

Knowledge Brief: When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together

Introduction

The recently adopted Sustainable Development Goals (SDGs) set an ambitious agenda of providing universal access to safely managed water supply and sanitation (WSS) services by 2030. Policy makers and sector practitioners know that the SDGs will be achieved only if service providers can provide better services at a lower cost. Yet, the past decades' policy approaches to structuring service delivery at the right level have been conflicting: some countries have chosen to consolidate service provision centrally, hoping for greater professionalism and economies of scale, whereas others have chosen to decentralize and empower local governments in the hope that more local accountability would provide strong incentives to provide good services.

To reconcile those two apparently contrary trends, an increasing number of countries and local governments are turning, with varying levels of success, to the aggregation of local utility companies.¹ Making

utilities work together has been regarded as an opportunity to improve the cost efficiency and performance of service providers, thus making them more sustainable. As a matter of fact, there is ample empirical evidence in the literature of the existence of economies of scale in the WSS industry, at least up to a certain level. Furthermore, it seems that large utilities tend to operate at a lower unit cost and perform better than smaller ones do. For instance, Abbot and Cohen (2009) found that significant economies of scale do exist in the WSS industry. More recently, Van den Berg (2015) found, in a study analyzing the performance of WSS utilities in Africa, that size matters in achieving good performance. Two recent analyses based on IB-Net data for utilities in the Danube region (Klien and Michaud 2016) and in the Latin American and the Caribbean (LAC) region (Diaz and Flores 2015) showed lower unit costs for larger utility companies. These studies compare utilities serving cities of different sizes. It is not clear when the same scale effects are achieved by

grouping a number of noncontiguous providers into a single, larger provider. Many utility companies and countries embarking on such an aggregation process have therefore found that those benefits do not always materialize in practice and that the accompanying processes are arduous and fraught with political challenges.

A Global Study on the Aggregation of Water Supply and Sanitation Utilities

This global study was initiated to provide evidence-based guidance to policy makers and practitioners regarding when, why, and how water and sanitation utilities can work together (“aggregate”) to successfully deliver specific policy outcomes, such as better services or lower costs. The outcomes of this study are summarized in this knowledge brief and detailed further in the main report, *Joining Forces for Better Services? When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together*, and the accompanying toolkit (accessible at www.worldbank.org/water/aggregationtoolkit). (See also box 1.)

This work does not advocate in favor of or against aggregations but rather presents and reviews global evidence, analyzes specific aggregation case studies, and identifies the key characteristics that successful aggregations have in common, depending on their purpose and the context in which they occur. The authors acknowledge that it is challenging to make “before aggregation” and “after aggregation” cost comparisons because the levels of service are changing, thus this

work focuses on proposing recommendations for successful aggregation, shaping lessons learned into a checklist of key questions to ask and pointing out key decision points. The recommendations are based on evidence and observed experiences rather than on theoretical considerations; sometimes the advice runs counter to conventional wisdom with regard to aggregation practices.

This study consists of a review of existing literature and an analysis of both qualitative and quantitative evidence—including a statistical analysis based on IB-Net data covering 1,306 utilities from more than 140 countries; a review of global aggregation trends, collecting data for 111 countries; and 14 case studies from seven countries that provide a deep-dive narrative of aggregation experiences.

Aggregation Typology

To analyze the evidence collected, and to expand on the work done by ERM and Kingdom (World Bank 2005), the report postulates that the design of a successful aggregation should consider both the purpose intended and the context in which it takes place, and the report characterizes the design of an aggregation in function of its scope, scale, process, and governance. (See figure 1.) This report defines a *successful aggregation* as one in which the aggregated service provider performs significantly better than the previously disaggregated entities in terms of the intended purpose, without unacceptable deterioration of other performance dimensions.

BOX 1. Relevant Literature

This report builds on previous work from the World Bank and others. It borrows significantly from the conceptual framework and practical typology proposed by the report, “Models of Aggregation for Water and Sanitation Provision.” (World Bank 2005). External literature also has been consulted substantially, for example on the issue of economies of scale. A complete literature review is available in the online toolkit, which provides resources to support aggregation processes.

Understanding Why Success Does Not Always Materialize

There can be many reasons an aggregation is not successful. Despite the potential for economies of scale, one-off, or long-term transaction costs may prevent the economies from appearing.² Aggregation also has possible drawbacks, such as loss in accountability and political reluctance that may hamper the process of aggregation, blocking it before it takes off or damaging it after it is launched. Clustering of service areas increases the distance between the service provider and the end user. Salaries of the agglomerated unit might be adjusted to reflect those of the highest-paying utility, a move that would increase operating costs without necessarily creating equivalent efficiency gains. Lack of political will in the aggregation reforms could arise because local authorities might perceive such reforms as a threat to their sovereignty. Aggregations also increase the organizational complexity of a utility because the number of systems, employees, and processes could increase substantially. In addition, utility ownership—in the sense of the allocation of decision and control rights—tends to become more complex. Instead of a single owner, several municipalities or regional entities share ownership or sign a lease agreement with a utility. Such fragmentation of control and decision rights can impose significant transaction costs.

In summary, although serving a larger number of customers has organizational advantages in the production process for utilities—which can materialize as economies of scale in lower unit costs or improved

FIGURE 1. Context, Purpose, and Design of Aggregations

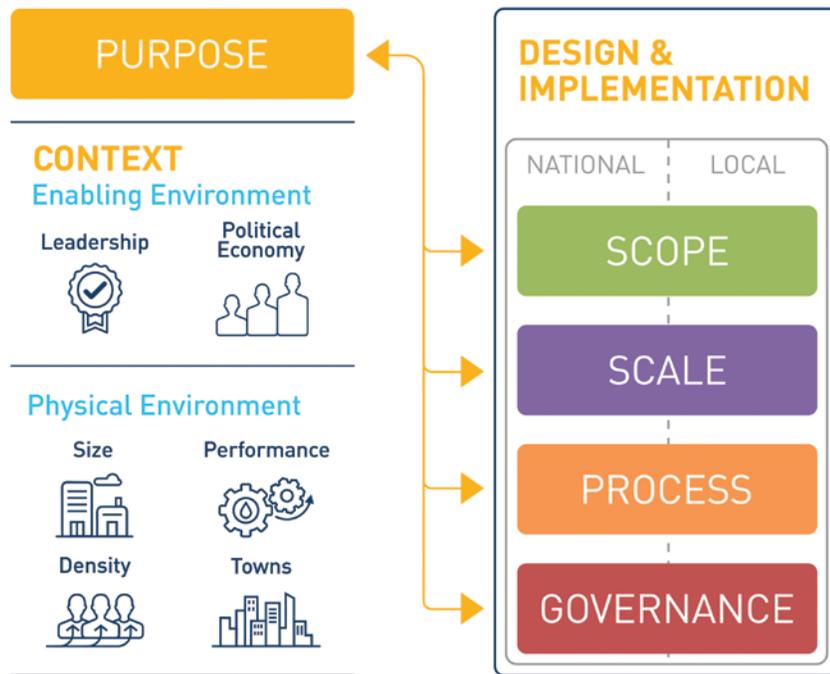
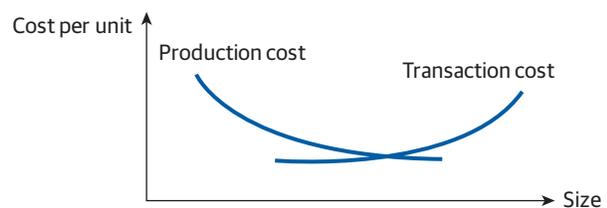


FIGURE 2. Trade-Off between Production and Transaction Costs



performance—greater size also implies higher transaction costs (Williamson and Winter 1993; Williamson 1975). See figure 2.

It is important to consider that the outcome of a given aggregation should be measured primarily against its original purpose, which might involve economic efficiency or not. In some cases, it might be necessary to accept a permanent transaction cost or change in the cost structure in return for an important externality—for example, a cross-subsidy between low- and high-cost service areas or an environmental benefit.

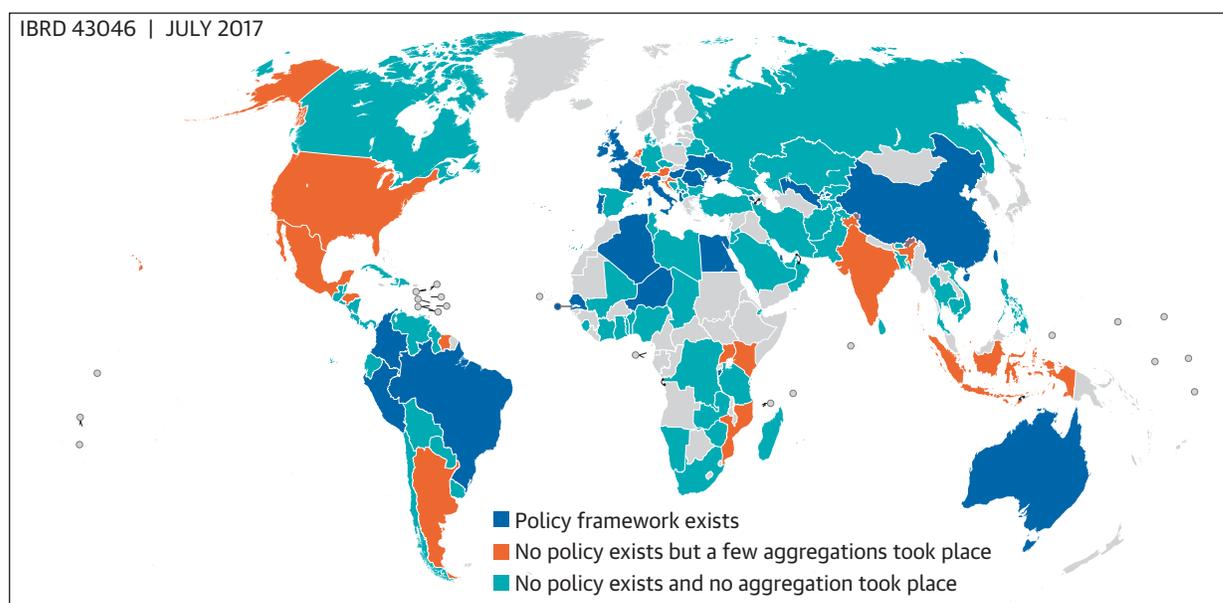
What Are Global Aggregation Trends?

The study collected worldwide information on water and sanitation services provision and aggregation. Information was collected from existing public sources (Joint Monitoring Program,³ Organisation for Economic Co-operation and Development,⁴ and World Bank databases⁵), as well as a systematic review of publicly available information on the websites of national agencies in the various countries. The global aggregation trends overview, available as an interactive map in the toolkit, provides country-specific data such as urban and rural population sizes as well as aggregation-specific information covering items such as the number of WSS utilities; the population served; the level of government formally responsible for providing WSS services; aggregation reforms adopted at the national level; the number of aggregation processes over the preceding five years; and the predominant process, purpose, scale, and scope of

aggregation. Information was collected on a total of 111 countries, representing 88 percent of the world's population and 51 percent of all countries. The entire data set is available publicly on an interactive map, available in the toolkit.

Map 1 shows the countries that have observed a certain degree of aggregation and have been considered in this global study either in the quantitative or the qualitative approaches that made up the methodology of the study. Overall, 43 percent of aggregations have been observed in European countries, whether from western, central, or eastern Europe; 17 percent have been in Sub-Saharan African countries; and 14 percent have occurred in Latin America. Fewer aggregations have been observed in East Asia and South Asia. Of the countries where a legal framework supports aggregations, 57 percent of these aggregation reforms are in European countries and 24 percent are in African countries.

MAP 1. Economies that Have a Formal Policy or Legal Framework that Supports Aggregation



Note: Based on data collected in May 2017.

The review of international aggregation trends led to the following observations:

- The level of decentralization of WSS services increases in countries with higher levels of development and overall service coverage.
- Aggregation is a relatively recent trend mainly observed in African, European, and Latin American countries.
- Aggregations are happening in a diversity of contexts but are more frequent in countries with high WSS services coverage.
- The predominant aggregation type is a top-down, mandated process targeted toward economic efficiency that encompasses all functions and services, follows administrative boundaries, and takes the form of a merger.
- Aggregations in countries with limited sector performance are predominantly aimed at improving services, whereas in countries where the coverage is high, economic efficiency is the main driver.

When Do They Work? The Quantitative Evidence

A statistical analysis based on IB-Net data, which cover 1,306 utilities from more than 140 countries, was conducted to understand in greater detail the potential gains from aggregation. Comprehensive time-series data for 79 actual aggregation cases identified in the data set were used to understand the effect of aggregations on disaggregated performance measures as well as differences in the cost structure. The statistical analysis comprised two complementary approaches: an empirical assessment of the performance consequences of aggregations and a cross-sectional analysis. The cross-sectional analysis complemented the first part of the analysis to understand how the different configurations of utility structure that are subject to change in the aggregation process determine long-term performance differences. This part of the

statistical analysis classified utilities according to core structural characteristics and compared the performance of the different utility types. A detailed description of the methodology of the statistical analysis is available in the main report; a supporting paper is also available in the online toolkit.

The analysis of actual utility aggregations using IB-Net data shows that in some cases the reforms have led to both improved financial sustainability and performance, whereas in other cases the benefits did not materialize. The research also shows that most aggregations involve larger, urban utility companies taking over utility service in small, more rural towns, thus adding few customers and decreasing the density of service area. In fact, utilities serving several towns do not see straightforward economies of scale when their size increases, contrarily to utilities that serve a single town. In addition, the analysis of available empirical data shows evidence that many aggregations do not generate lower labor unit cost per customer served in the way one would have expected given potential economies of scale.

The empirical analysis of IB-Net data also shows that the effect of aggregations varies widely and does not automatically show lower unit cost or better performance, because of the emergence of significant transaction costs in some cases. These results are based on before-and-after comparisons of utilities that aggregated with similar utilities that did not. Looking specifically at the post aggregation period, some evidence indicates that managerial efficiency tends to improve through aggregations. Additional statistical tests show that some utility types might benefit more than others and that the design of the aggregation matters:

- On the one hand, small, less complex aggregations and aggregations that involve utilities that are already serving multiple towns are more likely to achieve cost savings.
- On the other hand, aggregations that involve small or weak utilities tend to improve their overall performance rather than lowering their costs.

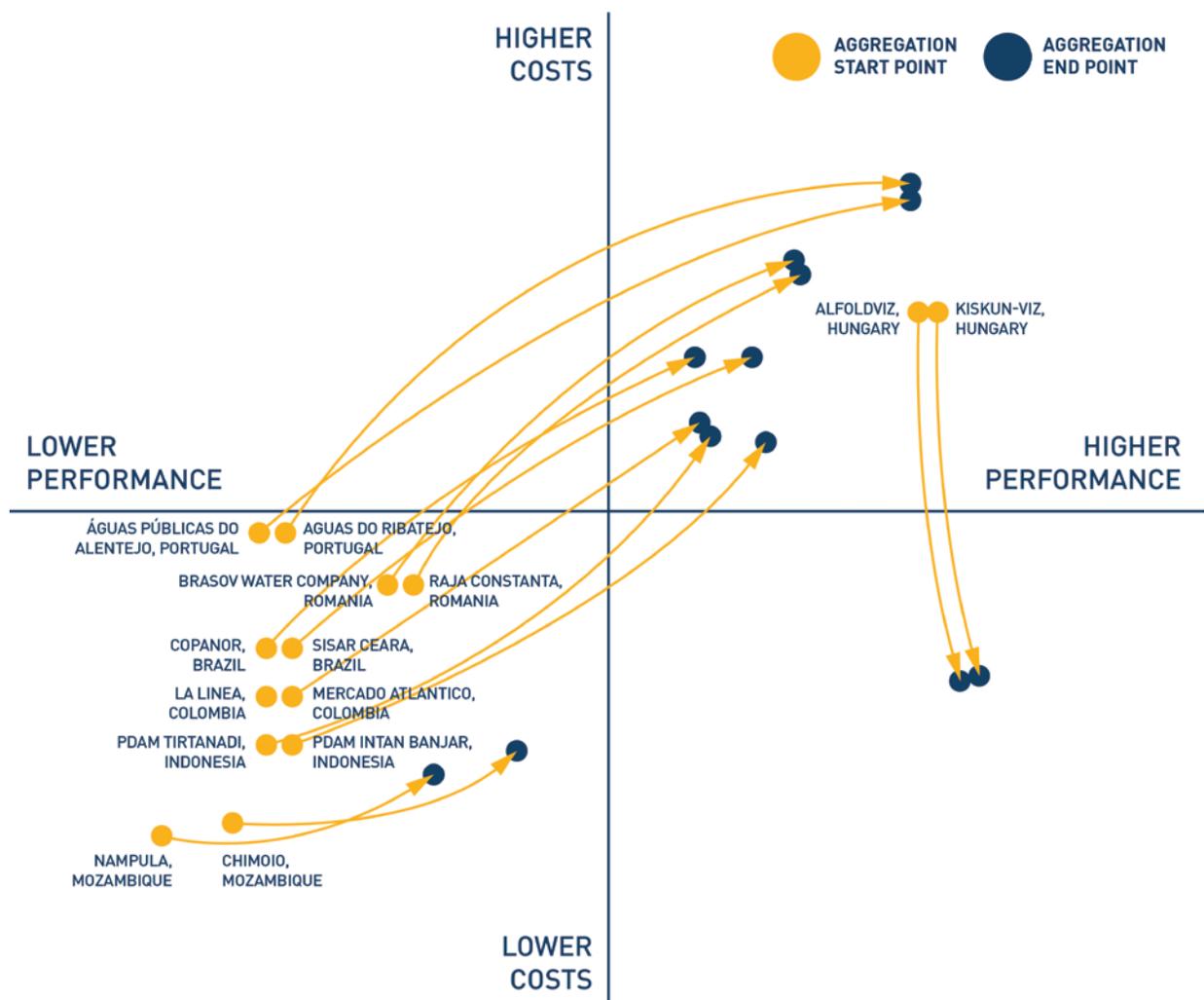
Why Do They Work? The Qualitative Evidence

To complement the hard data analysis, the study also investigated in greater detail a set of 14 case studies in seven countries, centering on the stakeholders involved, the decisions made, the roles of sector actors and their incentives, and the perceived outcomes with a view to bringing forward the essence of each case experience. The seven countries were Brazil, Colombia, Hungary, Indonesia, Mozambique, Portugal, and Romania. The selection of the countries and specific providers was done in a manner to ensure a diversity of geography, development levels, size, and aggregation

process and scope. Availability of data was also a key selection criterion.

Among other findings, this analysis provides evidence that many of the observed aggregations started from a low cost and low performance situation and went through a higher cost and higher performance status before finally reaching the ideal high performance and lower cost scenario. Figure 3 depicts these findings—the yellow circle shows the starting point and the blue circle, the aggregation outcome. The overall reform path was to increase performance first, and only in a second step to improve the cost situation.

FIGURE 3. Starting Point and Aggregation Outcome for Case Studies



Furthermore, the analysis of the 14 case studies enabled the identification of the following success factors:

- Having a stable champion throughout the aggregation often improves the likelihood of success.
- Building ownership and aligning interests of stakeholders at all levels is essential.
- Defining principles but allowing flexibility in implementation ensures local ownership.
- Aggregation takes time to show results; gradual improvement strategies with consequent focus on results are particularly successful.

Conversely, a series of risk factors that may prevent aggregation from delivering its benefits were also identified:

- Not acknowledging context and purpose when designing an aggregation can lead to failure.
- When political leadership changes over time, aggregation may be jeopardized.
- Harmonization of administrative practices may level performance down and costs up.
- Transaction costs can hamper aggregation success.
- Cherry-picking practices can undermine the outcome of an aggregation whose purpose involves externalities such as cross-subsidies or capacity transfers.

A list of the analyzed case studies with references for further information (available in the online toolkit, including multimedia field stories and Q and A with practitioners) are available at the end of this brief.

How Does WSS Utility Aggregation Work? Concrete Insights

The qualitative and quantitative analyses have enabled the authors to delve into the nuts and bolts of setting up a successful aggregated service provider, highlighting aspects such as scale and scope, the allocation of power, the management of assets and liabilities, and the harmonization of information technology systems.

Building on the aggregation typology—the proposed four design dimensions of scope, scale, process, and governance—the study seeks to highlight the trade-offs and potential challenges associated with each of those design decisions. A summary of the findings follows.

Scope of aggregation

The scope of aggregation varies among the case studies; however, all functions have been aggregated in most case studies. All stages of the service chain⁶ have been aggregated in all case studies except for Águas do Alentejo (Portugal), which supplies bulk water and oversees wastewater treatment only. Water and wastewater services have been aggregated in eight case studies. In four case studies, aggregation was limited to water service only, and in one case study, the operator is in charge of water supply and sanitation as well as waste collection. Those findings are consistent with the findings of the global aggregation trends review.

Scale of aggregation

The scale of aggregation follows administrative boundaries in 12 case studies; in the two Brazilian cases, aggregation happened within watershed limits and concerns only rural areas. The population covered varies from 32,000 inhabitants in the regional market of La Línea (Colombia) to 2.2 million inhabitants in the regional market of Atlántico (Colombia). In Brazil, where aggregations happened in rural areas, the case studies cover 89,500 inhabitants located in 153 settlements for SISAR and 303,000 inhabitants from 239 localities for Copanor, thus showing the low population density. In contrast, in Indonesia or Mozambique, where aggregations happened in urban areas, the case studies exhibit high density (respectively, 2.1 million inhabitants located in seven cities for PDAM Tirtanadi and 400,000 inhabitants located in three cities for FIPAG Northern Unit). The number of towns covered in an aggregation varies widely among the case studies, ranging from two cities for PDAM Intan Banjar (Indonesia) to 239 localities for Copanor (Brazil).

Process of aggregation

The process of aggregation was mandated in 4 case studies, all located in the European Union (EU), and was voluntary for all others. Among the 14 case studies, 6 received financial incentives from donors and 4 were financially supported by public funds; 2 received both donor aid and public subsidies. These financial incentives or support, when effectively provided, enabled the funding of large investment projects, which acted as a “big push” to improve WSS coverage, quality, and performance.

Governance

In most case studies, aggregated utilities have adopted a corporatized structure and have used a delegated governance arrangement. A variety of situations have been encountered regarding shares and power distribution (such as according to the asset value transferred to the aggregated entity or the volume or the population served per participating municipality). In most cases, asset transfer has been an opportunity to set up or update inventories. Similarly, cost and revenue are being consolidated for the utility as a whole, and tariffs are harmonized across the operating area. In half of the case studies, no staff transfer was undertaken. Entry

and exit rules are not clearly stipulated systematically. Almost none of the aggregated utilities took on liabilities from previous operators.

FIGURE 4. Stages in Undertaking Aggregation



Road Map to a Successful Aggregation

This study set out to provide concrete, evidence-based policy guidance on when, why, and how the aggregation of water and sanitation utilities can successfully deliver specific policy outcomes. It was found that the implementation of an aggregation is typically a long-term effort, taking anywhere from 3 to 20 years and involving, broadly speaking, four stages: (a) deciding on whether an aggregation process is the appropriate policy instrument to achieve the purpose sought; (b) designing the aggregation, (c) implementing the designed aggregation, and (d) sustaining its achievements. For each stage, figure 4 provides a summary of the main guidance provided by the study.

Key Messages

The evidence base is not always as conclusive and clear cut as a policy maker would want. Some of the conclusions might appear counter-intuitive or contradict conventional wisdom. This, by itself, is an important finding because it underlines the importance, for policy makers and practitioners, of pausing and thinking about reforms before replicating a model that might have appeared successful in a different context, for a different purpose. A few broad conclusions can be derived from the overall effort for anyone contemplating an aggregation, in addition to the more detailed guidance provided in the report and toolkit.

- 1. Aggregation is a policy option among others, not the panacea for all sector challenges.** A growing number of national and local governments are turning to aggregation to face the double challenge of increased demand for better services and limited fiscal space. In many cases, those aggregations have delivered positive outcomes, but not always those expected initially. In some cases, the process has stalled or failed because it was not the right policy action or because it was poorly designed. One-off and long-term transaction costs have prevented expected economies of scale from materializing at the scale expected, or such economies of scale have been reinvested into higher levels of service rather than into lower costs.
- 2. Aggregations come in many different shapes and forms, depending on the local circumstances.** The scope, scale, process, and governance of aggregation varied greatly between regions and countries and even within countries. Although some utilities chose to associate with neighboring ones for only specific functions such as the purchase of chemicals, others fully merged their operation at the regional level or set up a separate company to manage shared assets such as a large-scale water treatment plant. That diversity of cases reflects the diversity of local circumstances, and governments developing aggregation reforms will do well to leave

space for those to be considered in the final design of a given aggregation.

- 3. The design of a successful aggregation will depend on the intended purpose of the aggregation, as well as on the overall context in which it takes place.** For those practitioners and policy makers considering an aggregation process, the report recommends considering first what policy outcome is being sought: Better service? Lower costs? Solidarity between urban and rural areas? Environmental benefits? Furthermore, the overall context— political economy, performance and size of utilities, and so on— should be considered before undertaking the design of the aggregation’s scope, scale, governance, and process, preferably reflecting on the guidance provided in the study. Most of the cases of failure are linked to designs that responded poorly to the combination of purpose and context in which the aggregation was taking place.
- 4. In the developing world, aggregation is primarily a means to deliver better services rather than to lower costs.** Many practitioners will associate aggregations with the concept of economies of scale and expect to see cost reductions. However, in many cases, the preaggregation costs of services are below those necessary to provide a reasonable quality of service (low-level equilibrium). In fact, the study shows that most often in the developing world, aggregations involve larger municipal companies that take over smaller, underperforming ones nearby with an aim to improve the coverage and quality of services. This process often involves significant infrastructure investments—and, in effect, takes the utilities out of their low-level equilibrium. In such cases, costs increase alongside service quality, a necessary but not always expected outcome of the aggregation.
- 5. Aggregation is a gradual, long-term process that requires strong stakeholder commitment.** Aggregations take time to design, and even more time to implement and sustain. Among the study’s

14 concrete cases, only 2 took less than 5 years in total, with some needing as long as 20 years to fully consolidate their effect. Aggregations shift the balance of power among stakeholders significantly and therefore require time to build support and consensus in the first place. In addition, utilities aggregating often do so in successive phases rather than in a single step, as success builds experience and confidence into the process. Finally, many aggregated utilities find that dealing with harmonization issues, whether human resources, information technology systems, or administrative processes, is best pushed to after the actual merger and addressed gradually once the dust settles and the commitment to an aggregated provider grows.

6. **Finally, aggregations are most successful when accompanied by a broader sector reform that addresses governance, financing, and regulatory issues at the sector level.** Many countries accompany the actual

aggregation process with a solid sector reform package that ranges from clarifying arrangements for corporate governance to establishing a solid regulatory framework and a financing program that not only provides incentives toward aggregation but also helps achieve some of the performance gains that are often desired from the process (concept of the big push).

This study does not provide a definitive answer to the questions of when, why, and how aggregation can successfully deliver specific policy outcomes. Aggregation is a relatively recent phenomenon, and longer time series would be necessary to understand the long-term effect of aggregation. Similarly, the existing data sets do not enable researchers to fully understand the nature of the transaction costs that emerge during aggregations, how they evolve over time, and how they can be mitigated best. Aggregations are conducted for a wide variety of purposes, and the limited data available on aggregation reforms primarily focus

BOX 2. Online Toolkit

For more information, refer to the online toolkit (www.worldbank.org/water/aggregationtoolkit), which offers a broader set of references and resources to inform aggregation processes, including, among others:

- Full report, *Joining Forces for Better Services? When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together*
- Main feature video with information about the purpose of the report and leading voices from around the world
- Supporting documents on the aggregation of WSS utilities, presenting the results of the statistical analysis
- Literature review and an annotated bibliography on the aggregation of WSS services
- Summaries of 14 case studies that present the knowledge gathered through the report in multiple political, economic, and environmental contexts
- Multimedia field stories, including three short videos that share concrete experiences in WSS utility aggregation
- An engaging visual representation of *Aggregation Global Trends* through an interactive map that displays information from the data set of aggregation or fragmentation of the water sector in more than 111 countries
- Q and A with diverse global practitioners that provide concrete advice and unique glimpses into firsthand experiences with utility aggregation in multiple contexts

on their effectiveness regarding cost savings and performance improvements only. And, of course, the case studies demonstrate time and again the importance of a favorable political economy and overall country environment for the success of the process, but more work would be needed to detail those findings.

Nevertheless, this study seeks to shed some light on the complexities and trade-offs associated with

designing and implementing aggregation reforms, while also providing relevant guidance on how to make those as successful as possible. With that, let us hope that this work will allow policy makers and practitioners who are considering aggregation to better understand whether it is a relevant policy option for them, and to use the analysis and case studies to make more informed decisions with regard to the design and implementation of the process.

Case Studies and References for Further Information

	Case study	References available in the toolkit
	All 14 case studies are analyzed in the main report, <i>Joining Forces for Better Services? When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together</i> (World Bank Forthcoming). Additionally, more detailed information is available in the sources listed. The main report and supporting material are accessible in the online toolkit.	
Brazil	Coponor Minas Gerais	<ul style="list-style-type: none"> Case study: "Coponor Minas Gerais"
	SISAR Ceará	<ul style="list-style-type: none"> Case study "Sisar Ceará" Short video: "The Case of Sisar Ceará in Brazil"
Colombia	Mercado Regional del Atlántico	<ul style="list-style-type: none"> Case study: "Mercado Regional del Atlántico"
	Regional La Línea	<ul style="list-style-type: none"> Case study: "Regional La Línea"
Hungary	Alföldvíz	<ul style="list-style-type: none"> Case study: "Alföldvíz" Blog: Q and A with Deputy Chief Executive Officer (CEO) László Nagy and Financial Director Károly Uhrmann, "Unexpected Challenges of WSS Utility Aggregation Reform in South East Hungary"
	Kiskun-Víz	<ul style="list-style-type: none"> Case study: "Kiskun-Víz"
Indonesia	PDAM Intan Banjar	<ul style="list-style-type: none"> Case study: "PDAM Intan Banjar"
	PDAM Tirtanadi	<ul style="list-style-type: none"> Case study: "PDAM Tirtanadi"
Mozambique	Chimoio/Gondola/Manica	<ul style="list-style-type: none"> Case study: Chimoio/Gondola/Manica" Blog: "Federico Martins in Mozambique Shares Experiences with WSS Aggregation" Blog: "Mozambican Water and Sanitation Utility CEO Nelson Beets Shares Experiences with WSS Aggregation"
	Nampula, Nacala, and Pemba/Metuge	<ul style="list-style-type: none"> Case study: "Nampula, Nacala, and Pemba/Metuge" Blog: "Federico Martins in Mozambique Shares Experiences with WSS Aggregation" Blog: "Mozambican Water and Sanitation Utility CEO Nelson Beets Shares Experiences with WSS Aggregation"
Portugal	Águas Públicas do Alentejo	<ul style="list-style-type: none"> Case study: "Águas Públicas do Alentejo"
	Águas do Ribatejo	<ul style="list-style-type: none"> Case study "Águas do Ribatejo" Short video: "Case of Águas do Ribatejo in Portugal"
Romania	Brasov	<ul style="list-style-type: none"> Case study: "Brasov"
	Raja Constanta	<ul style="list-style-type: none"> Case study: "Raja Constanta" Short video: "The Case of Raja Constanta in Romania"

Notes

1. Aggregation is defined as the process by which two or more WSS service providers consolidate some or all their activities under a shared organizational structure, whether it implies physical infrastructure interconnection or not, and whether the original service providers continue to exist or not.
2. Transaction costs refer not only to costs incurred during the singular event when the utilities are merged but also to the additional costs in the aggregated utility, which may arise continuously. Therefore, transaction cost is defined here as comprising all costs except production cost, and it may be divided into one-offs and repeatedly incurred costs. (Williamson 1975; Williamson and Winter 1993).
3. Available at <https://washdata.org/data>.
4. Available at <http://www.oecd.org/regional/regional-policy/Subnational-governments-in-OECD-Countries-Key-Data-2016.pdf> (complete database available at: <http://stats.oecd.org/>).
5. Available at <http://data.worldbank.org/>.
6. Aggregated utilities can only supply stages of water and wastewater services—that is, production, distribution, collection, or treatment (World Bank 2005).

Sources

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