

# The Challenge of Managing Non-Revenue Water

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## Putting things in perspective

One of the major challenges facing water utilities around the world but especially in Low and Middle Income Countries (LAMIC) is the high level of water losses either through physical losses (leakage) or commercial losses (customer meter under-registration and theft of water in various forms). This difference between the amount of water put into the distribution system and the amount of water billed to consumers is known as “Non-Revenue Water” (NRW).

In a recent World Bank publication an attempt was made to quantify the worldwide water loss problem and the figures are shocking. The global annual volume of NRW was (conservatively) estimated to be in the order of 50 billion cubic metres – and the total cost to water utilities caused by higher production cost and lost revenues was estimated at US \$15 billion per year.

Sadly enough, two thirds of the volume of water lost is lost in LAMIC where every drop of water and every cent of revenues is desperately needed to satisfy the ever increasing demand.

In LAMIC water utilities 60 million cubic metres are lost daily through leaky pipes and 40 million cubic metres are delivered every day to customers but are not invoiced because of factors like pilferage, employees’ corruption and poor customer metering.

These challenges seriously affect the financial viability of water utilities through lost revenues, wasted water resources and increased operational cost, thus reducing their capacity to fund necessary expansions of service, especially to supply the urban poor.

To put this in perspective, the value of water lost every year in LAMIC water utilities through commercial losses - water actually delivered but not invoiced - is estimated to be more than US\$ 4 billion. This is nearly fifty percent of the total yearly investment in potable water infrastructure in the developing world.

### Clear benefits from NRW reduction

Reducing NRW in low and middle income countries to just half the current level would deliver the following benefits:

- Every year 11 billion m<sup>3</sup> of treated water would be available to service customers.
- 130 million people more could gain access to water supply
- Water utilities would gain access to an additional US\$ 4 billion in self-generated cash flow
- Fairness among users would be promoted by acting against illegal connections and those who engage in corrupt meter reading practices.
- Consumers would have improved service from more efficient and sustainable utilities.
- New business opportunities would be created for NRW reduction activities, with thousands of jobs created to support labour-intensive leakage reduction activities.

## Why do water utilities have high levels of NRW?

A high NRW level indicates a poorly run water utility that lacks the governance, autonomy, accountability and the technical and managerial skills necessary to provide reliable service.

Not understanding the magnitude, sources and cost of NRW is one of the main reasons for insufficient NRW reduction efforts around the world. Only by quantifying NRW and its components, calculating appropriate performance indicators and turning volumes of lost water into monetary values, can the NRW situation be properly understood and required action taken.

And even if NRW reduction is put on the agenda of a water utility it does not automatically mean that the efforts will be successful. Too often there is a complete lack of incentives for management and staff and substantial knowledge deficiencies. Failed NRW reduction efforts further discourage utility owners and key decision makers to invest in NRW reduction as the risk for poor project performance is simply too high.

### **How to introduce change?**

The benefits of NRW reduction are so obvious - but decades of work on the subject has not delivered much improvement in the sector in LAMIC. The reasons are manifold – but the underestimation of the complexity of NRW management and the underestimation of potential benefits are the two main reasons.

As long as utility owners are not sufficiently aware that they are “sitting on a goldmine” and therefore do not incentivise or oblige their utility Chief Executive Officers, (CEOs) (for example by paying or withholding subsidies) not much will happen.

On the other hand as long as utility CEO's are not sufficiently informed about the level, causes and cost of NRW and the improvement potential they will not be able to convince their owners to provide funding for NRW management activities and investments. And as long as neither the owners nor the CEOs are fully aware of the issues and in support of comprehensive NRW management it will be difficult to motivate utility staff.

The conclusion seems to be that awareness raising at local government / municipality level in combination with basic information on NRW management for key decision makers and CEOs is a precondition for the introduction of change in the water sector in LAMIC.

IWA is ideally positioned to address the issue and organise special events for the target audience – both in completely new ways or as special programs within the existing series of conferences. This could be done by making use of the wealth of experience in the Water Loss Task Force on the one hand and teaming up with organisations like the World Bank or the Asian Development Bank (just to mention two) on the other hand. The LAMIC TF will certainly be most interested in facilitating such activities.

### **Assessing the situation**

NRW management is not technically difficult, but it is complex. Properly understanding the baseline situation is a critical first step in moving toward an effective reduction program.

It is noteworthy that despite the fact that many utilities in low and middle income countries have implemented NRW reduction programs with donor funding, it is rare that a comprehensive water balance was actually developed and calculated. It is no wonder, therefore, that the end results often fail to match expectations.

Establishing the IWA water balance (in accordance with the Best Practice Manual “Performance Indicators for Water Supply Services”) and the calculation of appropriate performance indicators should always be the first step.

Often the most basic information is initially not available (like the system input volume, average pressure, supply time, length of mains and number of service connections) and working on the water balance and the calculation of performance indicators will reveal such deficiencies and bring them to the attention of the management which can take corrective action.

## **Getting the organisational setup right**

NRW management should be the “centrepiece” of good utility management in LAMIC water utilities. But the reality is different: often a few technicians with insufficient resources form the “leak detection unit” and this unit is placed all the way down somewhere under the technical or operations department. Such a unit will obviously not have a strong voice in the organisation.

In many cases the best solution is to create the position of an NRW manager reporting directly to the CEO who needs to be aware that NRW management is a full time job and needs sufficient staff, offices, facilities, equipment, means of transport and operations budgets.

## **Ensuring sufficient incentives at all levels**

First of all, there has to be an incentive for the utility as a whole. Recent findings suggest that the right incentives can be put in place in a public utility within a broader framework of encouraging autonomy, accountability, and market and customer orientation.

The second level would be to incentivise the CEO and his management team.

The third, most difficult and most important level is to provide sufficient incentives for all the members of staff that actually have to DO the NRW reduction activities.

The success of NRW reduction efforts largely depends on the efforts made by the lowest paid staff in the field. A well designed staff incentive scheme seems to be a precondition for success taking into account the low level of salary in general, and for young field staff in particular in the vast majority of LAMIC water utilities.

## **Flow, pressure and supply time monitoring**

What you don't measure you can't manage! And still, most LAMIC water utilities do not record pressures in the distribution network, do not measure supply time (intermittent supply is the rule rather than the exception in LAMIC water utilities) and sometimes not even the system input is measured.

For obvious reasons a water utility should have accurate water production data. But the importance of pressure and supply time information is not to be underestimated. The level of leakage depends on the level of pressure (10% more pressure means approximately 10% more leakage) – and of course on the supply hours per day (whether a pipe burst leaks 12 or 24 hours makes a difference!).

## **Mapping**

Unfortunately too often water utilities have poor records of their underground assets and do not take any action to improve the situation. Updated maps are a precondition for physical loss reduction and also for the fight against illegal connections. Updating of maps is of course only a first step and the objective has to be the establishment of a GIS.

## **Reduction of physical losses**

It is always the small leaks that leak for a long time that are responsible for the biggest volume of water lost. The big bursts that come to the surface are normally repaired quickly and the volume of water lost is therefore small. In general, more than 90% of all leaks do not come to

the surface and can only be detected with various types of leak detection equipment – and in most cases this can only be done during the quiet night hours. Therefore well trained leak detection staff with regular night time working hours is a precondition for a low level of leakage.

Another important aspect is zoning of the distribution network. Especially if the infrastructure is in poor condition it is extremely difficult to successfully manage physical losses at low levels in large network zones. Small zones are needed (called DMAs – District Metered Areas) to keep leakage levels low and these small zones are also useful for pressure management. Ideal DMA size depends on a number of factors but mainly on the infrastructure condition and in the LAMIC context the average size should be in the order of 1,000 service connections.

### **Reduction of commercial losses**

When talking about the reduction of commercial losses it has to be differentiated between customer meter under-registration and all kind of water theft. By introducing good customer meter management (system condition specific meter selection, testing, maintenance, replacement) meter under-registration can be kept to a minimum.

The fight against illegal connections, meter tampering and meter reader corruption is not a technical but a political problem. Only with the full support of the utility owner, local government and utility management can this (everlasting) battle be won.

However, the level of commercial losses is nearly always over estimated – sometimes because of simple lack of information and wrong perceptions but mostly because nobody can imagine that physical losses account for such a large part of NRW.

### **Utilising the private sector**

Outsourcing of water loss reduction activities is nothing new, it has been done in industrialized countries for decades. In low and middle income countries a rather new trend can be observed – outsourcing of NRW reduction (or only leakage reduction) under performance based contract arrangements.

Such contracts were used for example in Sao Paulo (Brazil), Kuala Lumpur (Malaysia), Bangkok (Thailand) and most recently in Ho Chi Minh City – the first time that the World Bank is funding such a contractual arrangement.

Using the private sector is certainly no panacea for reform or for getting utility management and staff involved in NRW management, but can be a worthwhile option to substantially reduce NRW in a short time and put all systems in place that are needed to maintain a low level of NRW.

### **In summary**

After decades of trial and error in the best case or no action at all, it is high time that water utilities in low and middle income countries get serious about NRW reduction. the Philippines Water Works Association should play a leading role in conveying the message to its members, local governments and the top management of all water utilities in the country.

## References

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