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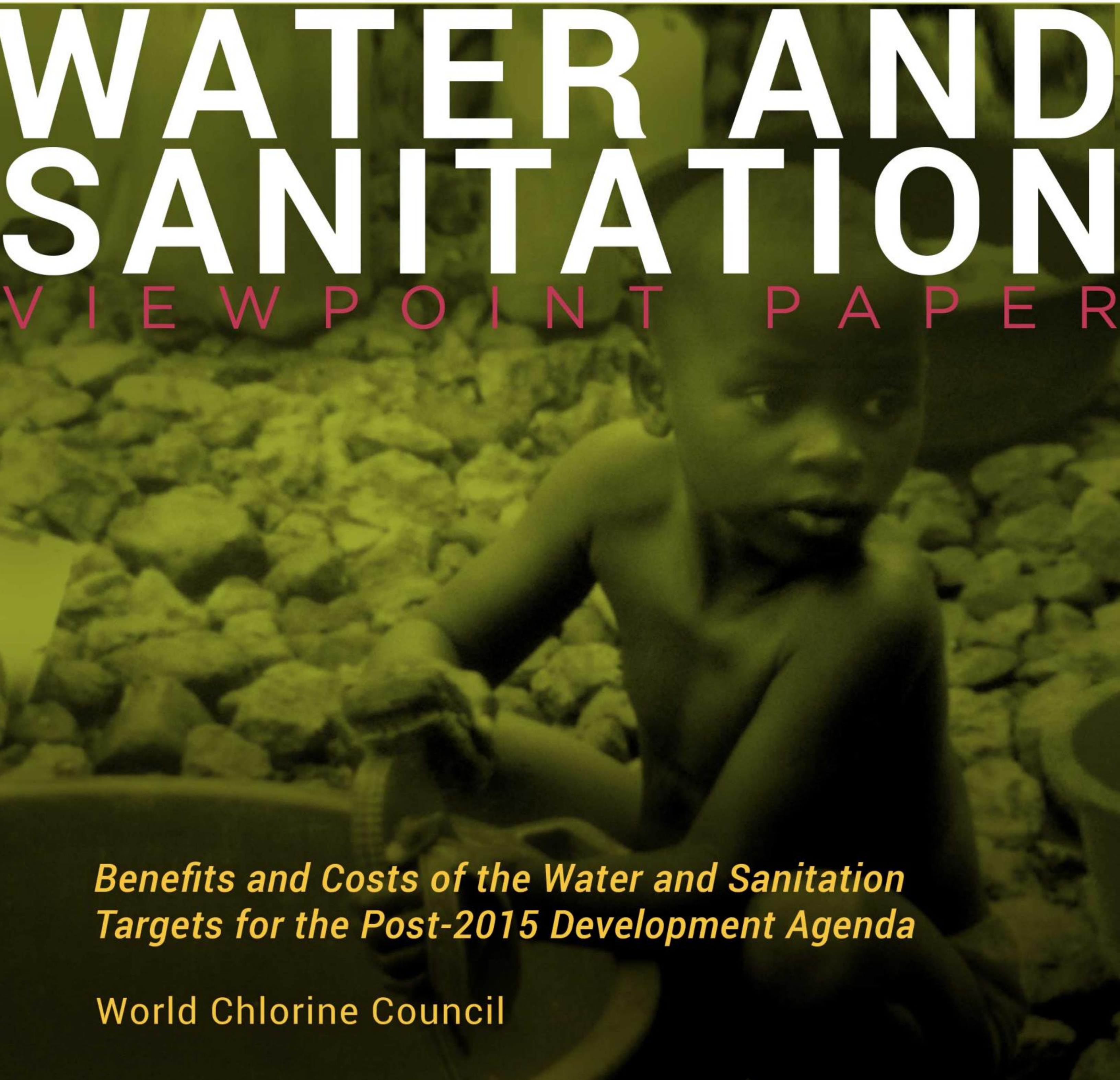

WATER AND SANITATION

VIEWPOINT PAPER

Benefits and Costs of the Water and Sanitation Targets for the Post-2015 Development Agenda

World Chlorine Council

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Working Paper as of 12 January, 2015

Introduction

The study "Costs, Cost-Benefits and Financing of the Post-2015 WASH Targets", currently under development by the Copenhagen Consensus Committee, describes an ambitious, data-driven tool to identify country populations that would most benefit from timely Water, Sanitation and Hygiene (WASH) interventions. The paper is based correctly on the premise that achieving global WASH goals is essential to facilitating and accelerating achievement toward a wide range of post-2015 global development goals.

The paper outlines a method by which enhanced data will be used to characterize the obstacles to achieving global progress in WASH. For example, the definition of a family having "basic drinking water at home" is enhanced by the requirement that "the total collection time [if water must be procured from a protected community source] is 30 minutes or less for a round trip including queuing." This type of enhanced context can lend greater sensitivity to the overall analysis, resulting in an action plan that directs available resources with a greater degree of precision than ever. Furthermore, assuming data are accurately estimated, focusing financing to improve the lives of those least served by WASH services will maximize global WASH progress.

This "Viewpoint Paper" provides commentary on the "Safely Managed Drinking Water Service" aspect of the proposed WASH targets for the post-2015 period.

Safely Managed Drinking Water Service

Beyond "basic drinking water at home," defined by types of wells in place, the study provides criteria for "safely managed drinking water service." These include supplying adequate quantities of accessible drinking water to all members of a household over two days per two week period, and meeting World Health Organization (WHO) guideline values for E. coli, fluoride and arsenic.

Functional drinking water access two days per two week period sets a disappointingly low target for safely managed drinking water service. This target should be more ambitious, so we recommend raising it to at least two days per week. Additionally, there are unique issues associated with storing water procured several days prior to its use. Specifically, stored water must contain a residual level of disinfectant to provide ongoing protection against the proliferation of waterborne pathogens. Chlorine-based disinfectants are commonly employed for this purpose. The study should address the safety of stored water explicitly and the need for a residual level of disinfectant.

What is a Chlorine Residual?

A chlorine residual is a very low level (single digit or less parts per million) of chlorine added to drinking water to help protect consumers against a wide range of waterborne diseases, such as cholera, typhoid fever, dysentery and hepatitis A. The chlorine residual helps maintain water quality after treatment until the time when water is consumed. Whether water is in transit through a distribution system or stored in a tank or other container before use, a residual level of chlorine is essential to maintaining good water quality over time.

Chlorine-based disinfectants are the most common types of water disinfectants, and among the most affordable. According to the WHO Guidelines for drinking-water quality- Volume 1: Recommendations, “Disinfection is of unquestionable importance in the supply of safe drinking- water. The destruction of microbial pathogens is essential and very commonly involves the use of reactive chemical agents such as chlorine.” Importantly, only chlorine-based disinfectants provide residual disinfectant levels. A detectable chlorine residual in drinking water helps to ensure the destruction of a wide variety of pathogens, including bacteria such as E. coli, Salmonella typhi, Vibrio cholera, and viruses, including hepatitis A, Norwalk viruses and rotavirus. Furthermore, for as long as it is detectable, the chlorine residual helps provide an ongoing barrier to new contamination.

The WHO notes E. coli detection provides “conclusive evidence of recent fecal pollution” (WHO Guidelines). Zero E. coli per 100 ml of water is the goal, therefore, for all water supplies, according to WHO. We agree that achieving a global standard of zero E. coli for drinking water is a measurable indicator of safely managed drinking water. We suggest, however, that for chlorinated systems, a detectable chlorine residual is an effective and more practical indicator of safely managed drinking water. Chlorine residual measurement can be performed much more quickly than E. coli detection, helping to ensure a more timely adjustment of water quality, when necessary.

Ensuring Good Water Quality

Because water is so critical to life, good water quality is critical to public health. Water quality varies greatly from place to place and is a function of both natural and anthropogenic factors, including local geology, land use, degree of watershed protection and wastewater discharge practices.

Disinfection processes help provide safe drinking water to communities throughout the developed world, and have done so for many decades, virtually eliminating diseases, such as cholera and typhoid fever. The first use of water chlorination occurred in 1898 in Maidstone, England to address a typhoid fever epidemic. Following the first continuous use of chlorine in municipal drinking water in North America in Jersey City, New Jersey in 1908, typhoid fever rates declined dramatically. By 1941, the US Public Health Service estimated that 85 percent of US drinking water supplies were chlorinated and the national death rate from typhoid fever was lower than one in 100,000, signalling the virtual conquest of typhoid fever in North America (McGuire, 2013[1]). Life magazine declared in 1997, “The filtration of drinking water plus the use of chlorine is probably the most significant public health advancement of the millennium.”[2]

Chlorination can provide cost-effective disinfection to large cities and remote rural villages alike. As the World Chlorine Council noted in its November, 2013 submission to the UN

[1] McGuire, M.J. (2012). The Chlorine Revolution: Water Disinfection and the Fight to Save Lives, American Water Works Association

[2] Life (1997). “The 100 Events (That Changed the World).” Fall: 14-134

Sustainable Development Knowledge Platform, "According to a 2012 joint report[3] by UNICEF and the United Nations, worldwide 783 million people lack access to safe drinking water, raising their risk of contracting waterborne disease. Children are most vulnerable to waterborne pathogens. A 2012 UNICEF report[4] notes that globally over 800,000 children under the age of five died from diarrhoeal disease in 2010. An analysis of interventions (Table. 3.6 of the report, p. 16) demonstrates that addressing point-of-use water quality and sanitation leads to some of the greatest reductions in child diarrhoea morbidity (29 and 34 percent, respectively)."

Chlorine Disinfectant is Already Widely Used

In developing nations, chlorine-based drinking water disinfectants are added commonly to drinking water at a central distribution point in the community or at the household point of use. Solid forms of chlorine disinfectant (e.g., calcium hypochlorite and chlorinated isocyanurates) or liquid sodium hypochlorite bleach are often used. Some communities in Haiti lacking treated water distribution systems, for example, dispense chlorinated water from central community chlorinator tanks that employ calcium hypochlorite for disinfection (see, for example, West Department Clean Water Project).

Where even such a basic level of infrastructure as a chlorinator is absent, several "point-of-use" products are available for sale to consumers to use at the household level. These products are used to treat procured volumes of raw water (see, for example, The Safe Water System on the website of the US Centers for Disease Control and Prevention). Household point-of-use products typically include a flocculent to remove particulate matter from water and a disinfectant, such as calcium hypochlorite, to destroy disease-causing germs.

The Value of the Chlorine Residual as a Water Quality Indicator

The detected, sustained presence of a chlorine residual in drinking water indicates a high degree of protection against microbial agents that produce diarrheal and other diseases. A report on the June, 2014 World Health Organization (WHO) Meeting on the Guidelines for Drinking-water Quality (Microbial Aspects Working Group Meeting and Chemical Mixtures Meeting) indicates that the WHO drinking water guidelines can be improved to help small water suppliers who do not continuously monitor drinking water for pathogens. In these cases, according to the report, chlorine dosing is critical. The report notes, "It has to be emphasized that if the chlorine pump is not working, the operator must get an alarm or notification on the telephone."

The WHO Guidelines for drinking water quality state, "Chlorine content should be tested in the field with, for example, a colour comparator, generally used in the range of 0.2-1 mg/litre." WHO notes other factors that affect the efficiency of disinfection with chlorine are pH and turbidity. Specifically, more alkaline water requires higher chlorine levels or

[3] UNICEF and the United Nations (2012), Progress on Drinking Water and Sanitation, 2012 Update, online: http://www.unicef.org/media/files/JMPreport2012.pdfm, accessed 10-31-13.
[4] UNICEF (2012), Pneumonia and diarrhoea: Tackling the deadliest diseases for the world's poorest children, online: http://www.unicef.org/media/files/UNICEF_P_D_complete_0604.pdf, accessed 10-31-13.

greater periods of contact with chlorine; high turbidity water adversely affects the efficiency of disinfection. Portable testing kits exist for monitoring these parameters.

Concluding Comment

The World Chlorine Council agrees with the statement articulated in the Budapest Water Summit that "Science is needed for developing effective indicators to monitor the achievement of targets" (see p. 35, Budapest Water Statement). To that end, WCC proposes that the proposed global Sustainable Development Goal for safe drinking water include a measurable, science-based indicator of treatment to destroy waterborne pathogens-- the chlorine residual.

This paper was written by Mary Ostrowski, Director - Chlorine Issues at American Chemistry Council and Allan Jones, Consultant at International Chemical Regulation on behalf of the World Chlorine Council. The project brings together 60 teams of economists with NGOs, international agencies and businesses to identify the targets with the greatest benefit-to-cost ratio for the UN's post-2015 development goals.

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Copenhagen Consensus Center is a think tank that investigates and publishes the best policies and investment opportunities based on how much social good (measured in dollars, but also incorporating e.g. welfare, health and environmental protection) for every dollar spent. The Copenhagen Consensus was conceived to address a fundamental, but overlooked topic in international development: In a world with limited budgets and attention spans, we need to find effective ways to do the most good for the most people. The Copenhagen Consensus works with 100+ of the world's top economists including 7 Nobel Laureates to prioritize solutions to the world's biggest problems, on the basis of data and cost-benefit analysis.

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