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Addressing the social consequences of tariffs for water supply and sanitation - Environment Working Paper No. 166

By Xavier Leflaive (1), Marit Hjort (2)

(1) OECD Environment Directorate
(2) OECD Environment Directorate (at the time of drafting; then UNDP)

Authorised for publication by Rodolfo Lacy, Director, Environment Directorate.

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Abstract

Where they exist, tariffs for water supply and sanitation services face a tension between different policy objectives, such as ensuring the financial sustainability of service provision and ensuring access to all, including vulnerable and poor social groups. Governments (local and national) resort to a range of measures to reconcile these objectives and address social consequences of tariffs: tariff levels and structures, nudging, budgetary transfers, targeted social measures.

The paper revisits most common practices and discusses their pros and cons, and requisites to make them work. It provides up-to-date analyses on a series of related issues, such as definitions of affordability, principle for cost recovery, benefits and costs of metering, elasticity of domestic water use to prices, fiscal transfers to water services. The paper is informed by recent academic research, data on selected countries, and interactions with OECD bodies.

Key words: water supply, sanitation, SDG 6, tariffs, financing, access, affordability, equity, metering

JEL classification: D12, D63, H23, H4, H53, H54, L95, L98, Q53, Q58

Résumé

Lorsqu'ils existent, les tarifs pour services d'eau et d'assainissement sont au confluent de plusieurs objectifs en termes de politiques publiques, comme financer le service de manière durable, et garantir l'accès à tous, y compris aux populations vulnérables et pauvres. Les gouvernements (nationaux et locaux) recourent à diverses mesures pour concilier ces objectifs et résoudre les problèmes sociaux que peut poser la tarification des services d'eau : le niveau et la structure des tarifs, la communication auprès des usagers, des mesures fiscales, ou des mesures sociales ciblées.

Cet article passe en revue les mesures les plus souvent rencontrées, évalue leurs forces et leurs faiblesses, ainsi que les conditions de leur succès. Il offre des analyses actualisées sur un ensemble de questions conjointes, telles que les définitions de la capacité à payer, le principe de récupération des coûts, les coûts et les avantages des compteurs d'eau, l'élasticité au prix de la demande en eau pour usages domestiques, les mesures fiscales pour les services d'eau. L'article s'appuie sur des recherches académiques récentes, des données sur un ensemble de pays, et des interactions avec les groupes de travail de l'OCDE compétents sur ces questions.

Mots clés : eau potable, assainissement, ODD 6, tarifs, financement, accès, capacité à payer, compteur

Classification JEL: D12, D63, H23, H4, H53, H54, L95, L98, Q53, Q58

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1. Take-away messages

Billions of people live in developing countries without access to safe water supply and sanitation (WSS), demonstrating the urgent needs for investment in services across the globe. In developed countries, governments and utilities need to accelerate the renewal of existing assets, adapt infrastructure to a changing climate and to implement more stringent health and environmental regulations. By contributing to enhanced water security, investments in water supply and sanitation can drive sustainable development. These investments are all the more pressing that the global health crisis triggered by Sars-CoV-2 confirmed that access to safe water provides the first line of defence against many infections.

In line with the Recommendation of the OECD Council on water, this paper takes the view that, while economic policy instruments should reflect each country's social and economic conditions, tariffs for water supply and sanitation services have a role to play to ensure efficient and fair service delivery and sustainable financing. It recommends that authorities - national or local - set tariffs for water services that cover the operation, maintenance and renewal costs of infrastructure and a progressive proportion of capital costs, where possible. Where considered, tariffs can be combined with taxes and transfers from the international community (where available) - i.e. the 3Ts. They should also be combined with other policy instruments, such as nudging and raising awareness of the costs and quality of water services.

The paper notes that tariffs for water supply and sanitation services matter from economic, financial, social and environmental perspectives. It also acknowledges that tariffs have social consequences, in particular when access to safe water and sanitation is compromised by costs that can be excessive for disadvantaged social groups. Such concerns are particularly acute in the current context of a looming economic crisis, which will affect the revenues of significant segments of the population globally and push between 70 to 100 million people into extreme poverty (see World Bank projections; consulted 12 June 2020).

While the social consequences of water tariffs are real and diverse, attempts to attain several policy objectives (including social ones) through the same instrument mostly fail. This observation is in line with the Tinbergen principle.

The paper argues that tariffs are best designed to secure sustainable financing for service provision. They can contribute to other policy objectives (economic efficiency, water resource management, inclusion and equity), which are best achieved through a combination of related policies. In OECD countries, where administrative capacities and social policies are already in place, targeted social measures can address concerns with vulnerable groups, in particular affordability, at least costs for the community.

This general point needs some qualification. First, the efficiency of tariffs as instruments to manage domestic water demand depends on households' response to price signals. The literature suggests that this response is usually limited, in particular in the short term. Accompanying measures, such as nudging, can enhance the elasticity of domestic water demand to price.

Second, while authorities and service providers allocate considerable amounts of time and efforts to designing and adjusting tariff structures to accommodate multiple policy objectives, they usually fail to combine efficiency and equity objectives. Cheap water

deprives utilities from revenues needed to extend coverage and improve service quality, ultimately at the detriment of proper maintenance and the services for poor households. Increasing-block tariffs - which provide water for basic needs at a lower price – can be progressive when they meet two conditions: i) highest tariff blocks are set well above the average cost of service provision and income generated serve to cover the costs of the subsidised lower block; and ii) they take into consideration that poor households can actually consume more water than wealthy ones (because they have larger families, or less water-efficient networks or appliances).

In practice well-targeted tariff structures are complicated and difficult to understand: they may be perceived as opaque. They require information on water use and household features (for instance on the size of households, age and physical conditions of individuals) that are either costly to collect or not accessible to service providers. This explains why sophisticated tariff structures can fail to target the households most in need.

Third, as fiscal transfers can be justified to cover part of the cost of water services, public authorities must pay attention to which fiscal instrument is most appropriate. Different fiscal instruments have distinctive capacities to address the social dimensions of paying for water supply and sanitation services. The most appropriate fiscal instruments will depend on national contexts; they have a broad base and a social orientation. Property taxes can be used to capture some of the value added by reliable water supply and sanitation services.

The paper reiterates that affordability is a multifaceted issue, which does not merely refer to the capacity to foot the water bill. Affordability also relates to how water bills affect households' capacity to meet other essential needs (e.g. food or health care). It relates to the capacity to save (when water bills are issued every quarter or year) and to have stable revenues.

It follows that appropriate responses to affordability issues need to combine several dimensions. They can waive or modulate access fees, which can be disproportionate with households' capacities to save or incur debt. They can adjust payment schedules to match households' liquidity or irregular income. They are better delivered through targeted social measures than through the water bill. The most appropriate responses vary according to national and local contexts. They usually combine a capacity to target households most in need of support; low transaction costs, building on existing data and social programmes; and synergies with water conservation measures.

Several additional messages derive from analyses in the paper. They relate to practical issues, which help address the social consequences of tariffs for water supply and sanitation services.

Public authorities can encourage utilities to explore innovative business models and to diversify revenue streams. This is particularly cogent where volumes of water sold or treated wastewater decrease, affecting utilities' revenues and capacity to operate and cover the fix costs of water service provision.

Introducing metering at household level in existing built up areas can be disproportionately costly to support sophisticated tariff structures. Depending on context and history, metering can be used at block level, to detect leakage and raise users' awareness of water use. Where in place, metering can be used to generate data that increasingly supports decision making though sophisticated data management techniques.

While it is hardly considered in the related literature, the tariff-setting process matters. Tariffs for WSS services derive from inherently political processes: the definition of the

appropriate level of service; the price a community is willing to pay; the allocation of costs between different sources of finance (tariffs, taxes, transfers; and the different types of taxes); the (usually opaque) cross-subsidies between different types of users; or trade-offs between different (at times conflicting) policy objectives. Tariffs need to be questioned and reviewed over time, as consensus on these and related issues will evolve. Well-designed tariff setting processes give a voice to all water users, including those who do not have access to the service. They also ensure service suppliers are accountable for operational efficiency. This can minimise the cost of service provision in the long term and enhance households' willingness to pay for the service.

These messages apply to tariffs for water supply and sanitation in urban environments, globally. Additional research is required to adjust some of them to rural environments, where the costs of service provision can be disproportionately high, social consequences of water tariffs distinctively acute, and business models for water supply and sanitations services more diverse.

2. Rationale and objectives of the paper

Tariffs for water supply and sanitation (WSS) constitute an important instrument for economic, financial, social and environmental policy objectives, potentially reflecting costs of service provision. Where they are in place, tariffs for WSS services remain contested, notably on questions of affordability and equity (OECD, 2003; 2010). On the one hand, sensitivity to the social impacts of water supply and sanitation service provision is critical to fairness and to the success of water management programmes. On the other hand, contestation affects how pricing instruments are considered, designed and managed, hindering their capacity to deliver as policy instruments. This in turn affects water management and finance in OECD countries and beyond.

The issue of WSS pricing is all the more important as developed and developing countries face severe challenges to finance the operation and maintenance, renewal or extension of WSS infrastructure and services (OECD, 2015, 2020). In this context, it is critical that governments, national and local, develop adequate financing strategies and make the best use of tariffs to provide and sustain WSS services.

The Recommendation of the OECD Council on water (OECD, 2016c) takes a balanced approach to tariffs and pricing for water supply and sanitation. The OECD Council recommends that governments consider the following four principles for financing water resources management: Polluter Pays, Beneficiary Pays, Equity and Coherence between policies that affect water resources. The principles do not necessarily reinforce each other, and there can be tensions between them, typically between Beneficiary Pays and Equity (see OECD, 2012, for a more detailed discussion).

The Recommendation acknowledges that economic instruments should reflect each country's social and economic conditions. Tariffs for water services have a role to play, in combination with transfers from public budgets (e.g. taxes) and transfers from the international community (i.e. the 3Ts) to recover the costs of investment, operation and maintenance of water infrastructure as much as possible and where efficient (OECD, 2016c). Where pricing instruments are considered, the Recommendation argues for setting tariffs or charges for water services and all other uses that cover the operation, maintenance and renewal costs of infrastructure and a progressive proportion of capital costs, where possible.

At the same time, the Recommendation of the Council acknowledges the social concerns related to pricing water supply and sanitation services. The OECD Council recommends that, where pricing instruments are considered, governments would benefit from "accounting for redistributive consequences and priority water uses, based on affordability studies, equity for vulnerable groups and assessment of competitiveness impacts, as appropriate, taking into account the right to safe drinking water and sanitation" (ibid.).

It follows that any discussion on tariffs for water supply and sanitation services should consider both economic efficiency and financial sustainability objectives and objectives related to equity and fair social distribution of costs and benefits.

The OECD explored the issue of distributive impacts of water pricing already in 2003, resulting in the publication *Social Issues in the Provision and Pricing of Water Services*. The publication suggested ways of addressing the social issues related to WSS pricing, including through adjusting tariff structures. It also pointed to the negative implications of

solving the distributive challenges of water tariffs through the water bill, a claim that has been confirmed and reinforced by more recent OECD literature (OECD, 2010, 2015, 2020). The equity dimension of WSS service provision is better addressed through dedicated, targeted social measures (OECD, 2010; 2013c; Boland and Whittington, 2000; Schoengold and Zilberman, 2014; Grafton et al., 2014).

This report updates and strengthens key messages from earlier literature by the OECD and external authors, while further elaborating on essential discussions and adding elements of recent evidence. Compared to *Social Issues in the Provision and Pricing of Water Services* (OECD, 2003), this report provides a more comprehensive view on WSS tariffs as economic and financial instruments, as well as puts forward recent evidence regarding the challenges related to various tariff strategies, including their consequences for water utilities' revenues. Furthermore, this report addresses trade-offs that emerge when pricing for water supply and sanitation services attempts to address several policy objectives simultaneously, including financial sustainability for service providers and social considerations for a fair access to service, in particular for poor and marginalised groups. It acknowledges commonly made objections to the use of tariffs to finance WSS services, such as the human rights to safe drinking water and sanitation, and the relatively low price elasticity of water demand. It revisits the 3Ts (the combination of revenues from tariffs, taxes and international transfers that are the ultimate sources of finance for WSS; see OECD, 2009) and emphasises the importance of the tariff setting process.

This report focuses on tariffs for WSS services in the domestic sector. It does not cover water pricing for agricultural or industrial uses. While most of the developments apply to both developed and developing countries, the emphasis is on the former. Developing countries can be a source of inspiration, when they implement innovative and effective policy responses to the social consequences of tariffs for water supply and sanitation services. Informal settlements raise distinct issues though, which are not covered here.

Section 3 of the paper demonstrates why pricing is essential to the management of WSS services. The fourth section presents the potential trade-offs and limitations associated with pricing of WSS services. The final section considers several options for managing some of these challenges, building on recent developments and new evidence. It reiterates that social issues potentially triggered by WSS tariffs are best addressed outside the water bill.

3. Tariffs for water supply and sanitation services: A policy tool

This section presents the economic case for investment in WSS services, as well as discusses pricing as a water policy instrument, from an economic and financial perspective. In the next section, these distinctive features of pricing instruments are balanced with other objectives of water policies and service delivery, such as fairness and equitable access to all.

3.1. The economic case for investment in water supply and sanitation

The international community recognises the critical contribution of water to sustainable development. The Sustainable Development Goals include a dedicated and ambitious water goal, and explicitly refer to water in relation to several other goals. The OECD/GWP report *Securing Water, Sustaining Growth* (Sadoff et al., 2015) estimates that strategic investment in water security has the potential to contribute at least USD 500 billion to global growth annually; approximately half of that amount (USD 260 billion) is estimated to stem from providing universal access to safe WSS services (WHO, 2012). However, investment in water supply and sanitation infrastructure and services falls well short of global needs (OECD, 2016e).

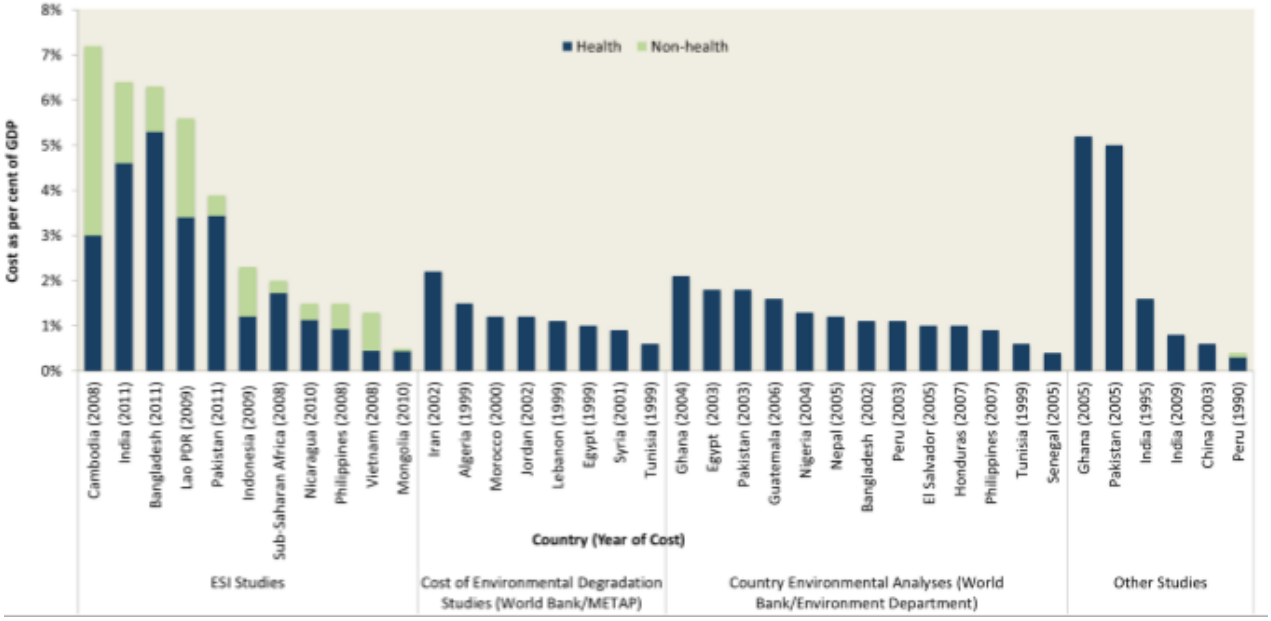
Currently, more than 2 billion people lack access to safe drinking water and 4.5 billion people (half of the world's population) do not have access to safely-managed sanitation. Poor sanitation, water, and hygiene lead to about 675 000 premature deaths annually, and estimated annual economic losses of up to 10% of GDP in some countries (Niger, Democratic Republic of Congo, and Somalia; see Sadoff et al., 2015; see also Figure 3.1). To achieve the Water-Sanitation-Hygiene component of the Sustainable Development Goals (SDGs) on water[1] by 2030, capital investment needs to multiply by three while operating and maintenance costs will be commensurately higher (Hutton and Varughese, 2016) (see Box 3.3 for further discussion of related investment needs).

Tariffs for water supply and sanitation services constitute important economic instruments, helping to minimise investment needs by managing demand (assuming water uses respond to price signals; see below for a discussion on elasticity of water use to price). They are also financing instruments, generating revenues that can cover expenditures associated with the provision of services. As stated in the Recommendation of the OECD Council on water (OECD, 2016c), tariffs for WSS are not a panacea and countries may consider alternatives to finance services. Where tariffs are considered, they do not operate in isolation and should be combined with other instruments and sources of finance (including taxes and transfers from the international community). The following sections argue how tariffs can best be used as economic and financial tools, where and when appropriate.

[1] The relevant SDGS read as follows:
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

Figure 3.1. Economic costs of poor water and sanitation in selected countries

as a percent of gross domestic product, disaggregated by health and non-health damages



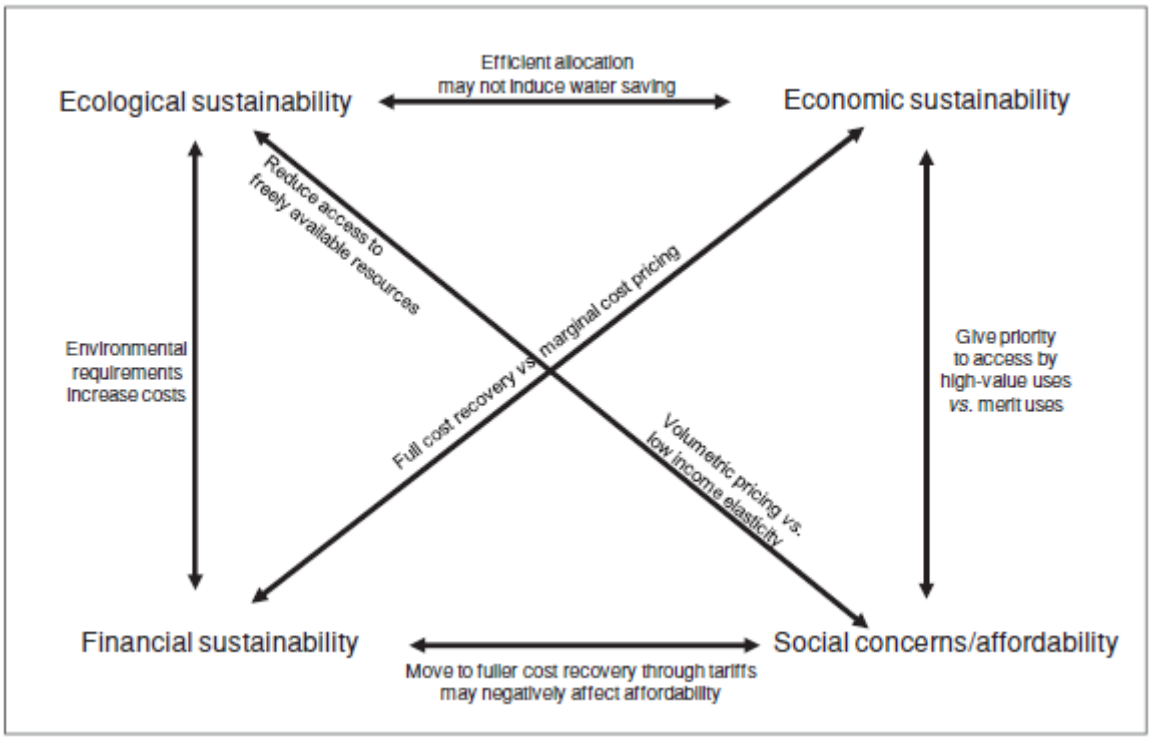
Source: Hutton, Chase (2016).

3.2. Tariffs as policy instruments. Potential trade-offs between policy objectives

WSS tariffs serve multiple policy objectives. These may support one another, but are also potentially conflicting. The objectives correspond to four different sustainability dimensions: i) financial sustainability, guaranteeing long-term operation of physical assets; ii) economic efficiency, allocating water to the most beneficial uses for the community and avoiding wastage of economic resources; iii) environmental sustainability, discouraging depletion of critical natural capital; and iv) social equity, securing adequate access to affordable water at fair and equitable conditions. Figure 4.1 displays the four policy objectives and the potential tensions and trade-offs associated with designing water prices.

The trade-offs and the capacity to address them evolve over time. Income improvements may enable a low-income community to face the prices needed to obtain services that were previously unaffordable; technological improvements might reduce costs; more effective institutions might emerge; social learning processes might enable the community to accept previously unacceptable solutions (*e.g.* pricing). It follows that pricing strategies would benefit from recurrent assessments and revisions (OECD, 2010; 2015).

Figure 3.2. Policy objectives and trade-offs affecting water pricing policies



Source: Based on Massarutto, A. (2007), "Abstraction Charges: How Can the Theory Guide Us?", presentation made at the OECD Expert Meeting "Sustainable Financing for Affordable Water Services: From Theory to Practice", November.

Tensions are likely to occur between the objectives associated with economic efficiency and financial sustainability. The optimal tariff-setting rule from the point of view of economic efficiency may be inconsistent with financial sustainability and may provide adverse incentives for investment.

Economic efficiency objectives focus on allocating water resources to the most beneficial uses for society, avoiding over-investment, using existing facilities efficiently, and ensuring the operational efficiency of water systems. The economic literature on water pricing generally recognises long-term marginal cost (MC) pricing as the first-best pricing option (OECD, 2010).

However, several factors have led critics to call into question the relevance of applying MC pricing to water management. Firstly, MC pricing only secures sufficient revenue to cover costs if MCs are higher than average costs; this is rarely the case for water utilities. While principles of MC pricing ignore the existence of fixed costs, and determine the producer surplus uniquely based on the slopes of the demand curve and the MC curve, water utilities typically face very high fixed costs. For example, the fixed costs of urban water services in Germany amount to as much as 85% of total costs (Green, n.d.). Besides, due to the high capital intensity of water management, investments to meet increases in demand create a saw tooth pattern of average costs (Green, n.d.).

Secondly, because many urban water utilities constitute monopolies, average costs are likely to decline, rather than rise, with increasing supply. Therefore, in order to ensure stable revenue flows that can cover costs and secure the accumulation of funds for future

investment, volumetric tariffs for WSS services are often supplemented by a fixed cost (Grafton et al., 2014).

Finally, MC pricing of water for residential use is challenged by the variability and uncertainty of water supply and demand, as there is no standard answer to whether marginal costs should be based on current water supply capacity or augmentation to existing capacity. Although methods have been developed to estimate the marginal costs associated with incremental increases to capacity, these have limitations, as they are unable to take into account uncertainty in timing and quantity of future supply augmentations (Grafton et al., 2014).

Another issue that sparks controversy in the debate regarding WSS tariffs is the potential conflict between financial sustainability through increased tariffs and social equity through access to affordable services (OECD, 2010). Equity is concerned with the fairness of the allocation of resources across a given population. From an equity perspective, special attention should be paid to such groups as indigenous people, poor households, or disabled or sick people, as they may lack equal access to essential services, or be more vulnerable to poor service quality. As efficiency only requires that total welfare is maximised, there is no requirement that the outcome is equitable: welfare maximisation does not consider distributional issues. As a result, equity objectives may sometimes conflict with efficiency objectives and both policy objectives need to be reconciled (OECD, 2011b; 2013a).

A commonly made objection against the use of tariffs as a financial instrument for water supply and sanitation services is that tariffs inequitably affect poor households, who need to allocate a larger share of their revenues to cover water bills (OECD, 2011b). However, in reality, the tensions between financial sustainability and social equity rest on a number of misunderstandings, and favouring one objective at the expense of the other may undermine the possibility of achieving either of them (OECD, 2010). For example, as already discussed, lowering tariffs for WSS services is likely to have disproportional negative implications for poorer households, as it deprives water utilities of revenues needed to expand the supply network and improve services.

3.3. Tariffs for water supply and sanitation services as economic instruments

3.3.1. Theoretical features of tariffs for WSS services as economic instruments

Efficient pricing of WSS services reflects the full social cost of water supply, including the negative externalities related to water use. In principle, WSS prices are designed to cover the long-run marginal cost of supplying water from existing water infrastructure, including up-front and O&M costs, or the cost of the next most affordable source of water. The problem with this approach is that it does not take into account the resource cost of water, reflecting its scarcity value, and the cost of pollution, and does not take account of refurbishment or replacement costs. The optimal economic solution is to set prices for WSS services based on three key elements: i) full supply costs, ii) resource costs (reflecting the scarcity of the resource), and iii) pollution costs (for further discussion, see OECD, 2011b; 2013a; 2016b).

Full supply costs (or financial costs) are costs associated with providing water supply and sanitation services to users without considering either the externalities of water consumption (positive or negative) or alternative uses of water (opportunity costs). The supply costs consist of i) operation and maintenance (O&M) costs, associated with daily running of the water supply system; and ii) capital costs, covering both capital for renewal

investment of existing infrastructure and new capital investment costs. The costs of servicing debt are normally included in i) or ii) (OECD, 2010).

The resource cost refers to the opportunity cost of using water. It reflects the cost of depriving the next possible user. If that user could have used water for a higher value, society experiences a welfare loss, defined as an opportunity cost. Thus, the opportunity cost mirrors the scarcity value of water among competing uses, including for environmental purposes. While supply cost is considered a financial cost, resource cost is an economic cost (OECD, 2010; 2011b; Reynaud et al., 2016).

Box 3.1. Abstraction charges and scarcity pricing

Abstraction charges - whether they are reflected in the water bills or not - offer several practical advantages for water management. By signalling scarcity, abstraction charges can contribute to manage water demand (doing more with less water), and to enhance water use efficiency (doing more with the same amount of water) (a regular feature of OECD publications on the issue; see OECD, 2010; 2013a; 2015b).

They make up an effective and efficient allocation mechanism in the context of competing users, directing water where it is more valuably employed (OECD, 2010; 2015b; 2017a). By allocating water efficiently, scarcity pricing allows managing the balance between water supply and demand, thus contributing to alleviate problems of water scarcity.

Furthermore, scarcity pricing of water resources can signal when new investments in water supply - such as large-scale water infrastructures - should be undertaken, thereby avoiding the considerable welfare losses associated with WSS tariffs being raised to cover the costs of poorly timed investments. In principle, efficient pricing of WSS services works as a market signal: a fall in water availability theoretically pushes the costs for users up and makes infrastructure investments profitable and at the same time raises revenues to invest in such infrastructure, thereby increasing water supply and balancing the supply and demand for water (OECD, 2010; 2011b; 2013a).

An alternative option to manage water supply variability under a given level of investment, is to offer water users a portfolio of water contracts, with different levels of water security and prices: users who want to ensure reliable supply and avoid mandatory water use restrictions would opt for a higher price; users less concerned about availability would opt for a lower price. This option acknowledges that different water users value water and water security differently, and are willing to pay a price that reflects this value (OECD, 2011b; 2016b). Just like scarcity pricing, a portfolio of water contracts can be more efficient and equitable than mandatory restrictions of water use in cases of droughts as such restrictions ignore the heterogeneity in values attached to water and the capacity to adjust to periods of water scarcity (OECD, 2015b; 2016b).

Practical difficulties associated with the calculation of abstraction charges and scarcity pricing are discussed in OECD (2010), Reynaud et al. (2016).

The economic costs of water also include pollution costs. This may for example refer to the costs associated with the release of pollutants upstream or downstream of an urban water system or piped waterways (loss of habitat). Resolving water quality problems through charges is based on the idea that pollution leads to declining water quality, which imposes costs, or negative externalities, on society and the environment. The problem of water pollution, therefore, arises because the full cost of declining water quality is not borne by

the polluter. This drives a wedge between the private costs of discharging pollutants and the social costs pollutants impose. The objectives of integrating pollution costs into water charges are to i) make polluters internalise the full cost of pollution, thus applying the Polluter-Pays principle; and ii) raise revenues that can cover the costs of e.g. pollution prevention, clean-up actions or monitoring (OECD, 2010; 2011b; Reynaud et al., 2016). Where the water provider is not the wastewater provider, the water piped to a household will have to be paid to be evacuated and treated through a separate service. The Polluter-Pays principle is here conceived of as a means to address *who* pays for negative environmental externalities in a fair way.

Reflecting the cost of pollution in bills for WSS services is an important means to raise users' awareness about the negative environmental externalities of household, commercial and industrial wastewater. It incentivises urban and notably rural water utilities' adoption of greener practices and technologies, including through investments in improved treatment of wastewater, and separation of the collection of wastewater and rainwater. Pollution costs can also incentivise consumers and such users as restaurants, laundries and hair dressers (which in the context of WSS tariffs are usually considered households, rather than industrial users), to adopt greener practices, thereby lowering the overall cost to society of meeting environmental targets. For example, households can reduce the release of unused pharmaceuticals into wastewater streams by switching to more sustainable practices (return unused drugs to industry instead of flushing them through toilets; see OECD, 2019). By taking into account the costs of negative environmental externalities, WSS bills can also be a means to cover the costs of restoration, protection or management of water resources. See the illustration from Lima, Peru, in Box 3.2 below.

It is useful to make a distinction between tariffs (set to cover the full supply costs) and (abstraction and pollution) charges that reflect the resource cost of water (see Box 3.1 above). They can all feature on the water bill payed by water users, but contribute to distinct policy objectives.

Economic instruments are theoretically more cost-effective than direct regulation of utilities and water users. For instance, Roibas *et al.* (2018) working on Seville's case, Spain, show that a rationing method based on price increases to face water scarcity would have had a lower impact on consumer welfare than the supply cuts that were actually implemented in Seville during the examined period. In the case of wastewater, regulation imposes the same controls on all polluters and does not take into account the heterogeneity of abatement costs. Pricing instruments also provide a dynamic incentive for additional pollution abatement, as polluters can reduce their costs by the amount of the pollution cost for each additional unit of abatement (see OECD, 2016b, for a recapitulation). Economic instruments deliver best when properly designed and able to target specific behaviour with adequate precision.

Box 3.2. Covering the costs of watershed conservation through WSS pricing in Lima, Peru

Prior to 2015, Lima's WSS prices failed to reflect pollution costs. For example, the tariffs did not consider the costs for the community of discharging wastewater into the Pacific Ocean. As a consequence, the cost of pollution was borne by local fishermen, in the form of reduced catches. In response to these pollution costs, the Peruvian water regulator, Superintendencia Nacional de Servicios de Sanaemento (SUNASS), took an innovative approach to tariff structures and established a reserve fund for watershed conservation, restoration and management in 2015.

SUNASS sets the WSS rates for all Service Providing Entities (SPEs) across the country, based on their Optimised Master Plans (OMPs), submitted to SUNASS every five years. The OMPs present a plan for rate increases over the following five years, as well as planned investments for a thirty years term. Prior to the establishment of the watershed conservation fund, the SPEs typically justified rate increased by pointing to the need to meet rising demand, and responded to this demand primarily by investing in grey infrastructure for supply. Since the creation of the conservation fund, SUNASS requires all SPEs to earmark 1% of revenues to invest in natural infrastructure and, in the case of Lima, an average of 3.5% for climate change adaptation and disaster mitigation. As a consequence, the SPEs now incorporate the costs of maintaining green infrastructure in its critical watersheds, including for purification of water, into its WSS pricing schemes.

For the major WSS service provider in Lima, SEDAPAL, serving more than 10 million people, the 4.5% earmarked for the conservation fund constitutes a significant amount of money. It is yet to be seen whether SEDAPAL succeeds in identifying suitable and efficient projects in which the funds can be invested. One limitation of the mechanism is that the level of public investment is determined by the level of revenues, not by cost-benefit analysis of allocating public funds.

Source: Nature Conservancy (n.d.), Lehmann, 2010.

3.3.2. A potential limitation of tariffs as economic policy instruments: elasticity of domestic water demand to price

A common objection against the use of tariffs for WSS services is that domestic water demand is price inelastic, so that raising WSS tariffs will not result in substantial reductions in consumption. Reynaud et al. (2016) state that while domestic users commonly are found to be sensitive to prices, the elasticity of water use to price changes is, in most cases, found to be relatively small (in the range -0.1 to -0.4). Thus, tariff increases need to be substantial to induce a change in water users' behaviour. Such increases may have direct social consequences for some consumers (Reynaud et al., 2016).

Claims that domestic water demand is unresponsive to price are undermined by a number of studies showing that: i) informing consumers about the volumetric price they pay on their water bill increases price elasticity; ii) consumers are more responsive to price changes the longer they have to adapt, meaning that the long-term price elasticity of water demand is greater than short-term price elasticity, calling for consistent water pricing policies over time; iii) price elasticity increases with higher prices, because at higher prices, water charges account for a larger share of household expenditures; and (iv) price elasticity of water demand depends on the local context and a number of variables, implying that

water pricing and conservation policies must be tailored to specific groups of users (OECD, 2011b; 2016b; Reynaud, 2015).

OECD studies confirm that price-based approaches can control long run urban water demand (OECD, 2011b). In New Zealand, in places where volumetric pricing has been introduced, this has been followed by significant decreases in the amount of water used, including for the residential sector. Having to pay for their actual water use, consumers have adopted water-saving habits (Watercare, n.d.). In Denmark, water prices were raised by 54% over two decades, leading to a 20% decline in water consumption (see Box 4.1).

Box 3.3. Price elasticity of water demand in Denmark

Denmark has a long tradition for water consumption metering and consumer charges for water supply and waste water treatment. Since 1992, urban WSS tariffs in Denmark have been based on full recovery of economic and environmental costs. During the period 1993-2004, water prices increased by 54 percent, leading to a decrease in urban water demand from 155 to 125 litres per person per day. In 2015, average consumption per capita was as low as 106 litres per day.

The average Danish family now pays 1.6% of their annual income in WSS charges. From the water bill paid by consumers, approximately 50% goes to the wastewater companies, 30% to the government and close to 20% to drinking water utilities.

A strong guiding principle for the financing of WSS services in Denmark is that supply policy and social policy should not be mixed. Thus, there is no social tariff, and affordability of water and waste water services is ensured via income support through Danish social policy.

Source: OECD,2007; OECD, 2011b; EurEAU, 2016 ; OECD (2017b).

Although relatively small, price elasticity of water demand can be used as a means to manage droughts. Research explores how dynamic pricing can signal scarcity and manage short term demand. Dynamic pricing at utility level models the potential impact of high tariff increases to cover short episodes of drought. In a particular context where elasticity of demand to price equals -.4, a 50% increase of the tariffs could trigger a 20% decrease in water demand, which may help address a drought on the short term (for a few days or weeks). Dynamic pricing is not appropriate to address frequent or lasting droughts, as changing prices may have social consequences, but can potentially help address short episodes of scarcity.

Studies emphasise that a combination of price- and non-price strategies is needed to achieve significant water use reduction. Regulation, education, information campaigns and stimulation and uptake of innovation in water efficient technologies play important roles in water conservation policies (OECD, 2016b; Reynaud, 2015).

3.4. Water supply and sanitation tariffs as financing instruments

3.4.1. The importance of generating sufficient revenues through WSS tariffs

The WSS challenge has to do with underinvestment, but also with investment that fails to deliver expected benefits to the community (e.g. in terms of achieving SDG 6). Box 3.3 presents the global financing needs of the WSS sector. While developing countries currently face the greatest WSS financing challenges, the needs of water finance are likely to increase in OECD countries in the future (OECD, 2003, 2015; OECD, 2020 for a focus

on the European Community). Currently, almost 100% of the population in most OECD countries have access to safe drinking water (OECD, 2010). A vast majority of city dwellers in OECD countries enjoy premium water and sanitation services (see Figure 3.2). However, increasing investments will be required in the future, driven by several factors. In Europe, the OECD considers economic growth and urbanisation as major drivers for further investment, especially where supply systems have already reached full capacity (e.g. Dublin, Ireland). Climate change is another driver, as it generates uncertainty as regards future water demand and availability; risks of prolonged droughts and heavier rains will translate into new infrastructure needs, to store water or manage storm water (OECD, 2020). Contaminants of emerging concern - such as pharmaceutical residues or micro plastics – will drive investment up, to adjust treatment capacities. Sludge management potentially adds another layer of costs (OECD, 2020).

Most importantly, in most OECD countries, future investments will need to catch up for past investment backlog, which leads to infrastructure decay (e.g. non-revenue water) and degraded service quality. The magnitude of the additional effort can only be assessed where the state of the assets is known with accuracy (OECD, 2020).

Box 3.4. Investment needs worldwide

The large financing needs in the water sector reflect substantial gaps in access to WSS. According to WHO/UNICEF (2017), as of 2015, 2.1 billion people still lacked access to safely managed drinking water services and 4.5 billion lacked access to sanitation compatible with the SDG 6 objectives. Payen (2011) estimates that more than 1.9 billion people use water that is unsafe and dangerous for their health, while 3.4 billion people use water of doubtful quality at least from time to time. However, due to inadequate monitoring options, world statistics fail to reflect the exact number of people living in such conditions. While the Millennium Development Goals (target 7c) sought to halve, by 2015, the proportion of the population without sustainable access to safe drinking water, only access to an improved water source was monitored.

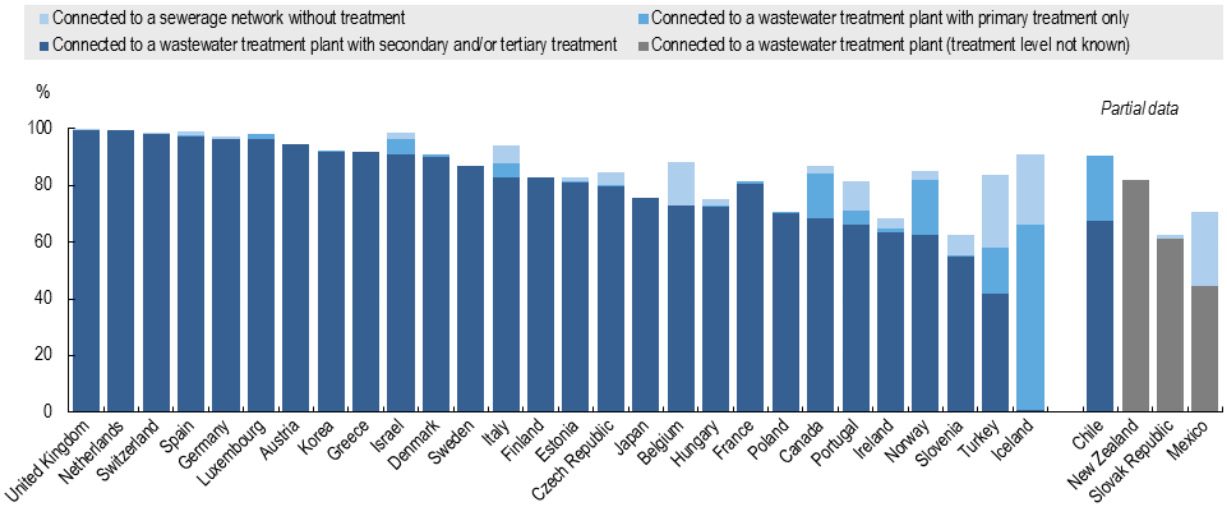
Poor sanitation, water and hygiene lead to about 675 000 premature deaths annually. Approximately 10% of the global burden of disease worldwide could be prevented with improvements to water, sanitation and hygiene and better water resource management. The burden of water-related diseases falls disproportionately on developing countries and particularly on children under five, with 30% of deaths of these children attributable to inadequate access to WSS. Wastewater from industrial and domestic uses often reach the environment untreated or insufficiently treated, resulting in major impacts on surface waters and associated ecosystems.

Hutton and Varughese (2016) estimate the costs of meeting the United Nations Sustainable Development Target of achieving universal and equitable access to safe and affordable drinking water for all by 2030. Cost estimates cover capital investment, programme delivery, operations, and major capital maintenance. The costs include only those of extending services to the unserved in 2015, and exclude the costs of maintaining access for those already served by a given service level in 2015. The present value of the additional investment needed globally until 2030 is around 1.7 trillion USD.

Source: WHO, UNICEF, 2017; OECD, 2011a; 2016b ; 2016e; Payen, 2013, 2011; UN, n.d.a ; Hutton and Varughese, 2016.

Figure 3.3. Percentage of national population connected to a wastewater treatment plant

OECD countries



Source: OECD (2016), Water: Wastewater Treatment (% Population Connected), OECD Environment Statistics (database).

In this context, water pricing is first and foremost a financing mechanism: it can generate revenues that can be used to maintain, renew and extend water infrastructure. If tariffs for WSS services are designed well, the revenues can be used to increase water access among low-income households. Keeping tariffs artificially low for all customers, including those who can afford the full price of the service, is a common tendency that leads to the vicious cycle of decaying infrastructure and deteriorating services. This in turn hurts the poor the most because poor households will need to procure water from private vendors often at greater cost and of poor quality. Even where the poor are connected to a public service, deteriorating services may hurt them disproportionately, as alternative options (*e.g.* bottled water) may be expensive (OECD, 2010; 2013a).

Contrary to common belief, the poor pay to access WSS services. When the service is not available, they pay in terms of time spent to fetch water ("coping costs"). Thus, for many poor households, the issue is not merely the ability to pay the WSS tariffs, but rather the ability to pay for a connection to the network (i.e. the capital costs of extending infrastructure to the poor). It relates to having sufficient liquidity to pay tariffs in large sums as well (i.e. monthly or annually; while coping costs are paid in a fragmented, typically daily basis), as the ability of poor households to save is limited. Devoto et al. (2012) show that access to credit, rather than costs, may be a significant barrier to improvement in households access to water services. Poor households may also have variable, unpredictable incomes.

Ensuring the connection of poor households to central water supply would ensure more valuable use of the resources these households spend on "coping costs". This would ensure reliable and safe WSS services at a predictable cost. Strategies to extend services to the poor include: connection access charge instalment, as seen in Chile; mobile phone payments allowing to eliminate travel time, as observed in Kenya and Uganda; allowing frequent billing (weekly or fortnight), even if it may increase administrative cost for the water supplier; cross-subsidisation of the poor through increasing block tariffs;

implementing a means-tested basic free water threshold, as seen in South Africa; or prepayment meters, as used in Mogale city, South Africa (WaterAid, 2009; 2016; Sharma and Bereket, 2008). The pros and limitations of some of these strategies are discussed in Section 5 of this report.

Inadequate water supply and sanitation services, resulting from low cost recovery through tariffs, do not only pose problems for the poor. Other customers are also likely to get discontented, leading to increased non-payment. This will reduce utilities' revenues, and cause further deterioration of services. Low revenues lead to low salaries at utilities, low motivation and capabilities, low performance and, again, to degraded WSS services.

Under-pricing water and sanitation services thus deprives utilities of important funds to extend services and improve their quality. This can have high welfare costs. Renzetti (2000) estimated that a reform of water prices in Vancouver, Canada, would lead to a 4.5 percent increase in social welfare. Studies carried out in other high-income countries have concluded on similar estimates. Nonetheless, welfare gains from water pricing reform in low-income countries are likely to be much higher, as the potential for gains often is larger, notably in terms of reduced pollution, improved health, reduction in illegal connections, and detection of system leakage (Renzetti, 2000). The World Health Organisation states that the global average benefit-cost ratio is bigger than 5 for investment in sanitation, and bigger than 2 for investment in drinking water (WHO, 2012), with significant regional or local disparities.

3.4.2. Tariffs structures to generate revenues to cover the financing needs of water supply and sanitation

The OECD acknowledges three ultimate sources of funding of water services and infrastructure: tariffs (revenues from the water bill), taxes (allocations from the public budget) and transfers from the international community (which have become secondary in most OECD countries) (the 3Ts). Other sources of finance –including loans, bonds and equity – can cover upfront investment, but will need to be repaid through a combination of the 3Ts (OECD, 2010; 2015a).

The 3Ts can be combined in many ways to cover the costs associated with WSS services. While cost recovery through tariffs is considered best practice, at least to cover the operation and maintenance costs of service provision, the public good dimension of WSS provides a rationale for covering some costs through taxation. Governments take highly divergent approaches to WSS cost recovery; while Ireland funds the supply costs related to WSS through general taxation (a policy that was confirmed in January 2017, after a failed attempt to introduce water tariffs), Denmark has achieved full cost recovery through tariffs. In the European Union, several member states – most particularly Bulgaria, Estonia, Latvia, Lithuania and Romania - rely on cohesion policy funds (see OECD, 2020 for an assessment). In developing countries, international transfers (official development assistance) remain a source to recover infrastructure costs, most efficiently in relation with other sources of finance. However, even poor countries can reach important cost-recovery targets at the sub-sector level, such as cost recovery for O&M and investments in urban water supply.

Where tariffs are in place, tariff structures can combine various elements in different ways. Table 3.1 presents a set of different tariff structures that can be used to cover costs of water supply and sanitation services, together with their prerequisites, advantages and inconveniences.

When designing WSS tariffs as a means to generate revenues covering financing needs, policy-makers should carefully consider what components to include in the tariff. Two-part tariffs combine volumetric charges with a recurrent fixed charge. They are increasingly common in OECD countries (OECD, 2010). While a volumetric charge is best suited to reflect the scarcity of water resources, the financial sustainability of water utilities is likely to be strengthened if the tariff also includes a recurrent fixed charge (uniform across customers or linked to certain customer characteristics). However, the integration of a fixed charge may give rise to social issues, notably due to its low level of transparency, as well as weakened conservation incentives. Environmental and economic objectives are most likely to be reached if the fixed charge is restricted to costs that are customer-specific (e.g. meter reading, billing and payment collection). This allows keeping the volumetric rate relatively high and avoiding disadvantaging smaller households (OECD, 2003).

Some water utilities also integrate a one-time connection fee, regardless of consumption. The use of connection fees can be justified in some contexts. However, minimum charges are best avoided altogether: by clouding scarcity and environmental signals, they confuse incentives, and also frequently undermine equity (OECD, 2003).

Table 3.1. Tariff structures - their requisites, advantages and inconveniences

Tariff structure	Requirements	Advantages	Disadvantages
Fixed tariff: a flat fee, independent of consumption; can be uniform across customers or linked to some customer characteristic (*e.g.* size of supply pipe or meter flow capacity; property value; number of water-using appliances).	Accurate data on property or consumer	No need for metering.	Does not encourage water use efficiency.
Volumetric tariff: customers pay a fixed per-unit price, multiplied by the volume of water consumed in a charging period; each additional unit of water costs the same.	Metering at district or household level, or at industrial or commercial establishment	Encourages water use efficiency (depending on how price sensitive uses are, which may vary with consumption levels).	The poor may not be able to moderate water demand; a decrease in consumption reduces the revenues of water utilities and may hamper cost recovery.
Connection fee: a one-time fee for an individual user to gain access to the service.	-	Covers utilities' costs to supply augmentation and infrastructure expansion.	May be a bottleneck for the poor, as these may be able to afford regular (e.g. monthly) tariffs, but not the connection fee.
Access fee: regular fixed component reflecting the infrastructure and operating costs that occur irrespective of consumption	Accurate data on property or consumer	Useful to make fixed and financing costs transparent	Easily confused with a minimum charge
Minimum charge: paid for each charging period, regardless of consumption.	Accurate data on property or consumer	Provides stable revenues for water utilities.	Depending on the level of the charge, it may undermine equity and fail to encourage water use efficiency.
Volumetric rates combined with recurrent fixed charges: a single rate per cubic metre is applied regardless of volume consumed. The fixed charge can be uniform or differentiated. It can also be negative (a coupon). Fixed charges and coupons can be uniform or vary according to customer characteristics.	Metering; data on household income.	Secures recovery of utilities' fixed costs; provides flexibility to meet equity objectives.	Additional complexity makes this more costly to administer. For example, care should be taken to avoid the following issues: insufficient metering and data access can hamper effective implementation; stigmatisation
Increasing block tariffs (IBT): the volumetric charge changes in steps with volumes consumed.	Metering (at household level); data on household wealth, composition and water use to design tariff blocks and subsidies.	In theory, promotes water-use efficiency and allows poor households to keep consumption within lifeline block, securing free or cheap access to basic water volumes.	Poor households may be larger and consume more water than more well-off ones, thus end up in higher tariff blocks; lack of metering at household level or insufficient household data hamper successful design; many poor households access water through shared connections, thus collectively end up in the higher tariff blocks; difficulty of understanding the tariff structure can hinder expected reaction to the price signal
Adjusted IBTs: either the volumetric rates applied to each block or the size of the blocks are adjusted based on specific customer characteristics (*e.g.* family size, income).	Metering (at household level); data on household wealth, composition and water use to design tariff blocks and subsidies.	In theory, avoids some of the drawbacks of IBTs; ensures that poor households' consumption falls within the cheapest block, regardless of household size.	The most complex and costly to administer. Key data may be hard to access. The detailed structure may be difficult to understand for households, hindering willingness-to-pay.
Decreasing block tariffs: the volumetric rates decline with successive consumption blocks.	Metering (at household level); data on household wealth, composition and water use	Secures utilities' revenues.	Provides decreasing incentive to conserve water the higher is the family's water use. Places a higher burden on low-income families, if they are the highest consumers .

Source: based on OECD, 2010; WaterAid, 2009.

3.4.3. Tariffs and business models for water supply and sanitation services

Per capita water consumption is declining in cities in OECD countries due to a combination of increased system efficiency, deindustrialisation and lower levels of domestic use. This has mixed consequences. On the one hand, it relieves pressure on the resource and allows coping with future uncertainties about water availability and use without additional investment. On the other hand, it can harm the financial sustainability of service providers (be they public or private), where revenues are a function of the volumes of water sold or treated (OECD, 2015; Aqua Publica Europea, 2016). In addition, the decline in per capita water consumption may end up with oversized or stranded assets that add to costs.

One option to compensate for declining water consumption is to explore opportunities to rationalise infrastructure management. New technologies can provide utilities with accurate knowledge of the state of the infrastructure, contributing to better planning with regards to renewal, expansion or shrinking of investments. In turn, improved management of water assets can facilitate self-financing and debt control. New management models should also include the possibility for citizens and independent experts to review asset management, infrastructure development and expenditure plans (OECD, 2013c).

Another option to compensate for declining water consumption is to stabilise revenues from water bills, through a combination of increasing bill collection rates and raising tariffs for WSS services (OECD, 2009). A number of policy measures can be employed to enhance bill collection rates. Some, including disconnection of users from central WSS services as a sanction for non-payment, can have dire consequences for human health as they deprive users of water to secure basic needs (see below). Other policy tools, including awareness-raising campaigns, are likely to have a disciplining, albeit harmless, effect on users.

Raising tariffs can be justified, but comes with potential drawbacks. First, rising tariffs have led to affordability issues in some contexts. Second, higher tariffs associated with declining water consumption can confuse customers, who may perceive they are being punished for virtuous behaviour (OECD, 2015). Third, higher tariffs can promote further decline in consumption, hindering utilities' revenues.

In such a context, the business model of WSS management is being challenged. While it is widely accepted that, where pricing instruments are considered, they should be designed so as to cover the O&M costs of infrastructure and a progressive proportion of capital costs, the sustainability of this model is questionable as costs increase and volumes of water sold diminish. This challenge is similar to the one faced by energy utilities as a consequence of efforts to improve energy efficiency.

Thus, to encourage water conservation and at the same time generate sufficient finance for water services, public authorities (national and local) might consider promoting the decoupling of service operators' revenues from the volumes of water sold. This could be done by systematically exploring new options to secure stable revenues even in the face of declining consumption. Such options are based on new functions (urban drainage, water efficiency, additional services to water users), performance (through contractual arrangements that reward performance), or tax bases (for instance, land-based taxes) (for a more detailed discussion, see OECD, 2013c; 2015). Box 3.4 presents how the business model for water supply in California was reformed to decouple revenues to water utilities from volumes of water consumed.

Box 3.5. Restructuring the business model for water supply in California

California first implemented the water revenue adjustment mechanism (WRAM) and modified cost balancing accounts (MCBAs) in 2008 as part of a pilot programme to promote water conservation and ensure revenue stability as sales declined. The WRAM enables utilities to compensate for any revenue shortfalls from water conservation by authorising customer surcharges. The MCBA allows utilities to recoup lost revenue from purchased power, purchased water and pump taxes by adjusting water tariffs to reflect the actual cost of operating the system. These tariff structures serve multiple goals: *(i)* sever the relationship between sales volume and revenue, and provide an incentive to implement conservation rates and programmes; *(ii)* pass production cost savings on to ratepayers; and *(iii)* reduce overall water consumption. The California Public Utilities Commission adopted the mechanisms as part of pilot programmes for conservation rate design. The level of protection enjoyed by utilities using such tariff structures have been the subject of debate.

In an alternative approach, the city of Davis, California, is experimenting with consumption-based fixed rate water rates (CBFR). The tariff aims to recover all fixed and variable costs, however much water is sold or saved. The rationale for CBFR water rates is that customers pay for the water they use and their share of the system built to bring it to them. In this system, water customers pay two fixed rates: the first based on their meter size, the second based on their peak volumetric water use. Revenues generated by these two rates cover the utility's fixed costs. Loge (2013, in OECD, 2015) argues that conservation is directly rewarded through lower bills, while rate increases stemming from lost revenue are diluted over the entire ratepayer base and predicated on the individual ratepayer's use of the water system. The new tariff structure was implemented in 2015, using summer 2014 data as a reference for peak use.

Source: OECD, 2015.

The options above are indifferent to any position with regards to water utilities' possibility to make profit. Some observers claim that, while water utilities should aim to fully recover costs through tariffs, they should not price WSS services over and above that level. They should not seek profits. Others argue that the possibility to generate profits can stimulate more efficient water management, and that competition among service providers can stimulate efficiency and performance in service provision. This paper is agnostic as regards the status of operators for water services and the possibility to operate at profit.

4. Social concerns associated with tariffs for water supply and sanitation services

This section discusses the social concerns associated with tariffs for water supply and sanitation services that reflect the cost of service provision. One issue relates to safe drinking water and sanitation as human rights. Other issues relate to affordability and risks of water shutoffs.

4.1. The human rights to safe drinking water and sanitation

In September 2010, the United Nations (UN) Human Rights Council affirmed by consensus that "the human right to safe drinking water and sanitation is derived from the right to an adequate standard of living and inextricably related to the right to the highest attainable standard of physical and mental health, as well as the right to life and human dignity" (UNHRC, 2010). The Millennium Development Goals (MDGs) recognise that, due to the benefits to human life, providing access to safe drinking water and sanitation is a key goal. This point was emphasised again in Sustainable Development Goal 6.

There are many misconceptions regarding the human rights to safe drinking water and sanitation. First of all, the fact that safe drinking water and sanitation are human rights does not entitle everyone to an unlimited free supply of water at all times, in any place, under any circumstances (OECD, 2013a). Secondly, basic human rights exist in many other forms, including the rights to shelter, basic health care and education, which also require substantial governmental investment. Thus, public money spent on securing one human right can mean less public money available to secure other rights. The UN's Special Rapporteur on the Right to Safe Drinking Water and Sanitation emphasises that the fact that water and sanitation are human rights does not mean that it should come for free, any more than health care is free (UN, 2015; OECD, 2013a).

The Special Rapporteur reiterates that user charges for WSS services can provide the funds necessary to improve access and ensure affordability of these services, thus fulfil the human rights to water and sanitation (UN, 2015). At the same time, the UN Declaration on the Human Right to Water and Sanitation stresses governments' responsibilities regarding securing the affordability and accessibility of water, making pricing of domestic WSS services acceptable within a reasonable range (see further discussion in Section 5 of this paper) (UN, 2015; n.d.b).

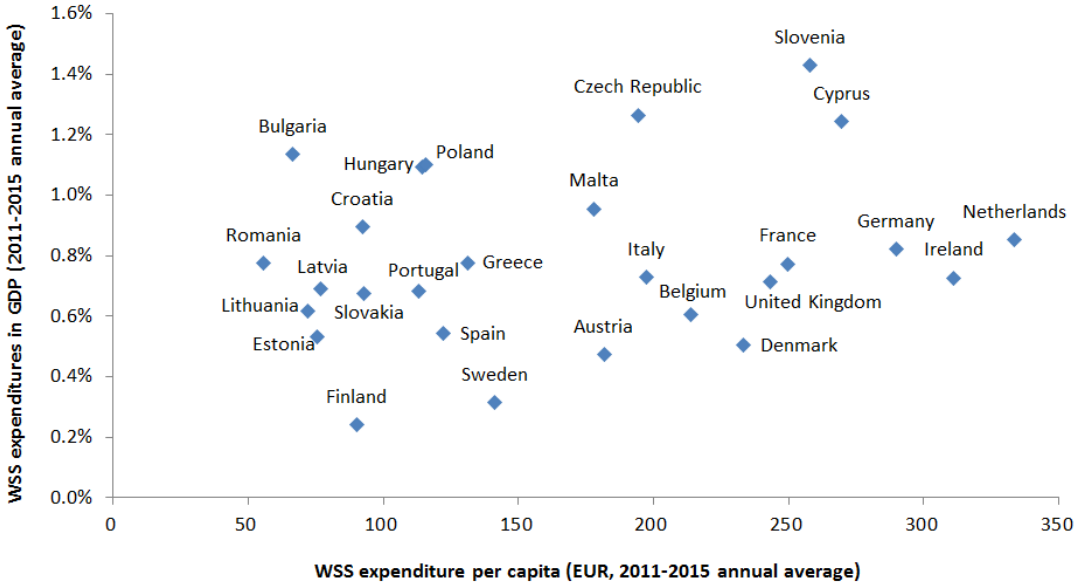
4.2. Affordability

Raising WSS tariffs in order to recover costs or reduce demand for water may give rise to affordability issues. The UN Economic Commission for Europe (UNECE) and the WHO emphasise that affordability issues constitute one out of three key dimensions of equitable access to water, along with geographical disparities and specific barriers faced by vulnerable groups (Aqua Publica Europea, 2016).

Affordability of water supply and sanitation services can be analysed at two levels. Macro-affordability refers to the ratio of average water charges to the mean aggregated household revenue, or to the mean aggregated household expenses. It provides some indication of the capacity to finance a water policy or investment programme. OECD (2020) compares macro-affordability of expenditures for water supply and sanitation in the European Union,

by clustering countries according to the share of GDP allocated to water-related expenditures. The figure below supports a comparison of the level of effort countries allocate to water supply and sanitation, independently of financing strategies.

Figure 4.1. Estimated expenditures per capita and as % of GDP



Note: Expenditure for Finland, Croatia and Sweden are underestimated due to data limitations.
Source: OECD analysis based on EUROSTAT (WSS-related public and household expenditures, GDP, population).

Micro-affordability is concerned with the impact of water expenses on various income groups, family sizes, regions, consumer types, generations, etc. (OECD, 2003; 2013c). Micro-affordability can be defined in multiple ways. A common view is that tariffs can be determined affordable if they ensure poor households' ability to afford access to adequate supplies of clean water. However, there is no unambiguous interpretation of *adequate supplies of clean water*. Does the notion refer to water quantities that ensure basic needs, or water quantities allowing people to maintain their current level of quality of life? The WHO has evaluated the lifeline consumption level to ensure basic needs at 15 m^3 per capita per year[2] (around 41 L/person/day); nonetheless, this definition remains contested, as basic needs may vary as a function of living conditions and the level of development of each country.

Hutton (2012) discusses the relevance of different affordability indicators. A common indicator is water bills as a share of households' disposable income. When income data is unavailable, expenditures can be used as a proxy. A limitation of the indicator is that it does not reflect the level of service. An alternative option is to measure *required* expenditure for a given service level, as a share of income or consumption. A different approach measures

[2] The WHO defines the "basic" minimum water requirement sufficient for drinking, cooking and basic hygiene (hand and food washing) as 20 L/person/day. This quota does not include water for bathing or laundry. Further, the WHO defines the "intermediate" water requirement for drinking, cooking and hygiene (including bathing and laundry) as 50L/person/day, and "optimal" access for all drinking, cooking and hygiene needs as >100 L/person/day (Guy and Bartram, 2003).

how water bills compromise a household's ability to pay for other vital goods and services, such as food, electricity, health care or education; this is the spirit of the human rights to water and sanitation. Specific attention may be paid to one-off expenditure for investment, such as the hardware or the connection: as mentioned above, upfront costs may be a barrier for poor households to access the service. Affordability analyses often focus on poor households; they could investigate other special categories, such as ethnic groups, indigenous people or disabled people.

When affordability is measured as a share of households' disposable income, analysts and authorities lack a clear definition of the appropriate threshold. Hutton notes that thresholds vary between 2 and 6% of disposable income, depending on IGOs and regions, and depending on whether the bill covers wastewater (Reynaud, 2015; Reynaud et al., 2016; Hutton, 2017).

In practice, measuring affordability can be very difficult. Research by Hoque and Hope shows that, in developing countries and particularly where water is scarce, households will use up to six different sources of water along the year, depending on availability and use. Each source will come at a different cost, including the time required to collect it. Measuring affordability is even more complex when revenues vary throughout the year, as is the case for intermittent or informal labour. Hoque and Hope explore how a water diary method can help monitor water use and affordability in a way that reflects the experience of households in such contexts (Hoque, Hope, 2017).

While it is widely recognised that affordability is a key challenge in developing countries, the European Association of Public Water Operators (Aqua Publica Europea, 2016) notes that affordability issues are escalating even in the European Union. This is, first of all, due to a steady increase, since 2008, in the share of the population at risk of poverty in EU countries. Secondly, it results from three structural factors, including (i) a decrease in cross-subsidisation of WSS services through general taxation (see Box 4.1); (ii) a decline in water consumption, leading utilities to raise prices in order to recover costs; and (iii) increasing environmental standards, which raise the costs of treatment (Aqua Publica Europea, 2016). Box 4.3 confirms that poorer households in some OECD countries do face affordability challenges even though affordability is not an issue at a macro, aggregate level.

Box 4.1. Cost recovery according to the EU Water Framework Directive

Article 9 of the Water Framework Directive stipulates that "Member States shall take account of the principle of recovery of the costs of water services, including environmental and resource costs […] in accordance in particular with the polluter pays principle. Member States shall ensure by 2010

- that water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive,

- an adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services […] and taking account of the polluter pays principle."

This article is often interpreted as a push towards recovery of the costs of service provision through revenues from water tariffs. However, Article 9 acknowledges that Member States may have regard to the social effects of cost recovery through tariffs: "Member States may in so doing have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected."

Article 9 stipulates that Member States shall not be in breach of the Directive if they decide - in accordance with established practices - not to apply the principle of cost recovery, for a given water-use activity, as long as this does not compromise the purposes and the achievement of the objectives of the Directive. More data is needed to systematically document transfers between categories of users.

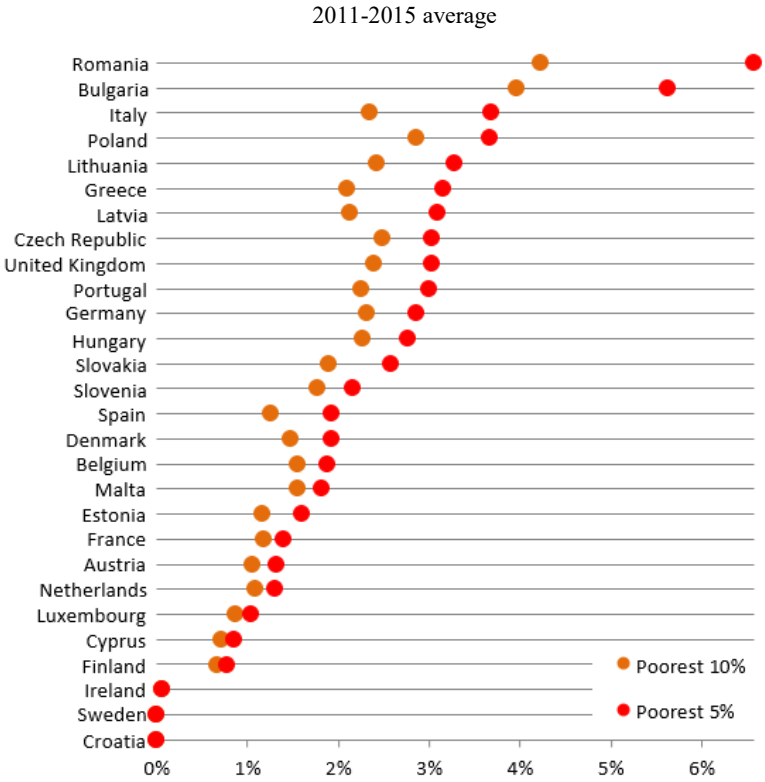
Source: Official Journal of the European Communities (2000), Directive 2000/60/EC of the European Parliament and of the Council, 22 December; available at http://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDFBox heading - If you do not need a box heading, please delete this line.

4.2.1. Zooming in. Affordability issues in selected OECD countries

In OECD countries, WSS bills do not represent a considerable burden on disposable household income, when using average income figures. OECD (2015) argues that the vast majority of city dwellers in OECD countries would be able to afford a larger water bill; hence, the implementation of the principle of cost recovery would not lead to significant macro-affordability issues.

However, the picture is more contrasted when one considers the lowest decile of the population (see Figure 4.2). Recent data in Europe measure the share of water supply and sanitation expenditures in households' disposable income. Based on current household expenditure levels, all EU countries remain below a 3% threshold if considering the lowest quartile and quintile. In a number of countries, shares for the lowest 10% and even more so for the lowest 5% tend to be significantly higher (compared to other EU Member States), which typically reflects a drop in income levels (income inequality). In those countries, targeted social measures are more effective than cheap water to enhance the financial sustainability of water services while addressing the social consequences of higher tariffs.

Figure 4.2. Share of water supply and sanitation expenditures in households' disposable income



Note: Lack of household expenditure data for Croatia and Sweden.
Source: EUROSTAT (household expenditures and income data); OECD (2020).

Note that, reflecting discussions above on affordability definitions and measurement, the statistics above fail to fully capture the complexity of affordability issues. Typically, poorest and most vulnerable households may not pay for public water supply and sanitation, because they are deprived from access to any service. This is typically the case of migrants, homeless, or remote and rural communities.

Affordability may become a more prominent issue in the future, as OECD countries accelerate renewal of existing assets, to avoid infrastructure decaying and adjust to emerging concerns, such as a changing climate, sludge management and emerging pollutants. A recent research in the US projects that, if tariffs rise at projected amounts, the percentage of households who will find water bills unaffordable could triple from 11.9 to 35.6% in the next five years (Mack, Wrase, 2017). Many of the households at risk of facing affordability issues are clustered in pockets of water poverty, adding a geographical dimension to a social issue.

4.3. Willingness to pay *versus* inability to pay

Low collection rates of water bills affect the capacity of (public and private) providers to finance the operation of services. It can lead to utilities' indebtedness, infrastructure decay, and decreasing service quality for the community (including those who pay). Policy makers must carefully consider the pros and cons of various payment discipline measures and debt penalties, including disconnection from central WSS services.

Users can fail to pay their water bills for two basic reasons: i) unwillingness to pay, or ii) inability to pay. Disconnection - used as a threat or sanction - has proven effective to urge the former to pay their water bills. In practice, most users who are unwilling to pay but have the capacity to do so settle their bills before the ultimate sanction of cut-off is applied.

However, disconnection remains an issue, as it can have severe social consequences. It can cut residential users off from access to basic WSS services. For that reason, disconnection is banned in several countries, including France and the UK. In 2014, Abu Dhabi authorities made illegal the disconnection of inhabited domestic premises, hospitals, and other centres for disabled, elderly or sick people (RSB, 2014).

Disconnection policies often are poorly targeted and fail to reflect the distinction between those who *can't* pay and those who *won't* pay (OECD, 2013c). In certain countries in Eastern Europe, Caucasus and Central Asia, shutoff policies have led utilities to enforce disconnection of entire apartment blocks, in cases where the total indebtedness of the apartment house had reached a certain threshold. This affected disciplined consumers and non-payers alike. Such practices had unfortunate implications, and resulted in consumers' lack of trust in water utilities and the government. In other cases from the same region, consumers' non-payment has left water utilities in such a severe indebtedness that these have been cut off by electricity suppliers. As a result, water supply has been suspended for the entire city, leading to local epidemiological disasters (EAP Task Force/OECD, 2003).

The cities of Durban, South Africa and Kolhapur, India apply an alternative approach whereby households are cut off from supply when water bills are not paid after receiving formal notification, but access to water is provided through public standpipes. Durban has an intermediate step whereby the first stage following non-payment is to fit a flow restrictor, limiting flow to a trickle. If the outstanding bill is paid, the restrictor is removed; if the bill is not paid, the household water supply is cut-off and residents are forced to collect water from public standpipes. The result is a much lower level of non-payment and a more sustainable WSS service supported by reliable revenue than in other cities that do not have a policy of disconnection (Rouse, 2013). Obviously, these effective measures to collect revenues from water bills raise social concerns, if they affect those who cannot pay their bills (and not only those who could but would not).

Good international practices to address households who are *unwilling* to pay include awareness-raising campaigns and other adequate policy measures. England and Wales faced a high increase in the number of non-payers following a rise in water bills after privatisation of asset ownership. The government's ban of disconnection from WSS services as a sanctioning mechanism, under Prime Minister Tony Blair, additionally increased the number of non-payers. While it was proven that the larger part of non-payers were 'won't pay', it could be shown that they also included households who could not afford new tariffs (OECD, 2013c).

Thus, the distinction between inability and unwillingness to pay is crucial for policy-makers to adequately address the lack of payment for services. This remains a practical challenge, which can only be addressed by access to user-specific data.

5. Addressing the social concerns associated with tariffs for water supply and sanitation services

This section considers options to reduce or address social issues related to tariffs for WSS services. It highlights the challenges related to alternative tariff structures for WSS services, in particular increasing block tariffs (IBT). It discusses which fiscal instruments are best suited to contribute to service provision in a affair and equitable way. It suggests ways of addressing equity issues resulting from WSS tariffs through targeted social measures, independent from water bills. The section also highlights how the tariff setting process can be designed to build trust in service provision and enhance households' willingness to pay. Finally, issues related to availability and access to water-related data are highlighted, as they can affect the design and implementation of some of the options discussed in the section.

The section assumes that, in order to ensure efficient use of consumers' financial contributions through the water bill, water utilities make the best use of existing funds by i) tapping efficiency gains in operations and asset management, ii) minimising investment needs, and iii) revisiting business models. Tariffs are expected to be backed by an assurance that utilities spend financial resources wisely.

5.1. Attempts to address social issues through alternative tariff structures

Several countries have tried to address the redistributive challenges related to WSS tariffs by adopting alternative tariff structures, such as proxies, flat tariffs, increasing block tariffs (IBTs). These may succeed in addressing some social issues, but only under certain conditions. Their impact on equity has in many cases proven to be weaker than intended, or even regressive.

5.1.1. Issues with flat tariffs and selected proxies

Proxies have been considered as means to differentiate volumetric charges for WSS services, so as to address the variation in consumers' ability to pay. Proxies that have been used include income level, the size of the surface area or the number of windows of a house or apartment, as well as other household features. While these proxies to some extent can provide information about the number of people in, and the socio-economic status of, a household, there is a high probability that they result in erroneous estimates when it comes to appropriately defining WSS tariffs.

Flat tariffs can be regressive since they impose a flat charge on all customers, regardless of their consumption. The tariff can be uniform, or differentiated based on customer characteristics, season, etc. (OECD, 2010). While providing equal conditions for all consumers, a flat tariff fails to provide an incentive to reduce consumption or to reflect the changing scarcity value of water. Furthermore, de facto it means a financial transfer to the higher water consumers, which can include those with higher income levels. Flat tariffs are contested due to their lack of transparency, complicating customers' understanding of what they actually pay for their consumption.

5.1.2. The pros and cons of IBTs

IBTs are designed so that the volumetric charge changes in steps with volumes consumed. These tariff structures are gaining increasing attention in a number of countries (OECD, 2010). Studies show that, while under some circumstances IBTs can secure full cost recovery and promote water conservation and efficiency, practical limitations can, in some cases, impair their capacity to address social and equity issues (Whittington, 1992; Grafton, 2017).

In theory, IBTs can secure affordable - or even free - access to a given quantity of water for low-income households, through the low marginal price in the lowest tariff block (sometimes referred to as a lifeline block). It follows that the higher prices in the upper blocks are meant to cross-subsidise the water usage of poorer households, and strengthen overall cost recovery by charging more from households that use larger quantities of water (Fuente et al., 2016; Boland and Whittington, 2000; OECD, 2016b). The higher prices in the upper blocks are also supposed to discourage wasteful or profligate water use (Fuente et al., 2016; Grafton et al., 2014).

In practice, however, the implementation of IBTs may be challenging, and can potentially have some adverse social consequences, if such variables as household size –which can drive domestic water consumption - are not taken into account. This results from several issues, which are considered below: an assumption that does not always reflect reality; a difficulty to define the lifeline block; lack of transparency; and heavy reliance on data.

IBTs can trigger social benefits when low-income households consume less water than high-income households (Fuente et al., 2016). In practice, however, poorer households can be larger than better-off ones. They may consume more water (where they have comparatively less efficient networks or appliances at home). They may then end up in the higher tariff blocks (OECD, 2013c; Grafton et al., 2014).

In order to successfully target poorer households, the initial block of IBTs should correspond to the minimum volume of water needed to cover basic human needs. However, determining this quantity can be highly complicated, and there is no generally agreed definition. The WHO's definition of human needs can be used as a reference. However, it should be adjusted to national or local conditions to be politically acceptable. Another option is to refer to the average, or median (or a percentage thereof) consumption of water in a given territory. The benefit of this definition is that it is dynamic: the allowance needs to be regularly adjusted to reflect changes in water use (possibly towards more efficiency and less leakage).

In practice, while internationally cited standards estimate the basic needs of a household of five at 4-5 m^3 per month, the initial block of most IBTs covers a much larger quantity of water (Boland and Whittington, 2000), reflecting a political decision. Although this benefits poorer households when they are large, it provides a disincentive to conserve water for smaller, wealthier households and may lead to a loss of revenue for the service provider if it s not compensated by income from the higher blocks. Policy-makers seeking to determine the first block tariff are faced with difficult trade-offs, knowing that a restriction designed to discourage richer households' overconsumption is likely to have negative implications for some poorer, larger households if household size and other variables that drive domestic water demand are not taken into account (Boland and Whittington, 2000; Schoengold and Zilberman, 2014; OECD, 2013c).

Furthermore, the design and implementation of IBTs are challenged by their complexity and low level of transparency, leaving customers with limited possibility to deduce the

average or marginal price they actually pay for water. The lack of transparency makes it difficult to explain the composition of the water bill to users. When the fixed rate of the fare is high, IBTs provide no straightforward signal to customers as to how a deliberate change in water consumption is associated with changes in their total water bill. This can be overcome by reducing or eliminating the fix rate in the IBT or by a single volumetric price which would send more understandable and consistent price signals to customers, as well as facilitate water utilities' adjustment of tariffs in line with rising costs (Boland and Whittington, 2000).

Finally, IBTs requires specific data. The design and implementation of IBTs require collecting detailed and relevant data at household level, on water use, household income and composition (e.g. number of people in the household, physical condition of individuals). That data can be costly to collect (it typically is collected where there is metering at household level), and difficult to access for utilities (households may be reluctant to disclose some information to service providers). To overcome this data issue, service providers can rely on households or social services applying for rebates on the basis of their structure or income level, as appropriate.

Data needed to design a single volumetric tariff, such as water consumption estimates for each customer class and a plausible estimate of overall price elasticity for the class, is likely to be available even in developing countries (Boland and Whittington, 2000). Volumetric prices therefore make it easier for utilities to forecast revenues. When using IBTs, such a projection can only be made if information about the probability distribution of water use is available, as well as projections regarding the price elasticity of customers at different points in that distribution. Such information is rarely available, especially in developing countries.

5.1.3. Adjusting IBTs to overcome their shortcomings

A vast literature looks at options to develop tariff structures that effectively include redistributive criteria. In some countries, tariff structures have been adjusted to account for household size, so as to avoid penalising large families. This solution is being adopted in an increasing number of OECD countries, including the Brussels and Flanders region in Belgium, Luxembourg, and some municipalities in Greece, Portugal and Spain (OECD, 2010). In Dunkirk, France, the water utility sought to combine IBTs with social rebates (see Box 5.1). The effects have so far been ambiguous (OECD, 2013c).

Box 5.1. Combination of IBTs and social rebates in Dunkirk, France

Several cities are experimenting with the combination of increasing block tariffs with social rebates, such as Dunkirk. Since 2012, Dunkirk implements a sophisticated tariff structure for water supply and sanitation services. This is a 3 block tariff; the initial block is provided at a reduced rate. The city supplies the first 75m3/yr block at EUR 0.80 per cubic metre (EUR/m3) and EUR 0.30/m3 for families receiving benefits. The second block, up to 200m3, costs EUR 1.50/m3, and additional consumption above that threshold costs EUR 2/m3; there are no social rebates for upper blocks.

The initial plan was to reflect actual income and the size of households. However, this option was ruled out, as it was illegal to use data on family sizes and to set the blocks per capita. Therefore, rebates in Dunkirk are based on the number of apartments behind a meter, irrespective of the number of residents in each apartment.

The design and the implementation of the tariff have been cumbersome. It remains to be seen how the social tariff performs in terms of social redistribution.

Source: OECD, 2013c.

Some countries have sought to overcome the shortcomings of IBTs by introducing a first block that provides basic water volumes for free, funded by tax revenue, rather than cross-subsidies. Due to the public good dimensions of water supply and sanitation, the use of fiscal resources for such purposes can be justified. Under such systems, it is essential that the allocated funding actually reaches the water operations that require it. South Africa is one of the countries that have experimented with the provision of basic water supply free of charge (see Box 5.2).

Box 5.2. Providing basic water for free. The experience of South African

Local governments in South Africa had been relying on IBTs for WSS pricing for years, when realising that the tariffs, despite policy intentions, put a disproportionate burden on poor households. In response, President Tabo Mbeki adopted the Free Basic Water (FBW) Policy in 2001, securing the provision of 6,000 litres of water per month to all households, free of charge. In line with recommendations made by the WHO, 6,000 litres were considered sufficient to meet the basic needs of a household of eight people, provided that each person needs 25 litres of water per day. The FBW policy would in most cases be used in combination with IBTs.

The Equitable Share, a federal fund distributing tax revenues from the central government to the provinces and municipalities, was set up to assist municipalities in providing FBW. While the support from the Equitable Share, and some additional grants, cover a substantial part of the costs related to providing FBW, municipalities are in charge of designing consumer tariffs and property taxes so as to subsidise the remaining costs. Municipalities in urban areas with a high number of wealthier households often cross-subsidise free water provisions through IBTs. On the contrary, municipalities in rural, poor areas are more dependent on grants from the central government to achieve cost recovery. This is due to the absence of wealthier households that can subsidise poorer households' consumption, as well as a lack of metering and functioning billing systems, complicating the successful implementation of IBTs.

The FBW policy has succeeded in providing free water to a majority of households, albeit not all. Nevertheless, the redistributional effects of the FBW policy, as compared to a fixed price structure, are contested. The combination of IBTs and free water provisions fails to effectively target the poorest households. In Cape Town, the introduction of the FBW policy reduced the water bill of the poorest households by an average of R3 million, or 30%, per year; however, households in the second wealth quintile experienced an annual reduction of R58 million. Observers suggest that the FBW policy would be more beneficial to the poorest households if further investment was made in WSS infrastructure, including in private piped connections, and an expansion of service provision.

Source: Burger and Jansen, 2014; Calfucoy et al., 2009; Van der Berg et al., 2009.

There is broad consensus that subsidies delivered through tariffs for water supply and sanitation services tend to be poorly targeted and regressive. Studies show that such subsidies even lead to more unequal distribution of resources as compared to if subsidies were equally distributed among the population, due to errors of *inclusion* as well as of *exclusion* from the subsidies (Fuente et al., 2016). In Lima, Peru, 20-30% of the population face water affordability issues (the critical share of total water expenditure in income is set to 2%). As many as 90% of poor connected customers receive a WSS subsidy; however, 91% of the subsidy beneficiaries, or 78% of the connected population, are non-poor (Barde and Lehmann, 2014). A similar situation can be observed in Nairobi, Kenya, where households in the lowest wealth quintile receive 15% of the total WSS subsidies delivered (see Box 5.3).

Box 5.3. Regressive effects of IBTs in Nairobi, Kenya

Pricing of WSS services in Nairobi is based on an IBT structure. A study carried out among 656 households in the Kenyan capital by Fuente et al. (2016) showed that the average water price payed by households in the lowest wealth quintile is USD 0.79/m3, while it is USD 0.56/m3 for households in the highest wealth quintile. The average price per unit of water is higher for poorer households because the WSS tariff includes a minimum charge as well as a positive fixed charge, applying to all households regardless of their consumption.

If the subsidies provided through the IBTs were evenly, or randomly, distributed across the population, each wealth quintile would receive 20% of total subsidies. However, Fuente et al.'s study revealed that among households with a private metered connection, those in the lowest wealth quintile receive only 15% of the total subsidies delivered, while households in the highest wealth quintile receive nearly 30% of the subsidies. Households in the top three wealth quintiles get close to 70% of the total subsidy. This demonstrates that the IBTs in Nairobi fail to effectively target subsidies to low-income households, and that the IBTs in place perform worse in terms of addressing social equity issues, as compared to a randomly distributed subsidy. The poor targeting of water subsidies in the Kenyan capital is a result of several intertwined factors. First of all, due to the current design of tariff blocks, close to all customers are entitled to subsidies. Secondly, because there are too few customers in the upper tariff blocks (close to 80% of customers fall into the two lower blocks), water utilities are unable to generate sufficient revenue to provide effective cross-subsidies to the poorest households. Finally, because a large number of households lack private, metered water connections, it is highly challenging to estimate households' water use and design subsidies in an adequate manner.

Source: Fuente et al., 2016.

Whittington and his colleagues modelled the distribution of subsidies to households in different income quintiles, calibrated with data from low and medium income countries. Simulations indicate that the most common tariff structures are unable to target subsidies to poor households. Moreover, when household income is highly correlated to water use, the proportion of subsidies received by poor household decreases (Whittington et al., 2015).

Drawing on a range of metadata, Thomas (2014) promotes a nuanced assessment of the capacity of social and progressive tariffs to address distributional issues. He warns that a robust *ex ante* assessment is required, to document the relative impacts of households features (size, type of housing, etc.), price elasticity at different block levels, readability of tariff structure to users, transaction costs of setting and administering the tariff, and the selection of social criteria or poverty indicators used to target populations and review distributional benefit of the tariff.

5.1.4. Issues with metering

Two prerequisites for alternative tariff structures are that all households have a private piped connection to the water network and that consumption is metered at household level. These prerequisites deserve some attention.

Many poor households, notably in cities in developing countries, do not possess a private connection and access water through connections shared by multiple households. Consequently, water consumption metered at the shared connection quickly exceeds the

water volume in the lowest tariff block, if this is not taken into account. In this case, the effects of IBTs end up being the exact opposite of their intention; richer households end up in the lower blocks and poorer households in the higher ones. Water utilities could increase the amount of water sold at the first block price to those households using a shared water connection, in order to avoid that these pay the price of the higher blocks. However, such manipulation has proved to be time-consuming as well as subject to corruption (Whittington, 1992; Boland and Whittington, 2000).

The inequality between households *with* and *without* private connections is exacerbated when households with private connection engage in informal water markets and sell water to unconnected users. Connected households will then withdraw larger water quantities, thus end up in higher tariff blocks. By charging water-buying households the price of the higher tariff blocks, the water-selling households can take advantage and only pay the first block price themselves. As a result, poorer, non-connected households end up paying a higher average price than richer, connected ones (Boland and Whittington, 2000). In other words, subsidised water primarily benefits richer households, undermining IBTs' capacity to address equity issues (Boland and Whittington, 2000; Schoengold and Zilberman, 2014).

The installation of universal water metering comes at a cost, and its effects on water consumption may be limited (see the discussion about elasticity of water demand to price). Charging for metered services creates uncertainty about revenue streams. This explains why several utilities were reluctant to roll out metering programmes in England and Wales after privatisation. This changed when the government authorised compulsory metering programmes in water stressed regions, as part of utilities' long term plans (Defra, 2007).

In low water usage households, resource savings eventually driven by metering are not likely to outweigh costs (of installing metering), notably in households of one-two people living in an apartment (Green, 2003). As a result, many countries have only installed one or a few meters per apartment building. Although easing the burden of costs, this weakens the capacity of meters to raise each household's awareness about own consumption (Green, n.d.).

The point is that metering is not in and by itself a means to reduce volumes of consumption. It is primarily a measure to make customers aware of their level of usage, and a tool to identify and situate water leaks. This explains why metering is most effective when it comes with nudging techniques to drive water users' behaviour. Loftus et al. (2016) note how Ofwat explored a range of nudging techniques, many of which were to be facilitated by the meter itself (see Ofwat, 2011). Whittington and Nauges (2018) adds a word of caution: social norms information treatments should be subjected to benefit-cost analysis at the local level to see if they are welfare enhancing; they are likely to be most useful during droughts.

An ancillary benefit of metering is the generation of data that can be used not only to determine the water bill of consumers, but also to drive improvements in tariff policy, water management and decisions on infrastructure maintenance and extension. If meters are used primarily with the purpose of detecting leakage and informing water policy, block or district metering is a fully adequate and less costly solution. As noted by IIASA in a joint publication with FAO and the OECD, digital sensors are used currently in many cities around the world to detect what is happening within the water networks, and to prevent small issues, such as leaks, from turning into big problems (IWA, 2019). Advanced monitoring technologies have dramatically increased the performance of the water network, improved the efficiency of field teams, and upgraded service levels to customers.

In addition, customers are provided with the opportunity to better manage their water consumption and reduce costs (OECD, FAO, IIASA, 2020).

5.2. Revisiting taxes as a source of finance for water supply and sanitation services

Recent debates have suggested revisiting the 3Ts, in order to fully acknowledge opportunities to access new sources of finance for WSS, including various forms of taxation (OECD, 2015). The public good dimension of water supply and sanitation provides a rationale for using not only tariffs, but also taxes, to cover costs related to WSS services. However, the definition of the public good dimension of water supply and sanitation is elusive. It certainly includes benefits for public health, street cleaning, fire protection and management of diffuse pollution such as runoff. Other elements could be considered, which are more difficult to inventory and cost. Thus, in practice, the definition of the public good dimension of water supply and sanitation services, and the allocation of costs between taxes and revenues from user tariffs, remain a political decision: they relate to how much the community needs - and is willing - to pay to cover the cost of an infrastructure that benefits most. It follows that any combination of tariffs and taxes to finance water supply and sanitation services in a community reflects a political arbitrage or social choices under particular social, historical or political circumstances.

Policy makers wishing to increase the use of taxation as a source of finance for the WSS sector will have to carefully select the most appropriate fiscal instruments. In principle, such a selection is part of fiscal policy. However, it is legitimate to take into account elements and objectives of WSS policy when determining the base and level of the taxes that are to be used, as well as the scale (national or local) at which these taxes are to be levied, and the orientation they should have. In Ireland, where the full cost of water supply and sanitation is financed through general taxation, the Expert Commission on Domestic Public Water Services (2016) recommended the fiscal instrument with the largest social basis, at national level. In Korea, costs of the WSS sector are covered by fiscal resources originating both from national and local taxation.

When considering the most appropriate tax base for WSS financing, income taxes might be perceived as less suitable, primarily because such taxes often are paid by a relatively low percentage of the population: in many countries, people whose income is lower than a defined threshold are exempted. As water supply and sanitation services benefit the entire population, a tax levied on (close to) all inhabitants might be more legitimate. Social taxes make up a most appropriate source of funding for WSS, because they are levied on everyone, as well as have a social orientation. The *Contribution Sociale Généralisée* in France and the *Universal Social Contribution* in Ireland constitute good examples.

Property taxes constitute another reliable source of public revenue, equally suitable for generating revenue to cover WSS costs. Because property owners and developers enjoy advantages of the government's investments in WSS infrastructure, property taxes are generally considered legitimate; hence the high collection rate. As property taxes primarily are levied at a local level, they can more easily be adapted to the financial needs associated with water supply and sanitation services, which often are managed at the same geographical scale (OECD, 2015). In few countries, property taxes are used not only to cover the costs of expanding WSS infrastructure, but also to fund the augmentation of supply needed to meet the demands of new properties. For example, city authorities in Casablanca, Morocco, relied on contributions from property developers to cover the costs of essential elements of WSS infrastructure, including the augmentation of supply (see Box 5.4). In Arizona, US, property developers have to demonstrate assured water supply for the

next 100 years before getting access to purchasing parcels (see Box 5.5). This may require building storage capacity or buying water entitlements, an investment initially borne by property developers.

Box 5.4. Property taxes in Casablanca, Morocco

Casablanca is characterised by rapid urbanisation; its population is expected to grow from 3.5 to 5 million by 2030. Extending the water network, securing access to the resource and protecting it against frequent floods are serious concerns for the local authority, which needs to finance these projects.

The city defined a new investment programme in 2007 and contracted Lydec, a subsidiary of Suez Environnement, to provide WSS services and mitigate flood risks. Revenues from user tariffs cover operational and maintenance costs and the renewal of existing assets (accounting for 70% of total cost over the last decade).

A dedicated account (fonds de travaux) covers the remaining costs (essentially land acquisition, network extension and social connections). Financed mainly by contributions from property developers, it has financed a growing share of total investment, from 7% in 2004 to 54% in 2014. Property developers also cover the costs of connecting to the network and in-house equipment. Their contribution varies depending on the type of housing (social housing, villas, hotels and industrial zones), and they pay additional costs for developments that do not feature in the master plan. Contributions are waived when the developments take place in underprivileged neighbourhoods and slums. Special conditions have also been set to adjust the contribution to the pace of urban expansion, and to harness major urban developments. The contribution is a share of the price of the property when sold, ranging from 0.7% of the selling cost for social housing to 1.3% for luxury apartments and buildings.

Source: OECD (2015).

Box 5.5. Property developers' financial contribution to augmented water supply in Arizona, US

Arizona's Assured Water Supply program was created as part of the historic 1980 Groundwater Management Act. It requires that property developers can demonstrate an assured water supply for the next 100 years before parcels can be sold in all Active Management Areas (AMAs), which have the goal of achieving safe yield of groundwater management. In order to obtain the required approval, seven criteria must be met:

1. The water supply must be physically available for 100 years.
2. The water supply must be legally available for 100 years
3. The proposed supply must be continuously available for 100 years.
4. The water must be of sufficient quality for the proposed use.
5. The proposed water use must be consistent with the management goal of the AMA.
6. The proposed water use must be consistent with the current management plan of the AMA.
7. The applicant must demonstrate the financial capability to construct any necessary water storage, treatment, and delivery systems.

The Assured Water Supply requires that municipal growth to depend mainly on renewable or imported water resources, such as surface water or treated wastewater. If the development relies on groundwater, any mined groundwater much be replenished (usually through a groundwater recharge programme). The Assured Water Supply requirement forms the cornerstone of Arizona's effort to reduce groundwater overdraft.

Source: Colby and Jacobs, 2007; ADWR, 2016.

5.3. Targeted social measures

The discussions on alternative tariff structures leaves no doubt that trying to achieve equity and efficiency goals with a single pricing instrument is likely to be ineffective, an observation aligned with the Tinbergen principle. An alternative can be for tariffs for WSS services to be set so as to reach efficiency goals, and targeted social measures be set to achieve equity goals and delivered outside the water bill (OECD, 2013a). Such an arrangement secures transparent pricing of WSS services, raises households' awareness of the actual cost of service provision, and provides an effective response to the distributive impacts of water pricing (OECD, 2013a). This combination also ensures stable revenues to utilities, aligned with the cost of service provision.

The section illustrates such options as providing payment relief through a dedicated social fund; vouchers or lump sum transfers; waiving connection fee; payment relief; or support to reduce water use. Note that decisions regarding which users should benefit from targeted social measures, as well as the question of by whom these decisions should be made, spark controversy in many contexts.

Targeted social measures for WSS services can be designed in a number of ways, sometimes in combination. One set of measures consists in providing payment relief to poor households through a dedicated fund replenished with revenues from water bills or

public finance. Matching funds are collected during times of scarcity pricing, or through the regular water bill. In Wallonia, Belgium, all customers pay EUR 0.025 per cubic meter of water to a social water fund. In France and in California, a social fund was set up, financed by water suppliers and the government. The social housing fund in France is funded by local governments, as well as by a number of water suppliers, which pay a small percentage of their revenues to the fund (see Box 5.6).

In California (USA), a policy adopted in May 2020 will direct the State Water Resources Control Board's efforts to administer the Safe and Affordable Drinking Water Fund to address long-standing challenges confronting an estimated one million people without safe drinking water throughout the state. The policy provides an overall funding strategy and, among other things, establishes a petition process for disadvantaged communities seeking consolidation with another – often larger and more economically viable – public water system. This innovative development combines a social fund with the capacity to access reliable and comparatively affordable water services.

Box 5.6. Funds to mitigate water-related social issues in Belgium and France

In Wallonia, Belgium

In Wallonia, Belgium, prices for water supply include a charge of 0.025 €/m³ destined for the Social Water Fund, to be distributed to households struggling to pay their water bills. The Social Water Fund amounts to approximately EUR 4 million. In addition to supporting water-poor households, a small share of the fund (about 5%) is spent on measures improving indoor water systems, including leakage reduction and replacement of high water consuming household devices.

Whether a household struggles to pay for WSS services is defined by affordability surveys carried out on a recurring basis, and by annual assessments of households' payment track record; if a household does not pay its water bill after a second reminder, it is considered as being in difficulty of payment. The affordability survey last carried out, in 2015, stated that 16% of households exceed the threshold of water affordability, defined as 2% of total income spent on water services. The survey also showed that households facing the biggest affordability tend to be large ones, whose head usually is aged between 45 and 54 years.

In France

In France, modalities for water and wastewater pricing are determined by local authorities. The Water Law (adopted in 2006) defines the right to access water at financially acceptable conditions as a legal principle. A solidarity fund for housing has been set up on department level (departments oversee all social and sanitation affairs) in order to secure families' access to decent and independent accommodation including water, energy, telecommunications and internet. Amongst others, the fund aims at helping those who have accumulated water arrears and face difficulties paying their water bill. Tenants wishing support from the solidarity fund can apply, and receive, if determined eligible, direct support with money drawn from the fund.

A key drawback of the solidarity fund is that it only can help people who are temporarily unable to pay; supporting needy people who do not receive bills, such as homeless people or people living in informal settlements, is more difficult.

On average, families targeted by the social housing fund during the period 2005-10 were given a payment relief of EUR 151 per invoice. 77% of the solidarity fund is financed from the general budget of the departments, and 23% is financed by voluntary contributions from water suppliers, sanitation companies, and municipal authorities. Although water suppliers only yield an average of 0.5% of their revenues to the solidarity fund, some suppliers, such as Eau de Paris, contribute with significant amounts.

Source: Moss, 2016; Reynaud et al., 2016 ; EurEau, 2016 ; Aqua Publica Europea, 2016 ; OECD, 2010, 2015.

Another option is to offer poor water users rebates, vouchers or lump sum transfers, as happens in selected French cities (e.g. through the suburban *Syndicat des eaux d'Ile-de-France*) or in Chile (see Box 5.7). Water vouchers or lump sum transfers can be provided by the government, water utilities, or by other private or charitable sources (OECD, 2003). A potential concern related to lump sum transfers provided to help poor households pay their water bill is that some might end up spending the money on other, less helpful, goods. When designing lump sum transfers, policy-makers must carefully take into account these challenges. Vouchers can often provide a better solution, as they can be spent on water

only. Thus, they secure basic water needs, as well as consumers' ability to pay the water bill. Nevertheless, the design of vouchers requires equal care and attention, notably with regards to whether users should be allowed to cash in the vouchers or sell them to others.

Box 5.7. Targeted water supply subsidies in Chile

Water reforms in Chile in the 1980s led to the introduction of a tariff for urban water services aimed at meeting the costs of service. Prior to the reform, water tariffs covered less than 50% of costs on average and only 20% in certain regions. The reforms led to higher water prices and substantial efficiency gains, although concerns were raised over the affordability of water and sanitation services to low-income households.

In order to address the equity issues, the government introduced an individual means-tested water consumption subsidy in the early 1990s. The subsidy covers 25-85% of the cost of household's basic water and sewerage consumption (up to 15 m3 a month), with all consumption beyond this limit charged at the full price. The subsidy is targeted towards households unable to purchase the basic water needs, roughly defined as households for which the WSS bill constitute more than 5% of their monthly income. Potential beneficiaries (defined as the 20% poorest nationwide) can apply to their municipality, which determines the eligibility of each household based on a scoring system. In practice, municipalities pay the subsidy directly to the water companies and customers are billed for the difference. The separation of water use into two distinct goods - basic needs and optional consumption - allows the government to provide a water subsidy to low income households that is independent of water consumption beyond the basic needs. The subsidy scheme is fully funded by the central government, and administered by the municipalities.

The introduction of the subsidy for basic water needs, combined with full cost pricing for further consumption, has allowed Chile to successfully raise water prices to reflect costs without compromising social and distributional goals. In 1998, nearly 450 000 subsidies were distributed, benefiting almost 13% of households by an average USD 10 per month. The cost of the subsidy scheme reached USD 42.5 million in 2000, much lower than the cost of the previous universal subsidy scheme which granted subsidies to loss making water service providers. Further, a financial deficit of 2% of assets in the water and sewerage sector was reversed to a surplus of 4% with net profits of USD 107 million, more than twice the cost of the subsidy scheme.

Despite the successes, only a quarter of households in the lowest quintile of income distribution received the subsidy in 1998, suggesting that some low income households did not receive subsidies while some high income households do. In 2002, changes were made to the targeting system in order to improve the targeting of low income households. In 2011, 15% of water company clients benefited from the vouchers at a cost of USD 80 million. The current average tariff in Chile is USD 1.4 per cubic metre (m3), which is high compared to other Latin American countries. Tariffs are almost double in some northern regions, reflecting water scarcity, as well as in the far south, possibly reflecting difficult conditions for providing water supply and sewerage to users.

Source: OECD, 2005; 2013a; OECD/ECLAC, 2016 ; Reynaud et al., 2016.

If a fixed access fee is included in the pricing system, this fee can be set to zero or even be negative for disadvantaged water users (they receive a payment, rather than paying; Grafton, 2017; OECD, 2011b; 2013a). This practice has been used in the US, known as a

fixed charge waiver (OECD, 2003). Alternatively, the fixed charge can be set to different levels for different income groups (Cardone and Fonseca, 2003). In many cases, subsidising access has been demonstrated to be more effective than subsiding consumption (OECD, 2009). As discussed by Grafton (2017), the funding gap for the service provider can be met by charging a higher connection fee to other water users, or setting volumetric water prices in excess of the marginal cost for the more well-off users: this may not be efficient, from an economic perspective, but can be socially desirable.

Another type of targeted social measure provides households with payment assistance in the form of fractioned payments (e.g. weekly or fortnight billing when liquidity to pay large sums is not available), other easier payment plans, special loan facilities and arrears or debt forgiveness (OECD, 2013c). Such assistance is particularly appropriate for households with unstable revenues and limited capacities to save money to pay monthly bills.

Lastly, instead of providing payment relief or assistance, governments or water utilities can help poor households reduce their water consumption, through conservation programmes for low-income consumers, including measures to facilitate access to water-saving technologies and appliances (OECD, 2003). This has been done in Paris, France, where *Eau de Paris* has established a system of "water ambassadors" tasked with identifying households that face difficulties with regards to paying their water bills, and giving them advice on how to limit their consumption, thus avoiding water poverty (Aqua Publica Europea, 2016).

Social measures serve to achieve policy objectives independently of households' levels of water consumption. Subsidies based on the level of water consumed are likely to cause distortions in consumption and, as a result, hamper efficient allocation of water resources (Reynaud et al., 2016; OECD, 2011b). This implies that the social measures should be designed in order to secure basic needs, rather than be based on measured consumption in the individual household. In Chile, policy-makers have created a clear distinction between basic water needs and optimal consumption (see Box 5.7, above). Eligible poor households are provided with vouchers that help them cover a smaller or larger share (depending on their assessed needs) of the bill for basic water volumes, but never for volumes above this level. This guarantees that the social measures never cover water for profligate use.

5.4. The tariff setting process

Fixing the tariff for water supply and sanitation services remains a challenging political task, and it can be difficult to acquire the necessary political and social acceptance in determining and introducing the tariff. Ireland illustrates how difficult it can be to introduce tariffs for water supply and sanitation services, despite the evidence that i) public finance has failed to cover the costs of infrastructure maintenance and renewal, and ii) affordability issues are limited. In many cases, *reforming* tariffs for WSS services can be as hard as implementing tariffs for the first time. A reform can be politically difficult, and the process of obtaining sufficient social and political support may face a number of obstacles. Nevertheless, failing to do so can end up in serious long-term consequences for the community.

Whether tariffs are being introduced for the first time or reformed, the tariff-setting process is an essential part of the social acceptance and economic efficiency of the tariff: it affects water users' willingness to pay and the capacity of the tariff to achieve its objectives. A well-designed tariff-setting process is an iterative one that may involve revisions of sector

development targets, investment and operational programmes of WSS utilities, as well as the development of financial plans (OECD, 2016f).

Several features of a well-designed tariff setting process derive empirically from international experience. First of all, this involves designing a tariff structure, a basis for charging and a bill collection system entailing low transaction costs. This implies ensuring that the costs of estimating, implementing, administrating and levying the tariff should not exceed the benefits.

Second, social and political acceptance of the WSS tariff can be facilitated if water utilities are accountable for operational efficiency. If utilities manage to demonstrate that available financial, technical and water resources are used efficiently, and prove their ability to seek to continuously strengthen their performance, customers are more likely to be willing to foot the water bill.

Third, the tariff setting process should be designed in such a way that consumers understand *what* and *why* they pay. This entails public awareness regarding the rationale for levying tariffs on users and the level of the charge.

A requisite for these conditions to be met is the engagement of relevant stakeholders throughout the tariff setting process. Stakeholder engagement can secure a better informed process as well as enhance public and political support for the tariff once it is established. Particular attention should be paid to active participation of such groups as indigenous people, poor or disabled people, as they are directly affected by - and more vulnerable to - changes in service delivery and charging policies. Engaging with people unserved is critical, as they know the cost of not benefitting from the service. Risk of consultation capture needs to be mitigated, especially as it may contribute to the status quo.

5.5. Overcoming lack of data

On a technical note, the tariff setting process and the design of accompanying social measures are only able to succeed if relevant data is available. Different tariff structures require different kinds and quantities of data. The creation and accessibility of adequate data in a specific context may contribute to the choice of tariff structures and accompanying social policies. For example, as noted above, IBTs require a broader set of data on individual households than volumetric pricing. Data regarding the number of children, adults as well as people with special medical conditions, constitutes indispensable information when seeking to adequately design social subsidies provided through the water bill.

Access to relevant data can be restricted in several ways. The absence of metering limits the capacity to document water use in details. Privacy laws can deny utilities access to data on the households behind the meter: data-privacy law in the UK, the Netherlands or California has prevented the installation of smart water meters in some jurisdictions (OECD, 2015).

If affordability issues are addressed outside the water bill, relevant data may be more readily available. The implementation of targeted social measures essentially relies on data regarding household income (and possibly health data). In order for the benefits of targeted social measures to exceed costs, the collection and management of such data should be straightforward, transparent and legitimate. In countries where targeted social programmes for non-water services already are in place, such as for housing or healthcare, it is wise to employ the same, or similar, household data and eligibility criteria for targeted social

measures for WSS services. For example, in France, the eligibility criteria developed for coverage of healthcare expenses, *Couverture Maladie Universelle* (CMU), could be used as a basis when designing the eligibility criteria for targeted social measures applying to WSS services. By using existing systems, provided that these are well targeted, countries can save transaction costs.

In cases where existing household data is insufficient, countries may choose various approaches to data collection. In addition to looking at households' socioeconomic status and demographics, many countries study households' water use and expenses, in order to estimate the share of WSS expenses in total income. Such affordability assessments have been carried out in a number of OECD countries. In Portugal, a comprehensive affordability study was conducted prior to the country's WSS tariff reform (see Box 5.8). In Wallonia, Belgium, affordability is estimated based on surveys, as well as annual assessments of households' payment track record (see Box 5.6, above).

Box 5.8. Addressing affordability issues in Portugal

As part of the process leading to the design of its proposed tariff reform, the economic regulator of WSS services in Portugal (ERSAR) carried out an affordability study. This identified geographically concentrated clusters of population that would fall below the affordability threshold, which had been set at 3% of household disposable income. Some 10.5% of Portuguese households faced bills in excess of the affordability criteria. These were concentrated in 60 out of 309 municipalities in the North and Tagus Valley regions, where 15-30% of households would face unaffordable bills. The affordability study, however, also showed that WSS services do not pose an affordability problem for society as a whole, as they represent a very small portion of overall expenditure by household on utility services (including electricity, gas, etc.).

The design of the tariff reform considered these results, by: i) allowing flexible solutions in different municipalities to address geographically localised affordability problems; ii) including support from ERSAR to local service providers on ways to manage the transition to financial sustainability; and iii) structuring a communication plan to the public to clarify the real situation with regards to the weight of WSS costs for Portuguese households. The Water Act makes it mandatory for each service provider to draw up a "social plan" which increases affordability for low-income households. Low-income households are defined as those whose annual income is below the national annual minimum wage. Evidence of eligibility will be required, to be renewed every three years – tax returns and statements of government benefits received will be accepted. The precise details of the social plan tariff will be determined by the municipality (regardless of whether or not it is the service provider).

Source: OECD, 2010.

In developing countries, identifying the poorest households, developing appropriate eligibility criteria and determining the size and form of social measures can be a complicated process, which comes at high administrative costs. Most developing countries have some data available on households' socioeconomic status, demographics and water expenses. However, all the pieces of information are rarely contained in a single, consistent data set (Cardone and Fonseca, 2003; Gómez-Lobo et al., 2000). As for water use, relevant data can be even harder to obtain, due to the lack of metering.

Seeking to tackle the challenges of data deficiency, policy-makers in a number of countries have used various proxies to measure parameters such as poverty. For example, property value, taken from public registries, has been used as a proxy of income. Many such proxies have proven to result in erroneous assumptions, and do often rely on incomplete sources of information. In other cases, where single household data is deficient, zonal proxies have been employed to measure wealth: eligibility criteria for social programmes are developed at a neighbourhood level rather than household level; as a consequence, social support is provided to all the households located within the neighbourhoods determined as poor. This, and other similar proxies, increases the risk of inclusion or exclusion errors (Foster et al., 1999; Gómez-Lobo et al., 2000).

Lack of relevant data can be overcome by collating and imaginatively manipulating different sources of data to generate estimates of the missing variables. In most countries, some data on socioeconomic characteristics is available in secondary household survey data, such as national income and expenditure surveys, or national censuses. The World Bank Living Standards Measurement Study (LSMS) can be used as a blueprint for national household surveys. Data on water use and expenditure can often be derived from water utilities' client databases, however, only for households with a private water connection. Willingness-to-pay surveys may provide useful information with regards to determining the value of e.g. vouchers and lump sum transfers. Once data from different sources, such as those mentioned above, have been gathered to a suitable data sets, simulation models allow governments to design and target social measures (Gómez-Lobo et al., 2000). Therefore, in order to further facilitate the implementation of targeted social measures for WSS services in developing countries, a key objective should be to build capacity as regards the development of surveys and analysis of statistical data. That capacity (and some of the data collected) would benefit other public services, such as electricity, gas, or district heating.

While capacity building and production of additional data can pave the way to future developments, a lot can be achieved with available capacities and data. The range of options for tariff structures and accompanying measures experienced globally and documented in this paper suggests that robust tariff policies can already build on existing capabilities.

6. Concluding remarks

This paper was triggered by a concern that several options considered by national or local authorities to address social consequences of water supply and sanitation tariffs may not generate the expected benefits. In a context where expenditures for water-related services are projected to increase, and public finance face severe and lasting constraints, revenues from tariffs have an essential role to play to contribute to the financial sustainability of service providers (be they public or private). At the same time, tariffs for water services generate social issues that need to be confronted thoroughly.

The paper explores several options to address social concerns triggered by tariffs for water supply and sanitation services. In essence, it discusses the respective strengths and limitations of alternative tariff structures, such as increasing block tariffs, which intend to combine financial, environmental and social objectives. It explores how different fiscal instruments contribute to fair and inclusive provision of water services, with a preference for taxes with a broad base and a social orientation to support social measures. A range of targeted social measures are presented, which can achieve social objectives outside of the water bill: social funds, vouchers, subsidised connections fees, fractioned payments have distinctive advantages, when they can build on existing social programmes and administrative capabilities.

This exploration concludes that there is no silver bullet. Policy makers need to consider and assess a range of relevant options, with consideration for such practical issues as the tariff setting process and data requirements and availability, according to local context and levels of water stress. On these issues, countries have a lot to benefit from monitoring innovative practices that can inspire reform of prevailing practices, which will need to adjust to shifting conditions and priorities. As social, economic and fiscal conditions deteriorate in OECD and developing countries in the aftermath of the SARS-COV-2 health crisis, the capacity to secure sustainable finance for water supply and sanitation services while addressing social concerns for tariffs can contribute to maintaining appropriate levels of service and achieving the ambition of national policies and the 2030 Development Agenda.

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