Institutionalising the monitoring of rural water supply services in Latin America; lessons from El Salvador, Honduras and Paraguay

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Abstract
Various countries in Latin America have started monitoring rural water supply service delivery at sector level, driven largely by two objectives:

1. To establish rural water inventories for investment planning.
2. To better target post-construction support for more sustainable service delivery.

However, such monitoring systems may suffer from limited sustainability themselves, in the absence of clear institutional arrangements for monitoring or when budgets and capacities for this are limited.

IRC and the Inter-American Development Bank have been supporting the development and implementation of rural water monitoring systems in El Salvador, Honduras and Paraguay. A methodology was developed and tested to institutionalise service delivery monitoring into the sector, by identifying institutional arrangements and defining responsibilities for financing the costs of monitoring. This paper provides an overview of the approach followed, illustrated by examples (including cost estimates), from the three countries.

Keywords
Monitoring, rural water, institutional arrangements, costing, Latin America.

Introduction
Community-based management has been the predominant service delivery model for rural water supply in Latin America. However, many rural water supplies under-perform. For example, in Honduras about 37% of the rural water systems presented major problems in the performance of the service provider and/or in the system itself (SANAA, 2009).

Monitoring can be one way of improving performance in service delivery. First of all, it would provide service providers with the information to take corrective actions themselves. In addition, it is indispensable for targeting post-construction support to community-based service providers. Various countries in the region have seen the

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emergence of such support mechanisms, either by the public sector (national or local government), or by private initiatives, such as associations of community-based service providers. Even though such support can have a positive impact on the performance of service providers (e.g. Kayser et al., 2010, Smits et al., 2012, Schweitzer and Mihelcic, 2012), often support providers (PATs or *Prestadores de Asistencia Técnica*, as they are known in Spanish) themselves have limited capacity and under-perform (as Smits et al. 2012 found in Colombia). One of the reasons for this is the *ad hoc* nature of the support provision, often when a problem has already occurred. Regular monitoring by PATs could help them to anticipate problems in service delivery and better target their support. Finally, monitoring may provide national entities with the information to adjust and improve policies and regulations for rural water supplies.
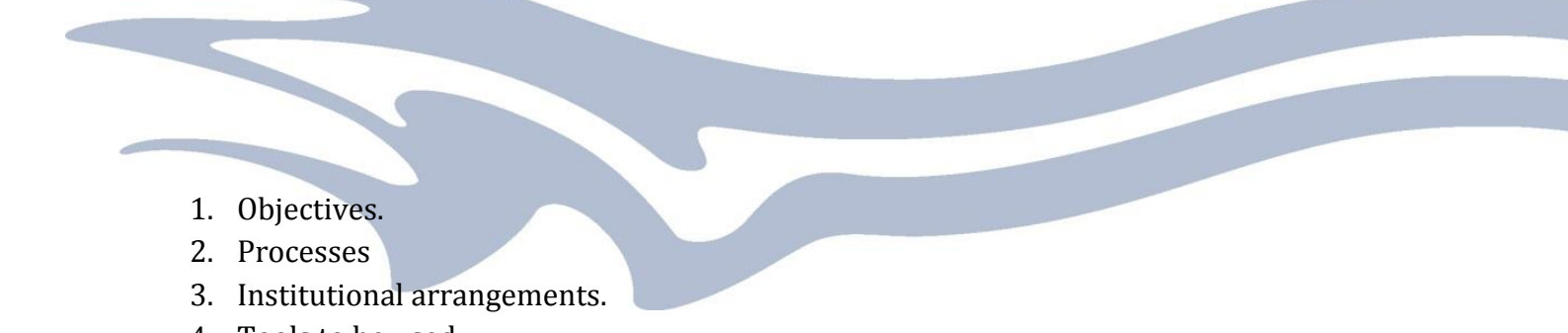
Yet monitoring itself has been fraught with problems, particularly in terms of coverage and sustainability. In many countries in the region, national regulators monitor urban service providers, but do not include rural providers, or only a small number of them, as regular data collection of the large number of rural service providers is difficult and expensive. Others have been successful in mapping rural services in the entire country, typically supported by a big project or programme, but then struggle to regularly update it, due to lack of resources or unclear institutional responsibilities for on-going monitoring. For example, the SIAR (Rural Water Information System) in Honduras had performed reasonably well until external funding ceased, and rapidly stopped being updated.

The Inter-American Development Bank (IDB), together with the Water and Sanitation Spanish Cooperation Fund for Latin America and the Caribbean (FECASALC), supports national and sub-national governments in the development of rural water and sanitation monitoring systems. IRC has been providing technical support to the design and implementation of such systems, particularly in terms of the service delivery indicators framework and the institutionalisation of these systems into the sector in three countries: El Salvador, Honduras and Paraguay. A generic approach for institutionalising the monitoring systems was developed and subsequently applied and refined in a process with relevant sector stakeholders in the three countries. This paper presents the approach towards the institutionalisation[4]. It does so by first presenting an overview of the generic approach (based on Smits et al., 2013 forthcoming). This is followed by a detailed description of each of the steps in the approach, illustrated by boxes with lessons from the countries (see Smits, 2013; Smits and Rivera, 2013 and Uytewaal, 2013 for detailed country reports in Spanish).

Overview of the approach

We define a monitoring system as the detailed description of the procedures for carrying out the monitoring process, including:

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[4] The experiences with the indicator framework are elaborated in a separate paper submitted to the symposium by Adank, et al., 2013.

1. Objectives.
2. Processes
3. Institutional arrangements.
4. Tools to be used.

It differs from an information system, which refers to the way in which information is managed and includes the indicators and algorithms to come to a qualification of the services and the information technologies to be used, such as data collection tools, databases and visualisation tools. The information system is thus one key component of the monitoring system.

For a monitoring system to be institutionalised, all these procedures need to be clearly defined and agreed upon. Specifically, it requires defining the institutional arrangements (who does what) and the financing framework (what does it cost to monitor and how will costs be covered over time). It will also need assessing whether the institutions actually have the capacity to fulfil these responsibilities and provide the required resources. If that is not the case, these may need to be further developed; or, alternatively, the scope of the institutional arrangements or the monitoring system itself may be changed. The decisions regarding the institutionalisation of the monitoring system depend on the decisions made with respect to the development of the system itself. The institutionalisation cannot be an afterthought; it needs to be developed alongside the monitoring system.

The approach that has been developed seeks to achieve such integration, through iterations between the development of the monitoring system and its institutionalisation. It consists of four main steps, as summarised in **Error! Reference source not found.**, and further elaborated in the following section.

Figure 1: Steps in the definition of the institutional arrangements for monitoring.

Step	Summary
1. Analysis of current monitoring practices	Current practices are mapped to assess where there are gaps and how a future system can build on those.
2. Definition of the monitoring system	The main components are defined (objectives, processes, tools and stakeholders).
3. Definition of the institutional arrangements	Detailed responsibilities for all steps in the process are defined and checked whether stakeholders have capacities to fulfill them.
4. Costing and responsibilities for financing	Costs of monitoring under different arrangements are assessed and agreement made on the covering of those.

Most service delivery monitoring systems will require the involvement of a number of stakeholders. These need to appropriate these roles and provide critical inputs on the decisions to be made in each step. Therefore this approach of developing a monitoring system and defining its institutionalisation is best applied through a multi-stakeholder process, for example through a sector working group (see **Error! Reference source not found.**). Such a process needs a clear lead and coordination to bring all stakeholders together and ensure the consistent application of the approach. This lead role is typically filled by the lead government agency for rural water.

Box 2: Steps in the definition of the institutional arrangements for monitoring.

In Paraguay, SENASA (the National Environmental Health Service) took leadership for the development of the rural monitoring system. For that purpose it convened a working group to provide strategic direction to the new system, consisting of other different government agencies (such as the national regulator and the water and sanitation directorate) and donors.

Applying the approach

Step 1: Analysis of current monitoring practices

Even if no formal sector service delivery monitoring system exists, there may be some monitoring activities going on, such as monitoring project implementation by NGOs or donors. There may also be informal information flows. Future monitoring should build

as much as possible upon these. This first step consists of making an inventory of current monitoring practices – both formal and informal. This can be supported by a matrix that maps these current practices, differentiating between the steps in monitoring at different institutional levels, as the basis for an analysis of the strengths and weaknesses **Error! Reference source not found.** provides the example of how this was done in Honduras.

Box 2: Analysis of existing monitoring activities in Honduras.

Honduras used to have a rural water monitoring system called SIAR, which stopped being used shortly after external support withdrew. Two years ago, a decision was made to join a regional initiative, called SIASAR (Rural Water and Sanitation Information System), an information system largely based on the strengths of the previous SIAR. This time period was used to revise the institutional set-up for monitoring to overcome the sustainability problems that affected SIAR. Moreover, it offered the opportunity to align with monitoring efforts of other government agencies and NGOs. A first step was an assessment of current arrangements, resulting in the matrix below.

Mapping current information flows and monitoring practices around rural service delivery in Honduras

Step / Stakeholder	Data collection	Processing	Analysis	Reporting	Identifying corrective actions
Service providers	On-going but unstructured	Without standard procedure or tool	Without standard procedure or tool	Annual reports to users	Some decision making tools for water quality and administration
Municipal Association of Water Committees	On-going but unstructured	Sometimes, but without standard procedure or tool	Without standard procedure or tool	Unknown	Unknown
Operation and Maintenance Technician	Using standard tool. Demand-based and depending on resources	Using SIAR	Using SIAR	To the service provider and national utility	Based on standard set of typical corrective measures
Regulation and Control Technician	Using standard tool	As above, but using other information system	By national regulator	Reports on website of national regulator	National regulator informs municipality to take action
Environmental Health Technicians	Using standard tool, but limited Resource	Data provided to Regional Health Secretariat	Unknown	Unknown	Unknown
NGOs and projects	Detailed assessments based on project	Based on own criteria	Based on own criteria	Internal	Feasibility assessment of Project

	needs				
Honduran Social Investment Fund (FHIS)	Detailed assessments for pre-feasibility	Based on own criteria	Based on own and funders' criteria	To mayor and to funders	Go/no-go of the project

The analysis of the results led to the following conclusions:

- Lots of information is collected about service providers, but in a fragmented manner, and each organisation has its own formats and instruments. Only the Operation and Maintenance Technicians and the Regulation and Control Technicians use standardised formats.
- This results in little use of the available information.
- Even though SIAR is out of date and few stakeholders besides SANAA and FHIS use it, it constitutes a useful basis to update, extend and improve upon.
- The information that is collected is not linked in a systematic manner to follow-up actions. This is compounded by a reduction in resources for post-construction support for the Operation and Maintenance Technicians, the main PAT. Other PATs do not access data from SIAR.
- There is limited aggregation of information from service provider level to national level. This only happens in an ad hoc manner, and mostly for project formulations.

Step 2: Definition of the monitoring system

The next step is the definition of the monitoring system, which consists of four sub-steps.

Step 2a: Setting monitoring objectives

Monitoring can serve various objectives, such as:

1. Obtaining data for investment planning,
2. Assessing service provision to target post-construction support activities, and
3. Regulation.

It is important to define which objectives are to be met as that defines the scope of the information system and the type of information to be included (see **Error! Reference source not found.** for the example of Paraguay).

Box 1: Objectives of the monitoring system in Paraguay.

In Paraguay, the expected objectives of the monitoring system were defined as:

- To provide information that allows defining corrective measures by: service providers, by PATs, by municipalities and by sector agencies
- To provide a baseline for investment planning and resource allocation
- To identify trends over time
- To provide the information needed for reporting and provision of accountability between levels

Step 2b: Mapping future stakeholders roles

The second step is to map stakeholders and their possible future roles in monitoring. This is done by listing general types of roles, and then identifying who could fulfil those (see Table 1 for the results of this exercise in Honduras). The general roles are:

- System manager: the entity that manages the information system (including the servers and software licenses) and coordinates the processing of data.
- Data collector: the entities that do primary data collection.
- Validators: check whether collected data is complete and doesn't contain obvious errors.
- Information users: the ones responsible for interpretation of results and identifying corrective measures. In sector monitoring systems, almost any actor could be a user.
- The PAT: is the entity that is specifically tasked with taking corrective action, through post-construction support to services providers.

The resulting list of institutions needs to be involved in the definition of the institutional arrangements.

Table 1: Example of stakeholder mapping with envisaged roles in Honduras.

Institution	Roles				
	System manager	Data collector	Validator	Information user	PAT
Technical assistance provider (SANAA)	●	●	●	●	●
Policy making body (CONASA)				●	
Regulator (ERSAPS)			●	●	
Implementing agency (FHIS)		●	●	●	
Health Secretariat		●	●	●	●
Finance and Planning Secretariat				●	
Association of Municipalities of Honduras				●	
Municipalities		●	●	●	●
Associations of Water Committees		●	●	●	●
Water Committees		●	●	●	
NGOs		●	●	●	●

Step 2c: Defining the process

What follows is a description of the steps in the monitoring process. The following general steps can be identified:

- **Preparation** includes liaison between data collectors, relevant authorities and service providers, and logistical arrangements.
- **Data collection** of primary and secondary data.
- **Validation** refers to the review of data to identify and correct errors and omissions in the data.
- **Processing** whereby data is transferred from the data collection tool (e.g. a phone or paper) to a database. In addition, it includes the calculation of indicators, through the application of algorithms. Finally, it may include the aggregation of data between levels of scale.
- **Publication** of results, in hard-copy or online.
- **Interpretation and identifying corrective actions**. In this step, sense is being made of the indicators obtained, by analysing trends and correlations between data, and possible explanations of these trends. Corrective (and preventative) measures are identified.

A common agreement needs to be reached on what each of these entails. For example, in Honduras, the steps of processing and publication of results were combined, as these are automated in the information system.

In addition, different phases may be identified in the development of a monitoring system. Many start with an initial development phase, in which several pilots may be done to test and calibrate the information system. This is followed by the baseline of all water services in a country. A final phase is the regular monitoring, where the monitoring cycle is repeated with certain frequency (e.g. annually).

Step 2d: Developing the information system

The final step in the definition of the monitoring system is the development of the information system. The details of this, such as the definition of indicators and algorithms and selection of information technologies, fall outside the scope of this paper. However, the institutionalisation of an information system requires a number of issues to be resolved:

- **Links to existing information systems**, such as an urban water information system already in use. These need to answer questions such as: Should this system be replaced or built upon? Are there possibilities to extend these systems to include rural water? Should links be made between systems? What should the scope of a new rural water information system be?
- (**Dis)aggregation of information:** Entities at different levels require different degrees of detail in their information. Algorithms can be used to (dis)aggregate data for different levels. The precise data requirement for each level needs to be known. To do so, insight is needed in data requirements, particularly at higher levels of aggregation, and how these can be obtained at lower levels.
- **Information technology** requirements and resource implications: the use of cell phones may imply a higher initial investment but reduce time needed for compiling data. Technical capacity, time and costs requirements of these technologies need to be assessed in relation to available funding.

Based on these discussions and the identification of other possible implications, the mapping of future roles of stakeholders can be fine-tuned.

Step 3: Defining the institutional arrangements

The considerations from the previous step feed into decision making to define and detail the institutional arrangements. A matrix similar to the one presented in **Error! Reference source not found.**can be used to allocate responsibilities. It allows responsibilities to be allocated, ensuring that all steps are covered. It may be necessary to repeat the defining of roles and responsibilities as the monitoring system is developed over time. For example, both in El Salvador and Honduras, the nation-wide baseline was planned to be done mainly in a centralised manner by national-level entities, but the regular monitoring phase is expected to be largely decentralised to service providers and municipalities, as shown in Table 2.

Table 2: Matrix with proposed responsibilities for regular monitoring in El Salvador.

Data collection	Validation	Processing	Publishing of results	Analysis	Identifying corrective measures
Self-reporting by service providers	In municipal Water Roundtables, bringing together municipal officials and water committees. ANDA (national utility) revises information to identity obvious errors and uploads to database	Automatised but under supervision of ANDA	ANDA makes national synthesis report. Municipalities make local reports based on the results from database, where needed supported by ANDA	Municipal Water Roundtables do this jointly	Municipal Water Roundtables do this jointly, supported by ANDA or other PATs

This matrix (Table 2) needs to be compared to the information obtained in the first step (Box 1), so as to assess whether the weaknesses identified earlier are being addressed. Outstanding weaknesses can be discussed and resolved over time. Various rounds of iterations may be needed to come to a final decision. The different institutional arrangements in the three countries may serve as a reference for similar decision-making elsewhere (see **Error! Reference source not found.**). Once the responsibilities are confirmed, further details can be added such as the frequency with which data collection is undertaken and the tools to be used. The results of this work should be captured in a reference document such as an operational manual or institutional guideline.

Box 4: Considerations in institutional arrangements for monitoring across the three countries.

The following options were considered for the various steps in monitoring

Data collection
- Self-monitoring by service providers. This would be a low-cost option, as the bulk of the work would be done by service providers themselves and many already do this in an informal manner. Providing service providers with standardised formats could greatly enhance this. However, there would be little incentive for service providers to take up this formal task and report to central information systems. Many may not have the capacity to do this work. In all three countries, it was decided that this modality would only be promoted in the medium term, so adequate capacity could be developed.

- By the municipality. In the context of decentralisation, municipalities often have a mandate for monitoring. However, similar to service providers, capacity for monitoring is limited, and many will need initial support. In all 3 countries it was decided to give municipalities an oversight role over data collection, rather than doing this directly.
- By a centralised agency like SANAA (Honduras), ANDA (El Salvador) or SENASA (Paraguay). The advantage would be that they have technical capacity for large-scale data collection. Besides, they would be able to mobilise additional capacity, e.g. contracted enumerators. However, this was only considered feasible in a first baseline effort and not for regular monitoring rounds.
- By implementers. Both government agencies and NGOs that implement water projects regularly carry out assessments. This information could feed into a service delivery monitoring system. However, often their geographical scope is limited and they cannot collect data on a regular basis. In Honduras, it was decided that these agencies could contribute to the baseline, but not to regular monitoring.

Validation
Various modalities for validation were discussed:

- Spot checks by a supervisor, to verify data is captured correctly.
- By the administrator, who can check whether survey forms are complete and do not have obvious errors (e.g. wrong use of units).
- Validation by municipalities and service providers. Once reports are generated, these local actors can check whether data about their services are correct.

In all cases, a combination of the three would be used, with spot checks only considered in the calibration phase, to see whether survey questions are clear and not open to ambiguities. Based on this, simple checks could then also be built into the software so that checks would be minimised.

Processing and publications of reports
The responsibility for this typically lies with the administrator, as it would be largely automatised in the information system. Though originally envisaged mainly as a supervisory role, in fact this appeared to be substantial during the initial development phase in Honduras, as errors in indicator definitions and algorithms and content of reports needed to be adjusted.

Interpretation and corrective actions
As all monitoring systems are designed to be open, any interested institution could use the information for its own purposes. However, it was recognised that often an active dissemination and learning strategy is needed to make most use of the results. The discussions focused particularly on the role of stakeholders at decentralised level: municipalities, PATs and service providers. Three scenarios were identified:

- Local actors could access and use the data directly. However, many of these would not have the capacity nor the incentive to do so. There would be a risk that the system remains under-used.
- Use only by a trained PAT. This PAT would interpret the data and identify corrective actions to be taken among the service providers in the area. Whereas this may be efficient, it would not build capacity of municipalities and service providers to analyse their own performance and act upon those.
- Facilitated interpretation. In this case, the PAT would facilitate a joint interpretation of results with municipal staff and service providers to plan for corrective actions. This modality is seen as most relevant in the first rounds of monitoring so that capacity for data analysis can be built. Eventually, the expectation would be that the degree of PAT support would reduce and that this can be done within existing coordination platforms between municipality and service providers, such as the Water and Sanitation Committees in Honduras and the envisaged Water Roundtables in El Salvador.

In addition to the specific roles for each step, two overarching institutional arrangements need to be defined:

- **Administrator**. This role (as defined in Step 2b) is crucial as the administrator not only manages the information system, but also plays a coordinating role ensuring that all steps are fulfilled and that all stakeholders contribute. In all three cases, this role is envisaged to be filled by the centralised agency. It may even need a specific unit within the agencies, so it can have dedicated resources
- **Governing body**. In most cases, the exercise of defining the institutional arrangements will result in a large number of institutions being directly involved, with possibly an even larger group of potential users. In order to ensure that this multi-stakeholder set-up will continue working adequately, and even develop further, due consideration should be given to the governing body for it. One option could be to place the ultimate decision-making and oversight with the administrator, but that may disempower other stakeholders to engage with it. An alternative could be the establishment of a governing body (in the form of a steering committee or working group) that represents the various stakeholders so that future decisions on the implementation and development of the monitoring system are also taken with these interests in mind.

Step 4: Costing and responsibilities for financing
A final step is the costing of monitoring and defining responsibilities for financing. So far, few references exist on the costs of monitoring. Pearce (2013) provides an overview of unit cost data for water point mapping, showing costs of around 0.10 US$/capita. Even though these provide a good first indication of the order of magnitude, they may not apply in Latin America, as they mainly refer to water points and not to piped

supplies, which are common in Latin America. Besides, these often only refer to the mapping and would not include interpretation and corrective actions.

Therefore specific detailed budgeting exercises were carried out, differentiating between initial baseline and regular monitoring. This included all possible costs such as staff time, travel and material and equipment. It is important to quantify all time costs, including those of government staff and service providers, even if these are often not considered a direct cost, as their salaries are paid anyway, or because this is a voluntary time dedication. An example is provided in **Error! Reference source not found.**.

Box 2: Costing of the baseline and regular monitoring in El Salvador.

In El Salvador the baseline will be done by the national utility (ANDA). A detailed budget was made for this showing a cost equivalent to about 0.39 US$ per rural inhabitant. This is considered only justifiable for a first baseline, but not feasible for regular monitoring. To test the feasibility of the proposal to decentralise this, a detailed budget was made (see below), thereby also quantifying time of local government staff and water committees, and assuming an annual frequency of monitoring. The costs of this are much lower at about 0.11 US$/person/year. To this, a one-off cost of building capacity of local stakeholders has to be added, equivalent to about 0.08 US$/year.

The originally budgeted data can be validated through the calibration or piloting. This requires that expenditures and time dedication are carefully tracked. Even though unit costs during a pilot are often relatively high, as it takes time for everyone to get used to the monitoring system and there may be still errors in the information system, it can still give an indication on the orders of magnitude or whether adjustments need to be made. In Honduras, two pilots were done, which indicated costs of 0.24-0.34 US$/person.

The costs are then used to confirm responsibilities for financing them. The following can typically assume a share of the costs:

- **PATs**. Because of their mandate to provide post-construction support, PATs should do monitoring of service providers in their area. They could assume these costs, particularly of their staff and travel. These may eventually need to be recovered from a national or local authority, depending on how the PAT is funded.
- **Municipalities.** They often have a formal mandate for monitoring and could take up a share of regular monitoring costs. In this way, the total costs of monitoring are shared among all municipalities in a country. The risk is that not all municipalities establish budget lines for this.
- **Service providers**. Similar as for municipalities, dividing the costs among all service providers would lead to a low cost per service provider. But there is the same risk that they do not dedicate the time to it.

- **National level agencies**. This is where costs for initial development and baseline assessment are mostly covered, often through externally funded programmes. These may also cover the recurrent costs of administering the information system and providing support to the decentralised entities.

To verify whether these different institutions, particularly the decentralised ones, can actually assume the costs, it may be necessary to do a feasibility check, by reviewing all recurrent costs that these institutions have around water (for example using a Life-Cycle Cost Analysis, proposed by Fonseca et al., 2011). The expected costs for monitoring can then be compared to these recurrent costs, and an assessment made on the feasibility of adding the costs of monitoring. Based on the results of this analysis, the proposed institutional set-up and cost sharing mechanism can be confirmed, or adjusted, by choosing a different set-up or changing the ambition, e.g. a lower frequency of monitoring.

Conclusions

Service delivery monitoring can be an important contribution to the sustainability of rural water supplies. It may provide post-construction support providers with the information to target support activities to community-based service providers. Moreover, the data can be used by service providers and municipalities to take corrective actions themselves, or use it for purposes such as planning and regulation.

However, many monitoring systems suffer from sustainability problems themselves. If it is not clear who is responsible for the various steps in monitoring and assuming the costs involved, systems may not get updated regularly or remain under-used. It is therefore key to institutionalise the monitoring system alongside its development, so that responsibilities, including those for financing, can be defined in a realistic manner and possibly adjusted.

This paper has provided a generic approach for defining a rural water supply monitoring system alongside its institutionalisation into the sector in the context of Latin America. This approach, best applied in a multi-stakeholder process, under the coordination or leadership by the relevant government agency, provides a series of steps going from an assessment of current practices to the detailing of institutional arrangements.

Based on initial application in El Salvador, Honduras and Paraguay, some first lessons have been identified. Even in the absence of a country monitoring system, a range of monitoring practices may already exist that can be built upon. The mapping of these opens up the possibility of considering a wider group of stakeholders who could eventually be users of the information, as well as contributing to the efforts and costs of data collection.

Centralised options for monitoring, whereby national-level agencies do the bulk of data collection, may be appropriate for a baseline. However, this tends to be relatively expensive and is often only feasible when there is an externally-funded project or programme to support it. For regular monitoring, it may be more feasible to consider decentralised monitoring by municipalities and service providers themselves, provided the system allows for aggregation to higher levels of scale. This also fits better with the mandates of these entities in the context of decentralisation. The disadvantage is that many of these will initially not have the capacity nor the incentive to carry out all steps in monitoring and support may be needed.

It is important to introduce sector-wide monitoring through a number of phases, including some pilots, which are documented and analysed. This provides an important testing of the information system, but also of the institutional arrangements and may serve also to validate the costs. It is also important to achieve more ownership and commitment from the relevant stakeholders.

Finally, it forces to make the costs of monitoring - and the financing of those - explicit, which in turn can be used to assess the feasibility of the proposed institutional arrangements. It is felt that in this way, risks can be identified at an early stage, and alternative options considered, so that more sustainable service delivery monitoring systems are developed.

References

Adank, M., Smits, S., Bey, V., Pezon, C. and J. Verhoeven. 2013. *Development and use of service delivery indicators for monitoring rural water services*. Paper submitted to the Symposium Monitoring Sustainable WASH Service Delivery, Addis Ababa, 9-12 April 2011.

Anon. 2012. *Manual usuario de SIASAR.*

Fonseca, C. et al., 2011. *Life-cycle costs approach: costing sustainable services*. (WASHCost Briefing Note 1a). The Hague: IRC International Water and Sanitation Centre.

Kayser, G., Griffiths, J., Moomaw, W., Schaffner, J. and Rogers, B., 2010. Assessing the Impact of Post-Construction Support—The Circuit Rider Model—on System Performance and Sustainability in Community Managed Water Supply: Evidence from El Salvador. In: *Proceedings of the International Symposium on Rural Water Services, Providing Sustainable Water Services at Scale, 13 - 15 April 2010, Kampala, Uganda*. The Netherlands: Thematic Group on Scaling Up Rural Water Services.

Pearce, J. 2012. *RWSN Water Point Mapping Group: A Synthesis of Experiences and Lessons discussed in 2012*. St. Gallen, Switzerland, Rural Water Supply Network.

SANAA, 2009. *Sistema de Información de Acueductos Rurales (SIAR) database*. Tegucigalpa:Servicio Autónomo Nacional de Acueductos y Alcantarillados.

Schweitzer, R.W. and J.R. Mihelcic. 2012. Assessing sustainability of community management of rural water systems in the developing world. In: *Journal of Water, Sanitation and Hygiene for Development* 2 (1): 20–30.

SIASAR. 2012. *Sistema de Información de Agua y Saneamiento Rural*. www.siasar.org.

Smits, S. Tamayo, S.P., Ibarra, V., Rojas, J., Benavidez, A. and V. Bey. 2012. *Gobernanza y sostenibilidad de los sistemas de agua potable y saneamiento rurales en Colombia*. Monografía No. IDB-MG-133. Banco Interamericano de Desarrollo, Washington, DC.

Smits, S. y Rivera, J. 2013. *Institucionalidad del Sistema de Información de Agua y Saneamiento Rural (SIASAR) en Honduras*. SANAA, Tegucigalpa, Honduras.

Smits, S. 2013 forthcoming. *Hacia un sistema de monitoreo para agua potable y saneamiento en zonas rurales de El Salvador*. ANDA, San Salvador, El Salvador.

Smits, S., Uytewaal, E. y Sturzenegger, G. 2013 forthcoming. *Una guía metodológica para: Monitoreo de la sostenibilidad de servicios de agua y saneamiento en zonas rurales de América Latina*. Banco Interamericano de Desarrollo, Washington, DC.

Uytewaal, E. 2013 forthcoming. *Hacia un sistema de monitoreo de los servicios de agua y saneamiento rural en Paraguay*. Asunción, Paraguay.