Clean drinking water as a Sustainable Development Goal: fair, universal access with increasing block tariffs

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One focus of the G20 Summit in Hamburg in July 2017 was the United Nations' sustainable development goals, including those set for the water sector. Despite progress, around 800 million people worldwide do not have adequate access to drinking water. Increasing block tariffs are an instrument widely used to support access to drinking water for poorer segments of the population. With this system, the price of water progressively increases with the volume consumed. An affordable first block ensures that poorer segments of the population have access to drinking water. However, neoclassical economic theory deems this form of tariff inefficient and advises against its use. From a behavioral economics perspective, however, it does have some advantages, which the present study discusses. In addition to their relative ease of implementation, increasing block tariffs are in line with the general public's concept of fairness: poorer population segments should pay less for vital goods.

At the G20 Summit in Hamburg at the beginning of July 2017, the implementation of the Sustainable Development Goals of the United Nations (UN) was a key focus (Box 1).[1] This includes universal access to drinking water stipulated in the sixth goal. Since at least 2000, access to clean drinking water has been a concrete goal of sustainable development. For example, United Nations Millennium Goal 7c proposed reducing the proportion of the global population without access to safe drinking water in 2015 by 50 percent in comparison to 1990.[2] The development goal was generalized to include access to clean water as a universal human right in 2010: UN Resolution 64/292 demanded a guarantee of the availability and sustainable management of drinking water for everyone.[3]

Indeed, progress has been made. For example, the number of people in the world with access to a clean drinking water source (defined as adequate protection against external contaminants)[4] rose by 2.6 million between 1990 and 2015, from 76 to 91 percent. The expansion of water main and pipe systems played an important role in this.[5] Yet, in 2015 around 800 million people still did not have access to safe clean drinking water—especially in sub-Saharan Africa and rural regions.[6] Furthermore, one third of the world's population lives without adequate sanitation. The UN estimates the resulting annual income loss in developing countries to be approximately

1 See United Nations, "Sustainable Development Goals: 17 Goals to Transform our World," (Website, United Nations, New York City, 2016). (available online; retrieved June 15, 2017. This applies to all other online sources cited in this report unless otherwise noted.)

2 See United Nations, "United Nations Millennium Declaration," (Resolution adopted by the General Assembly 55/2, United Nations, New York City, 2000) (available online).

3 See United Nations, "The Human Right to Water and Sanitation," (Resolution adopted by the General Assembly 64/292, United Nations, New York City, 2000) (available online).

4 WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation, "Improved and unimproved water sources and sanitation facilities," (WHO/UNICEF, Geneva/New York City, 2017) (available online).

5 United Nations, "The Millennium Development Goals Report 2015," (PDF, United Nations, New York City, 2015) (available online).

6 United Nations, "Millennium Development Goals."

Box 1

Issue linking: the ties between sustainable development goals are growing stronger

The G20 summit in Hamburg in July 2017 took place under German presidency. Measures for implementing the sustainable development goals were on the agenda for discussion. The goals were adopted in 2015, almost at the same time as the 2015 United Nations Climate Change Conference, as part of Agenda 2030.[1] They not only provide guidelines for future development cooperations but also connect climate protection and development.

In the ongoing debates within the G20 group and the upstream T20 group of international think tanks, an intensification of the ties between the individual development goals can be detected.[2] This process of issue linking can connect global and local environmental protection and development goals. One area in which it is possible to link climate protection and other United Nations sustainable development goals is carbon pricing and subsequently using the yields for infrastructure development,[3] including sustainable access to drinking water. This connection makes it possible to achieve two goals using one means: the financial flows resulting from carbon pricing could be efficiently allocated to sustainable infrastructure measures in order to support "green growth" in both emerging and industrial countries. According to estimates, a global investment of over 15 trillion U.S. dollars in water and sanitation alone will be required by 2030.[4] Some countries could take part of their revenue from national carbon pricing to cover their share of the amount.[5]

1 See United Nations, "Transforming our world: the 2030 Agenda for sustainable development," (Resolution adopted by the General Assembly A/70/L.1, United Nations, New York City, 2015) (available online) (accessed: June 15, 2017). For more details, see Jeffrey Sachs, *The Age of Sustainable Development*, (New York: Columbia University Press, 2015).

2 See Cèline Bak et al., "Towards a Comprehensive Approach to Climate Policy, Sustainable Infrastructure, and Finance," (PDF, G20 Insights, Berlin, 2017) (available online).

3 See Joseph Stiglitz and Nicholas Stern, "Report of the High-level Commission on Carbon Prices," (PDF, Carbon Pricing Leadership Coalition, Washington, DC, 2017) (available online).

4 See Amar Bhattacharya et al., "Delivering on Sustainable Infrastructure for Better Development and Better Climate," (PDF, Brookings Institution, Washington, DC, 2016) (available online).

5 Bak et al., "Comprehensive Approach."

Box 2

Increasing block tariffs in practice

Increasing block tariffs are used in many developing and emerging countries. There are significant differences in the design of increasing block tariffs with regard to number of blocks, water volume assigned to each block, price, and price structure (Figure 1). In all of the cities shown here, the lowest block, or lifeline tariff block, starts in a lower price segment and rises with increasing water consumption (in cubic meters per month and metered connection).

A survey of water tariffs from the literature shows the worldwide significance of increasing block tariffs, not only in the developing world.[1] In 60 percent of the cases included, they are used for drinking water (Figure 2). The cases include major cities in emerging and developing countries in Africa, the Middle East, and Asia. However, we also found IBTs in some metropolitan regions in industrialized countries such as the USA. (San Diego, San José, Los Angeles, and Seattle) and Australia (Melbourne and Perth).

The differences in design indicate that it is not possible to make a general statement about which increasing block tariff designs are most advantageous. Take Manila and Curitiba for example: both cities allocated a volume of ten cubic meters and a price of zero U.S. dollars per cubic meter to the lifeline block but diverged markedly from there. While the price increases in subsequent blocks were quite low in Manila, Curitiba chose to use sharp rises in the price of water as the volume consumed increased and the blocks themselves were larger.

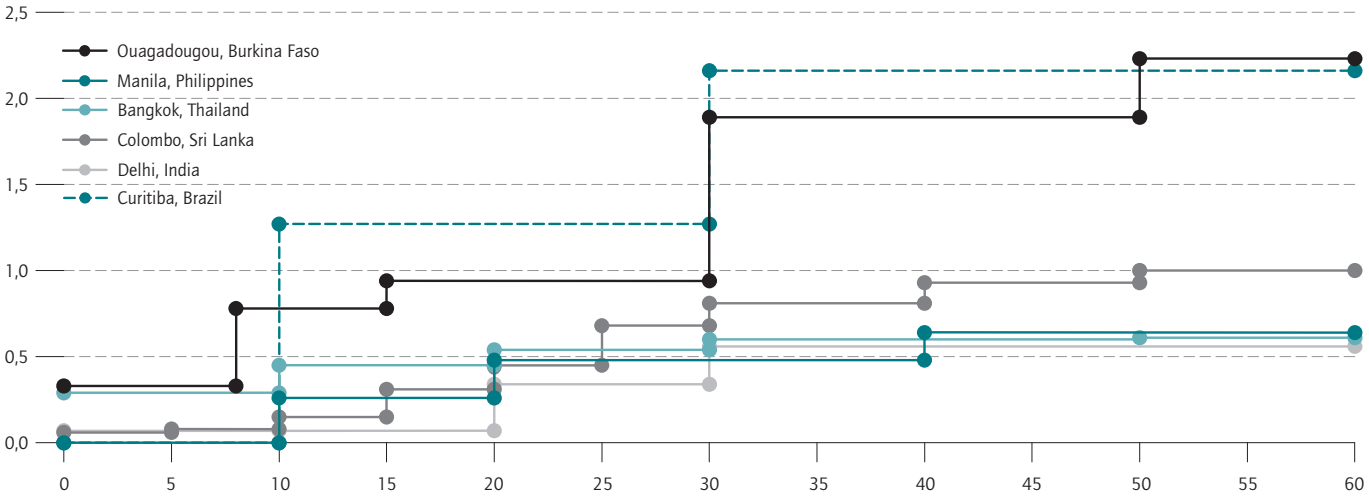
Country-based and hydrological particularities play key roles in the detailed design of increasing block tariffs. These include: the amount of water required for survival, access to the water piping network, and the relationship between household size and water consumption.

1 See Young and Whittington, "Beyond increasing block tariffs."

Figure 1

Examples for specific designs of increasing block tariffs worldwide

Block price in U.S. dollars per cubic meter drinking water



Source: Own depiction based on data taken from the International Benchmarking Network for Water and Sanitation Utilities (IBNET) tariff database (2017), which is a joint project of Global Water Intelligence (GWI) and the International Benchmarking Network IBNET of the World Bank. It provides information on 193 countries, 1907 utilities, and 5054 tariffs (available online).

Globally, increasing block tariffs vary not only with respect to the height of the lifeline tariff but also in their further progression.

Figure 2

Sample of places where increasing block tariffs are implemented

Status 2013

Note: This overview shows a sample of cities worldwide where increasing block tariffs are implemented. There is no claim of completeness.

Source: Own depiction based on data taken from Mike Young und Dale Whittington (2016): Beyond increasing block tariffs: Decoupling water charges from the provision of financial assistance to poor households. Global Water Partnership, Stockholm.

Increasing blocktariffs are not only relevant in a development context

lifeline tariff block can be too large. In some cases, for example, it ranges from ten to 20 cubic meters per month and household or connection (Figure 1, Box 2).[14] This is a very wide range and would probably include consumers in higher income segments as well. From a politico-economic perspective, cases like this would be examples of "subsidizing the middle class." The working assumption which increasing block tariffs are based on—the positive relationship between water consumption and income—may also turn out to be critical. The relationship between rising income and increased water consumption has not been documented in a uniform empirical manner.[15] Furthermore, if the water prices in the first blocks are too low, this could lead to excessive consumption, aggravating an existing water shortage.

On the other hand, the lifeline tariff block could be too small. Assuming in general that poorer households have more members,[16] the total consumption of the household would rise and a lower volume of water would be available at the lifeline tariff, if it is charged on a per household basis. If several families share a water connection this will lead to higher consumption, moving them into a higher block and in turn, assign them to a higher tariff. These types of contexts can undermine the original purpose and effectiveness of increasing block tariffs, namely, to provide poor population segments with the required water volume at an affordable price.

Others criticize that block tariffs do not reach certain segments of the population at all. This is typically the case in rural regions, where the connection density is low and network infrastructure minimal. Poor population segments are often not connected to the public water network. They procure their drinking water from wells, open water, or mobile water sellers, for example, and do not benefit from the tariff design at all.

Acknowledging social preferences: increasing block tariffs facilitate fair distribution of welfare

The results of current research at DIW Berlin, which takes into consideration the general population's social preferences, cast increasing block tariffs in a better light than the neoclassical view does.[17] For some time now, economists have been reviving their interest in the issues of distribution and fairness (Box 3). Taking distribution into consideration has led to further development in preference theory. In the conventional view, only bundles of goods that individuals consume themselves can generate utility. This is the assumption usually underlying *homo economicus*. The theory of social preferences, on the other hand, encompasses the interaction between one's own consumption and that of others. It assumes that people are social beings and they express this through sympathy or envy of other people—as discussed in the economic literature for centuries (Box 3).

The present report assumes that individuals not only derive utility from self-consumed goods (x_1), but also from the relationship between their own self-consumed goods and the goods that others consume (x_2). A differentiation between envy (weighted with parameter γ) and sympathy (weighted with parameter δ) is made. While envy plays a role when a larger bundle of goods is available to the reference group, sympathy plays a role when an excess of personal consumption in comparison to others leads to negative utility. Fehr and Schmidt introduced this type of social preferences into the literature;[18] it can be formalized as,

$$\text{Social utility} = x_1 - \gamma \max(x_2 - x_1, 0) - \delta \max(x_1 - x_2, 0)$$

The social preferences outlined here indicate that inequality receives a negative rating—with regard to universal access to clean drinking water, for example. If broad sections of the population have little or no access, society's welfare is at a low level. The perspective of the people who have inadequate access to drinking water is just as important as the perspective of the people who have adequate access to drinking water. The former experience lower utility because they both can access less drinking water and compare this to the higher level of access of others. The latter experience lower utility because they assess others' inadequate access negatively. In this case, redistribution would be welcome from both societal and individual perspectives.

A society with a high preference for redistribution can assess increasing block tariffs more positively than is possible from the perspective of the neoclassical *homo economicus*. However, it should be taken into account that the specific extent of the redistribution preference

14 For more information on the categories of "drought," "water shortage," and "safe water," see Water Forum www.water-forum.com/page_1.htm and Phil Greaney, Sue Pfiffner, and David Wilson, eds., *Humanitäre Charta und Mindeststandards in der humanitären Hilfe*, (Bonn: The Sphere Project, 2011) (available online).

15 See Young and Whittington, "Beyond increasing block tariffs."

16 See Momi Dahan and Udi Nisan, "Unintended Consequences of Increasing Block Tariffs: Pricing Policy in Urban Water," *Water Resources Research* 43 (3) (2007).

17 For this section, see Georg Meran and Christian von Hirschhausen, "Increasing Block Tariffs in the Water Sector: An Interpretation in Terms of Social Preferences," *The B.E. Journal of Economic Analysis & Policy* (available online).

18 Ernst Fehr and Klaus M. Schmidt, "A Theory of Fairness, Competition, and Cooperation," *„The Quarterly Journal of Economics"* 114 (3) (1999): 817–868.

Box 3

Social preferences: Adam Smith's "moral sentiments" in the 21st century

The concepts of fairness and equity are slowly but surely working their way into mainstream economics. In these days of financial crises and global risks, they are resonating with large sections of the population. In this context, however, it is important to point out that key arguments in support of fairness and morality in economic action were introduced centuries ago. Classical Greek philosophers, for example, viewed elevated levels of inequality within social segments as potentially explosive. Plato called for capping the income difference between well-to-do and poorer citizens at a factor of four.[1] In the Middle Ages, the ideal of equality was tied to religious standards. In his work *Utopia*, Tudor-era philosopher Thomas More posited the equality of material needs (at a generally low level).

Adam Smith, a founder of classical political economics, reasoned that a key driver of economic development is people's ability to empathize with fellow human beings. In his major work published in 1759, *The Theory of Moral Sentiments*, he developed the concept of the "sympathy" of a non-partisan well-educated spectator concerned with the fate of others out of a human sense for what is right.[2] During the 19th century and well into the 20th, the moral issues of equality and inequality were at the core of political economics.[3]

During the Cold War after 1945, the subject of "distribution" was removed from most economics textbooks, and the focus was placed on the "optimal allocation" of production factors and goods. Distribution issues were relegated to the set of subjects that economics was incapable of making claims about.[4] With the end of the Cold War and the crisis of neoclassical economics in the wake of the most recent financial and economic crisis, the issue is back on the agenda in the 21st century.

1 Bertram Schefold, "Platon und Aristoteles," ed. Joachim Starbatty, *Klassiker des ökonomischen Denkens*, (Hamburg: C. H. Beck, 2008).

2 "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortunes of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it." See Knud Haakonssen, ed., *Adam Smith: The Theory of Moral Sentiments*, (Cambridge: Cambridge University Press, 2002).

3 In 1873, Gustav Schmoller founded the German Economic Association (*Verein für Socialpolitik*), the society of German-speaking economists that is still active today, based upon this concept.

4 See Michael Fritsch, Thomas Wein, and Hans-Jürgen Ewers, *Marktversagen und Wirtschaftspolitik*, (Munich: Verlag Franz Vahlen, 1993), Chapter 2.

depends on the socio-economic characteristics of the society in question.[19]

In addition, it can be shown that the progression of the tariffs—meaning the relationship of the prices in the different consumption blocks—correlates positively to redistribution preferences in different ways. The stronger the society's preference for providing universal access to essential goods and services, the greater the differentiation required in block tariffs. This implies a price for the initial block that is much lower than the marginal cost, the lifeline tariff. Accordingly, tariffs are determined under consideration of the aspect of social equality.[20] Accepting the validity of social preferences implies that increasing block tariffs are more equitable than linear tariffs.[21]

Block tariffs are easily implemented

Another argument in favor of block tariffs is their relative ease of implementation. Increasing block tariffs are a simple tariff form with lower transaction costs. It is superior to direct financial assistance, that is, direct transfers to individuals, to the extent that these require specific knowledge of the income of individuals, families, or households. In the developing world of low administrative capacity and typically inadequate governance structures, robust transfer systems are difficult to implement. Alongside mismanagement and corruption, those factors can trigger artificial water shortages.[22] Increasing block tariffs reduce the risk of artificial water shortages because they are less susceptible to corruption due to the lack of direct subsidy payments.

19 See Roland Bénabou and Jean Tirole, "Belief in a just world and redistributive politics," *The Quarterly Journal of Economics*, 121 (2) (2005): 699–746.

20 Redistribution neutrality results in linear tariffs without differentiation.

21 Structurally, this finding is similar to the debate on progressive taxes; in particular, income tax. Here as well, in the context of an increasing consideration of fairness and equality, there appears to be a relationship between societal concepts of fairness and progressive taxes. See Peter Diamond and Emmanuel Saez, "The Case for a Progressive Tax: From Basic Research to Policy Recommendations," *Journal of Economic Perspectives* 25 (4) (2011): 165–190.

22 Martin Jekel, Georg Meran, and Christian Remy, "Sauberes Wasser: Millenniumsziel kaum zu schaffen, Privatisierungsdebatte entspannt sich," *DIW Wochenbericht* No. 12/13 (2008): 143–148.

However, one cannot assume that once increasing block tariffs are adopted as policy, they will permanently secure access to drinking water for all. In the medium term, financing is an issue (through budgetary resources, funds, external donors, etc.) as well. Interest groups could attempt to influence the detailed design of the block tariffs politically or economically. And other problems relevant in the developing world, such as weak governance structures, could also make it difficult to create an effective design. For this reason, this single economic instrument cannot guarantee universal access to drinking water. It is, rather, one key to achieving the Sustainable Development Goal of universal access to drinking water within a polycentric decision-making context involving diverse actors and interest groups.[23]

Conclusions

Despite improvements in recent decades, access to drinking water remains a critical factor in the developing world with respect to direct access for poorer population segments as well as long-term growth in the countries particularly affected. Lacking drinking water quality is a significant economic obstacle to development. To implement the United Nations Sustainable Development Goals, the responsible parties in countries with water shortages—as well as donor countries and international development banks—must re-think the pricing and subsidy instruments being used to provide and finance drinking water.

Increasing block tariffs are a widespread instrument for improving poorer population segments' access to clean water. A specific amount of water is provided at low volumetric prices, and higher consumption leads to a gradual price increase by block. The most affordable block of a block tariff is called the lifeline tariff. This tariff form frequently draws criticism in the economic literature, in particular because of its (ostensible) allocative inefficiency: its prices are not oriented to the marginal cost principle and are therefore attributed with reducing welfare. The design of the blocks and the uncertainty inherent in the relationship between water consumption and household income are also controversial points.

From a behavioral economics perspective, the value of a block tariff system is easier to assess. In societies that are averse to inequality, progressive increasing block tariffs are considered fair because they better map the societal preference for supporting poorer segments of the population. In addition to the arguments based on behavioral economics, simple implementation speaks in favor of the block tariff model, in particular the ease with which they can achieve the goal of providing minimum amounts of drinking water to poorer population segments.

Actually, the apparent conflict between allocative inefficiency and equality of distribution depends on the subjective assessment of different goals. In any case, an important prerequisite for effective block tariff design is adequate block dimensions—above all, the size of the lowest or lifeline tariff. Country-specific aspects must also be taken into consideration when planning the concrete implementation of instruments. They must be carefully weighed in view of various priorities, such as economic efficiency and effectiveness, fairness, and ecological sustainability.

23 Elinor Ostrom and Roy Gardner, "Coping with asymmetries in the commons: self-governing irrigation systems can work," *Journal of Economic Perspectives* 7 (4) (1993): 93–112.

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