dis·cus·sion pa·per

/dəˈskəSH(ə)n ˈpāpər/ (n.)

A paper to present new ideas, to engage neoteric innovators, and to invite discussion on critical issues.

Access Defined

Linking Source, Shelter, and Service

April 2021

This paper seeks to connect the major components of water and sanitation provision into a single unified theory of access that combines source water protection, sufficient household infrastructure, and quality service provision. The paper argues that all of these major components must be fully provided and protected in order for a government to ensure access to water and sanitation now, later, and for all.

THE CENTER FOR WATER SECURITY AND COOPERATION

STARTING THE DISCUSSION

Every human needs water to survive. Sanitation saves lives by protecting human health and the environment. Despite these life-and-death needs, there are no universally-accepted definitions and measures of access to water and sanitation. Without a clear definition for access, millions of people will continue to lack access or will lose it over time. We can only make sure that people have access, get access, and keep access to water and sanitation if we know what access is. Access to water and sanitation can only be truly gained and maintained if we know what it is that must be achieved and protected.

In this paper, the CWSC defines access: what it is and what is required to achieve and maintain it. By considering the multiple factors determining whether access to water and sanitation have been achieved and maintained, the CWSC establishes an actionable, authentic definition of access to water and sanitation that will enable the CWSC to determine existing levels of access, gauge potential vulnerability to loss of access in any country or community, and monitor gains and losses over time.

ACCESS TO WATER AND SANITATION RE-DEFINED

Access to water and access to sanitation, while defined similarly, must be defined separately. What is required to achieve access to water and what is required to achieve access to sanitation are different. The CWSC defines access to water as having in-home, reliable availability of sufficient water to meet domestic needs safely. This definition involves two components: that water is available and that water is available within the home.

First, water must be available. Water is available where there is sufficient water to meet domestic needs safely at all times. If there is insufficient water from a quantity, quality and/or timeliness perspective, water is not available. This can mean there is an insufficient quantity of water to satisfy domestic needs, that the quality of water makes it unusable for domestic purposes, or that water is not available when it is needed or requested. The focus for determining access is on meeting water needs for domestic purposes, not for commercial or industrial purposes. Domestic purposes include water for drinking, hand-washing, bathing, cooking and flush toilets.[1] For there to be sufficient water to meet domestic needs, a minimum of 50-100 liters (13.2 to 26.4 gallons) of water per person per day must be available. For water to be available there must be water sufficient in quantity, quality and timeliness to satisfy water needs for domestic purposes.

Second, water must be available inside the home. Millions of people still

[1] Most pre-1992 toilets use 7 gallons of water per flush, while toilets now typically only require 1.6 gallons per flush.

have to walk long distances to get access to water or depend on periodic deliveries of water to their home. Today, drinking water is made available through centralized drinking water treatment plants and distribution systems, personal wells and boreholes, community standpipes, water tankers, and bottled water. Only some of those delivery methods meet the in-home requirement. Drinking water provided by water tankers, by bottled water, or by any impermanent means does not meet the in-home requirement.[2] Water is available in-home where water is available at the household level. For access to water to be achieved there must be sufficient water in the home to meet domestic needs.

The CWSC defines access to sanitation as having in-home availability of sanitation infrastructure to safely collect and transfer solid and liquid domestic waste to a treatment facility or to safely collect and treat solid and liquid waste onsite. The CWSC uses the term "sanitation" versus "wastewater" because it is a more inclusive term. By using the term sanitation the CWSC acknowledges that there are greater infrastructure and technology options available for collecting and treating solid and liquid domestic wastes beyond wastewater treatment plants. This acknowledgement is important to meet the needs of communities that continue to lack access to sanitation and to reenvision the provision of sanitation services to existing customers where wastewater treatment plants no longer present the best option. Whereas wastewater treatment plants may be cost prohibitive or not be a viable option given the geographical characteristics of the community receiving services, equivalent human health and environmental benefits can be achieved through sanitation infrastructure. It is essential that those human health and environmental benefits be achievable for all communities.

As with water, this definition includes two components: that sanitation infrastructure is available and that the infrastructure is available within the home. First, sanitation infrastructure must be available. Sanitation infrastructure is available where the sanitation collection and treatment system is sufficient to safely capture and contain domestic waste and to transfer the waste to be treated for safe disposal or safe reuse. Not only do homes need to have sanitation infrastructure, but that sanitation infrastructure must prevent communities from exposure to untreated human waste. Existing access ranges from no sanitation facilities within the home, to community sanitation facilities, to improperly constructed capture, containment and

[2] It is important to acknowledge that certain delivery systems are better options than others, and that achieving access to water may be a gradual process. Therefore, the introduction of community standpipes may be an improvement from water tankers or other less reliable delivery systems, but still does not meet the in-home requirement. By defining access more clearly, we set forth the desired standard and will be able to track progress toward that.

treatment facilities that expose people and the environment to untreated waste. When the infrastructure is lacking or fails to protect people and the environment from contact with or exposure to untreated waste, access to sanitation has not been achieved.

Second, sanitation must be available inside the home. Unfortunately, millions of people continue to not have access to sanitation facilities within their home or must share sanitation facilities with the community. This does not qualify as having access to sanitation facilities. Each household should have individual access to sanitation.

For access to sanitation to be achieved, sanitation facilities must be located within the home and the untreated waste must be safely treated and disposed of. Ultimately, this means that for wastewater infrastructure to be available, domestic and human waste must be effectively captured in the home, transferred to a centralized treatment facility, and treated to be safely discharged into a waterway or safely treated for reuse as drinking water or recycled water and/or biosolids for agriculture. For onsite sanitation to be available, such as septic tanks, pit latrines or cartridge-based systems, domestic and human waste must be effectively captured in the home and treated either onsite or at a fecal sludge treatment plant to ensure protection of human health and the environment.

Achieving universal access requires explicit consideration of principles of equity and non-discrimination. Having a certain gender, race, income-level, religion, age or disability should not result in a greater or lesser likelihood that you will have access to water or sanitation or that the quality of access will be better or worse. Therefore, while the terms equity and non-discrimination or not used in the definition of access, they are critical to any analysis of whether access is being achieved for all.

CREATING AN ACTIONABLE DEFINITION

These definitions of access to water and sanitation help to more broadly conceptualize what access means. To make these definitions actionable, the CWSC has identified two factors that must be measured and monitored over time in order to ensure households gain and maintain access to water and sanitation. For households to have access to water and sanitation they must have both physical and economic access.

Physical Access

Physical access to water requires having: 1) sufficient source water available to meet current and projected demand for domestic water use, 2) the infrastructure necessary to receive water in the household, and 3) a good quality water service that protects human health. Physical access to sanitation requires having: 1) for wastewater treatment networks, sufficient water, 2) the infrastructure to receive sanitation services in the household,

and 3) a good quality sanitation service that protects human health and the environment. Each component will be discussed below.

Sufficient Source Water

To meet domestic water needs for each household, there must be sufficient water resources available. Drinking water is sourced from surface water and groundwater. Water is withdrawn from rivers or lakes or pumped from underground aquifers, treated, and distributed as drinking water. Whether the drinking water is coming from the watercourse directly, the water is treated and distributed through a centralized network, or the water is withdrawn from a well or borehole, there must be water resources to have drinking water.[3] Access to drinking water requires sufficient water resources to satisfy our drinking water and other domestic needs, including water for flush toilets. Wastewater treatment plants depend on water to move human waste from the toilet to the treatment plant. Without sufficient water resources, we would not have the necessary water supply to meet domestic water needs.

The management and stewardship of water resources is critical for sufficient water supplies to meet all domestic water needs. However, drinking water and domestic needs are not the only demands on water resources. Domestic demands compete with agriculture, energy production, industry and the environment for limited water resources. Without proper management, surface water and groundwater resources will dry up as demand for water exceeds the supply. As the volume of water flowing decreases, pollutants will become more concentrated. Overdrawn aquifers may suffer saltwater intrusion, rendering them unusable for drinking water. Climate change will exacerbate water source depletion and will intensify the mismatch between the location of available water resources, and the population and its demand for water. As the availability of water resources declines, so does the water available to meet domestic water needs, increasing the likelihood of water shortages. From a water security perspective water resources management is critical to ensure sufficient water to meet domestic needs and to ensure access to water and sanitation.

There are no alternatives to freshwater for drinking water. Humans cannot drink salt water. Freshwater must be available or created to satisfy drinking and domestic needs. Ocean water and brackish water can be used as a source for drinking water. However, the cost of desalination is still prohibitive, and the desalination process is excessively energy intensive. The

[3] Historically, drinking water needs were satisfied with direct use from rivers and lakes. For many communities, this is still the case. Access to drinking water is no longer achieved by simply having access to untreated water from waterbodies. Infrastructure was developed to treat and distribute access to water to eliminate the negative health impacts of consuming raw water and to increase access to potable water.

alternatives are not feasible nor preferred.

There are more feasible options for providing alternative sanitation services to wastewater treatment services. Potable water used for flush toilets can be replaced with grey or recycled water, which offers the additional benefit of reducing the strain on meeting drinking water-quality water needs. However, this simply replaces one type of water with another and does not eliminate the need for water to provide wastewater treatment services. Moreover, retrofitting existing infrastructure to transition to this option would be cost-prohibitive for many service providers. Alternative sanitation infrastructure and technology that does not use water could also be deployed, such as dry toilets. But again, retrofitting households would be cost prohibitive and difficult with the infrastructure changes required. These alternatives could be important considerations when expanding existing infrastructure or planning new communities. While alternatives exist, they do not eliminate the need for water and for effective management and stewardship of water resources.

Without source water, there is no water for drinking, cooking or hygiene. And, without infrastructure, source water cannot be transformed and safely delivered as the safe drinking water that fuels our life.

Infrastructure to receive water and sanitation at the household level

For water and sanitation in the home, households must have the necessary infrastructure to receive water and to capture, contain and treat domestic and human waste. To receive drinking water, homes must: 1) be connected to a source of drinking water, such as a well or a centralized drinking water treatment facility, and 2) have the necessary plumbing to deliver the water to the home. Without a connection to a source of drinking water and the necessary network of pipes and fixtures to receive the water within the home, access to water cannot be achieved.

To receive sanitation, homes must have: 1) a capture and containment unit in the home, and 2) a system by which to transfer the human waste for treatment either onsite or to a wastewater treatment plant or fecal sludge treatment plant offsite. Capture and containment infrastructure ensures households do not come into contact with untreated human waste. Human waste presents a threat to public health because of the bacteria contained in the waste. Once captured and contained, treatment of the waste further ensures that the public does not come into contact with untreated waste and that the environment is not polluted. Without the infrastructure to capture and contain human waste and a system by which domestic and human waste is treated before being released into the environment, access to sanitation cannot be achieved.

Without the proper infrastructure, water and sanitation cannot be supplied to homes, thereby denying access. While infrastructure is necessary, if that infrastructure delivers unsafe drinking water or releases untreated waste, access to water is also denied. Therefore, infrastructure must not only be present, but must provide good quality water and sanitation services.

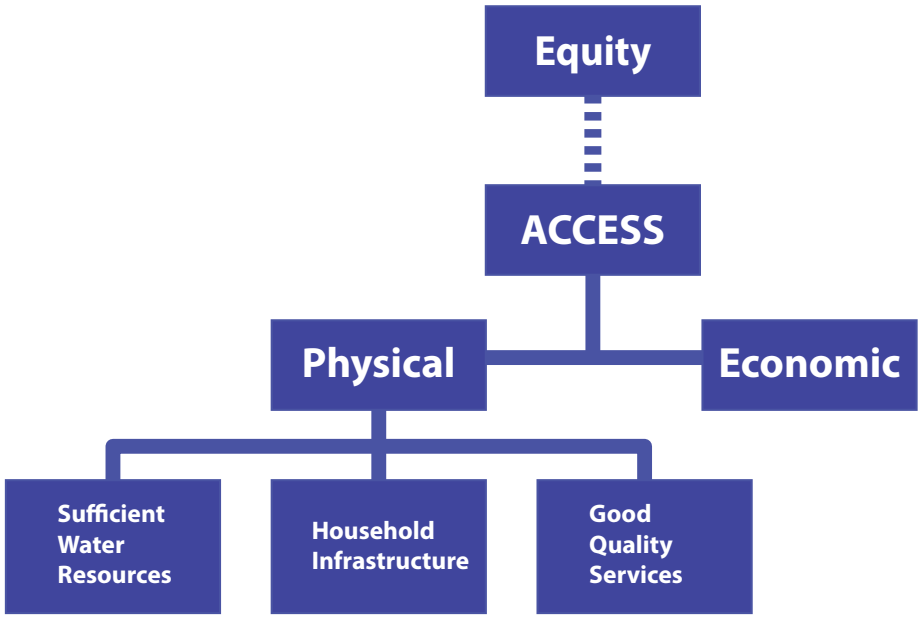

fig. This diagram illustrates the relationship between equity and physical and economic access to water and santiation services.

Good quality water and sanitation services

Access to water and sanitation requires receiving safe, reliable water and sanitation that protects human health and the environment. Water infrastructure must supply water that is safe for drinking, cooking, hand-washing and bathing. Sanitation infrastructure must capture and contain human waste and ensure the release of effluent that does not contaminate the environment or threaten human health. Infrastructure that delivers unsafe and ineffective services fails to allow recipients access to water and sanitation.

If utilities do not deliver clean, safe reliable water that can be used to drink, to shower, and to cook, households are denied access to water. Water can be physically available and flow from the tap but be unsafe to use. If water sickens people or causes long-term health issues, households do not have access to water. When water being supplied to homes is unsuitable for the purpose it is being supplied, access to water is denied.

Inadequate sanitation infrastructure can impede access to sanitation. If waste is not properly captured and contained, humans can come into contact with untreated human waste. This presents significant health risks. If

waste is not properly transferred to a treatment facility - either due to a failed network of pipes or through improperly disposed waste from septic tanks, pit latrines or other cartridge based systems - untreated waste will be released presenting both a risk to the environment and human health. Consequently, households do not have access to sanitation when the infrastructure allows untreated human waste to be released into the environment.

There are additional threats impacting access to water including contamination from the pipes delivering water and water leakage. If infrastructure along the drinking water provision supply chain increases the chances of delivering contaminated water then that infrastructure threatens access. For example, houses with lead service lines, pipes, faucets, and fixtures face a greater likelihood of exposure to lead versus houses without lead pipes.[4] Infrastructure failures, such as water leakage, divert both financial resources and water resources. Water leakage leads to water waste and higher water bills. Infrastructure inefficiencies threaten short-term and long-term physical and economic access to water.

Poor sanitation has a negative impact on the ability to provide safe, clean drinking water. Untreated wastewater can foul waterbodies and pollute the environment if not effectively captured and contained. As mentioned earlier, drinking water is sourced from waterways and groundwater. As the sources become polluted with contaminants, it becomes more difficult and expensive to treat the water to meet drinking water quality standards. The increased treatment costs incurred by the utility are passed on to the ratepayers. Unnecessary escalating costs increase the probability that more households will be unable to afford the services which would threaten their access to water and sanitation.

The tremendous cost of providing water and sanitation services is one of the biggest threats to access of these services. In the United States alone $472.6 billion is needed to maintain and improve drinking water infrastructure over the next twenty years. The World Bank states that countries need to invest $150 billion annually in order to achieve universal access to water and sanitation. Utilities cannot operate, maintain, renew and rehabilitate service providing infrastructure without sufficient revenue. If ratepayers are unable to afford the increased costs, and financial resources are not invested in water and sanitation, the quality of the services will be compromised. Without sufficient resources to invest in maintenance and the renewal of water and wastewater infrastructure, that infrastructure will fall into disrepair. The end result is a lack of access for customers because safe water and sanitation cannot be guaranteed.

[4] With corrosion control treatment the likelihood of contamination decreases, but the threat still exists.

Economic Access

Economic access to water and wastewater services is defined by the CWSC as access to water and wastewater services despite an inability to pay. The core of economic access is that households are able to retain access to the water needed to survive even if the household cannot afford the water necessary for basic human needs. Households may have access to water infrastructure, but they may not have the financial means to guarantee that water flows when the faucet is turned on. Some households may not have the financial resources to pay every monthly bill in full or even to make partial payments. When this occurs, most service providers are allowed to discontinue service. Most service providers execute service shutoffs for nonpayment and fail to consider the financial capacity of households before making decisions to shut off services. Often providers make no accommodations for households unable to pay the bill. Moreover, service providers are often not required to offer rate assistance or payment plans to qualifying households that defray or spread out the cost of services. Economic access to water and sanitation is denied to households when services are not provided or services are shut off as a result of an inability to pay.

Economic access is defined in this way for two reasons: 1) every household must have access to drinking water and sanitation regardless of their ability to pay, and 2) the most direct threat to economic access comes from the failure to consider the household's ability to pay.

Access to water and sanitation should not be denied as a result of an inability to pay. Humans require water to survive. It is not a choice. There is no alternative to or replacement for water. Therefore, the basic premise is that every household should have access to safe, clean drinking water despite their ability to pay. Each household must have access to at least enough water for drinking, hand-washing, and flush toilets. Ideally households would have adequate water to satisfy all of their domestic needs, including water for cooking, bathing, and subsistence agriculture. Though all households should pay for water services, the reality is that some have limited financial resources and cannot pay. Households should not lose access because of their inability to pay.

Moreover, the most direct threat to access comes from the failure to consider ability to pay. This failure presents in two ways: in gaining access to water and sanitation services and in maintaining access. Where water and sanitation services are not available, lower income households often cannot afford to construct the infrastructure necessary to achieve access for themselves or do not qualify for loans that would give them the financial means to pay for services to be brought to them. Where water and sanitation infrastructure exists, households cannot afford to maintain access. The cost of service, charged to households through tariffs, may make water too

expensive for some households to be able to pay. When households do not have the money to pay, they are met with fees, water shutoffs, liens, and foreclosures. These responses by municipalities and utilities deny access to water and sanitation. When municipalities and utilities choose water shutoffs, liens, and foreclosures to respond to an inability to pay, households are punished for being poor. Inability to pay should not prevent access to water and sanitation.

CONCLUSION: THE LAW DECIDES

With a clear understanding of access, we can determine who has access to water and sanitation, who needs access, and who is likely to maintain that access in the future. For households to have access to water and sanitation, households must have physical and economic access. Physical access requires having sufficient water resources to meet current and projected demand, infrastructure to receive water and sanitation services, and good quality services. Economic access requires that households retain access to water despite their ability to pay.

At the heart of achieving and maintaining access to water and sanitation is the law. The law ensures there is water available to meet our domestic needs, that infrastructure fulfills its purpose and delivers safe, reliable services that protect human health and the environment, and that those households without financial means to pay get and maintain access to these critical services. With access now clearly defined, we can ensure that the law enables and accelerates households' access to water. With better law all households will have and maintain access to water and sanitation.

This discussion paper is a publication of The Center for Water Security and Cooperation, a 501c3 non-profit organization dedicated to understanding, evaluating and innovating in water law and governance around the world.

BIBLIOGRAPHY

Aiga, H., Umenai, T., 2003. Standardisation of the definition of access to safe water. The Lancet 361:9375 available at https://doi.org/10.1016/S0140-6736(03)13703-8.

Center for Disease Control (CDC), Healthy Housing Reference Manual, Chapter 9: Plumbing, available at https://www.cdc.gov/nceh/publications/books/housing/cha09.htm.

Environmental Protection Agency, 6th Drinking Water Infrastructure Needs Assessment (2018), available at https://www.epa.gov/dwsrf/epas-6th-drinking-water-infrastructure-needs-survey-and-assessment.

"The cost of clean water: $150 billion a year, says World Bank," 28 August 2017, available at https://www.reuters.com/article/us-global-water-health/the-cost-of-clean-water-150-billion-a-year-says-world-bank-idUSKCN1B812E.

UNICEF, WHO, Progress on Sanitation and Drinking Water – 2015 update and MDG assessment (2015), available at https://www.who.int/water_sanitation_health/publications/jmp-2015-update/en/.

United Nations, Sustainable Development Goals Report 2020, available at https://unstats.un.org/sdgs/report/2020/.

United Nations, The Right to Water: Fact Sheet No. 35 (2010), available at https://www.ohchr.org/documents/publications/factsheet35en.pdf.

United Nations Economic and Social Council, Comment on Economic, Social and Cultural Rights, General Comment No. 15 (2002), The Right to Water (Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights), U.N. ESCOR Doc. E/C.12/2002/11 (Nov. 26, 2002) available at https://www.unhcr.org/en-us/publications/operations/49d095742/committee-economic-social-cultural-rights-general-comment-15-2002-right.html.

WaterAid, Water security framework (2012), available at https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/download-our-water-security-framework.pdf.

World Health Organization (WHO), Progress on household drinking water, sanitation and hygiene 2000-2017: Special focus on inequalities, available

at https://www.who.int/water_sanitation_health/publications/jmp-report-2019/en/.

Aiga, H., Umenai, T., 2003. Standardisation of the definition of access to safe water. The Lancet 361:9375 available at https://doi.org/10.1016/S0140-6736(03)13703-8.

Center for Disease Control (CDC), Healthy Housing Reference Manual, Chapter 9: Plumbing, available at https://www.cdc.gov/nceh/publications/books/housing/cha09.htm.

Environmental Protection Agency, 6th Drinking Water Infrastructure Needs Assessment (2018), available at https://www.epa.gov/dwsrf/epas-6th-drinking-water-infrastructure-needs-survey-and-assessment.

"The cost of clean water: $150 billion a year, says World Bank," 28 August 2017, available at https://www.reuters.com/article/us-global-water-health/the-cost-of-clean-water-150-billion-a-year-says-world-bank-idUSKCN1B812E.

UNICEF, WHO, Progress on Sanitation and Drinking Water – 2015 update and MDG assessment (2015), available at https://www.who.int/water_sanitation_health/publications/jmp-2015-update/en/.

United Nations, Sustainable Development Goals Report 2020, available at https://unstats.un.org/sdgs/report/2020/.

United Nations, The Right to Water: Fact Sheet No. 35 (2010), available at https://www.ohchr.org/documents/publications/factsheet35en.pdf.

United Nations Economic and Social Council, Comment on Economic, Social and Cultural Rights, General Comment No. 15 (2002), The Right to Water (Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights), U.N. ESCOR Doc. E/C.12/2002/11 (Nov. 26, 2002) available at https://www.unhcr.org/en-us/publications/operations/49d095742/committee-economic-social-cultural-rights-general-comment-15-2002-right.html.

WaterAid, Water security framework (2012), available at https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/download-our-water-security-framework.pdf.

World Health Organization (WHO), Progress on household drinking water, sanitation and hygiene 2000-2017: Special focus on inequalities, available at https://www.who.int/water_sanitation_health/publications/jmp-report-2019/en/.