

The Problem of Water and Sanitation on the Example of India and Russia

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Abstract

Despite the efforts of the United Nations General Assembly to promote sustainability as a vehicle of resource management and tackle social inequalities through the 17 Sustainable Development Goals, the challenges remain. Therefore, the need to solve the fundamental problem of life “water-energy-food” (henceforth WEF) creates the basis for an integrated approach to eliminating the obstacles that arise on the path of sustainable life evolution on Earth. The WEF concept based on a socio-ecological systemic approach is a platform for the most rational approach to solving complex problems and adapting to climate change. At the same time it contributes to regional economic development. Taking examples from India and Russia, this commentary aims to highlight the challenges of water and sanitation of the world.

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Introduction: Water and Sanitation Problems

The 1987 Brundtland Report titled *Our Common Future* developed by the World Commission on Environment and Development, United Nations (UN) and named after Gro Harlem Brundtland remains very much relevant even after three decades. This age-old report stated “that critical global environmental problems were primarily the result of the enormous poverty of the South and the non-sustainable patterns of consumption and production in the North. It called for a strategy that united development and the environment – described by the now-common term “sustainable development”.¹

In similar context, the United Nations Millennium Declaration (adopted by General Assembly resolution 55/2 of 8 September 2000) in paragraph 6 reads as follows: “The safeguarding and rational use of all living organisms and natural resources must be based on the principles of sustainable development. Only in this way can we preserve for our descendants the enormous wealth that nature has bestowed upon us. The current unsustainable production and consumption patterns must be changed in the interests of our and our descendants’ well-being” [The United Nations (UN), 2000]. The key goal of the UN in the field of sustainable development under paragraph 6 is “achieving universal and equitable access to safe and affordable drinking water for all” by 2030 (UN, 2018).

The importance and indispensability of water for life on Earth is connected with the most significant biological, economic and social sides of human life. However, despite the role of water as a necessary element of human life, it is only in 2010 that the UN declared the human right to water and sanitation (General Assembly, 2010). This emphasises that the human right to water and sanitation must be considered within the framework of the basic requirements in the field of international law, although its

understanding and ways of implementation can have fundamental differences in countries with different economic and social development levels. In any case, separating the right to health and water is almost impossible. In this regard, there is an opinion in literature that the application of the law on compensation for damage through harm may become a financial constraint that forces states to expand drinking water protection (Gaber, 2019). UN resolution 64/292 reflected the mechanisms of alleged control over states that violate the human right to water. In practice, the UN Human Rights Council ability to influence states in the field of human rights is manifested very differently. Nevertheless, achieving high-quality water supply and improving human sanitary culture is the most critical project in gaining political, economic and social capital (UN, 2014).

The Millennium Declaration provides evidence that 2.5 billion people still live in unsanitary conditions (Jenkins et al., 2014; WSSCC, Water Aid, & Unilever, 2013) and about one billion people do not have access to clean water (UN, 2008; Water Aid, 2007). According to the 2017 data retrieved from the World Health Organisation (WHO), every year 525, 000 children die from infectious diarrhoea (Mohan et al., 2017). Moreover, it is alarming that every year more than 300,000 children in India under the age of five die from infectious diarrhoeal diseases caused by lack of clean water and poor sanitation (Nandiet al., 2017). The current Prime minister Mr Narendra Modi launched the *Swachh Bharat Abhiyan* (SBA-“Neat and tidy India”) aimed at building a cleaner India by 2022. Both SBA (urban & rural) gained massive success in building toilets. However, it is not easy to change the behaviour of the people who are habituated to defecating in the open and consider that having a toilet at home is an impure practice” (Bhattacharyya and Pulla, 2019: pp.1-14).

¹ 1987: Brundtland Report. Federal Office for Spatial Development. Retrieved on 10 July 2019 from, https://www.are.admin.ch/are/en/home/sustainable-development/international-cooperation/2030agenda/un_-milestones-in-sustainable-development/1987--brundtland-report.html

In the future, the situation may grow significantly worse. It is reckoned that by 2050, the demand for water and food will be increased by more than 50%, and the one for energy will be doubled, which will lead to resources reproduction shortage and increase in migration processes (IRENA, 2015). This can further expose problems such as malnutrition, poor health and sanitation (Adeyeye et al., 2017; Bain et al., 2013). Climatic conditions deterioration in the world space together with an increase in the Earth's population requires an interstate approach to stabilise the situation and create conditions for further (Nhamo et al., 2018). According to the experts, in the absence of effective measures, the precipitation reduction by approximately 20% by 2080 can significantly aggravate water, energy and food security (Conway et al., 2015). Therefore, the need to solve the fundamental problem of life called WEF creates the basis for an integrated approach to eliminating the obstacles for sustainable evolution of life on Earth. The concept of WEF from the standpoint of a socio-ecological systems approach is the platform for the most rational way to solving complex problems and adapting to climate change, while at the same time contributing to regional economic development (Mabhaudhi et al., 2016).

Even highly developed countries with access to quality drinking water may experience certain difficulties with it. In the United States of America (USA), which has 1/5 of the world's water supply at its disposal, the vast majority of citizens are provided with safe drinking water and at the same time there are some problems in realising this right in full (WHO & UNICEF, 2015). So, in 2015, in a joint WHO / UNICEF report, it was estimated that 99% of the US residents have access to safe drinking water and 89.5% - to safe sanitation (Dandabathula, et al., 2019). Despite this, in Michigan as of January 2019, an elevated level of lead in water was detected in more than 70 public sources. In some regions of the USA, limited access to water in households may exceed 35% by 2020 (Mack & Wrase, 2017). An alarming sign is the case of a massive repeated water cut in Detroit, which is a gross violation of the human right to water

(Howell et al., 2017). In this regard, the phrase expressed in the WHO resolution "Until now, the global model was that the richest people move forward first, and only when they gain access, the poorest begin to catch up. If we want to ensure universal access to sanitation by 2030, we need to ensure that the poorest segments of the population immediately begin to make progress." (WHO & UNICEF, 2015).

The importance of water in human life is also reflected in the Russian law and its policy. Russian Federal Law #52 (dated 30.03.1999) states: "Organizations providing hot water supply, cold water supply using centralized hot water supply systems and cold water supply are required to ensure that the quality of hot and drinking water of the indicated systems complies with sanitary and epidemiological requirements (Article 19, paragraph 2. Sanitary and Epidemiological requirements for drinking water, as well as drinking and household water supply" (*Russian Federal Law #52 [dated 30.03.1999]*)).

The same Russian law goes on to outline on sanitation via On Sanitary and Epidemiological Welfare of the Population., 1999 that:

Drinking water should be safe in epidemiological and radiation terms, harmless in its chemical composition and should have favorable organoleptic properties. (Article 19, paragraph 1. Sanitary and epidemiological requirements for drinking water, as well as drinking and domestic water supply (as amended by Federal Law of 26.07.2019 N 44-FL) (*Russian Federal Law #52 [dated 30.03.1999]. On Sanitary and Epidemiological Welfare of the Population., 1999*).

The law further states:

Sanitary rules development is carried out by the executive body, which carries out federal state sanitary and epidemiological surveillance, in connection with the established need for sanitary and epidemiological regulation of environmental factors and human life

conditions in the way, established by the state sanitary and epidemiological regulation (as amended by Federal laws dated 25.06.2012 N 93-FL, dated 23.07.2013 N 246-FL) (*Russian Federal Law #52 (dated 30.03.1999). On Sanitary and Epidemiological Welfare of the Population.*, 1999).

In light of these backdrops, the primary objective of this commentary is the comparative characteristics of the state of water and sanitation taking examples from India and Russia.

The review addresses the main issues of poor-quality water supply and poor sanitation in India related to the population's culture, material conditions, inadequate access to safe water sources and their consequences for the health of the nation, including the child population. It is the purification of water supply sources from industrial impurities and bringing drinking water quality to acceptable indicators, and not the poor sanitation and culture of the population that are significant factors for Russia. Both in India and Russia, as in any country of the world, the state plays the main role in solving these problems if there is a careful attitude of residents to water sources and the environment. With sufficiently high requirements for the preservation and renewal of natural resources in both countries, the implementation of state programs to provide residents with safe sources of drinking and household water can lead to preserving health and increasing life expectancy. The next section discusses the problems that emanate from poor water supply and the ways to prevent it.

Infectious Diseases Associated with Poor Water supply, Ways of Prevention

In 2011, about 2.5 billion people lived without access to sanitary facilities meeting generally accepted standards, and 770 million people did not receive drinking water from quality sources. These factors are directly related to the problem of diarrhoea, which is the second most important factor in the health system global burden (WHO, 2010). Thus, diarrhoea in children under 5 years of age causes 15% of deaths per

year and is closely related to other leading mortality and morbidity roots, such as HIV / AIDS and measles (Victora et al., 2008). Diarrhoea, being one of malnutrition underlying conditions, increases the risk of stunting by about 5% in the first two years of life (Guerrant et al., 2002; Victora et al., 2008). Repeated diarrhoea episodes also have a negative long-term effect on child's physical and mental development (Loevinsohn et al., 2015).

Noteworthy is the evidence that the incidence of infectious diseases associated with diarrhoea in developing countries is directly proportional to the population (Pinfold, Horan, & Mara, 1991; Riddle, DuPont, & Connor, 2016; SBM-U, 2017). Diarrhoea incidence is strongly correlated with seasonality. So, 52-60% of infectious diarrhoea outbreaks were recorded in India in May, June, July and August from 2010 to 2017. In 2018, a certain environmental correction was accompanied by fewer outbreaks compared to previous years (only 46.60%). In 2017 and 2018, infectious diarrhoea outbreaks were minimal in May, July, August, September, November and December (Dandabathula et al., 2019).

Prevention of most infectious diseases and mortality caused by them is associated with three components: water, sanitation and hygiene. A particular difficulty in achieving this pathology prevention comes from problems linked to sources of water supply and sanitation, since their solutions cannot be found only at the expense of health ministries. As discussed above, the Government of India has launched flagship programme to accomplish cleaner India. The next section discusses the same.

Government Programs to Improve Sanitation and the Implementation of the "Clean Water Mission in India"

In October 2014, the government began fully funding a national campaign on hygiene, sanitation and waste management called the *Swachh Bharat Abhyan or Mission* (SBM) (SBM, 2019). The Mission scope covers both rural and urban areas of the country. The urban mission program is implemented under the auspices of the Ministry of Urban Development, and the rural one - by the Ministry of Drinking Water and

Sanitation. The overall SBM goals are as follows (SBM-G, 2019; SBM-U, 2017):

- Improve rural and urban population's quality of life by encouraging residents to cleanliness, hygiene and avoiding open defecation.
- Ensure individual and public toilets construction for the entire population by October 2019 and regulate proper water storage and its use in hand washing.
- Strive for the implementation of effective sanitation methods and tools through health education with the help of communities and institutions involved in village development.
- Promote the implementation of economically and environmentally sound sanitation methods, including scientifically adapted methods for managing solid and liquid household waste.
- Seek positive impacts on gender and social inclusion through improved sanitation, especially in marginalised communities.
- Stimulate private sector participation in capital investment, operation and maintenance of industrial sanitation systems.

The strategy is to move to *Swachh Bharat* (Cleaner India), making it a massive movement that seeks to engage everyone in the task of cleaning houses, working places, villages, cities and surrounding areas

Implementation of the UN resolution in order to achieve Goal 6 means "ensuring access to adequate and effective sanitation and hygiene for all residents and putting an end to open defecation, paying particular attention to the needs of women and girls and those in vulnerable situations" (SBM, 2019). The Government of India had committed to eliminating open defecation and unsafe sanitation by the 150th birth anniversary of Mahatma Gandhi, the father of the Nation, which was already celebrated on 2nd October 2019. However, there needs to be a reality check in every nook and corner of India to validate as to whether the promises made on paper and

websites have really been translated on the ground. The following section we discuss the sanitation and its impact on health.

In their work, Colombara et al. point out that in India the incidence of acute intestinal infections and their health effects are much higher than in other countries (Colombara et al., 2016). As stated above, high diarrhoea incidence caused by intestinal infection in this region of the globe is associated with poor socio-economic conditions, such as lack of access to safe water and sanitation, poor hygiene and unprotected human waste proximity (Ahs et al., 2010). Of particular interest is Coffey et al.'s opinion that open defecation in India must be considered to be the sign of public health and human capital crisis (Coffey et al., 2014). Thus, according to the Census of India in 2011, 68.84% of the country's inhabitants lived in villages; among them, only 32.70% of the houses had an equipped toilet (Ghosh, 2018). However, literature data alongside the SBM show that the measures are taken to improve sanitary and hygienic conditions leading to high efficiency in reducing diarrhoea developing risk (Bhattacharyya and Pulla, 2019; IIE, 2009).

In 2013, India became the fourth country in the world (after Russia, the USA and the European Union) and the only developing country to launch a Martian probe into space. But it remains part of a group of 45 developing countries with less than 50 % sanitary coverage, with many citizens practising open defecation, either due to lack of access to the toilet, or because of personal preferences (Ramani, 2016).

As part of the Clean India project, in 2014, the Prime Minister of India Narendra Modi's announced the completion of stationary toilets construction in more than 60 million homes by 2019. But building toilets turned out to be an easier task than getting people to use them. Reports from the regions show that many of them remain unclaimed for their intended purpose and are more often used for storing grain or clothing or for tying goats, which impedes the Modi's sanitary revolution (Bhattacharyya & Pulla, 2019). This is due to religious and caste traditions. So, in many

villages, new toilets are used regularly mainly by women and older people. Men of working age, as before, prefer open defecation. This is due to the fact that families use toilets sparingly because they do not want the pits to fill up quickly. The existing centuries—old caste system of India suggests that members of the lower caste, previously called "untouchables" will remove human waste, which is unacceptable in the modern world (Lakshmi, 2015).

For dynamically developing India, participating in a research mission on Mars is an easier task than moving the country's inhabitants from open to closed defecation. In order to achieve the goal of eliminating open bowel movements in India, it will require interaction between the mass media, state authorities, and the construction industry in building safe, lighter service toilets that can be used for a long time and raise the population cultural standards (Ramani, 2016).

Comparison of morbidity rates in India from March 2015 to March 2019, when the SBM program began its implementation, yielded certain results. According to the data obtained, the first group (areas with low stationary toilets coverage) suffered more from diarrhoea, malaria, stillbirths and low birth weight than the second group (areas with high stationary toilets coverage). This means that sanitation and hygiene are the leading cause of existing health problems in the country. According to the survey results for these population groups, the number of diarrhoea cases in the first and second groups was respectively: 6 968 and 5262 in 2015, 5 683 and 4550 in 2019. The number of malaria cases also decreased in the first and second groups: 761 and 273 in 2015, 222 and 113 in 2019. Stillbirths in the first and second groups were respectively: 540 and 403 in 2015, 456 and 368 in 2019. The number of cases with low birth weight in the first and second groups was: 3,890 and 3,230 in 2015, 3,686 and 3,198 in 2019 (Sharma, 2019).

India's sanitation coverage reached 80.65 %, compared to 38 % in 2014. Improving sanitation has led to a decrease in the number of diseases per capita in India, but still continues to be high.

Thus, the number of diseases per person, caused by baby food and malnutrition, was 12 times higher than in China. According to the 2015 health system analysis, even in the most prosperous state of Kerala in India, the morbidity rate was 2.7 times higher than in China, which indicates significant opportunities for improving health in the country if water quality and sanitation change for the better (WHO, 2015). According to preliminary data, the SBM-Grameen mission prevented more than 300,000 deaths (diarrhoea and protein-energy malnutrition) from 2014 to October 2019. Unsafe sanitation caused an estimated 199 million cases of diarrhoea annually before the SBM program began in 2014. Their number is gradually declining and has to almost completely disappear by October 2019, after the achievement of widespread use of safe sanitation facilities.

According to statistics, more than 14 million DALYs (disability-adjusted life years) will have been avoided (diarrhoea and protein-energy malnutrition) from 2014 to October 2019 (WHO, 2018). Scholars argue that diarrhoea in India is related to short-term (Walker et al., 2011) and long-term (Bozzoli et al., 2009) effects on human capital. The lack of satisfactory sanitary conditions leads to recurrent intestinal disorders with the subsequent development of the so-called environmental enteropathy, accompanied by impaired child growth (Lin et al., 2013). It should be recognised that environmental enteropathy, according to many authors, makes a much greater contribution to growth retardation than episodic diarrhoea. This pathology is characterised by inflammatory changes in the intestine with a breakdown of the barrier function, leading to malabsorption and systemic inflammation in the absence of obvious signs of diarrhoea (Augsburg & Rodríguez-Lesmes, 2018; Mbuya & Humphrey, 2016).

A nationwide survey of children, conducted in 2013-14 by the Ministry of Women and Child Development in collaboration with UNICEF, showed stunning results. Thus, 41.6% of children under 5 years of age in the state of Madhya Pradesh were stunted (18.6% were especially

significantly stunted) compared with the national average of 38.7%. In another study conducted in India later, 46% of children under 5 years old were stunted (Augsburg & Rodríguez-Lesmes, 2018).

Currently, progress in sanitation has covered 98.8% of the rural areas, in which 92 million public toilets and 5.9 million individual household toilets have been built (Dandabathula et al., 2019). The Government of India's measures to eliminate the problem of poor water supply, improve sanitation and hygiene fully fit into the concept "Mission of clean India" implementation (Ravindra & Smith, 2018). Thus, the population of India, according to the Census of India (2011), amounted to 1.21 billion people, and at the end of 2018 - to 1.37 billion people (McCarthy, 2018). In recent years, a positive trend has been observed in India in the total number of infectious diarrhoeal diseases outbreaks. It shows a 50% reduction in their number in 2017 and 2018 compared to the total number of infectious diarrhoea outbreaks in 2016 (UN, 2019).

Journalists view SBM as part of the "Indian Sanitary Revolution" (McCarthy, 2018). So, more and more people are switching to equipped toilets use (Coffey et al., 2014; Menezes et al., 2012). Integration of Goals 1 and 6.3 led to an increase in per capita gross domestic product (GDP) due to improved sanitation rates, which in turn reduced the incidence of water and sanitation diseases, especially among children and the elderly (Gupta et al., 2019).

The State of Water Supply in Russia: Ways to Improve the Quality of Drinking Water

Assessment of drinking water quality in the Russian Federation remains the leading area of human health protection that is directly related to the quality of life (Rakhmanin et al., 2014, 2017). Only in recent decades, up to 52 km³ / year of wastewater is discharged into water bodies of the Russian Federation annually, of which 19.2 km³ are subject to treatment. Of this amount, only 11% (2 km³) goes into water bodies cleaned up to established standards; 72% (13.8 km³) - insufficiently cleaned or non-disinfected, and 17% (3.4 km³) - without any cleaning and

disinfection (Onishchenko, 2010; Rakhmanin et al., 2016; Zavarzin, 1990). At the same time, the implementation of federal and regional programs to improve drinking water quality, along with positive factors, may in some cases lead to a deterioration in the quality of drinking water due to multistage complex water treatment. These tactics were used for certain reasons. According to Rospotrebnadzor for 2015, 33.9% of surface and 15.3% of underground sources of centralised drinking water supply did not meet established sanitary requirements and required strong disinfectants, which could be sources of a significant amount of by-products (Huck, 2000; Mokienko, 2014). In this regard, the question involuntarily arises as to how much such water is harmless to health due to the presence of transformation products in it (Rakhmanin & Malysheva, 2013; Rakhmanin & Mikhaylova, 2014). The main byproducts formed during chlorination are trihalogenomethanes, monochloroacetic acid, ketones and haloacetonitriles, which also affect the intestinal microbiota (WHO, 2011). Chemically contaminated wastewater discharge changes not only water bodies' biocenosis, but also changes the ratio of various groups of bacteria, protozoa cysts, and helminths. This leads to deterioration or levelling of sanitary-indicative microorganisms' indicator value, which help to carry out epidemic control of surface water bodies safety in consent with the current water-sanitary legislation. This can lead to epidemically dangerous situations in which there may be a discrepancy in water bodies quality assessment according to the existing standardised indicators for pathogenic enterobacteria detection in water (Rakhmanin et al., 2016). The following section discusses the ecology and the quality of drinking water in India and Russia.

Ecology and the Quality of Drinking Water in India and Russia: The Need to Develop New Technological Solutions to Maintain Health and Life on Earth

A special role in assessing global water and sanitation sustainability under climatic cataclysms, typical not only for India and Russia,

but for all countries of the world, is played by drought, a decrease in inter-annual precipitation, floods, gale winds, salt and dust storms. At the same time, data are presented that the range of resistance indicators to hurricane floods demonstrates the lowest figures, compared with other dangers connected with climate change (Luh et al., 2017). In general, it was found that sanitation technologies have low and medium resilience under all climatic changes, which indicates the need to adapt sanitation systems to ensure functionality during and after climatic hazards. The research results can be used to develop new technologies that are able to withstand any natural disasters.

The problem of people's health, water and sanitation in the life of modern society, directly depends not only on the level of society development and access to quality sources of water supply, but also on society's general sanitary-hygienic education, the efforts of the Ministry of Health and the government. The measures taken in this direction, including the UN level, demonstrate a positive trend in the field of water supply and sanitation in most countries of our planet. Respect for natural resources and their replenishment is the key to maintaining health and life on Earth.

Conclusion

Water and sanitation can rightfully be considered the most important factors in human life associated with the biological, economic and social aspects. Poor water supply and poor sanitation in India have a negative impact on the nation's health, including the child population. For Russia, unlike India, the more significant factors are the purification of water supply sources from industrial impurities and bringing the quality of drinking water to acceptable levels. As in any country of the world, in India and Russia the state plays the main role in solving these problems with the active participation of citizens in the sphere of preservation of high-quality water sources and respect for the environment. In both countries, the implementation of state programs aimed at providing residents with high-quality sources of drinking and household water, can lead to the

preservation of health and an increase in life expectancy, if natural resources are preserved and restored.

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