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## **Utilities, land-use change and urban development: Brownfield sites as “cold-spots” of infrastructure networks in Berlin**

Timothy Moss

### **Abstract**

This paper explores the interrelationships between urban land use, resource consumption and utility service provision with a study of brownfield regeneration from an infrastructure perspective. Drawing on recent research into the spatial strategies of utility companies following liberalisation and privatisation the paper identifies disused industrial sites as “cold-spots” of infrastructure systems where energy and water consumption has recently collapsed. A case study of Berlin analyses first the challenges facing the city’s three major utilities as a result of shifting patterns of

resource consumption and over-capacity in parts of their networks. The second part examines the responses of the three utilities to these challenges in the context of recent institutional changes to infrastructure provision, examining how the utilities are moving towards greater spatial differentiation in their network management and what interest they have in brownfield regeneration.

## **Introduction: Connecting changes in urban land use and resource consumption to utility service provision**

When a large urban site loses its industrial function as a result of economic restructuring it creates a hole not only in the local economy but also in established infrastructure systems. In terms of the site alone the environmental impact relating to resource use is positive: consumption of energy and water drop sharply. From the perspective of the city or urban region, however, disuse of a major industrial site can create serious resource inefficiencies, in particular relating to the under-utilisation of existing technical networks for power, gas and water. For beneath the derelict site lie a web of water pipes, sewers, electricity cables and gas pipelines. These have all been built to meet the generally very high levels of energy and water required by large industrial consumers of the past. When these consumers leave and are not replaced the underground infrastructure loses its primary function and is required – if at all – merely to transport energy or water flows across the disused site to other consumers. Not only the on-site infrastructure is affected. Beyond the site boundary the pipes and cables are linked to intermediate nodes, such as electricity transformers or pumping stations,

which themselves are linked to the power stations, water works or sewage treatment plants at the hub of each technical network. All are affected to a greater or lesser degree by the disappearance of a major industrial customer. This paper explores the task of finding new uses for urban brownfield, or disused, sites from an infrastructure perspective. The aim is to discover what interest the utilities responsible for these technical networks have in reactivating large-scale former industrial sites so as to maximise use of their existing physical infrastructure.<sup>1</sup>

The paper draws on, and contributes to, a growing literature on the reconfiguration of urban technical networks in the wake of broad trends towards the liberalisation, privatisation and commercialisation of utility services for electricity, gas and water supply, sewage disposal and telecommunications (Graham 2000a, 2000b; Graham/Marvin 1996; Guy et al 1996; Guy et al 1997; Guy et al 2001; Marvin/Guy 1997; Offner 2000). The paper offers a rather unusual perspective on this debate in several respects. Firstly, it is a story not of the changing relationships between service provider and service user – a key feature of reconfiguration processes – but of the absence of consumers and how utility companies respond to this. Secondly, in the case of brownfield sites the utility company is not the agenda setter we have become familiar with in recent years, creating new services and forging new partnerships in response to growing commercial pressures, but is a victim of forces of economic restructuring and urban change beyond its control. Thirdly, in terms of the spatial development of technical networks our interest lies not in new consumption spaces of

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growth – such as Stephen Graham’s “premium network spaces” – but in less dynamic parts of the networks (Graham 2000b). The focus is less on those spaces the utilities choose to by-pass than on those they have to pass in order to reach other consumers.

The point of departure for this paper is the thesis, widely substantiated in the recent literature, that current trends towards liberalisation and privatisation are creating greater differentiation in the kinds of utility services available and the way they are provided. Various terms such as “splintering” or “unbundling” are used to refer to processes in which utility companies, under pressure to raise efficiency and compete for customers, are questioning the value of offering a standard, basic range of services to all customers at a fixed price and are consequently varying their services – and prices – to attract or retain customers and raise income (Graham 2000a ; Guy et al 1997). As several commentators have demonstrated convincingly, there is a distinct spatial dimension to these processes of differentiation (Graham 2000a, 2000b; Guy et al 1997; Marvin/Guy 1997; Offner 2000). Following the removal of territorial monopolies, utility companies are inclined to view and treat the area they serve no longer as a homogenous space bounded by the limits of their physical network but as a web of spatially diverse sub-units often linked to wider national or even supranational grids.

Guy, Graham and Marvin have provided a simple model of “hot-spots” and “cold-spots” to illustrate how utility companies today increasingly distinguish between different spatial sections of their network (Guy et al 1997). Whereas “hot-spots” represent those areas where local demand is high and in danger of exceeding existing capacities for provision, “cold-spots” occur where demand is low or stagnating. “Cold-spots” are often areas of decline which are, for the service provider, “zones of limited

commercial opportunity” (Guy et al 1997). In the past their existence posed little problem so long as a territorial monopoly enabled costs to be shared amongst all customers. Under a liberalised utility market, however, these “cold-spots” can become a commercial liability. Utility companies respond either by neglecting them – i.e. providing only the minimum service required by law or service contract – or by seeking actively to raise demand by attracting new customers to locate on their “cold-spots”.

Large-scale brownfield sites – especially former industrial sites – would appear to represent an extreme form of “cold-spots” in an urban infrastructure network. On brownfield sites localised demand is not just stagnant or declining, it has disappeared. For this reason we apply here the concepts of “cold-spots” and spatial differentiation to investigate empirically how far utility companies are interested in stimulating demand and finding new uses for brownfield sites.

The city of Berlin provides an ideal setting for a study of this kind. Firstly, Berlin has a major brownfield problem, caused primarily by rapid de-industrialisation following the reunification of Germany – and Berlin – in 1990. It has been estimated that by 1998 around one third of the land used for industrial production in Berlin only a decade earlier had fallen into disuse (Ferber et al 1997/98: 65). As industrial production has collapsed, so has the consumption of water and energy by industrial users in particular. The ongoing process of socio-spatial restructuring in Berlin has created a phenomenon previously unknown to the city’s utility managers: over-capacity in parts of their networks. Utility companies used to expanding their networks to meet ever-growing demand, serving the urban development priorities in both East and West Berlin, are today having to come to terms with a declining or, at best, stagnating market

punctuated with pockets of high and low demand. At the same time the institutional context of infrastructure provision in Berlin has changed markedly. The three principal utility companies for electricity, gas and water/sewerage services were, until recently, owned by the city-state government and, with histories extending back over a hundred years, have strong local roots. All three have, however, been fully or partially privatised since 1997. Compared with other utilities in Germany they display a high degree of commercialisation, particularly in the electricity and gas sectors following the recent liberalisation of the energy market in Germany.

In this paper we aim, with a case study of Berlin, to provide some answers to the following questions:

1. How has de-industrialisation affected the consumption of energy and water resources provided by the utilities? In what ways has the disappearance of major industrial customers affected the performance of technical networks?
2. How far are the utilities interested in maximising the use of their existing technical networks? Are they taking a more spatially sensitive approach to infrastructure provision, differentiating between “hot-spots” and “cold-spots”?
3. Do they show any interest in revitalising brownfield sites as part of a strategy to stimulate demand in their “cold spots”? What opportunities do utility managers see to influence urban development and planning processes to this end?

Answers to these questions should contribute to a better understanding of some wider issues raised in the literature on the relationships between utility companies and the cities they serve (cf. Graham 2000a). Firstly, they provide evidence of how the reconfiguration of infrastructure networks is tied up closely with the reconfiguration of urban space. Network development and land use patterns have always shaped each

other; here we point out some interesting expressions of this relationship in a period characterised by new forms of land use and new styles of infrastructure management. Secondly, the case-study of Berlin offers an example of how the global trend towards greater liberalisation of utility sectors is contextualised in an urban setting. Recent reviews of the literature on network reconfiguration have rightly warned of the danger of over-simplifying the forms which liberalised and/or privatised utility markets are acquiring, emphasising the need to take a closer look at how the institutional, economic, political and socio-cultural context of a locality can cause reconfiguration to proceed along different paths and at different speeds (Graham 2000b: 186). Finally, the paper provides links to the planning debate on urban form. Should we view today's utilities as forces for urban sprawl, pursuing lucrative customers on prime sites on the urban fringe? Or, conversely, can they be seen as forces for urban density and the 'compact city', seeking to maximise use of their networks in existing settlements (Offner 2000; on the compact city Jenks et al 1996; Nijkamp/Perrels 1994; Owens 1992)? Within this broad discourse the paper is particularly pertinent to the current debate on the "shrinking city" ("*schrumpfende Stadt*") relating to processes of negative growth in many post-socialist cities and towns of Eastern Germany (Keim 2002; Institut für Stadtentwicklung und Wohnen 2001).

These issues are investigated by analysing first the challenges facing Berlin's water, power and gas utilities following unification. It is shown how early expectations of economic growth and urban development fuelled infrastructure expansionism and how subsequent de-industrialisation and socio-spatial restructuring created over-capacities in the technical networks, particularly on industrial sites. The second part examines the responses of the three utilities to these challenges, setting out the institutional changes to infrastructure provision in recent years and then examining how the utilities are

moving towards greater spatial differentiation in their network management and whether they are interested in maximising use of their infrastructure on brownfield sites.

## **Challenges facing the infrastructure providers in post-unification Berlin**

### **Expansionism in a reunified Berlin: the role of the utilities**

Within weeks of the reunification of Germany in October 1990 the water, energy and waste utilities in Western Berlin were preparing to amalgamate with their Eastern Berlin counterparts and launch major investment programmes with which to extend and upgrade their technical networks, particularly in the Eastern half of the city. Since the building of the Berlin Wall in 1961 infrastructure managers on both sides of the divide had sought to maximise network capacity, for political as well as technical reasons. In West Berlin security interests had prompted planners to strive for self-sufficiency in the supply of energy and water as far as possible and to build in adequate reserve capacity for an emergency (Interview 3). All West Berlin's electricity was supplied by 11 power stations located in the half-city. A new wastewater treatment plant was built in West Berlin so as to reduce dependency on the German Democratic Republic and save on payments for sewage disposal services in East German sewerage systems. In East Berlin energy, water and wastewater networks – where they existed – were also built to high capacity standards (cf. Koziol 2002). This was a result in part of very high per capita rates of consumption owing to inadequate structural incentives and technical opportunities for conserving water and energy. It was also a product,

though, of the political importance attached to major building programmes for industry and housing and over-generous assessments of consumption requirements for new urban developments. Despite this network expansion both sets of infrastructure networks still suffered from under-capacity in many parts prior to 1990.

Following unification early predictions of rapid urban development and the decision for the federal government to locate in Berlin put pressure on the infrastructure managers to expand and up-grade the existing technical networks to meet the anticipated growth in demand. The new Land Use Plan for Berlin, approved in 1994, was based on the assumption that by the year 2010 the population would grow from 3.4 to 3.7 million, the number of homes from 1.7 to 2.0 million and the total area of industrial/commercial sites from 3750 ha to 4300 ha (SenStadtUm 1994: 4). An additional 11 million m<sup>2</sup> of office space and 1.4 million m<sup>2</sup> for shops would be required, according to the plan. On the basis of these predictions and past per capita consumption figures the utilities launched ambitious programmes to modernise their networks and extend them into areas not previously serviced and new development sites. The water and sewage utility, Berliner Wasserbetriebe, developed a ten-year investment programme and between 1994 and 1997 was investing well over 1 billion DM a year in its water supply and sewage disposal infrastructure (Berliner Wasserbetriebe 1997: 23). We can observe, therefore, how urban development pressures in early post-unification Berlin reinforced the utilities' commitment to the "extend-and-supply" logic of infrastructure provision.

### **Restructuring, de-industrialisation and land-use change**

By the mid 1990s, however, it was becoming clear that Berlin, despite its long-term development potential, was in the grips of rapid and substantial structural change. This ongoing socio-spatial and economic transformation process is characterised by severe de-industrialisation, rising unemployment, a declining population and growing social polarisation (on the following Krätke/Borst 2000; Momper et al 1999). Berlin lost nearly one half of its industrial workforce (47.5%) between 1991 and 2000 (Statistisches Landesamt Berlin 2001: 289). A substantial number of the city's industrial manufacturers have either collapsed, relocated beyond the city limits or left the region entirely following the removal of state subsidies, subsidised prices and other protective measures which had long shielded the economies in both halves of the city from external competition. Worryingly, this development has affected not just heavy industry but also research-intensive forms of production and the cultural sector (Krätke/Borst 2000: 39). The number of registered unemployed increased from 180,000 in 1991 to 273,000 in 1998, representing 15.6% of the workforce (Statistisches Landesamt Berlin 2001: 287). The population of Berlin, counter to expectations, actually fell by 93,223 – or 2.7% - between 1993 and 2000, with the in-migration of foreigners, federal government staff and others failing to offset out-migration to the surrounding Brandenburg or Western Germany and the declining birth rate (Statistisches Landesamt Berlin 2001: 33).

There are important spatial dimensions to these trends. Berlin was always known as the divided city; today, as a result of restructuring, new economic and social divisions are emerging between and within the two halves of the city (Krätke/Borst 2000: 217). Eastern Berlin has experienced higher job losses in the industrial sector – some 58% over the period 1990-1998 (Lünser/Haeder 1997/98: 68) – and a rapid decline in its birth rate. The rates of unemployment and population loss are, however, greater in

Western Berlin. Within both halves of the city processes of social exclusion and gentrification are leading to greater spatial polarisation, with inner city boroughs in Western Berlin and some large housing estates in Eastern Berlin particularly badly affected. The traditional spatial integration of business activities (termed the “Berlin mix”) and the social mix in Eastern Berlin’s new housing estates are giving way to greater socio-spatial segregation. Looking at the Berlin metropolitan region as a whole it is clear that these changes cannot be explained simply in terms of belated suburbanisation (Krätke/Borst 2000: 38). Although a large proportion of out-migration from the city has been to the surrounding area the job gains here fall far short of the losses in the city.

Brownfield sites are an important indicator of this process of de-industrialisation. In 1997 under-utilised commercial/industrial sites in Berlin were estimated to total some 1500 hectares (SenSUT 1997: 32). This amounts to ca. 40% of the city’s total area of industrial and commercial sites (excluding mixed use sites) of 3750 ha in 1990 (SenStadtUm 1994: 4). In addition to these sites are those vacated by the Allied and Soviet military, amounting to ca. 1300 hectares, and derelict sites belonging to the German railways and post office (Röhring 2001: 6). Figure 1 maps the 14 largest brownfield sites in Berlin in the mid 1990s. What is striking – besides the concentration in Eastern Berlin – is their sheer size, with 9 sites covering over 100 hectares and three sites of more than 200 hectares.

**Figure 1: Berlin’s major brownfield sites in the mid 1990s**

[insert fig1.eps here]

*Source: own calculations*

Finding new uses for brownfield sites is generally regarded as a task for urban planning or economic development agencies and is often a key component of urban regeneration schemes. In the literature on brownfield development and urban regeneration little attention is usually paid to the role of the existing physical infrastructure. Most studies and reports focus on the building stock above ground rather than the invisible networks below. Where infrastructure is referred to, it is usually limited to the issue of road and rail access (e.g. Carnegie Mellon University 1998). Some commentators do argue that the availability and condition of infrastructure networks for energy, water, telecommunications and transport can be critical to the success of urban regeneration projects (Jeffrey/Pounder 2000). Others have demonstrated within the context of brownfield studies in Germany that by re-using existing infrastructure investors can save significant costs over installing new technical networks on greenfield sites (Haß et al 1997/98: 75; Kommunalwirtschaft 1998: 352). This claim is disputed by others, however, who point to the costs involved in refurbishing and/or modernising existing infrastructure as one of several disincentives to reusing brownfield sites (Department of the Environment 1993; Elkin et al 1991). A recurring theme in the literature on brownfield regeneration is, however, the need to win the support of a wide range of stakeholders responsible for different dimensions to this complex task (e.g. BfLR 1994; Healey 1995). This leads us to consider what interest utilities have in finding new uses for urban brownfield sites.

### **The impact of de-industrialisation on water and energy consumption**

For the city's infrastructure planners and utilities the immediate impact of these processes of de-industrialisation, economic restructuring and demographic change has been on the consumption of water and energy. Contrary to predictions water consumption has declined sharply and electricity consumption stagnated since the early 1990s. Worst affected are those parts of the technical networks where industrial production has ceased: today's brownfield sites.

Site-specific data on energy and water consumption is generally not available in Germany. Spatially differentiated data has in the past not been particularly important to utilities operating territorial monopolies of supply. For this reason we are only able to indicate the decline in resource consumption on brownfield sites by analysing shifts in energy and water use by industrial and commercial customers across a utility's urban network as a whole. A brief analysis of levels of energy and water consumption in Berlin since 1990 reveals marked differences between the various utility sectors but delivers a clear indication of the impact of de-industrialisation on resource use.

Figures 2 and 3 show the recent development of consumption levels for water and electricity in Berlin as provided by the city's principal utilities.<sup>2</sup> Most striking is the drop in water consumption by 38% over the ten-year period (see Figure 2). This has been precipitated by the introduction of full-cost pricing in Eastern Berlin following

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<sup>2</sup> The following figures represent virtually all the consumption of water and electricity in Berlin, given the near-monopoly position of the city's main utilities – Bewag (electricity, district heating) and Berliner Wasserbetriebe (water/sewerage) – at least until recently. Only since 1998 have competing utilities been permitted in the electricity and gas markets, with negligible impact on the gas utility's market share as yet. Some large industrial users operate their own water supply, but this amounts to less than 4% of total water consumption in the city (Interview 3).

unification, price increases to cover investment costs, the installation of water-saving technologies and, to a lesser extent, out-migration. Above all, though, de-industrialisation has had a major impact. Berliner Wasserbetriebe “has been badly hit by the downturn in industrial production” (Interview 3), “the loss of large customers has been particularly painful for us” (Interview 4). Between 1989 and 1999 water consumption by industrial and commercial customers declined by a massive 59%. Whereas in 1989 industrial and commercial users accounted for 16% of total water consumption, by 1999 this figure had fallen to 10%. The pressure on the water utility to raise water consumption – for commercial and technical reasons – is great.

By contrast, electricity consumption has remained relatively stable, declining by a modest 3% between 1990 and 1999 (see Figure 3). The overall trend does, however, hide some distinct shifts between consumer groups. As with water, there is a clear decline in consumption by the industrial sector, down by 35% against 1990 levels (cf. SenSUT 1998a: 29). Similarly, the relative importance of industrial customers has fallen, from 26% to 17% of total electricity consumption. Since liberalisation in 1998 this may be attributed in part to large consumers shifting allegiance to competing power utilities. The principal drop, however, occurred before 1997, indicating a strong correlation to the de-industrialisation process.

**Figure 2: Water consumption in Berlin, 1989-1999**

[insert fig2.eps here]

*Sources: Statistisches Landesamt Berlin (1994, 1999);*

[www.bwb.de](http://www.bwb.de)

*Graphics: IRS*

**Figure 3: Electricity consumption in Berlin, 1990-1999**

[insert fig3.eps here]

*Source: Statistisches Landesamt Berlin (1994, 1999)*

*Graphics: IRS*

**Over-capacities in the networks: the extend-and-supply paradigm undermined**

Declining consumption levels pose an unfamiliar challenge to infrastructure managers: over-capacity. Pipelines, cables and plant built to provide a certain quantity of energy or water according to expectations of peak demand operate less efficiently – and in some cases less effectively – if consumption remains significantly and continuously below full capacity (Koziol 2002). Technical networks are examples of “network goods” in the sense that the benefits for all users increase the more the good is used, so long as usage remains within existing capacity (Kaul et al 1999: 5). As a major proportion of the costs of service provision (particularly in the water sector) are fixed costs resulting from investment in the physical infrastructure, a decline in use (i.e. consumption) does not reduce overall costs significantly. A sudden and unexpected drop in consumption levels can therefore disrupt long-term calculations for covering investment costs through service charges. Even if older parts of the physical infrastructure have long since been written off financially their continued use at near-maximum capacity is important for the economic performance of the network as a whole. The ability to draw financial returns from amortised infrastructure strengthens a utility’s commercial viability.

Over-capacity in parts of Berlin's technical networks has arisen, as we have seen, from a combination of declining or stagnating consumption, a large infrastructure stock and accelerated network expansion following reunification. Urban development in excess of real demand – resulting in some 90,000 vacant flats in Berlin by 2001 – has also contributed to the current under-utilisation of technical networks and the spatially more dispersed distribution of consumers and consumption (Interviews 2 and 4). All of Berlin's major utilities face over-capacity, albeit in varying degrees. Even the electricity networks, less spatially bound than water or gas, are affected: "We have sites where industry has disappeared where huge cables are lying underused. A major customer could come in and get connected up within four weeks" (Interview 1).

Particular "cold-spots" of low consumption levels are causing problems of both an economic and technical nature. Through over-capacity certain infrastructure plant or sections of a network can lose their commercial viability. This applies in Berlin to those parts of the district heating network where significant numbers of previous users have switched to other heating forms, notably gas. Under-utilised parts of the gas network pose a problem of sub-optimal operation for the gas utility (Interview 2). The high level of local electricity generation, referred to earlier, is being threatened by cheaper electricity imports. Whether this constitutes over-capacity depends, however, on available generation capacity in the national and European electricity markets to which the city grid is linked (Interview 1). This illustrates the importance, when considering "cold-spots" and spatial differentiation, of the degree to which an urban infrastructure network is integrated into wider networks, the availability of the natural resource in question and the ease with which it can be transported (on the scale effects of different infrastructure networks, Graham 2000a: 118).

Water supply and sewage disposal systems are for this reason particularly susceptible to problems of over-capacity (cf. Koziol 2002: 45-46). Apart from the sharp fall in water consumption in Berlin, the water/sewage sector is worst affected because of the relative difficulties of transporting water and, generally, the greater spatial dependency of the infrastructure. In Eastern Berlin the situation is particularly serious: there “over-capacity exists in virtually all sections of the water supply network” (Interview 4). Beyond the economic problems of sub-optimal performance “cold-spots” in the water and sewerage networks are posing serious technical, environmental and public health problems. In areas where water consumption has fallen sharply, in particular the former industrial zones in Eastern Berlin, water is flowing so slowly through the supply pipes that it is reacting with the deposits that line them to the detriment of water quality and taste (Interview 4; cf. Koziol 2002: 45). As a counter measure the water utility is currently flushing several hundred thousands of cubic metres of water a year through the affected pipes simply to maintain the required drinking water quality standards. This practice, referred to as “artificial consumption” (Interview 4), is also used in the sewer system to prevent unpleasant smells caused by an inadequate flow of wastewater passing through certain under-utilised sections of the sewer network. Falling water consumption has also caused groundwater levels in the city to rise. This development, though welcome in principle, is causing problems in areas of the city – again, often close to brownfield sites – where rising groundwater is flooding cellars or otherwise impairing buildings. On certain brownfield sites themselves the rising groundwater is coming into contact with contaminated soil, posing a serious threat to future drinking water resources from wells serving nearby water works (Lünser/Haeder 1998: 69; Interview 4). In all these cases solutions to the problems are complicated by the absence of any end-user or consumer who could be called upon to pay for remedial

measures. Neither the water utility nor the Berlin state government feel themselves responsible for the problems but both are under pressure to solve them in order to maintain water quality standards and prevent pollution. In the opinion of the water utility it is “a general urban development issue, not just a technical one, which must be paid for by the politicians” (Interview 4).

## **Responses of the utilities**

### **Institutional changes to infrastructure provision**

Before examining how the three utilities are responding to these pressures associated with over-capacity and “cold-spots” it is important to outline how changes to their ownership and regulatory regimes have affected their commercial strategies. All three utilities are currently undergoing rapid and substantial transformation in response to (partial) privatisation and (possible) liberalisation.

Like most utilities in Germany, Berlin’s power, gas and water/sewerage companies have long histories of municipal ownership and management. Prior to 1997 the city-state still owned Berliner Wasserbetriebe fully and had a majority shareholding in Bewag and the gas utility GASAG. In order to help offset the city’s major debt and budget crisis since the mid-1990s, however, it was decided to sell off all or part of these – in the case of Bewag and Berliner Wasserbetriebe very lucrative – companies. In return for its shareholding in the three utilities the city received lump sums amounting to 7.35 billion DM (3.76 billion Euro) together with contractual obligations

from the new owners to invest in Berlin, fund environmental technologies and minimise staff cuts or create new jobs in the city.<sup>3</sup> Figure 4 shows the distribution of shares in the three utilities in July 2001 following the privatisation of Bewag in 1997 and of GASAG in 1998 as well as the partial privatisation of Berliner Wasserbetriebe in 1999. Important to note in each case is the role played by key players in utility markets both nationally (RWE, VEBA, HEW, Ruhrgas) and internationally (Vivendi, Gaz de France, Mirant – formerly Southern Energy). The city-state of Berlin still retains a majority shareholding of the water/sewerage utility Berliner Wasserbetriebe.

**Figure 4: Ownership of Berlin’s major power, gas and water/wastewater utilities**  
(July 2001)

[insert fig4.eps here]

*Graphics: IRS*

The second major institutional change has been the liberalisation of the energy market in Germany. This occurred concurrently with the privatisation offensive in Berlin; the prospect of liberalisation was, indeed, used as an argument in favour of privatising the city’s utilities. Since 1998 the generation and trading of electricity and since 2000 the trading of gas have been liberalised in Germany (Cronenberg 1998; Monstadt 2000; Schneider 1999). This means that, in theory at least, all consumers – i.e. including households – can choose their service provider. The territorial monopolies for energy supply have been abolished. The physical distribution and supply networks, however,

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<sup>3</sup> The revenue for the city-state of Berlin from the share sales were: 2.85 billion DM for Bewag, 1.4 billion DM for GASAG and 3.1 billion DM for Berliner Wasserbetriebe.

remain under monopoly control, with regional network operators responsible for ensuring adequate network performance and access for third parties. In Berlin's case the responsible regional operators are Bewag for electricity and GASAG for gas. The impact of liberalisation in the city has been most notable in the intense competition for large commercial, industrial and public customers in the electricity sector, where Bewag has lost some important clients. The company's market share for electricity sales in Berlin fell to 86% by the end of the financial year 2000/2001 with the sharpest decline amongst industrial customers (Bewag 2001: 10). Inroads into GASAG's monopoly of gas supply have been as yet very limited. By contrast, water supply services in Germany remain the responsibility of local authorities and are protected by territorial monopolies. However, it has always been possible for water utilities to provide their services in contract to other authorities, enabling Berliner Wasserbetriebe to expand its market into surrounding municipalities and abroad following unification. Moreover, the issue of whether to liberalise water supply services in Germany is currently under discussion. For this reason Berliner Wasserbetriebe, as one of Germany's largest water utilities, is preparing to take advantage of potential market opportunities in the future.

The effect of both privatisation and liberalisation has been to radically alter the commercial strategies of the three utilities over a short space of time. In line with familiar trends in other industrialised countries the utilities are taking various steps to raise efficiency, increase their market share and develop new markets. Some examples are listed here:

- *Cutting costs*: Bewag cut staff levels by 57% between 1992 and 2001, GASAG by 41% between 1995 and 1999 (Bewag 1995: 47; Bewag 2001: 22; GASAG 1999: 25). There have been substantial reductions to post-unification investment

programmes by all three utilities. In 1997 Berliner Wasserbetriebe cut back its ten-year investment plan radically from 21 to 12.2 billion DM (SenSUT 1998b).

- *Winning new customers:* GASAG has launched a campaign to capture new customers, for instance offering the free disposal of oil tanks to those switching to gas heating (Interview 2).
- *Offering new services:* Bewag and GASAG advertise a wide range of services 'beyond the meter', such as energy saving audits, load management and the operation of block-type combined heat and power plants.
- *Reducing prices:* Energy prices have been cut following liberalisation, especially for larger customers (Bewag 2000: 10-11). Gas prices for major commercial customers fell by 47% between 1995 and 1998 (GASAG 1999).
- *Building strategic partnerships:* All three utilities are drawing on their new international partners to improve internal management and gain access to new markets.
- *Developing a multi-utility profile:* A subsidiary of Berliner Wasserbetriebe (Avida) is offering a single-charge package for electricity, telephone and internet services. Both GASAG and Berliner Wasserbetriebe are using their existing physical networks to house telecommunication cables. Bewag, having expanded into new fields, is now focussing once more on its core market of electricity.

## **Towards greater spatial differentiation**

Driven by new pressures to raise efficiency all utilities are showing a keen interest in maximising the use of their existing networks. In the words of one interviewee, “our company as a whole and my unit [customer services] in particular is differentiating increasingly between customer groups and between sections of our network, mainly for commercial reasons” (Interview 3). Infrastructure managers are looking more closely than before at the performance of the whole network, but also of its constituent parts. In this section we explore whether the utilities are today taking a more spatially differentiated approach to network management, distinguishing between the “hot-spots” and “cold-spots” of their physical networks. Although the shifts in commercial strategies are relatively new and incomplete there are clear signs of spatial differentiation by the utilities, albeit in differing degrees. These differences, as mentioned earlier, are strongly influenced by the degree of dependence on local natural resources and local physical infrastructure and the mobility of the resource supplied.

The first form of spatial differentiation relates to data collection. The utilities are exploring new methods of gaining more detailed data on consumption patterns which is spatially and user specific. Berliner Wasserbetriebe is currently developing a data system which will in future enable it to identify water consumption profiles according to customer types, urban neighbourhoods and sub-sections of their water supply network. Spatially differentiated data will help the company “to plan for plant closures and the redirection of sewage flows” (Interview 3). GASAG is already building up a database on gas consumption which will enable the utility to determine more precisely the performance of individual sections of its supply network (Interview 2). Bewag has

recently conducted a study on energy consumption within its sub-networks (Interview 1).

Data of this kind will be used to improve the commercial viability of these sub-sections, the second form of spatial differentiation. It is part of GASAG's new commercial strategy, for instance, to ensure adequate economic performance of each section of its gas supply network, and not simply the network as a whole: "Each sub-network is responsible for its performance – it must be economically viable on its own" (Interview 2). For management purposes the network is divided into sections which are each responsible for their own performance. Investments in the physical infrastructure must be able to contribute to the commercial viability of that section. Whereas in the past decisions to build new or expand existing gas pipelines were dependent primarily on the existence or anticipation of demand, today the impact of these investments on the profitability of the relevant section of the network will be additionally taken into account. For example, where it is not commercially viable to replace gas pipes designed solely for cooking purposes with larger ones capable of meeting demand for gas heating the investment will not be undertaken. Similarly, when a large customer requires connecting to the gas network GASAG will take into consideration not only the specific costs of the investment but also how the consumption of the customer is likely to affect the performance and capacity of that network section.

Altogether the utilities are looking to minimise the financial risks involved in funding major infrastructure extensions. This applies in particular to providing new infrastructure on greenfield sites. In the past the utilities would be required by the state government of Berlin to provide for the necessary physical infrastructure up to the property boundary and would recoup the costs via service charges paid by all their

customers. Under today's commercial climate they are less willing to take this risk, not least because of past experiences where consumption on greenfield sites fell well short of predictions. GASAG now obliges investors to enter into a contract which ensures compensation to the gas utility if the quantity of gas consumed following completion of the site development does not reach an agreed level "in order to avoid stranded investments" (Interview 2). Berliner Wasserbetriebe has introduced contractual agreements whereby the developer undertakes to build the necessary infrastructure extensions which are subsequently operated by the water utility (Interviews 3 and 4).

Finally, the utilities are closing down plant which is not commercially viable, especially in those areas where demand is falling sharply. Bewag was considering the closure of several of its combined heat and power (CHP) stations in the city until a federal law was introduced – on the initiative of the Berlin state government – to protect existing CHP plants from competition. Berliner Wasserbetriebe have already shut down four water works and one sewage treatment plant since unification. There are advanced plans to close a further sewage treatment plant at Falkenberg and two water works at Johannistal and Jungfernheide, where demand has fallen sharply (Interview 4). The planned closure of Johannistal is controversial, however, because it would exacerbate the problems caused by rising groundwater levels referred to earlier. It appears likely that, at least as an interim solution, untreated water will have to be pumped from the wells into the nearby Teltow Canal. Who is to pay for this is as yet unclear.

## **Utilities as partners for brownfield regeneration?**

Berlin's three major utilities are keen to optimise use of their existing networks. They would also appear to be interested, albeit in differing degrees, in directing urban development away from greenfield sites to areas where their existing networks are operating below capacity.

“We [GASAG] are very keen to keep new customers off greenfield sites and to locate them where possible in those parts of the network where we have free capacity” (Interview 2).

As Jean-Marc Offner has argued, density is generally regarded as favourable for the development of physical infrastructure, since the marginal costs of additional connections are low in an existing network (Offner 2000: 170). The question remains, though, whether the utilities are interested specifically in the re-use of brownfield sites and, if so, what action they are taking to encourage investors to locate in areas of under-utilised infrastructure.

It is intriguing to note, in this context, that one of the conditions to the privatisation of the three utilities in the late 1990s was that the new owners should actively engage in attracting international investors to Berlin (Abgeordnetenhaus von Berlin 2000a). During the negotiations this contractual obligation proved important in winning political support for privatisation. In 1998 following the share sale of Bewag one of the new owners, the US energy utility Mirant (formerly Southern Energy), signed a cooperation agreement with the Berlin Economic Development Corporation to encourage US investors to locate in Berlin. By October 2000 nine US companies had made investments in Berlin directly attributed to this agreement, creating some 1100 jobs (Abgeordnetenhaus von Berlin 2000b: 929). Similar cooperation agreements have

been signed with Gas de France and Vivendi, the two French utilities with shares in GASAG and Berliner Wasserbetriebe respectively, to attract French businesses to the German capital.

Similar motives lie behind the sponsorship by Bewag, GASAG and Berliner Wasserbetriebe of the Business Location Center in Berlin, created in 2001 (Business Location Center 2001).<sup>4</sup> This centre is designed to provide potential investors with a one-stop point of call, providing information on the city ranging from economic and structural data to land use plans, funding programmes and available property. In addition the centre provides basic information on the city's technical infrastructure, with links to the three utilities. The utilities themselves give several motives for their engagement with the Business Location Center (Interviews 1-4). These include opportunities to gain early access to potential customers interested in investing in Berlin, to strengthen links with decision-makers responsible for urban development and to reinforce their public image as Berlin's principal utilities. None of the utilities, however, intend to use their involvement in the Business Location Center in order to direct investment to the "cold-spots" of their infrastructure networks. According to the GASAG representative "our engagement is more about getting access to new customers, not about influencing where they locate" (Interview 2). Berliner Wasserbetriebe sees its involvement solely as a means of "winning big customers and improving links to city politics" (Interview 3). The same is true of a new internal unit created in Bewag in June 1999 to help attract businesses to Berlin. The purpose here is to capture new customers rather than to influence location decisions towards brownfield or other sites.

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<sup>4</sup> Cf. the engagement in North-East England of the regional power, gas and water utilities in the economic development agency for the region, Guy et al. 1996: 735.

Why is it that the three utilities, although appearing to have a vested interest in finding new customers on brownfield sites, are not actively involved in attracting investors to these infrastructure “cold-spots”? Although most of our interviewees acknowledged the case for regarding utilities as potential partners of brownfield management, they and others appear to be profoundly sceptical of the ability of utilities to influence the relevant decision-making processes in the city. To take a representative viewpoint:

“The idea is excellent, but I don’t reckon it’s really feasible in practice. There are so many things to consider and people involved ... and it would be extremely difficult at a time when there are so many sites vacant. Together we [the utilities] could get all the parameter for a customer’s gas, water, power and transport needs sorted out for a specific site and still not have any success. We have at best third-hand influence and are only consulted at the end of the day” (Interview 1).

In more detail the arguments against direct involvement offer important insights into the problems confronting brownfield regeneration in general and the infrastructure dimension in particular:

1. The utilities recognise that any new occupants of former industrial sites are highly unlikely to consume levels of energy and water comparable to previous site users: “The problem for Berlin is whole industries have disappeared. And they won’t come back. Whatever takes their place will of course be far less energy-intensive than the old production plants” (Interview 1). The only exception would appear to be data processing companies which require surprisingly large amounts of energy and demand large reserves (Interview 1).

2. Infrastructure provision is not generally regarded by investors as an important location factor: “the influence of infrastructure on location decisions is relatively small” (Interview 1). Although the cost of connecting a greenfield site to all the necessary technical networks can represent as much as 20% of total investment costs (Interview 4), most investors view infrastructure costs as an unavoidable, largely fixed variable.
3. Utilities are usually involved too late in the decision-making process. As one interviewee commented: “investors discover far too late how high infrastructure investment costs will be. By that time the decision where to locate has usually been made” (Interview 4).
4. There are difficulties in matching investors’ multiple infrastructure requirements to specific brownfield sites. The idea of preparing in advance site-specific packages for electricity, gas, water and telecommunication infrastructure which are then advertised to potential investors is viewed by some as a welcome step in the right direction but by others as impractical given the very diverse needs of investors.
5. Related to this are problems of coordinating very different time scales. While major investors expect answers to their requests for site information within days, infrastructure planning in Berlin – as elsewhere – is a long-term process of political negotiation.
6. The utilities feel they have only limited means to influence location decisions. The GASAG representative voices a common complaint: “We’ve hardly got any leverage over investors and their location decisions, except for price cuts” (Interview 2). However, prices of electricity and gas for large customers are already low, having been cut sharply in recent years, and water prices are fixed by contract until 2003.

7. Difficulties in mobilising brownfield sites are viewed as part of a wider problem of the Berlin authorities failing to provide adequate support and encouragement to potential investors. For this reason the utilities would welcome better cooperation with urban planning departments and economic development agencies in the city. Currently, they see economic development as “not being geared to site-specific interests” (Interview 1).
8. Utilities view the risk of contamination on brownfield sites as a major disincentive for potential investors and therefore an argument against their active involvement in brownfield regeneration.

## **Conclusion: Utilities as urban managers?**

In this paper we have observed how utilities in Berlin are faced – to a varying degree – with the challenge of how to manage under-utilised and sub-efficient parts of their technical networks. This situation has arisen out of a combination of declining or stagnating localised demand and a legacy of network expansionism. The problem of over-capacity has become more serious as pressures for greater efficiency increase in more commercialised utility markets. Utilities are showing a growing interest in how different sub-sections of their technical networks perform. They are beginning to differentiate spatially between viable and non-viable parts of their networks, between “hot-spots” and “cold-spots”. Furthermore, utilities are keen to win new customers in the new commercialised climate of infrastructure provision. Their involvement in attracting new investors to locate in Berlin is indicative of this novel dimension to infrastructure management. Yet none of the three utilities studied here has gone so far

as to attempt to direct potential customers to under-utilised parts of their networks such as large brownfield sites.

It would be misleading to read too much into the experience of three utilities in a single city, but we can reflect on how the case study contributes to our understanding of the wider issues of infrastructure reconfiguration and urban development raised in the introduction. This unusual perspective on reconfiguration processes – focussing on “cold-spots”, the absence of consumers and utilities as victims rather than initiators of change – provides interesting insights into the relationship between utilities and the localities they serve.

Firstly, the fine-grain picture of the Berlin case reveals reconfiguration of infrastructure management to be a more subtle, piecemeal process than is often portrayed in the literature. The city’s three principal utilities are moving in a similar direction, but at different speeds and with different points of emphasis. Moreover, the transition to a fully commercialised utility is not complete. Tensions remain, for instance, within each utility between engineering units following the traditional supply logic and marketing units keen to create greater customer awareness. Recently hired marketing specialists complain at the “persistent public sector mentality” (Interview 3) and a “disregard for individual customer’s needs” (Interview 1) of some of their own colleagues. These findings highlight the importance of appreciating the diverse intensity and direction of ongoing transformation processes in infrastructure management and adopting a more context-sensitive approach to their analysis.

Secondly, diverse pathways of infrastructure reconfiguration are shaped to a significant degree by spatial factors. Utilities’ responses to emerging commercial pressures are

founded not solely on the degree of liberalisation and privatisation, as we observed with the Berlin water utility, but also on the spatial embeddedness of their networks. This embeddedness can be of a physical, institutional or socio-cultural nature. We have observed, for instance, how the degree of spatial dependency of physical networks and the natural resources they transport influences a utility's interest in adopting spatially differentiated strategies of infrastructure management. Where spatial dependence is high – as in the case of Berlin's water utility – so is spatial differentiation; where it is low – as with the power utility – interest in the performance of sub-sections of a network is less marked. This observation is indicative of the need for a more sector-specific understanding of reconfiguration processes and greater sensitivity for the limitations to extrapolating from one sector to another.

More specifically, this study has revealed in particularly stark form how dependent utilities can be on forces of urban development beyond their control. In the case of Berlin processes of de-industrialisation and socio-spatial restructuring have altered patterns of land use and resource consumption across the city, but particularly in certain areas. Declining or stagnant consumption levels now pose a major challenge to utility managers accustomed to extending their networks to meet ever-growing demand. They are seriously concerned at the emergence of under-utilised “cold-spots” diminishing the financial returns and jeopardising the technical effectiveness of their networks. Initial responses to this problem – such as developing area-specific performance standards and minimising investment risks on undeveloped sites – indicate heightened sensitivity for spatial structures and urban dynamics on the part of utility managers. The trend towards greater spatial differentiation documented in the literature would appear to apply, therefore, not solely to zones of high commercial opportunity but also to under-utilised sections of a utility's networks.

This raises the question as to how utilities can actively influence urban development to help maximise use of their networks. This case study has revealed a potential community of interest between utilities keen to re-use existing infrastructure stock and urban managers in planning departments or economic development agencies interested in urban regeneration and inner city development. Whilst others have shown how commercialised utilities are contributing to urban sprawl by pursuing lucrative customers to new development zones frequently located on greenfield sites, this paper has demonstrated how concern at the under-performance of existing networks is a force acting in the opposite direction, encouraging utilities to maximise use of the built environment. In cities or parts of cities subject to negative growth utilities would appear to be potential partners for urban regeneration.

However, the study of Berlin has also illustrated how powerless utilities regard themselves in decision-making processes relating to land use. One simple explanation in the case of brownfield sites is that no consumers exist with whom the utilities can engage. New customer-oriented services are less effective when the addressees – and their potential needs – are difficult to identify. Utilities themselves, though, see more fundamental obstacles discouraging them from intervening more actively in urban planning and development processes. They raise general grievances about the lack of awareness for infrastructure issues in decision-making processes and the difficulties of coordinating infrastructure and land-use planning procedures. They also point to specific problems relating to brownfield regeneration, such as matching an investor's infrastructure requirements to the profile of an individual site. These concerns will need to be addressed by city authorities before utilities can be considered genuine partners for brownfield regeneration. The utilities themselves could benefit from

cultivating closer relations not only with consumers, as they are currently, but also with those responsible for guiding urban development processes. In today's more commercialised climate spatially specific data on economic growth, demographic trends and consumption patterns are becoming increasingly important to utility managers. Closer cooperation with urban planning and development agencies offers the prospect for the utilities of better knowledge of their local market. By exploiting existing communities of interest in this way the ongoing reconfiguration of infrastructure management could be more fruitfully connected to the concurrent reconfiguration of urban space.

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