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## Article

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# No decline in investment in public-sector energy and water supply

By Astrid Cullmann, Maria Nieswand and Caroline Stiel

A considerable share of public investment comes not only from public budgets but also from public utility companies. One major area of investment is energy and water supply, where the utility companies have substantial fixed assets in the form of distribution infrastructure. Using new microdata which has not been analyzed before, the present report shows that—unlike with the core public budgets—public energy and water supply companies show no signs of insufficient investment. On the contrary, gross investment into distribution networks over the past ten years has shown an upward trend comparable to that of private energy and water supply companies—if investment related to the expansion of infrastructure resulting from the energy transition is not taken into account. In addition, no clear correlation was found between the investment expenditure of energy and water supply companies and the financial strength or demographic trends within a given region. However, this does not rule out the possibility of diverging investment trends in the near future in response to demographic changes.

Energy and water supply companies are instrumental in providing public infrastructure. In Germany responsibility for energy and water supply lies with the government. One way of providing energy and water is through publicly-owned companies. Most of them are owned by municipalities.<sup>1</sup> Only few enterprises belong to *Länder*, for example in city states. The federal state has no shares in public utilities.<sup>2</sup> On the other hand, local authorities may also regulate energy and water supply using private companies. In the energy supply sector, the ratio of public to private enterprises is currently relatively balanced: according to the German Association of Local Utilities (*Verband Kommunaler Unternehmen, VKU*), public enterprises supplied roughly half of the energy consumed in Germany in 2014.<sup>3</sup> In the area of water supply, as much as 80 percent of consumption was covered by public enterprises. In 2012, they operated 64 percent of the gas networks, 60 percent of the water networks and 38 percent of the electricity distribution networks. Furthermore, they ran 16 percent of power generating capacities.

**1** Under Article 28 (2) of German Basic Law, municipalities reserve the right to manage any and all matters pertaining to the local community on their own authority. In the vast majority of cases, municipalities avail themselves of this right.

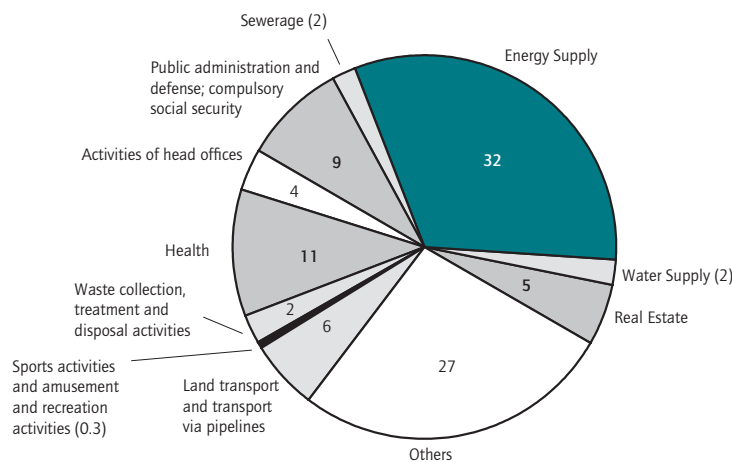
**2** N. Schmidt, "Ausgliederungen aus den Kernhaushalten: öffentliche Fonds, Einrichtungen und Unternehmen," *Wirtschaft und Statistik* 62 (2) (2011); Diagram 2 and calculations by DIW Berlin.

**3** The energy supply figures for the individual sectors are as follows: 46 percent for electricity, 59 percent for gas, and 65 percent for heating. Verband Kommunaler Unternehmen (German Association of Local Utilities), *Zahlen, Daten, Fakten* (2014), <http://www.vku.de/presse/publikationen/zahlen-daten-fakten2014.html>, accessed September 29, 2015. For figures on the network length see VKU (2014) and BNetzA/BKartA, *Monitoringbericht 2013*, Bonn (2013) and BMU, *Wasserwirtschaft in Deutschland* (2011). For details on power generating capacities, see Monopolies Commission, "Special Report 65: Energie 2013: Competition in times of the Energiewende," special report by the Monopolies Commission pursuant to Section 62 (1) of the German Energy Industry Act (EnWG) (Bonn: 2013).

Figure 1

### Revenue of public funds, institutions and enterprises (491 billion Euros in 2011)

In percentages



Source: Own calculations by DIW Berlin based on Heil, Hollmann, Jahresabschlussstatistik.

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Revenue of energy supply plays the most important role when compared to revenue from other sectors within public funds, institutions and enterprises.

### Energy and water supply constitutes a major part of the outsourced economic activity of public companies

Unlike in public road construction companies, for example, public energy and water supply companies are not factored into the core or supplementary public budgets.<sup>4</sup> Normally, public energy and water supply companies are counted as other entities that fall into the category public funds, institutions, and enterprises (in German: FEUs)<sup>5</sup>. In 2011, a good 21 percent of the 15,000 FEUs operated in the energy (9.6 percent) and water supply sectors (11.8 percent).<sup>6</sup> Consequently, energy and water supply companies make up the majority of FEUs after real estate and wastewater management.

Public energy and water supply companies also account for the largest share of the total revenue from FEUs. Around 32 percent of the total revenue for the year 2011 (according to Code of commercial law), which amount-

<sup>4</sup> Schmidt, "Ausgliederungen," 154–163.

<sup>5</sup> For more information, see the box in M. Gornig, et al., "Local Public Infrastructure Showing Signs of Wear and Tear," DIW Economic Bulletin, no. 42/ 43 (2015): 564

<sup>6</sup> N. Heil and D. Hollmann, "Jahresabschlussstatistik öffentlicher Fonds, Einrichtungen und Unternehmen," *Wirtschaft und Statistik* 65 (5) (2014): 307–315.

ed to some 491 billion euros, was accounted for by energy supply companies alone (see Figure 1), as opposed to just two percent for water supply companies.

The total assets of public energy and water supply companies according to the balance sheet amounted to around 154 billion euros in 2009, increasing to 179 billion euros by 2012.<sup>7</sup> In 2009, 94 percent of the total assets were attributed to municipally-owned companies, with the remaining six percent coming from companies in which the *Länder* hold shares.

The asset structure illustrates the capital intensity of both economic sectors: in order to provide the population with energy and water, substantial fixed assets such as generating, production, and distribution equipment are required. Fixed assets therefore make up, on average, between 60 percent (energy supply) and 86 percent (water supply) of the balance sheet total assets, which is why investment in infrastructure is of such great importance for energy and water supply companies.

### Most of investment goes into distribution networks

In public energy and water supply companies, investment depends, among other things, on the extent to which the given municipal infrastructure is in need of expansion or repair and maintenance. This can vary from one region to the next for a number of reasons, ranging from demographic trends and economic structure to the need to integrate renewable sources of energy into the energy mix and the condition of existing equipment and installations. *De facto* requirements, however, are difficult to determine. Fundamental findings on the investment behavior of public energy and water supply companies can be obtained using newly available microdata from official statistics. This data can be used, in particular, to compare public and private enterprises. The main data source is an investment survey of energy and water supply companies conducted for official statistics purposes.<sup>8</sup> This survey contains information on both public and private energy and water supply com-

<sup>7</sup> N. Heil and P. Mödinger, "Ausgewählte Struktur- und Bilanzmerkmale öffentlicher Fonds, Einrichtungen und Unternehmen," *Wirtschaft und Statistik* 63 (4) (2012): 342–352; German Federal Statistical Office (Destatis), "Vermögensstruktur der kaufmännischen öffentlichen Fonds, Einrichtungen und Unternehmen 2012," accessed September 29, 2015, [https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/OeffentlicheFinanzenSteuern/OeffentlicheFinanzen/FondsEinrichtungenUnternehmen/Tabellen/Vermögensstruktur\\_Wirtschaftszweige.html](https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/OeffentlicheFinanzenSteuern/OeffentlicheFinanzen/FondsEinrichtungenUnternehmen/Tabellen/Vermögensstruktur_Wirtschaftszweige.html).

<sup>8</sup> German Federal Statistical Office (Destatis), "Investitionserhebung bei Unternehmen der Energieversorgung, Wasserversorgung, Abwasser- und Abfallentsorgung, Beseitigung von Umweltverschmutzungen," quality report (Wiesbaden: 2015).

Table 1

**Investment of Energy and Water Supply Companies in 2012**

In billion euros

	Public	Private
Generation and Collection	710	2,283
Distribution		
Networks	2,855	2,386
Equipment	330	1,165
Other fixed assets	885	1,013
Total investment	4,780	6,847

Source: AFID Investment Survey of German Energy and Water Supply Companies. Subsample with NACE Codes 35 and 36 according to NACE classification rev. 2. Firms from the land Baden-Württemberg discarded. Deflation based on 2010. Own calculations by DIW Berlin.

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Publicly-owned energy and water supply firms invested up to 4.8 billion euros in 2012.

panies and is available for the years 2005 to 2012.<sup>9</sup> The survey is conducted annually on around 1,000 private enterprises, 1,400 purely public companies, and around 300 companies where government entities are majority shareholders. The census was conducted among all companies in the German energy and water supply industry with more than ten employees.<sup>10</sup>

Both public and private energy and water supply companies invest mainly in distribution networks and equipment (see Table 1 and Figure 2). These are used to distribute electricity, gas, and district heat. In 2012, two-thirds of total investment in fixed assets made by public energy and water supply companies went into distribution networks and other distribution equipment such as transformers or pump installations. As little as 15 percent of investment capital is allocated to generation and production equipment. This is in line with the relatively minor role played by government-owned conventional power generation facilities: in 2012, just 16 percent of conventional power generation was in government hands.<sup>11</sup> At 33 percent, the share of investment in production and generating equipment by private energy and water supply companies is correspondingly

9 For more details on the dataset, see Stiel, "Data Documentation Energiestatistiken der amtlichen Statistik (Official Data on German Utilities) DIW Data Documentation No. 80 (2015). (2015).

10 For easier comparability over time, companies from the state of Baden-Württemberg were not included. In 2010, the state government of Baden-Württemberg bought back the energy company EnBW, resulting in the transfer of substantial investment capital from the private to the public sector.

11 Monopolies Commission, "Energie."

Figure 2

**Composition of investment into fixed assets in energy and water supply in 2012**

In percentages



Source: AFID Investment Survey of German Energy and Water Supply Companies. Subsample with NACE Codes 35 and 36 according to NACE classification rev. 2. Firms from the land Baden-Württemberg discarded. Deflation based on 2010. Own calculations by DIW Berlin.

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Both public and private firms spend the majority of their investment on network infrastructure.

higher. As with the public sector, the majority of private-sector investment (52 percent) is also used for distribution networks.

**Identical trend in public and private-sector investment in distribution networks**

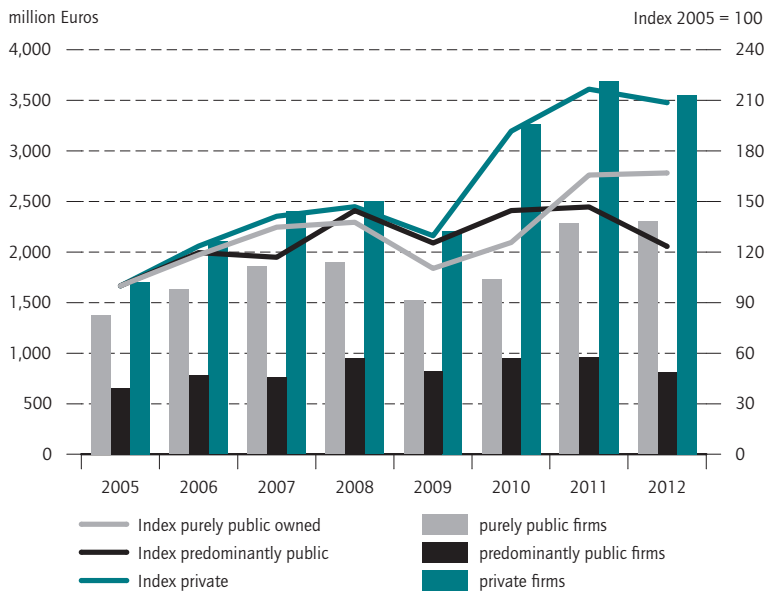
A look at the past ten years reveals little difference between public and private investment in distribution networks: by 2009, the investment behavior of energy and water supply companies, irrespective of ownership, was very similar (see Figure 3). Induced by the energy transition in Germany, investment behavior since 2009, however, has taken different paths. The integration of equipment and installations under the German Renewable Energy Sources Act (*Erneuerbare-Energien-Gesetz, EEG*) and the German Act on Combined Heat and Power Generation (*Kraft-Wärme-Kopplungsgesetz, KWKG*) called for investment in grid expansion infrastructure. Under the new regulations, network operators are obligated<sup>12</sup> to make the necessary investments before they are entitled to receive compensation payments.<sup>13</sup> Much of

12 Priority dispatch under Section 8 of the Renewable Energy Sources Act (EEG) and Section 4 of the Combined Heat and Power Generation Act (KWKG).

13 See Sections 10, 11, and 23 of the incentive regulation scheme (*Anreizregulierungsverordnung*).

Figure 3

**Gross investment into networks of public and private energy and water companies**



Source: AFID Investment Survey of German Energy and Water Supply Companies. Subsample with NACE Codes 35 and 36 according to NACE classification rev. 2. Firms from the land Baden-Württemberg discarded. Deflation based on 2010. Own calculations by DIW Berlin.

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After 2009, private firms raised their investment expenditure more than public firms...

the renewable energy infrastructure is located in sparsely populated rural areas and coastal regions where area distribution and transmission network operators mainly operate. Calculations by RWTH Aachen University show that the connection of 80 percent of the installed renewable energy capacity to the grids lies within the responsibility of only 20 area network operators.<sup>14</sup> If these companies are divided up into public and private ownership, it becomes clear that the vast majority of grid connection has to be done by private-sector energy and water supply companies (see Table 2).

This development is also evident in the investment survey conducted for official statistics: while the investment spending of predominantly public energy and water supply companies barely went up from 2005 to 2012, private-sector and purely-public energy and water supply companies increased their investment considerably (see

<sup>14</sup> A. Moser, "Zukünftige Herausforderungen für Verteilnetzbetreiber," presentation on November 25, 2013 at the Federal Network Agency (Bonn: 2013), accessed on September 29, 2015, [http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen\\_Institutionen/Netzentgelte/Evaluierung\\_ARegV/Auftaktveranstaltung\\_Evaluierung/Vortrag\\_Prof\\_Moser.pdf](http://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Energie/Unternehmen_Institutionen/Netzentgelte/Evaluierung_ARegV/Auftaktveranstaltung_Evaluierung/Vortrag_Prof_Moser.pdf).

Table 2

**Location of decentralized generation capacities (EEG-Anlagen) within network areas of selected electricity network operators**

Owner	Number of network operators	Share of installed capacities in total installed capacity (Percentage)
majority private	9	58
purely public	7	15
predominantly public	3	2
EnBW	2	5
Sum	21	80

Source: Own calculations by DIW Berlin based on data on installed decentralized capacities (EEG-Anlagen-Stammdaten) from 50Hertz Transmission GmbH, TenneT TSO GmbH, Transnet EnBW GmbH and Amprion GmbH as of 2014.

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...because they had to connect the majority of decentralized generation capacities to their networks.

Figure 3). The level of investment among private enterprises is also greater than that of public enterprises.

If, however, the uneven spread of installed renewable energy capacity across the network areas of major public and private network operators is taken into account, one can assume that, in the area of distribution networks, the investment behavior of public enterprises does not differ much from that of private ones.

This conclusion is concurrent with the findings of a report commissioned by the German Federal Network Agency as part of the evaluation of the regulation.<sup>15</sup> This report investigates the investment behavior of energy distribution network operators using a different source of data which is not available to the public. The rate of investment of these operators is positively affected by the expansion of renewable energy sources, but no variation resulting from the difference in ownership structure was found.

**No clear correlation between investment behavior of public supply companies and regional financial resources**

A correlation can be found between a municipality's investment behavior and its finances: municipalities with fewer financial resources invest less than those whose

<sup>15</sup> F. Pavel, A. Cullmann et al., "Gutachten zum Investitionsverhalten der Strom- und Gasnetzbetreiber im Rahmen des Evaluierungsberichtes nach § 33 Abs. 1 ARegV," *Politikberatung kompakt* 92 (Berlin: 2014).

finances are stronger.<sup>16</sup> The question that arises here is whether this also applies to public energy and water supply companies, i.e., whether they, too, invest less if the municipality has less money at its disposal. To answer this question, a comparison of the finances of the municipalities with the investments made by public companies would be ideal. No comparative data of this kind is available to date, however.<sup>17</sup> For this reason, a first approximation is performed using data on the level of the Länder: taking the financial strength in relation to the fiscal equalization indicator<sup>18</sup> as a basis, the Länder are divided up into donor states, western recipient states, and eastern recipient states as per the German fiscal equalization system. In relation to the reference year 2005, public companies in the donor states spent even less than those in the recipient states up to 2008 (see Figure 4). Thereafter, this trend was reversed, albeit as a result of the ever increasing grid expansion in the course of the energy transition. Interestingly, the investment behavior of eastern German recipient states, despite their having the lowest financial strength on average, did not differ from that of their counterparts in western Germany.

Here, it is worth noting that the energy and water supply sectors are fundamentally different from other municipal services. Indeed, these sectors tend to be profitable, meaning they are largely independent of the financial situation in the municipality. Nevertheless, the municipality could, in its capacity as owner, demand that profits be transferred, thus reducing the financial resources the companies have at their disposal to such an extent that their scope for investment would be limited. The present study shows no indication whatsoever of this, however. Moreover, electricity, gas, and water supply companies are each subject to distinct quality regulations that call for continual investment into

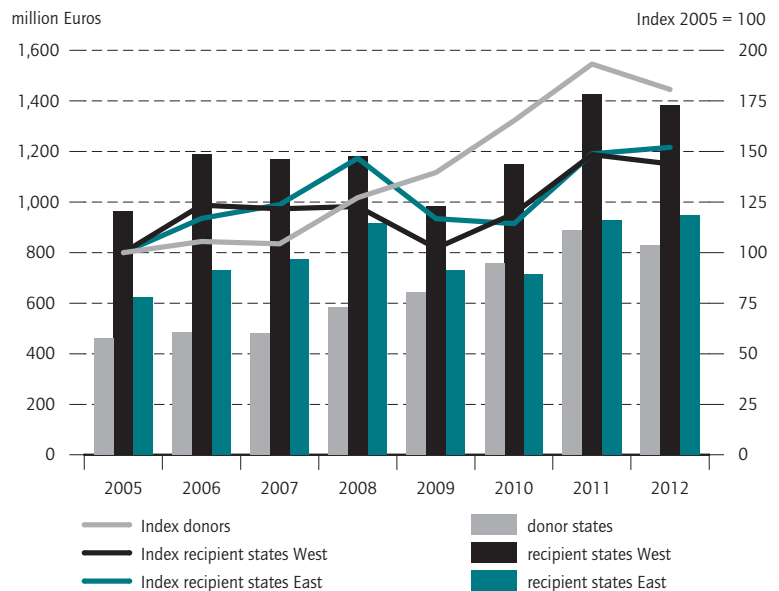
<sup>16</sup> See also F. Arnold et al., "Local Public Investment: Growing Economic Divide Due to Longstanding Inequalities," *DIW Economic Bulletin*, no. 42/43 (2015).

<sup>17</sup> This is mainly due to the strict data protection requirements of official statistics and the harmonization processes that would be required.

<sup>18</sup> To determine the allocations in the fiscal equalization system, the financial strength per capita of the given state is calculated on the basis of the state revenue. A total of 64 percent of the revenue generated in the municipalities goes into the financial strength calculation. The equalization indicator is then determined: this indicator represents the fictitious revenue of the state if the state had the average financial strength. If the financial strength of a state exceeds the equalization indicator, the state is deemed a donor state and vice versa. For the purposes of our analysis, annual data for the years 2005 to 2012 were taken. With the exception of North Rhine-Westphalia, no switches from donor to recipient occurred. In the present study, owing to its lower financial strength in comparison to Bavaria, Hamburg, and Hesse, North Rhine-Westphalia is considered to be a recipient state for the entire analysis period. For further information on the federal fiscal equalization system between Länder, see Federal Ministry of Finance, "Der bundesstaatliche Finanzausgleich" (2015) accessed on October 7, 2015, [http://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Oeffentliche\\_Finzen/Foederale\\_Finanzbeziehungen/Laenderfinanzausgleich/DE/Bundestaatliche-FAG.pdf](http://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Oeffentliche_Finzen/Foederale_Finanzbeziehungen/Laenderfinanzausgleich/DE/Bundestaatliche-FAG.pdf).

Figure 4

### Gross investment into energy and water networks of public utilities by regional financial resources of the countries



Source: AFID Investment Survey of German Energy and Water Supply Companies. Subsample with NACE Codes 35 and 36 according to NACE classification rev. 2. Firms from the land Baden-Württemberg discarded. Deflation based on 2010. Donor states: Bavaria, Hesse. Recipient states West: Schleswig-Holstein, Lower Saxony, Rhineland-Palatinate, Saarland, North Rhine-Westphalia. Recipient states East: Former Eastern Germany. Own calculations by DIW Berlin.

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There is no clear evidence for gross investment into networks being correlated with regional financial resources.

treatment and distribution equipment.<sup>19</sup> Consequently, the quality of the infrastructure cannot be reduced arbitrarily. In addition to the mandatory requirement to connect and feed-in new renewable energy, the gas and electricity distribution companies are also subject to the obligation to connect customers to the network, meaning that they are required to build new distribution networks where economically viable.<sup>20</sup>

In sum, it can be said that there is no indication of a correlation between the municipalities' financial strength and the investment activities of municipal energy and water suppliers.

<sup>19</sup> See German ordinance on the quality of water intended for human consumption (*Trinkwasserverordnung, TrinkwV 2001*) as well as the Incentive Regulation Ordinance (*ARegV*) of October 29, 2007, paragraph 4.

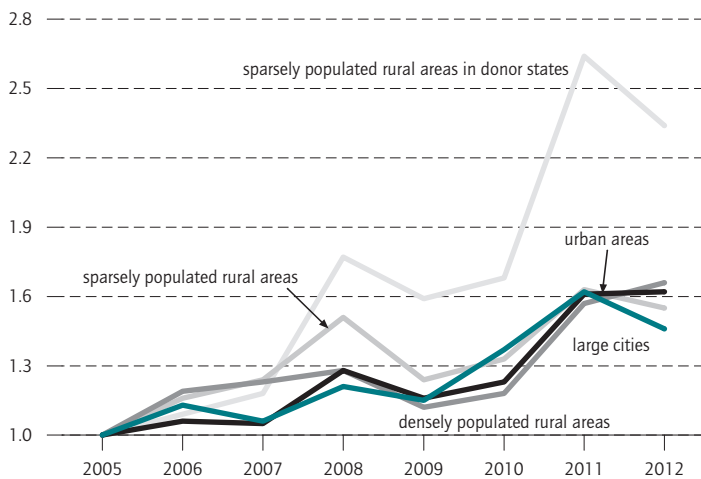
<sup>20</sup> See the German Energy Sources Act (*Energiewirtschaftsgesetz, EnWG*) of July 7, 2005. Sections 17 and 18.



Figure 5

### Gross investment into energy and water networks of public utilities by settlement patterns

Index 2005 = 1



Source: AfID Investment Survey of German Energy and Water Supply Companies. Subsample with NACE Codes 35 and 36 according to NACE classification rev. 2. Firms from the land Baden-Württemberg discarded. Deflation based on 2010. Classification of settlement types was done using data from BBSR (2015) at regional level Kreis. Own calculations by DIW Berlin.

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Diverging trends in population growths do not yet seem to influence investment expenditure by local utilities.

### No signs of waning investment in rural areas

Various studies argue that, in the long term, demographic change and altered settlement patterns will have an impact on the use of distribution infrastructure and will, consequently, indirectly affect the need for investment on the part of public energy and water supply companies.<sup>21</sup> For this reason, the possible existence of a correlation between settlement patterns and the investment behavior of public energy and water supply companies is examined below.

Changes in population figures and settlement patterns are all-important for energy and water supply. While rural areas are suffering from declining populations, the

<sup>21</sup> S. Siedentop, M. Hans et al., *Kommunale Infrastrukturkosten und Demographie*, (Dortmund: TU Dortmund and Institut für Landes- und Stadtentwicklungsforschung gGmbH, 2015); M. Köller, "Baustelle Kommunen: Demografischer Wandel trifft kommunale Infrastruktur," *Fokus Volkswirtschaft* 30 (September 2013): 1-3; C. Deilmann and P. Haug, *Demografischer Wandel und technische Infrastruktur: Wer soll die Kosten tragen? Eine Untersuchung am Beispiel ostdeutscher Mittelstädte*, (Aachen: Shaker, 2010). K. Einig, S. Siedentop et al., "Infrastrukturkostenrechnung in der Regionalplanung," *Werkstatt: Praxis* 43 (2006).

cities are growing. In the influx areas, existing infrastructure consequently has to be expanded. In the exodus areas, investment is needed to adapt the distribution networks to the changed demand. Owing to technical problems associated with the reduction or change in network capacity, in particular, investment in this area has been very limited to date. A survey conducted among the municipalities as part of the 2012 KfW Municipal Panel—a nationwide survey among local governments conducted by the reconstruction loan corporation KfW—shows that investment into network downsizing in the energy and water supply sectors has not been one of the main focus areas of the municipalities to date.<sup>22</sup>

To analyze the correlation between settlement patterns and investment behavior, the investment survey data were used once again, although in this case they were linked at district level with settlement data from the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). Here, a distinction was drawn between independent major cities, urban areas, rural districts, and sparsely populated areas. The analyses revealed that, over the period 2005 to 2012, investment trends in rural and urban areas took a similar course. In other words, the different population trends in cities and rural areas have not yet taken their toll on the level of investment in the public energy and water supply sectors (see Figure 5). One exception here is sparsely populated areas in Hesse or Bavaria, where the level of investment has soared. The assumption here, however, is that this surge of investment is mainly a result of the network expansion required for the integration of renewable energy sources.

In the cities, in contrast, the energy transition has meant that the need for network expansion has decreased. Thus, if a correlation between investment behavior and demographic trends did exist, small towns in eastern Germany, in particular, might be expected to invest less in infrastructure given the drop in population in the wake of reunification. Empirical data, however, do not show this to be the case: a comparison of investment activities shows that investment in small eastern German towns is not lagging behind that of small towns in Lower Saxony or North Rhine-Westphalia (see Figure 6). However, owing to nature of the data used here, it is impossible to finally clarify whether the investment is related to changes in demographic structure or differences in investment cycles.

### Conclusion

A considerable share of public investment comes not only from public budgets but also from public companies.

<sup>22</sup> Köller, "Baustelle Kommunen."

Around 21 percent of public companies operate in the energy and water supply sectors. Unlike with core municipal budgets,<sup>23</sup> in the area of outsourced energy and water supply, no decline in investment was seen. In contrast, gross investment in distribution equipment and installations by municipal energy and water supply companies is on the increase. This is similar to the trend observed among private energy and water supply companies. It remains to be seen, however, whether these findings also apply to other outsourced or non-outsourced municipal services. This is of importance since the energy and water supply sectors are different from other public tasks: they are often profitable, meaning they are not dependent on the financial state of affairs in the municipality.

Despite the differences that exist in the financial strength and demographic trends in the distribution areas, these differences have not been found to have a clear impact on the investment behavior of public energy and water supply companies to date. Existing differences in investment behavior among public and private municipal infrastructure firms are mainly a result of the increasing use of renewable sources of energy. Given the considerable challenges that municipalities will have to face in future, in particular in light of demographic change, it is impossible to rule out demographics and financial strength having an effect on investment behavior in the future.

<sup>23</sup> See also Arnold, "Local Public Investment."

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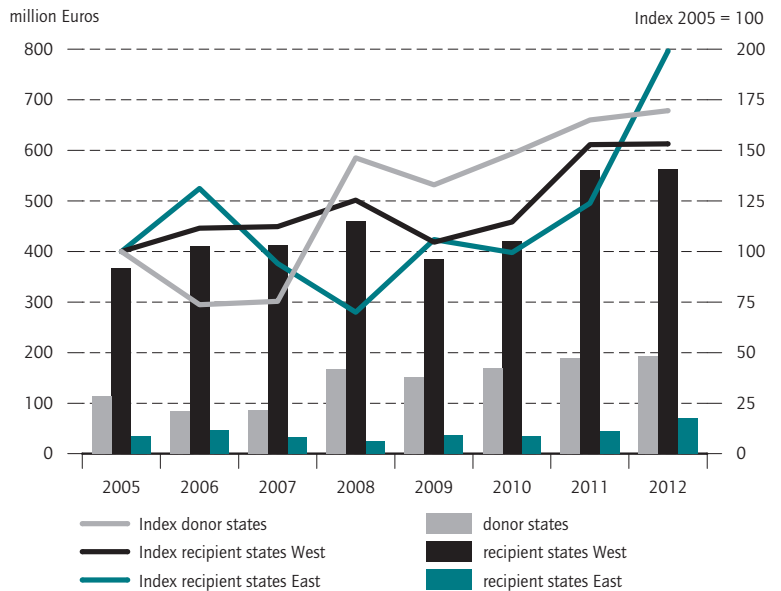
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JEL: R53, L33, L97

Keywords: Investments, Public Utilities

Figure 6

Gross investment into energy and water networks of public utilities in urban areas by regional financial resources



Source: AFID Investment Survey of German Energy and Water Supply Companies. Subsample with NACE Codes 35 and 36 according to NACE classification rev. 2. Firms from the land Baden-Württemberg discarded. Deflation based on 2010. Donor states: Bavaria, Hesse. Recipient states West: Schleswig-Holstein, Lower Saxony, Rhineland-Palatinate, Saarland, North Rhine-Westphalia. Recipient states East: Former Eastern Germany. Classification of settlement types was done using data from BBSR (2015) at district level. Own calculations by DIW Berlin.

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Public local utilities do not spend less on investment into networks in small towns located in Eastern Germany compared to those situated in Western Germany.

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