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Worldwide needs for safe drinking water are underestimated: billions of people are impacted[1]

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Abstract

There is serious ignorance about the urgent needs for improving access to safe water in the world. The statistical information available on the global scale lacks precision. Public policies are nevertheless determined by the limited information available. The current Millennium Development Goal for access to water is measured using an indicator that only describes a minimal level of access to water and does not guarantee its safety. The often-repeated assertion that some "900 million people do not have access to safe drinking water" is a long way from the reality.

While the notion of water potability (safe to drink) is relatively clear, that of “access to safe drinking water” is much less precise, leaving scope for widely ranging interpretations. Furthermore, the right to safe drinking water, recognized as a human right in 2010, requires conditions of access to water that go much further than simply the "potability" of the water.

Depending on the criteria used to define satisfactory access to safe drinking water, the current need can be assessed to be either less than one billion people (1 person in 8), or almost 4 billion (more than half the world's population).

In spite of the lack of precise statistical data, the available information can be used with appropriate reasoning to estimate the order of magnitude of the different needs for access to drinking water. The author's estimations lead to the assertion that billions of people need their daily access to water to be improved.

At least 1.9 billion people use water that is unsafe and dangerous for their health, while 3.4 billion people use water of doubtful quality at least from time to time. For a vast number of people - about half of mankind - the safety of the water they use is not guaranteed.

The human right to safe drinking water was recognized by the international community in 2010. Implementing this right concerns at least as many people as the safety of water, perhaps even more, because safety is just one of the components of this right. There are others, such as the accessibility, acceptability, and affordability of the water. Considering safety alone, the right to water of more than 2 billion people is not satisfied. It seems that the right to safe drinking water is inadequately satisfied for more than 3.4 billion people.

Access to water creates a real social divide. On the one hand are those people who have permanent access to safe drinking water in their home. They do not really recognize the value of safe drinking water or appreciate just how lucky they are. On the other hand are all those for whom access to water is more difficult, more risky or more costly. They are more numerous, nearly 4 billion people (about 57% of the world's population). Safe drinking water has an obvious value for them, but they do not have access to it - or only with difficulty.

Future improvements in the United Nations statistics will enable these estimates to be refined.

Consequently, the need for improved access to water is enormous. Billions of people are concerned not hundreds of millions. Public policies must make a quantum leap to ensure satisfactory access to truly safe drinking water for everyone.

1. Introduction

The 7 billion men, women and children living on our planet all have access to water – otherwise they would not survive – but they do not all have the same kind of access. This is a major factor of social inequality. Water is vital for life. We all need fresh water on a daily basis, not only to drink, but also to cook, to wash ourselves and clean our clothes, our household and our environment. Everyone knows this. But the inhabitants of our planet do not all have equal opportunities.

Some people - almost all those living in the rich countries - use "safe drinking" water that they obtain as and when needed by simply turning on a tap. For others, life is more dangerous: the water they use carries diseases, either all the time or from time to time. Things can be more complicated for some populations: the water supply from their taps is irregular; they have to organise themselves and invest in water storage equipment. Yet others have a harder life: they have to spend several hours a day travelling to fetch water from afar and carry it to their homes. Others have no other choice than to buy water of unknown origin in jerry cans from street vendors.

What is the scale of the problem? How many people need better access to safe drinking water? What is the scale of the unsatisfied needs requiring action by the public authorities? This article aims to provide some answers to these questions.

The subject is not as simple as is stated and repeated in the media. Information from governments and the United Nations - their global representative - paints a very simplified picture. It tends to be either black or white, implying that one either has access to safe drinking water or not. It suggests that these are two highly different situations, and that the main issue is to shift all people from one situation to the other. In reality, the individual situations of access to water vary widely and are difficult to compare. Moreover, the notion of access to safe drinking water is poorly defined. Depending on the criteria used to define satisfactory access to safe drinking water, the current need can be assessed to be either less than one billion people (1 person in 8), or almost 4 billion (more than half the population of the world)!

2. A persistent and convenient underestimation

884 million people reportedly do not have access to safe drinking water. This figure is repeated over and over again in the press. Public opinion understands that 884 million people use water that presents risks for their health. It is perfectly understandable for the media to air this estimate because it is the official estimate. International institutions and prominent personalities mention it publicly or echo it indirectly[2]. When governments meet together to take important decisions on access to water, their statements always mention this figure of 884 million. They sometimes give it its exact meaning, but they often associate it with the lack of access to safe drinking water. Thus in July 2010, when the General Assembly of the United Nations recognized access to safe drinking water as being a human right, it adopted a resolution[3] starting with the words *"Deeply concerned that approximately 884 million people lack access to safe drinking water…"*. This unfortunately is not true. There is a misunderstanding. Billions of people do not have satisfactory access to "safe drinking" water[4]. Where does this figure of 884 million people come from?

This figure is an official statistic from the United Nations, but it is often misinterpreted. 884 million is the estimate, for the end of 2008, of the number of people in the world lacking

[2] For example, the Secretary-General of the United Nations on 22 March 2011, French ministers (Le Monde of 22 September 2010 and 21 January 2011), etc. It also appears on the UNICEF website and that of the Millennium Development Goals.

[3] See reference 5

[4] See references 1, 4 and 12.

access to "improved" water sources[5]. We are not talking about "safe drinking" water. Many people use "improved" water but which is not "safe drinking water". At present however there are no global statistics measuring access to drinking water that is truly safe. The only available statistic relates to "improved water sources". Furthermore, "improved sources" is not a familiar notion in everyday language. Communication departments and orators prefer to say things that their audience understands. So they unabashedly replace "improved" by "safe drinking". Initially this was just a simplification of language to get round the lack of information on the needs for safe drinking water. But in our so-called "information society", a cut-and-paste approach to information leads to misinterpretations becoming all-pervasive. The initial error becomes everyone's belief. The approximation has become the truth. This confusion has resulted in a serious underestimation of the needs.

It must be acknowledged that the initial intention of the United Nations was indeed to improve access to "safe drinking" water. The Millennium Development Goal, adopted by the United Nations in 2000, aims to halve the proportion of the world's population without access to safe drinking water in 25 years. But how do you measure progress with respect to this goal? The statisticians of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have done their best to establish an indicator capable of replicating the variations in access to safe drinking water. A compound indicator, called "access to improved water sources", was developed from the data available on the ways in which individuals obtain water (from a well, a hydrant, a tap, etc.). It assumes that the water is more or less safe according to these different sources. This substitute indicator is relatively robust and it gives a reasonably good idea of the progress made and an indication of the collective dynamics. Experience shows, however, that it significantly underestimates the needs in terms of the potability of water. Having access to an "improved" source is a minimalist goal since it only means the source is protected against contamination by animals. This is of course vital, but not enough to ensure water of good quality. The WHO-UNICEF statistics indicate that 884 million people did not have access to improved water sources at the end of 2008[6]. Therefore, it would be correct to say that "884 million people do not have the required minimum access to water", but incorrect to use this number in the context of access to "safe drinking" water.

One can understand that governments use the only statistic at their disposal. Furthermore, several government reports do indeed mention that the estimates used relate to "improved" water sources, but this notion is very poorly understood and many people do not see the difference from "safe drinking" water.

Simplifying language can be a means of making life easier. If the need concerns 884 million people, the required policies - that are obviously costly - are not at all on the same scale as those required if access to water has to be improved for billions of people. The "access to improved water sources" indicator enables the international community to measure the year-on-year progress in line with its target for 2015, which is very reassuring. With such an indicator, in 2015 it will be possible to declare that the Millennium Development Goal for access to drinking water has been achieved. By 2015, the proportion of the world's population that does not have access to "improved" sources should effectively be reduced by more than half compared with the situation in 1990.

Yet in 2015 the real human needs for better access to safe drinking water will still be enormous. But how can they be estimated? How many people need better access to water? There is not one single answer: it all depends on the desired objective.

Let us try to specify the needs and estimate the corresponding number of people involved.

[5] "Improved" water sources are defined in a list according to their nature (see ref. 8). The easiest definition to retain is that these are water sources also used by animals. This criterion of "water shared with animals" applies to 90% of their users. The distance between the source and the dwelling is not taken into consideration

[6] See ref. 8

3. Water, but for what needs? How can different situations be compared?

As said above, the individual modes of access to water vary widely and are often difficult to compare. Is it better to have polluted running water permanently available in the home, or healthy water available at a standpipe situated 1 mile from the home? When you have access to a water network that only runs for 4 hours every two days, is it better to invest in a storage tank where the water risks stagnating, or to turn to alternative supply systems? Is it better to go and fetch water yourself from the well or a water kiosk in spite of the time this takes, or to buy jerry cans of water of unknown origin from a street vendor?

This large diversity of situations makes it impossible to classify each one on a scale of values. Yet to measure progress in a given population, it is necessary to define thresholds and levels of service that correspond to satisfying certain criteria.

Today global statistics provide precise estimates for two levels: i) access to "improved" water sources and ii) access to a water tap in the home or the immediate vicinity. The latter situation is of course preferable to the first, but does not guarantee that the water is safe to drink.

Below we will put forward estimations for other thresholds that are potentially useful for reflection and action.

3.1. The basic need: water safety

Safe drinking water is water that is not contaminated, that can be relied upon, and that does not carry diseases. How can we define access to safe drinking water in a way that corresponds to this health objective, to the needs of life in society, and at the same time enables us to make an inventory of the people who have it?

Water quality is not really in debate. Safe drinking water is water that does not represent a significant risk for health. It is accepted that the quality of water, at its point of use, must conform to national standards, which often follow the international standards of the World Health Organisation (WHO). Taking water of uncertain quality and boiling it to render it drinkable is not considered as having access to safe drinking water, particularly owing to the significant expenditure in time and energy involved to purify only small quantities of water.

The question of modes of access is less clear. There are numerous modes of access to water. Can they all be used acceptably to declare that someone has access to safe drinking water?

In modern networks, great attention is paid to the quality of the water distributed to the home. The water is purified and disinfected in specialised treatment plants, then protected chemically for delivery under pressure to the consumer's tap. The user can then draw the water as and when required, without having to take the risk of storing it in the home.

Is this what having access to safe drinking water means? Should the water be safe at the source, with the consumer being responsible for maintaining its quality during transport and storage, or should the water be safe for consumption directly on arrival in the home? Are home water purification systems, which effectively give safe drinking water but are often more costly than collective systems, acceptable? Should the water be permanently safe? What are the permissible exceptions: 1 day per year, 10 days per year, 1 month per year? Such decisions are a question of social organisation. But they do show that access to safe drinking water is not an all or nothing subject. The quality of access to safe drinking water can vary.

At a statistical level, let us aim at estimating the number of people who benefit in their home from good quality water in sufficient quantity for all their daily needs virtually all the time and without additional treatment.

Assessing the true quality of the water used is a major difficulty. This is because the WHO sets many criteria that determine potability. Checking against these criteria requires costly

laboratory tests and it is therefore impossible to check the quality of the water used by each of the planet's 7 billion inhabitants on a daily basis.

This article aims to classify the population in 3 categories:

- Those who use water that represents a health hazard, either because of the way it is used (if it is shared with animals or other sources of contamination, for example), or because it is acknowledged to be unsafe.
- Those who use water that is safe, that is to say its safeness can be reasonably relied on because its quality is checked statistically and it is conveyed to the home taking appropriate precautions throughout the supply chain.
- Those who use water of doubtful quality, that is to say water which is perhaps healthy, but without this being guaranteed.

These categories are imprecise, but it is worthwhile estimating their respective proportions in terms of population numbers.

3.2. The other needs, the requirements of the human right to safe drinking water

Water is essential for human life, as was mentioned earlier. But in what conditions? The potability of water is indispensable. This has been an essential factor in lowering mortality in many countries. But this is not the only criterion defining good access to water. There are other needs. In 2010 the United Nations recognized access to safe drinking water as being a human right. Through this decision governments formalised the need for each individual to have water in sufficient quantity and of good sanitary quality, they also specified additional criteria[7]. The water must be simultaneously accessible, available, acceptable, affordable[8] and access must be equitable. These different dimensions are expressed operationally in a very concrete manner as is shown by the examples in table 1.

Table 1 – Dimensions of the right to safe drinking water
Legal and operational terminology

Criteria for the right to safe drinking water	*Examples of corresponding operational subjects*
Safe	Conformity with standards for potability
Acceptable	Colour, smell, etc.
Accessible, available	Continuous supply 24/7 Distance from household to water source Need for alternative sources
Affordable	Subsidies to the most disadvantaged, etc. % of the household budget, appropriate tariff structure, costs in addition to that for access to the public service.
In sufficient quantity	Daily quantity, minimum delivery pressure, etc.
Without discrimination	Equity of the public service, etc.

[7] See General Comment No.15 on the International Human Rights Treaty called the International Covenant on Economic, Social and Cultural Rights.

[8] According to General Comment No.15 of the International Covenant on Economic, Social and Cultural Rights, "Water, and water facilities and services, must be affordable for all. The direct and indirect costs and charges associated with securing water must be affordable"

The criteria adopted mean that access to water that only satisfies the "safety" criterion is not sufficient in human rights terms. Implementation of this right requires the public authorities to organize themselves to improve access to water progressively in all the dimensions of the right to safe drinking water diagram below (Diagram 1).

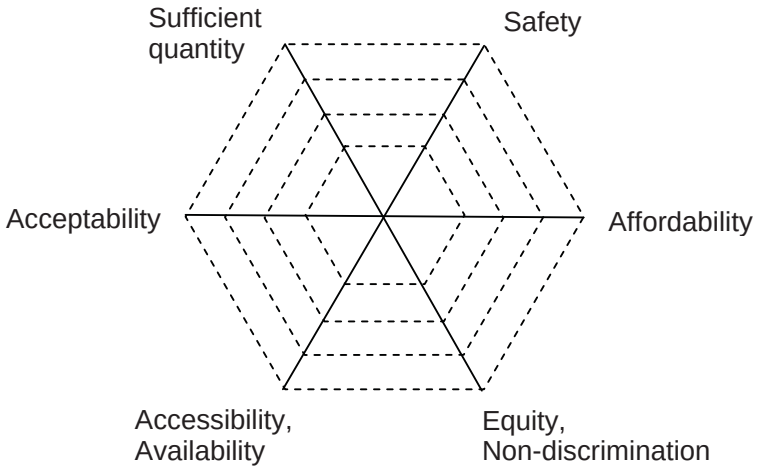

Diagram 1: The water access dimensions according to human rights

Since the criteria of the human right to safe drinking water are more rigorous than the single criterion of potability, the number of people whose right is not satisfied is greater than the number of people who do not have access to potable water. Measuring the difference between these two populations would enable the fine-tuning of the more extensive public policies that have been made necessary by the recognition of access to drinking water as a human right. No statistics are available yet, and it will be technically difficult to obtain them. It is nevertheless worthwhile to estimate an approximate order of magnitude of the needs in order to trigger the actions necessary.

4. Existing world statistics: their value and their limits

4.1. The joint WHO-UNICEF programme

The available information on access to water for the world population comes from the United Nations. Every two years, a joint WHO-UNICEF team produces statistics derived from surveys conducted in each country. This "Joint Monitoring Programme" [JMP] is based on a sound methodology[9]. Essentially it provides information on the number of people using each particular means of access to water. This information is summarised in reports that are published every other year and the source information can be consulted by country on the website www.wssinfo.org.

Two indicators are monitored regularly:

- The number of people with access to a tap in the home or the immediate vicinity
- A compound indicator, the number people with access to "improved" water sources. This indicator groups together the preceding category of users with those using standpipes, wells or boreholes that are protected against contamination by animals.

  Those without access to "improved" sources are mainly people who collect water from the natural environment (river, lake, etc.) or from water holes that are also used by animals[4].

[9] See reference 13

Table 2: World statistics at end of 2008 – Source: JMP

Means of access to the water	*Beneficiaries*		*Non- beneficiaries*		*World total population*	
	billions	%*	billions	%*	Billions	%*
Tap in home or immediate vicinity	3.84	57	2.91	43	6.75	100
"Improved" water sources	5.87	87	0.88	13		

** = Percentage of world total population*

4.2. Useful and increasingly abundant information on means of access to water

The two indicators above have been subject to statistical analysis since 1990. The way they evolve over time can be measured, which is very useful to provide understanding of the true impact of the numerous programmes throughout the world for developing access to water. It is thus clear that very substantial progress has been made in reducing the number of people who do not even have access to "improved" water sources. The United Nations' goal is to halve the proportion of the world's population that does not have this minimum access during the period 1990 to 2015. It is very likely that this goal will be reached in 2015.

This being said, the progress is not uniformly distributed. For example, the number of people without access to "improved" sources is increasing in the urban half of the world. Likewise, there is a continuing increase in the number of city dwellers without access to a water tap. The urban programmes are not progressing fast enough to keep pace with urban population growth, and the global average for access to water in towns is getting worse[10].

The WHO-UNICEF Joint Monitoring Programme is currently establishing more precise statistical indicators by breaking down the aggregated "improved" sources indicator into more detailed categories. The final results will be published late 2011 or early 2012. Preliminary indications were made public in Stockholm on August 24, 2011. In particular, they provide estimates of the number of people who get their water from standpipes (water taps situated outside their home and supplied by drinking water networks) and the number of people having no other means of supply than rivers or lakes. This preliminary information has been disclosed for all the developing countries (excluding CIS - Commonwealth of Independent States - and developed countries). By adding the other countries to this from the national data of the JMP, we obtain the estimates of table 3 below.

The information in table 3 is more detailed than the statistics of the JMP's reports. For example, it allows a relatively accurate assessment of the number of people connected to a public network (3.84 billion) or using a standpipe (0.4 billion) supplied by a public network. These people who benefit from a "public water service" thus represent some 4.2 billion people, just 63% of the world's population.

[10] See references 3 and 12

Table 3: Number of users according to their means of access to water
Author's estimates based on JMP data[a]

Broad categories	*billions*	*Means of access to water*	*billions*
Tap in the home or in its vicinity	3.84	Tap in the home or in its immediate vicinity	3.84
Improved sources excluding tap in home	2.03	• Standpipes	0.4
		• Boreholes	1.3
		• Rainwater	Ns
		• Wells and springs protected from animals	0.3
Unimproved sources	0.88	Wells and springs not protected from animals	0.6
		Tanker trucks, street vendors	0.1
		surface water	0.2
World population	6.75		6.74

Note: This table has the precision of the JMP statistics – Values at end 2008

[a] *Data available in September 2011, ref. 8, 9 and 11*

4.3. Limits of the available statistics

The existing statistical indicators are very useful for gaining an idea of the world situation in terms of means of access to water. They are however often wrongly interpreted, as explained earlier. This is partly due to the use of indicators that combine different physical situations, and of which few people understand the true meaning. Current efforts to achieve more precise measurement should improve the understanding of these indicators.

These indicators are however based solely on the practical means of access to water. They provide no indication of the safety of the water used, therefore they do not provide a measure of the number of people who really have access to safe drinking water. As explained in paragraph 5 below, many people using "improved" sources only have access to unsafe water. Extrapolation leads to an estimate that at least one billion people are in this situation.

The current statistical indicators give no information on the other dimensions of the right to safe drinking water. In the absence of statistics on the numbers of people who do not have access to truly safe drinking water or whose right to water is not fully satisfied, we are obliged to resort to estimations based on deduction and experience to evaluate these numbers. This is the subject of paragraphs 5 to 8 below.

5. Estimating the number of people using unsafe water sources

Water can be hazardous as revealed by quality tests, for example by identifying the presence of arsenic, coliform bacteria or any other chemical, physical or biological contamination. It can also be hazardous due to the way it is used, for example, if the source is shared with animals or other sources of contamination. This is the case with unprotected

wells used for both livestock and humans.

The "unimproved water sources" indicator probably gives a fairly good estimate of the number of people using water that is hazardous due to the conditions of access at the source. It includes nearly 200 million people who use water from rivers or lakes, and some 600 million who use wells or sources that are not protected from animals. It also includes the 100 million people who get their water from street vendors or tanker trucks, a portion of which are known to be poorly maintained, while others sell water of doubtful quality. Some do nevertheless provide good quality water, but the number is small in comparison with the total number of users of water from unimproved sources, today estimated at about 900 million people.

Among the "improved" sources, a significant number deliver unsafe water. However, no global inventory exists and one can only make a rough estimate of those that undoubtedly supply unsafe water. Studies[11] on this subject conducted by the WHO and UNICEF in 6 countries[12] have shown that, taking just the single parameter of "faecal coliforms", the water did not comply with the WHO standard in 57% of protected wells, 37% of protected springs, 31% of boreholes and 11% of water networks (tap water). For a water specialist, these results are not aberrant. An extrapolation using the same percentages in all countries is provided in table 4. In spite of its lack of precision (uncertainty of several hundred million), this extrapolation gives an order of magnitude that is useful for the reflection on the subject. It leads to the estimate that one billion people use "improved" water sources that do not satisfy an essential bacteriological criterion. Given that other parameters must also be satisfied to ensure the safety of water, one can consider that one billion is a rough, but minimum, estimate of the number of people using "improved" water that is hazardous for their health.

Table 4. Extrapolated estimate of improved sources that do not comply with the WHO standard on faecal coliforms

Means of access to water		Non-conformity with faecal coliforms	
	Billions of users	% of users of these means[b]	Billions of users
Taps in the home or in its immediate vicinity	3.8	11%	0.4
Standpipes	0.4	11%	0.04
Boreholes	1.3	31%	0.4
Wells and springs protected against animals	0.3	47% [a]	0.1
Total improved sources	5.8		1.0

a average between 37% and 57%;
b results of RADWQ surveys by OMS-UNICEF in 5 countries

Adding the number of users of unimproved sources (0.9 billion people) to the users of improved sources acknowledged as unsafe (1 billion people), gives a total of at least 1.9 billion people who only use unsafe water that is hazardous for their health.

[11] RADWQ studies, a summary of which was presented by WHO-UNICEF in Stockholm on 24 August 2011 (Ref.10)

[12] China, Ethiopia, Jordan, Nicaragua, Nigeria, Tadjikistan

6. People using safe water

How many people have almost constant access to "safe" water in their home? As mentioned in paragraph 3.1, in the context of this examination, water is considered "safe" when its safeness for health is almost certain. The minimum requirement to ensure this is:

a) to check regularly the chemical and biological quality of the water,

b) to take precautions to prevent any contamination of the water during its transport from the source to the point of use, and particularly to the household.

These criteria can be satisfied for users who have access to running water or who use standpipes, or who use protected wells or boreholes, all of which are "improved sources". But as was indicated in paragraph 5, the safety of the water from improved sources is not guaranteed. In these cases the water is only "safe" if certain other conditions are satisfied.

6.1. Water networks: intermittence of supply.

It is obvious that "running" water available 24 hours a day in the home is very likely to be of safe drinking quality if the water fed into the network has been purified correctly in water treatment facilities. But the protected transport criterion is not satisfied if the supply is discontinuous so that the water only reaches the tap a few hours per day or per week. This is because when the supply is interrupted, the pressure in the theoretically safe drinking water networks drops, allowing polluted water from the surrounding soils to infiltrate through the inevitable cracks in the pipes. This risk of external contamination is aggravated if users connect pumps to extract water from the networks, something that unfortunately happens in many towns. The network operator cannot guarantee that water, which is safe when it enters the network, will still be safe when it reaches the user's tap. The water in distribution networks that are not permanently supplied and under pressure cannot be qualified as safe because there is always a risk of external infiltration. This is confirmed by studies on the ground[13].

Supply intermittence can be chronic, that is to say that the network operator's infrastructures do not allow all the consumers to be permanently supplied with water at sufficient pressure. In such cases water is only available at the consumer's taps for a few hours per day or per week, as the supply is managed by rotation to successive geographical sectors. Supply intermittence can also be random, resulting from failures in the water supply systems or, more frequently, electrical power failures that stop the water pumps.

6.2. Water networks: water safe most days is not necessarily safe every day

Millions of people receive perfectly safe drinking water distributed to their homes under continuous pressure via networks that are in good condition and closely monitored, but nonetheless do not have safe drinking water every day of the year. This is because climatic events that are quite normal can reduce the quality of the raw water drawn from the natural supply to an extent that exceeds the purification capacities of the existing facilities. Guaranteeing the supply of perfectly safe drinking water every day of the year would necessitate additional investments. As long as these investments are not made, the public authorities are obliged to declare the water occasionally non-potable and ask the population to boil the tap water before using it. These excessive deteriorations in the raw water occur in all countries, including developed countries. These temporary prohibitions on consumption can sometimes extend over several years, in which case the users cannot be considered as having access to safe drinking water[14].

How many people who are connected to "safe drinking" water supply networks do not have water that complies with the safety standards every day of the year, save exceptional events? In India, no public authority (except in very specific cases) manages to supply its

[13] See reference 7 for example

[14] See reference 6 which inventoried at a given moment in Canada 1766 water networks under an administrative prohibition to consume the water delivered. In some cases the prohibition had been in effect for several years.

water networks 24 hours a day. There are therefore at least 260 million[15] Indians in this situation of doubtful quality. But they are not alone; supply intermittence in public networks is frequent in Africa, Asia and Latin America. Furthermore, many networks deliver water that is acknowledged as being unsafe.

6.3. Wells and boreholes

Wells and boreholes present other types of risks, including:

- the quality of the water is rarely checked. It is not uncommon for the quality to be checked once when the well or borehole is created, and never again.
- the water drawn is often used as it is without any treatment to make it safe. Its quality therefore depends directly on the quality of the groundwater that supplies the well. Alas, in very many cases, particularly in cities, the water that infiltrates from the surface into wells and boreholes is contaminated by humans and animals. This is very often the case when there is no purification system or if purification is only partial.

6.4. Conveying the water to the home

The means of water conveyance affects its quality. Conveying water under pressure through pipes is a good method on condition that the pipe interiors are not contaminated. This is usually done by adding a disinfectant product when the water leaves the treatment plant. The other methods of conveyance involve containers, such as jerry cans or tanker trucks under the responsibility of carriers or the users themselves. These containers must be kept clean constantly and it is advisable to disinfect them periodically. This however is not always the case.

6.5. Storing the water in the home

Apart from the case of continuous water supply via networks, users are obliged to store water in their home. This is the case for almost 3 billion people who fetch water from an external source. Some protect their tanks and jerry cans, others leave them uncovered or let the family take water by dipping diverse recipients into the tank. This is also the case for all those who are connected to a water network that only functions intermittently. It is thus common in many countries for the dwellings to have a storage tank on the roof. Even though cleaning instructions are regularly issued, many household tanks are only disinfected very occasionally, if ever.

6.6. Regularity and reliability of the water supply system

All water supply systems that do not ensure a regular supply pose problems of water safety. Even if the water is normally "safe", any unexpected interruption in the supply (electricity failure, fuel running out, mechanical failure, etc.) obliges the consumers to use alternative water sources temporarily. In the majority of cases, these sources supply water of doubtful quality. Thus, the only alternative for those who usually go to a standpipe is to get water from street vendors, who in turn can no longer take water from the public network and tend to draw it from the natural environment (lake, river, etc.). It is estimated that more than a third of the hand-pumps in Sub-Saharan Africa do not function at any one given time[16]. During these periods the users go to find water that will obviously be of lower quality.

The reliability of disinfection of water quite often leaves much to be desired in poor countries where it is difficult to obtain chemical products and hard to cover their cost. It is not uncommon for the disinfection facilities to be out of service even though water continues to be supplied.

[15] Number of inhabitants in India connected to safe drinking water networks according to JMP2010 (Ref.9)

[16] Source: Rural Water Supply Network, ref.15

6.7. Estimating of the number of people using safe water

Let's try to estimate the number of people benefiting from safe water by using the means of access categories that are shown in table 3, which estimates the number of users for each category.

Running water in the home. Altogether, out of the 3.8 billion people who have at least one water tap in the home or its immediate vicinity, there are probably at least one billion, i.e. about 25%, who only have water of uncertain quality, at least for part of the year. There are many reasons for this, as outlined above including: feeding unsafe drinking water into the network, supply intermittence, unexpected supply interruptions, poorly managed individual storage tanks, etc.

Standpipes. Standpipes present the same risk as household taps if the supply is intermittent. An additional risk comes from the transport of the water to the home and its temporary storage before use. As half the standpipe users are found in India[17] where the supply is intermittent, an estimation of beneficiaries of safe water based on the assumption that only 50% of the other half have safe water seems reasonable, possibly even slightly optimistic.

Wells and boreholes. Wells and boreholes present the same transport and storage risk, often along with considerable uncertainty regarding the quality of the water, due to the shortcomings in the chemical and biological tests and the risks of contamination from the surrounding groundwater.

Table 5 gives an estimate of the total number of people making daily use of water of verified safe quality. It takes 50% of the standpipe users outside India and 75% of the borehole users. Using these figures, an estimated 3.3 billion people, that is to say slightly less than half humanity would be the number of people involved.

Table 5. Estimation of users of safe drinking water (of reliable quality)

All qualities of water		*Of which water of constantly reliable quality*	
Means of access to water	*Billions of users*	*%*	*Billions of users*
Taps in the home or in its immediate vicinity	3.84	75%	2.9
Standpipes	0.4	50% of 0.2 outside India	0.1
Boreholes	1.3	25%	0.3
Wells and springs protected against animals	0.3	?	?
Total	5.8		3.3

We can thus consider that 3.3 billion is a rough estimate of the number of people using safe water. The uncertainty in these calculations is of the order of several hundred millions. Nevertheless, it is useful to know that it is probably less than half the world's population. The rest (larger half) is made up of people using water that is hazardous of doubtful quality as described in paragraphs 5 and 7 respectively.

[17] About 200 million according to the *District Level Health Survey* of 2008 (Source JMP, ref. 9)

7. People using water of doubtful quality

The people using water of doubtful quality are those using water that is perhaps safe, but with no certainty of this.

The uncertainty about water quality can be due to many factors, such as the origin of the water, a lack of systematic quality control or a lack of precautions during transport and storage. These factors were described earlier in conjunction with the estimations of people using hazardous water and safe water. Water of doubtful quality is an intermediate case, but not necessarily better than that for hazardous water, because the difference can simply be a question of lack of information.

There are a great many people in this category. Table 6 summarizes the estimates for the safe water and hazardous water categories. The difference between them gives an estimate of the number of people using water of uncertain quality. This comes out at about 1.6 billion people, that is to say 23% of humanity or almost one person in four.

Tableau 6. Estimated numbers of users per type of water
(2008 estimates in billions of people – precision unknown)

Means of access to water		*All qualities of water*	*Safe water*	*Doubtful water*	*Hazardous water*
Improved sources	Taps in the home or in its immediate vicinity	3.84	2.9	0.6	0.4
	Standpipes	0.4	0.1	0.3	0.04
	Boreholes	1.3	0.3	0.6	0.4
	Wells and springs protected against animals	0.3		0.1	0.1
Not improved	Wells / springs not protected from animals	0.6			0.6
	Tankers / vendors	0.1		0.05 ?	0.05 ?
	Surface water	0.2			0.2
Total population		6.75	3.3	1.6	1.9
		100%	49%	23%	28%

8. People who need their right to safe drinking water to be assured better

The human right to safe drinking water comprises several dimensions as shown schematically in diagram 1.

Water safety is one of the criteria. This criterion is certainly not satisfied for the 1.9 billion people using hazardous water. It is also a problem for the 1.6 billion people who use water of doubtful quality. The authorities have the obligation to ensure the progressive realisation of the right to safe drinking water for every individual. They must therefore ensure that the water used by everyone is safe by taking the necessary action to improve doubtful sources and make them safe with a good level of probability. Hazardous and doubtful water sources taken as a whole are used by an estimated 3.4 billion people, that is to say half the population of the world[18].

[18] 3.4 = 1.6 + 1.9 (rounded down)

Water availability is another criterion. It is not satisfied if the dwelling does not receive its normal supply regularly, for example because of problems with repeated technical failures or weather phenomena that the existing infrastructure cannot manage. When the supply is intermittent, availability of supply is debatable. The obligation to have individual storage facilities is very costly. This can create a financial problem for certain users, which challenges the affordability criterion.

The affordability of the user's access to water is an important criterion. The cost to be taken into account comprises the cost of access to the public service (where applicable) and additional or alternative costs[19]. There is no standardised indicator however. There is no global information available allowing an estimate of the number of people for whom the cost of access is too high.

This is the case for several other criteria concerning the human right to safe drinking water. Given the lack of information on these criteria, it is currently impossible to make a precise estimate of how many people do not have all the aspects of their right to water satisfied.

With the estimations made on the criterion of safety, we can nevertheless estimate minimum values and assert that:

- there are more than 1.9 billion people whose right to water is not satisfied because the number of people who almost certainly use water of hazardous quality exceeds this 1.9 billion[20] figure.
- the right to safe drinking water is not assured by the public authorities for more than half of humanity, as this is the estimate of the number of people using water of quality that is doubtful or recognised as being unsafe.

9. Synthesis: 3 to 4 billion people need better access to water

The concept of safe drinking water is relatively well defined: it is the conformity of the water with national standards, most of which refer to the guidelines of the World Health Organisation. Access to safe drinking water, on the other hand, is not a precise concept. There are many ways of having "safe drinking" water in the home. Some are easier, others more costly, tedious or risky to implement.

This article endeavours to estimate the number of people who benefit from water of good quality, in sufficient quantity, and without need for additional treatment, on an almost constant basis, in their homes for their daily life. Table 7 summarizes the various estimates of the global needs that have been established using the partial information available. Diagram 2 gives a graphic view of these estimates.

In the absence of adequate statistical measurements, the precision of the majority of these estimates is unknown. Nevertheless, they do provide orders of magnitude that are useful to understand and describe the scale of the challenge of developing access to safe water throughout the world. Hopefully more precise information will allow more accurate estimates to be made in the future and permit better tracking of progress over time.

Consequently, the current assertion that "900 million people do not have access to safe drinking water" has no real meaning. The issue of access to safe drinking water concerns billions of people. For any census, the type of access to water must be specified. At least 1.9 billion people use water that is potentially dangerous for their health, while 3.4 billion use water that is of uncertain quality at least some of the time.

[19] The costs comprise the transport from the water source to the home, the storage, in-home purification treatments if vital, the equipment for access to alternative sources, etc.

[20] Catarina de Albuquerque, the United Nations Special Rapporteur on the Right to safe drinking water and sanitation, has declared several times that 2 to 3 billion people may not have access to safe drinking water. See ref 1.

Table 7: Estimations of different water access needs

Types of access to water	Reference within this paper	Estimated number of people	
		Billions	% of world population
Users of unimproved water sources	§ 4.2	0.9[a]	13%
Users of hazardous water sources	§ 5	> 1.9[b]	> 28%
Right to safe drinking water not satisfied	§ 8	> 1.9[b]	> 28%
Users without access to a water network	§ 4.2	2.5[a]	37%
Users without a running water tap in the home or the immediate vicinity	§ 4.2	2.9[a]	43%
Users of water of doubtful or hazardous quality	§ 8	3.4[b]	51%
Right to safe drinking water not guaranteed by public authorities	§ 8	> 3.4[b]	> 51%
Users without permanent and satisfactory safe drinking water supply in the home	Table 6	3.9[b]	57%

[a] *OMS-UNICEF statistics or equivalent precision*
[b] *author's estimate*

Thus, even if these estimations are marred by a high level of uncertainty, it is obvious that today a great many people - roughly half the world's population - have no assurance that the water that they use is safe.

The human right to safe drinking water was recognised by the international community in 2010. Implementing this right concerns at least as many people as does the safety of the water. It could be more, because safety is just one of the aspects of this right. Others include the accessibility, acceptability and affordability of the water. If the safety criterion alone is considered, at least 1.9 billion people do not have their right to water satisfied. The number of people whose right to water needs to be better realised seems to exceed 3.4 billion.

Access to water creates a real social divide. On the one hand there are those people who have permanent access to safe water in their home. They do not really recognise the value of safe drinking water or appreciate how lucky they are. On the other hand are all those for whom access to water is more difficult, more risky or more costly. They are more numerous, nearly 4 billion people (about 57% of the world population). Safe drinking water has an obvious value for them, but they do not have access to it - or only with difficulty.

Consequently, the needs for improving the conditions of access to water are enormous. Billions of people are concerned not hundreds of millions. The international community underestimates these needs. By only targeting “unimproved sources”, the current Millennium Development Goal for access to water excludes the needs - and even the rights - of billions of people. Public policies today are insufficient and need to be stepped up substantially. The world needs more ambitious policies[21] aiming to enable everyone to have satisfactory access to truly safe drinking water.

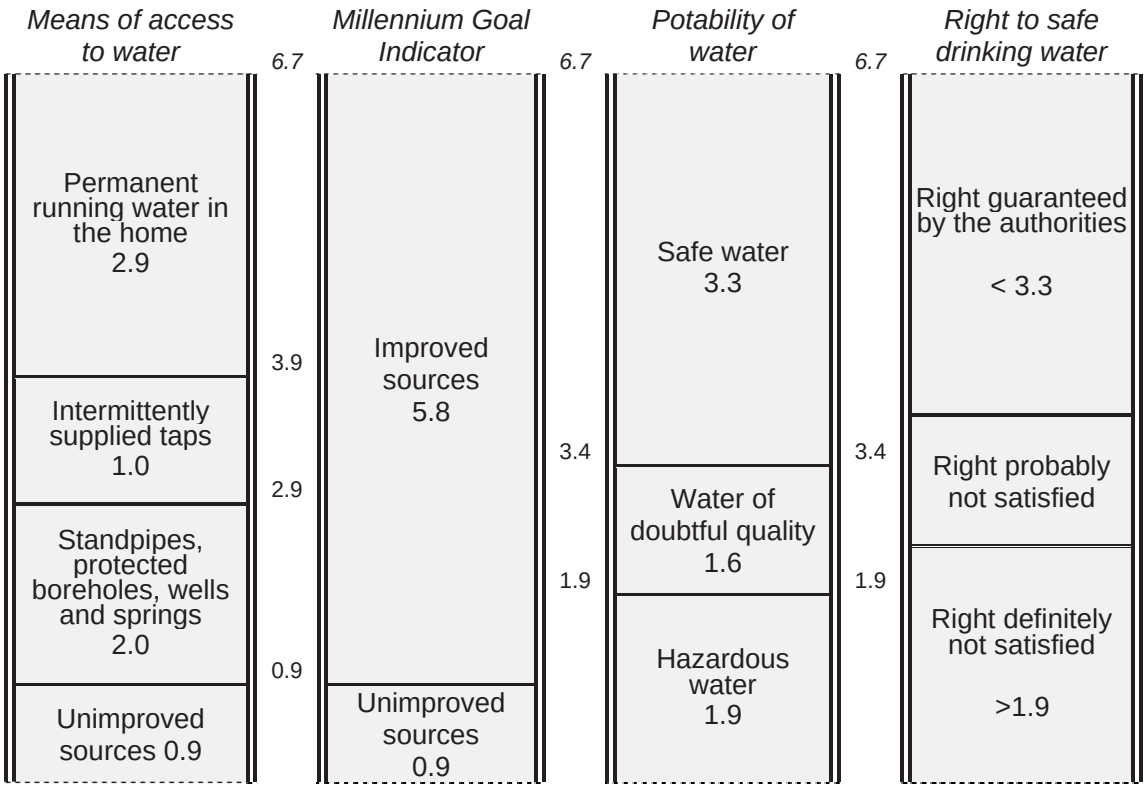

Diagram 2: Access to water: estimation of the world population on 4 different value scales (estimations - billions of people - 2008)

[21] See reference 12

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