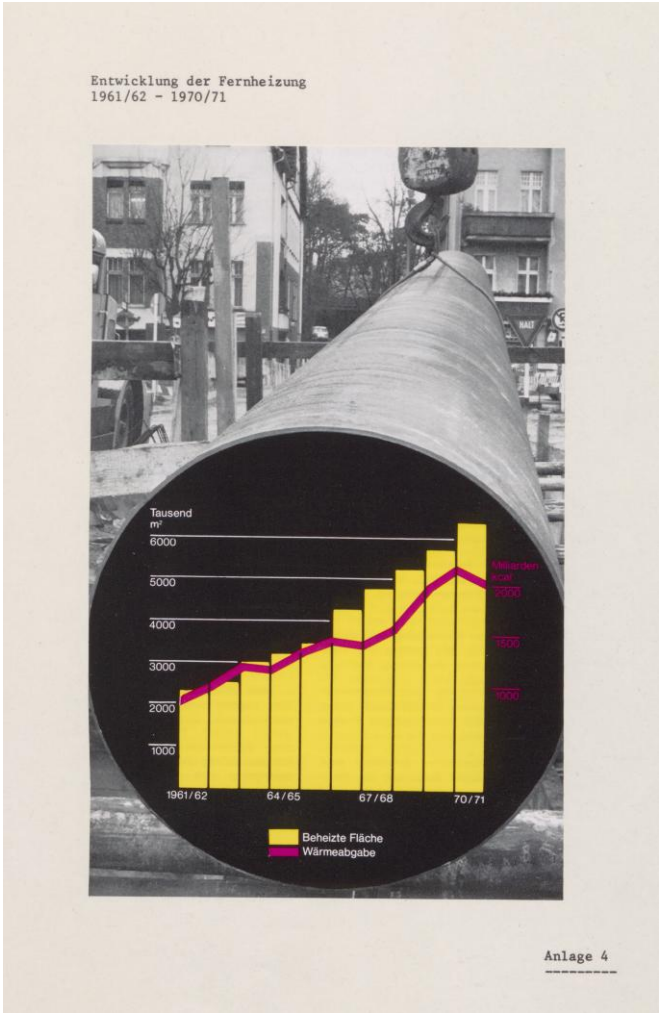
- DH becomes central part of energy resilience strategy: locally produced, reducing dependence on oil
- Presented to public as major factor behind improved air quality

Landesarchiv Berlin, F Rep. 290, No.0051153

DH network in West Berlin grew from 65 km in 1958 to 183 km in 1971 and 419 km in 1990

By 1990 Bewag operated 7 CHP plants with thermal output of 2660 MW, supplying around 200,000 homes

80% of DH in West Berlin provided in CHP



Landesarchiv Berlin, B Rep. 016, No.460_00002

The district heating fix

Financial: High operating costs >>> Bewag demanding state subsidies, cross-subsidising with higher electricity charges, charging by surface area not energy used

Territorial: Bewag pressing for obligatory connections to the DH network for areas close to CHP plants

Institutional: Existing decentral heating systems in public housing decommissioned to enforce DH from Bewag

Environmental: Air pollution from coal- and oil-fired CHP played down by Bewag

Technical: No or little regulation of heating units possible >>> consumers tied to high energy use

Public & professional criticism, 1980s

- DH being pushed by Bewag and Senate as the only technology for energy efficient heating
- Alternative heating technologies – especially block-type CHP – being ignored
- Expansionism (planning 20 new coal-fired heating plants in 1979) potentially damaging to urban environment
- Argument of DH reducing dependency on expensive oil no longer valid

Main argument: A protectionist alliance between city politics and energy industry to shore up DH

4. Socialist heating in East Berlin

Many Eastern European cities developed city-wide DH under state socialism:

- Sofia, Budapest, Berlin, Belgrade, Bucharest, many Soviet cities

East Berlin: unfavourable conditions for DH

- No DH systems at end of war, unlike in West Berlin, except 1.3 km heating pipe from Klingenberg power station
- Structural shortages:
  - of factories to build the boilers,
  - of material for the pipes and shafts,
  - of money for the civil engineering,
  - of know-how for large heating plants

>>> supply regularly failed to meet rising demand for DH

Early beginnings

DH plant Friedrichshain:

- Opened 1953 to serve Stalinallee housing complex
- Supplied 6,217 homes via 10.3 km network by 1956
- Supplied heat also to printing works of “Neues Deutschland”, Reichsbahn and light-bulb factory NARVA

Klingenberg-Lichtenberg heating network:

- 8.4 km steam pipe, built 1971, supplying large factories in Oberschöneweide

Bärthel (2006). “Anlagen und Bauten der Fernwärmeversorgung“, p.304

Between 1968 and 1988, East Berlin DH network grew 10-fold in length

- from 37 to 371 km for hot water-based system and from 40 to 407 km for steam-based system

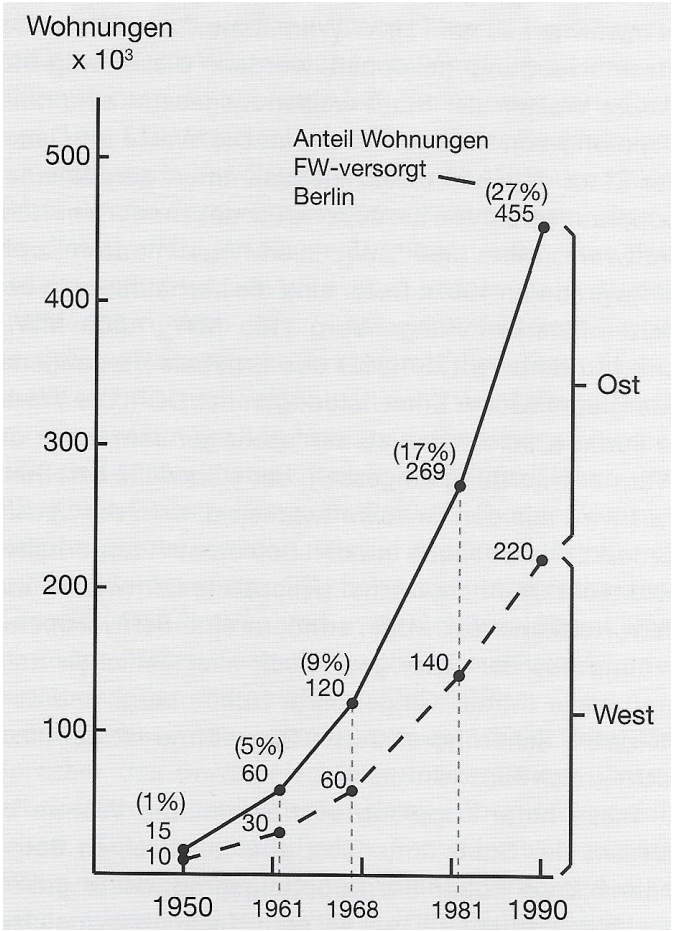
Yet only ca. 20% of East Berlin's district heating produced in CHP

- since electricity provided largely from external power plants in Lusatia

5. Adapting in the reunited city

1990: 27% of all Berlin homes heated with district heating

- 37% in East Berlin, 20% in West Berlin



Tepasse (2006). *Stadttechnik im Städtebau Berlins*. p.181

Post-1990 challenges and opportunities

Connectivity of heating networks, East and West, prevented by divergent technical systems

Growing competition from smaller, block-type heating plants

Liberalisation of electricity market, 1990s >>> Bewag/Vattenfall's electricity too costly for European market >>> decommissioning of some CHP plants

Today, many CHP plants kept operative to sustain district heating

Retaining DH networks has created openings for decarbonising Berlin's heating systems

6. Conclusion: the value of real histories

1. The energy crisis of the 2020s has resurrected the rhetoric of energy independence, energy security and energy affordability from the embers of the Cold War, warranting historical research on past DH.
2. History shows how technical, economic and institutional factors interact in processes of establishing, developing and adapting a DH system.
3. Berlin's history reveals scepticism and criticism of DH: especially over the territorial, financial and institutional fixes enrolled.
4. The hypes and contentions around DH in the past can be productively revisited to alert us to problems in the making today and ways of dealing with them.