



**Environmental Health:
A Focus on Access to Food and Water**

Background Guide

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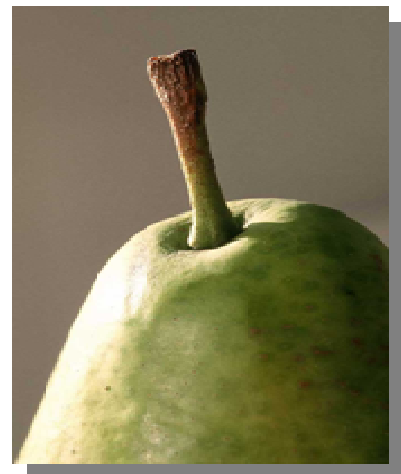


"Water and Sanitation is one of the primary drivers of public health. I often refer to it as "Health 101", which means that once we can secure access to clean water and to adequate sanitation facilities for all people, irrespective of the difference in their living conditions, a huge battle against all kinds of diseases will be won."

**Dr. Lee Jong-wook, former Director-General,
World Health Organization.**

"Few things have more impact than nutrition on a child's ability to survive, learn effectively and escape a life of poverty."

Ann Veneman, Executive Director, UNICEF.



Montreal World Health Organization Simulation 2009

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A Word from the Executive Director

Dear Delegates,

On behalf of the International Federation of Medical Students Associations Québec chapter (IFMSA-Québec) and the entire conference Secretariat, I would like to welcome you all to the third annual Montréal World Health Organization Simulation (MonWHO). This year the conference will address the critical issue of Environmental Health. In these times of economic crisis, let us not forget that the global food crisis is still hindering millions of people's ability to feed themselves and their family. Also, in this Background Guide, we are sadly reminded that almost 10% of the world disease burden could be prevented if proper sanitation and safe water were accessible to all. How can we, as students, address these critical issues? How can we work towards universal access to water and food? Is it possible to reconcile the economic and political forces at play with the fundamental human rights to water and food?



In your role as delegates to the Model World Health Organization, you will have to address these issues and more, while adhering to your respective countries' desires, established policies and biases. As within the real United Nations (UN), any solution will have to be acceptable to the majority. Negotiation, diplomacy and knowledge of the issue at hand will be critical to your success.

Three years ago, I witnessed the realization of Martin Smoragiewicz's visionary idea to simulate the World Health Organization. Since then, I have been passionately involved with the simulation and have seen it grow beyond my wildest expectations. This past year, the organizing team has worked with inspiration and dedication, to welcome you once again from all across the country to a conference that poignantly presents global health issues and the manner in which they are resolved at the World Health Organization. As always, we have ensured that MonWHO is an open and friendly event that is easily accessible to those who are attending their first Model UN conference. For newcomer and veteran alike, I hope that MonWHO will excite and inspire your interest in global health issues.

We have much work ahead of us. I believe that together we will find some answers to the pressing global health issues at hand. Together, let us fully engage in the MonWHO experience and fulfill our vision:

“Simulating the WHO to foster a new generation of Global Health Leaders”

I look forward to meeting you all on March 6th.

Sincerely,

A handwritten signature in black ink that reads "St. Forté".

Stéphanie Forté

Executive Director - Montréal World Health Organization Simulation 2009
National Global Health Officer – IFMSA-Québec 2008-2009

The World Health Organization

The World Health Organization (WHO) is the guiding authority within the United Nations system, whose overall objective is to attain the highest level of health for all peoples. Its role involves providing leadership on many aspects relating to health. The following list is an excerpt from the WHO website, describing the organization's core functions:

- providing leadership on matters critical to health and engaging in partnerships where joint action is needed;
- shaping the research agenda and stimulating the generation, translation and dissemination of valuable knowledge;
- setting norms and standards and promoting and monitoring their implementation;
- articulating ethical and evidence-based policy options;
- providing technical support, catalysing change, and building sustainable institutional capacity; and
- monitoring the health situation and assessing health trends

These core functions demonstrate how the WHO achieves its overarching objective.

Currently, the WHO is composed of 193 member countries, all of whom have signed the WHO's constitution. The supreme decision-making body for the WHO is the World Health Assembly (WHA), which comprises delegations from all member states. The organization itself employs over 8000 individuals hailing from more than 150 countries, whose qualifications range from public health specialists, to scientists, to administrative staff. With employees in over 147 countries, the WHO has its main offices in Geneva, Switzerland.

The World Health Organization Simulation

Each of you has been assigned a member state or non-governmental organization (NGO) to represent for the duration of the conference. As a delegate, you will have the opportunity to help shape international health policy by working with your fellow delegates to draft resolutions on a particular topic within the MonWHO General Assembly. This year, delegates will address the issue of Environmental Health, focusing on access to food and water.

Prior to the conference, you should understand the important health policies of your member nation or NGO and reflect on how these policies can be used to frame your approach to the conference topic. Your research will prepare you to work with your fellow delegates to develop strategies in response to the crises in access to food and water, in a manner that reflects the particular views of your member state or NGO.

Prior to the General Assembly, you will be separated into working groups based on your country or NGO assignment: delegates representing nations will be separated into regional blocks that consist of member states within their geographic region; in contrast, delegates representing NGOs will form one separate working group. The working groups provide an important opportunity for delegates to recognize the particular health policy goals and interests that are common to their region. The purpose of the working groups is to have delegates draft working papers that outline the solutions or ideas that have been developed during their block committee sessions. These working papers must then be approved by the directorate to be presented during the plenary session which follows.

During this General Assembly, all delegates will be grouped together. The General Assembly is an opportunity for delegates to turn their working papers into formal draft resolutions that can then be discussed, debated and voted on. Delegates may also draft amendments to the draft resolutions. Delegates representing member states will be allowed to vote on both procedural and substantive motions. In contrast, delegates representing NGOs can only vote on procedural motions. As a general rule, substantive motions involve voting on draft resolutions and their amendments, whereas procedural motions involve voting on everything else (i.e. motions for moderated/unmoderated caucuses, closure of debate, etc.). Upon closure of debate, all draft resolutions and their amendments will be voted on sequentially and separately. Those that pass will be combined to write a Declaration of Principles outlining the view of the simulated WHO on the issue of Access to Food and Water. This declaration will be sent to the actual World Health Organization.

Access to Food and Water

Introduction

Environmental health encompasses the assessment and control of those environmental factors (physical, chemical, and biological factors external to a person) that can potentially affect health (WHO, 2009a). Access to sufficient quantities of safe water and healthy foods are key aspects of global environmental health. Simply put, having access to food and water means: 1) there is enough of the resource; 2) it is safe to consume and 3) people have the means to acquire and use it.

Not only is access to food and water enshrined in the Universal Declaration of Human Rights (article 25), but the importance of these issues has been recognized by the United Nations (UN) and the World Health Organization (WHO) in the Millennium Development Goals (MDGs). Although progress has been made in the past decade in addressing these issues, access to safe food and water remain significant concerns in many parts of the world.

Why is Access to Food and Water Important for Health?

A strong synergism exists between malnutrition and access to clean water and sanitation. A poor nutritional state compromises the body's natural immunity, which leads to increased susceptibility to water- and food-borne infection, to more frequent and prolonged episodes of infection, and to increased severity of disease (WHO, 2005a). Conversely, these infections can aggravate malnutrition through malabsorption of nutrients, nutrient loss, decreased appetite and food intake, or increased metabolic needs (ibid). As such, policies and programmes aiming to improve access to clean water and safe food often go hand in hand, as do treatments for malnutrition and water and food borne infections.

Food and Health

Malnutrition

Chronic food deprivation results in malnutrition, a state of inadequate or improper diet (WHO, 2005b). Although malnutrition encompasses undernutrition as well as overnutrition (obesity), this article will focus solely on undernutrition. Chronic undernutrition results in

underweight, poor growth (in children), compromised immunity (increasing susceptibility to infection) and other adverse health effects. Undernutrition can result from inadequate consumption of calories, macronutrients (protein, carbohydrates and fat), and/or micronutrients (vitamins and minerals). Diseases caused by nutrient deficiency include protein deficiencies (kwashiorkor and marasmus) and micronutrient deficiencies, such as night blindness, scurvy, osteoporosis and rickets, anaemia, beriberi, pellagra, etc.

Malnutrition frequently affects all members in a community, but young children and infants are most vulnerable due to their particular nutritional requirements for growth and development and to their dependence on adults for appropriate access to food and water (Blössner and de Onis, 2005; Prüss-Üstün *et al.*, 2008; WHO, 2005b). In fact, undernutrition is estimated to be the underlying cause of mortality in more than one third of deaths in children under age five (United Nations, 2008). Pregnant and lactating women are also a vulnerable group, since malnourished mothers are at risk of giving birth to low-birthweight babies and other obstetric complications (WHO, 2005b). Maternal and child undernutrition is the leading cause of health loss worldwide, according to a recent study comparing different causes of mortality and morbidity (Ezzati *et al.*, 2002).

In children, severe undernutrition leads to increased morbidity (incidence and severity) and mortality and can also result in delayed psychological and intellectual development (Blössner and de Onis, 2005). These adverse outcomes can have continued consequences later in adult life, such as functional and mental impairment, which affect an individual's economic productivity and quality of life (Blössner and de Onis, 2005). The intergenerational impacts of malnutrition are particularly severe for women, since malnourished girls risk growing into malnourished mothers, who are at greater risk to have low-birthweight babies, who will in turn be prone to growth and developmental delays during infancy and childhood (Blössner and de Onis, 2005). Since smaller children tend to grow into less economically productive and less healthy adults the cycle of poverty and malnutrition can be transmitted throughout several generations. In addition, undernutrition during gestation and/or early infancy increases susceptibility to developing obesity, diabetes and hypertension in adulthood (Ravelli, 1976; Gluckman, 2004).

Food Safety

Food safety is also an important concern, as contamination with microbial or chemical contaminants can impact health. Particularly in developing countries, food-borne diarrhoeal diseases (often the result of poor hygiene and sanitation practices) are a major cause of illness, especially among vulnerable populations such as children and pregnant women (WHO, 2006a). Several emerging diseases, such as SARS and avian influenza, are associated with food animals sold in markets and people living in close contact with domestic animals (WHO, 2006a). Another recent example of chemical contamination in foods is the recent melamine-contaminated infant formula in China, which affected 294,000 children by November 2008 (WHO, 2008a).

Water and Health

The lack of access to safe water, sanitation and hygiene impacts negatively across many aspects of population health. It is estimated that global improvements to water, sanitation and hygiene have the potential to decrease by 9.1% the global disease burden (in DALYs) and decrease by 6.3% the global mortality rate (Prüss-Üstün *et al.*, 2008). For example, water-related diseases are a leading cause of death in children of developing countries (UNESCO, 2007) and reliability of drinking water supplies and improved water management in human settlements contribute to reducing spread of malaria and dengue fever transmission risks (United Nations, 2006).

Insufficient access to clean water for drinking, cooking, sanitation, hygiene and other purposes is strongly linked to the spread of infectious diseases (WHO, 2008b). Water can convey pathogens to people by providing a habitat for vectors and intermediate hosts of pathogens (FAO and UN Water, 2007). There are four types of water-related diseases that affect population health (United Kingdom Department for International Development, 2001):

- 1) feco-oral infections that cause diarrhea and include cholera, typhoid and dysentery;
- 2) skin and eye infections, including trachoma which is a major cause of blindness;
- 3) various worm infections, including guinea worm and schistosomiasis, many of which are caught by wading in contaminated water;

4) and diseases spread by insects such as mosquitoes that breed in water.

The first two types can be spread by contaminated water or by poor hygiene. Infectious diseases resulting from microbial contamination (bacteriological, viral, protozoan, helminthic) cause the majority of water-borne disease outbreaks (Prüss-Üstün *et al.*, 2008).

In addition, serious health concerns can also result from chemical contamination of drinking water (WHO and ENHIS, 2007). These non-communicable conditions include fluorosis, arsenicosis, lead contamination and exposure to modern pollutants such as PCBs, dioxins, furans and others (Bartram, 2008). Water-borne diseases and exposure to chemically contaminated water are associated with malnutrition since these conditions often prevent sufficient absorption of nutrients, and may decrease appetite while increasing metabolic needs (WHO, 2005a).



Box 1: A UN Initiative to Reduce Mercury Contamination in Water Supplies

Factories, coal-fired powerplants and mines are not the only sources of pollution of our lakes and rivers. Artisanal gold mining, once popular in the Klondike, is increasingly practiced in developing countries. 10 to 15 million people practice artisanal gold mining and 100 million people are connected to this industry (Huidobro, 2006). This quickly growing industry produces 1000 tons of mercury a year, which accounts for 30% of mercury emissions connected to human activities. It is the second biggest source of mercury pollution, after coal-fired powerplants (Huidobro, 2006). The United Nations Industrial Development Organization (UNIDO) set up the Global Mercury Project (GMP) in 2002 to “introduce solutions specifically for problems arising from the use of mercury in artisanal and small-scale gold mining” (Huidobro, 2006). The initiative found that certain factors were endemic among populations who practice artisanal gold mining, such as high levels of river pollution and extreme poverty. For these populations, artisanal gold mining generates three times more income than any other occupation. Concretely, the initiative began by raising awareness of the problem, both at the policy level and at the population level, by trainings on amalgam manipulation and on protecting their food and water supply for themselves and their children. Although the majority of GMP’s actions concentrate on technical aspects, it does not forget that this is not sufficient and that it is necessary to set up long-lasting solutions which would attack the economic root causes of this problem (Huidobro, 2006).

Clean and abundant water is also essential for agriculture (food production), recreational use, and ecosystem health - aspects vital to human health and quality of life (FAO and UN Water, 2007). Local water scarcity can impact food production, livestock rearing and domestic uses (such as bathing and household cleaning). In many countries, agriculture is often the first sector affected by water scarcity, which decreases the capacity to maintain per-capita food production while maintaining sufficient water resources for industrial, domestic and environmental needs (FAO and UN Water, 2007). Insufficient access to water often affects the poor first and foremost (especially in rural areas), who experience increasing difficulty in maintaining household food production and personal hygiene and sanitation needs. Water

scarcity thus perpetuates the cycle of poverty, malnutrition and poor health (FAO and UN Water, 2007).

Furthermore, according to the United Nations (United Nations, 2006):

- “improved access to safe water leads to better nutrition and a reduced number of episodes of illness resulting in improved physical and mental growth of children;
- healthy people are better able to absorb nutrients in food than those suffering from water-related diseases;
- access to safe drinking water and adequate sanitation helps reduce household expenditures on health care;
- illnesses caused by unsafe drinking water and inadequate sanitation generate high health costs relative to income for the poor;
- the time lost because of long-distance water collection and poor health contributes to poverty and reduced food security”.

Current Levels of Access to Food and Water

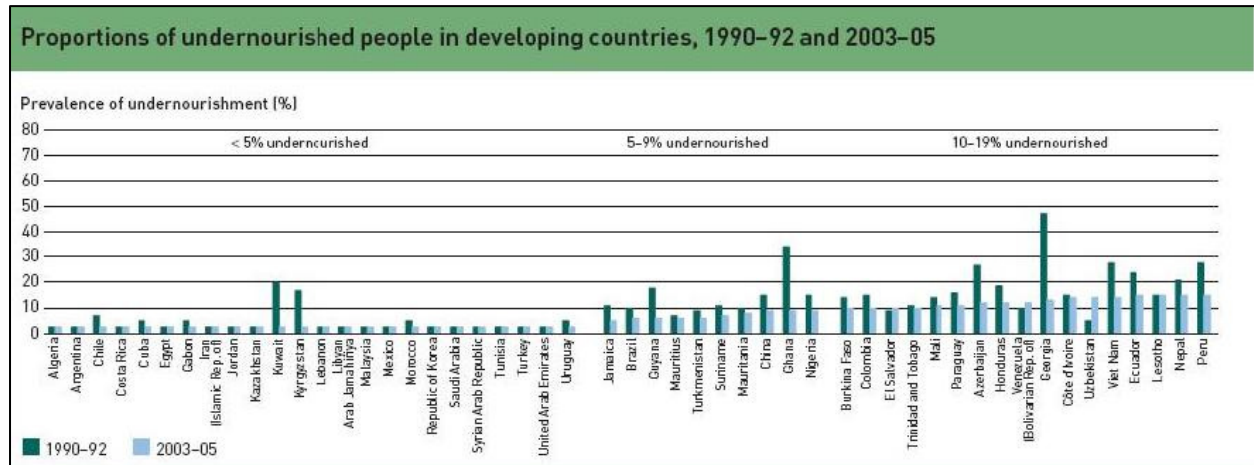
Food

The world economy produces enough food to feed the entire world population, if food were distributed equitably (UNESCO, 2009). However, food distribution has been unequal for some time, with overabundance in most developed countries, and scarcity in most developing countries. During the past few years, efforts have been made to reduce hunger in developing countries. Food aid and laws were put in place over the course of several years and we saw a decade of relatively low food prices until the end of 2006. Despite this, the planet now faces a food crisis, where an unprecedented number of people are going hungry, mostly in developing countries, and even developed countries face sharply rising food prices.

The number of chronically hungry people rose by 75 million in 2007, mainly as a result of high food prices, reaching an estimated total of 923 million people, a number which represents 17% of the world's population. This rise in hunger indicates a set-back from improvements made in combating global hunger since 1990-92 (FAO, 2008a). The majority of the people in the world who lack access to sufficient food and water live in developing countries. In 2003-2005,

these countries were home to 832 million of the 848 million chronically hungry people (FAO, 2008a). Of these, 65% live in only seven countries: India, China, the Democratic Republic of the Congo, Bangladesh, Indonesia, Pakistan and Ethiopia (FAO, 2008a).

Figure 1



From FAO, 2008, p12



Box 2: Unfulfilled Promise - GMOs Fail to Live Up to their Potential

Genetically modified organisms (GMOs) have been in the news for many years now. According to the WHO, biotechnology could play an important role in establishing food security for all. In a report published in 2005, the WHO mentions the positive effects that genetic engineering could have on agriculture, while noting that the conditions required for these effects to occur have yet to be reached. Potential benefits include increasing yield, reducing the use of fertilizers, weed-killers and insecticides, attributing to plants a resistance to heat, salt or disease, increasing nutrient content of plants, or decreasing postharvest losses by increasing crop shelf-life (Baynton *et al.*, 2005). However, these advantages are currently far from realized and the GMO market is actually controlled by only a few multinationals such as Monsanto.

Until recently, there was no reason to believe that GMOs posed direct risks to human health. However, for the first time in 2007, an independent study led by CRIIGEN (Independent Research and Information Committee on Genetic engineering) showed that a Monsanto genetically modified corn presented signs of toxicity. Despite being authorized for consumption, it may be harmful to the liver and kidneys (Séralini, Cellier and Spiroux de Vendomois 2007).

Although the dangers of GMOs to health are still an intense matter of debate, many actors would agree that GMOs have not yet lived up to their potential. A recent report published by Friends of the Earth International shows that the expected beneficial effects of genetic engineering have not been achieved. Instead of finding reduced pesticide use, the report noted an increase in the use of pesticides, particularly of RoundUp, a very toxic compound produced by Monsanto. This increase could be caused by growing pesticide resistance and would lead to increased production costs and environmental consequences. In addition, GMO production plays no part in helping nourish the poorest of this world. The majority of it is rather used to feed animals intended for the consumption of rich countries. GMO production also facilitates extensive farming, which spells the demise of small family farms. Finally, until now no food has been modified to increase its yield (CRIIGEN, 2008).

Water

It has been estimated that in order to ensure our basic needs, every individual needs 20 to 50 liters of water free from harmful contaminants each and every day (United Nations, 2006). Yet approximately one billion people currently do not have access to safe and affordable drinking water (United Kingdom Department for International Development, 2001). Approximately four million people die annually of water-borne diseases, including two million children who die of diarrhea, and more than 800 million people, 15% of the world population, are malnourished, due in part to insufficient water for crops (United Kingdom Department for International Development, 2001).

Levels of access to safe water vary globally. About 80% of the world population lacking access to safe drinking water is concentrated in three developing regions: sub-Saharan Africa, Eastern Asia and Southern Asia (WHO and UNICEF, 2006). In addition, many developing countries can use approximately only 20% of their potentially available freshwater resources due to the seasonal nature of the water supply and annual weather variations. The El Niño Southern Oscillation for example, can lead to significant seasonal differences in rainfall in the southern Pacific Ocean, affecting southeast Asia and south and central America (Suleymanova, 2002). Between 1990 and 2008, the proportion of the world's population using water from improved sources rose from 77% to 87% (WHO, 2008b). Despite this improvement, nearly one sixth of the world population (900 million people), 84% of whom live in rural areas, remains without access to improved drinking water (WHO, 2008b; WHO and UNICEF, 2006).

Two types of water scarcity particularly affect developing countries (Suleymanova, 2002). :

- Physical water scarcity occurs where water consumption exceeds 60% of usable supply; water supply here is insufficient to meet the demands of agriculture, domestic and industrial sectors. Countries in this category include those in the Middle East.
- Economic water scarcity occurs where a country has physically sufficient water resources to meet its needs, but additional storage and transport facilities are required. This poses difficulties for mobilizing financial and other resources necessary to increase water supplies to adequate levels. Countries in this category include those in sub-Saharan Africa.

By the year 2000, the consumption of global freshwater had risen to more than six times what it was in 1900, a rate of increase twice that of population growth (United Kingdom Department for International Development, 2001). Demand for water resources continues to increase due to population growth and because of increasing per person demand for freshwater. This is due to a combination of factors including industrialization, increasing individual use of water as incomes rise, and development of irrigation systems (United Kingdom Department for International Development, 2001).

On a positive note, some of the greatest achievements in water supply of the last 20 years have been made in India, where the population with access to water is reported to have increased from 41% to 88%. In Africa, by contrast, over one third of the population remains without access to water (United Kingdom Department for International Development, 2001).

Factors that Determine Current Access to Food and Water

In many countries, food and water are not readily available. Many factors contribute to the scarcity of these necessities in developing countries. These determinants will be exposed in two categories: political and economical factors, and environmental factors.

Political and Economic Factors

The current global food crisis provides an example of how political and economic interests can interfere with access to food and water, which comprise some of society's most basic needs. Among the factors that have brought about this deplorable situation, a major contributor is the shift of developing countries from producers to exporters. In fact, the World Bank and the World Trade Organization encouraged these countries to reduce food production for the domestic market and to increase cash crops for export to industrialized countries. By offering low market prices and investing in cash-crop enterprises, these entities promoted the culture of coffee, tea, cotton and cocoa, and at the same time compelled the people of developing countries to diminish the production of staple foods such as yams, cassava, millet, wheat, corn and sorghum (Oxfam International, 2008). In Africa, cultivated acres planted in food staples grew by 50% between 1983 and 1994. After the WTO went into effect, it grew only by 13.3%, between 1995 and 2006 (Food & Water Watch, 2008). Consequently, these countries became

importers of staple foods. But when oil prices recently skyrocketed, food prices followed and these products were suddenly inaccessible to the most vulnerable people on the planet.

The phenomenon called “dumping” consists of offering products at prices lower than those charged in the country of origin (Food & Water Watch, 2008). This commercial practice, considered non-ethical but used in the last decade, also encouraged developing countries to become importers of the goods that form the basis of their diet.

Box 3: A Green Idea Gone Bad -

Effects of Tree Monoculture on Food and Water Supply

At first glance, planting trees seems to be a positive gesture for the environment. However, the monoculture of several tree varieties around the world causes damages to the food and water supply of populations adjoining these plantations, as well as causing many other problems. Changes to hydrologic cycles decrease water reserves, river degradation is increased and the soil, water and air are polluted by use of pesticides, weed-killers, etc. The region’s food security is also compromised, as plantations replace or prevent food cultures or animal breeding (Les amis de la Terre International, 2008).

Let us examine the case of the "Pampa", a region situated in the South of Brazil, in Argentina and in Uruguay. The subsoil of this particular ecological system contains one of the biggest water reserves in South America. To illustrate this abundance, consider that a eucalyptus, a plant that consumes up to 20 litres of water a day, grows more than seven times more quickly in these fertile lands than in a country such as Scandinavia. Such rapid growth renders monoculture economically favourable. In Uruguay, water shortages have already taken place, as these artificial forests have decreased water flow by 52 % and dried up 13 % of the rivers in the Argentine Pampa. In Brazil, it is estimated that water consumption by plantations will surpass by 20 % the actual amount of rainwater, causing desertification and soil acidification (World Rainforest Movement, 2008). Tree monoculture is present all around the world: palm tree plantations in Asia, the Pacific and Africa; biofuel monocultures, particularly prevalent in Latin America; as well as production of rubber and wood pulp (Les amis de la Terre International, 2008).

The rapid economic growth of China and India has created a larger and increasing middle class which consumes more and more meat and dairy products, thus increasing the global demand for corn and soybean to feed livestock. (Food & Water Watch 2008) The production of biofuel, which is related to the increasing demand in these two countries, also contributed to the increase in food prices, again making food inaccessible for millions of already undernourished people.



In sub-Saharan countries, where physical access to water is precarious, water transport and storage facilities are particularly vulnerable to the dangers of raging conflicts in these regions. Water infrastructures can be both military targets and sources of confrontation. In many countries, water shortage is such that it can cause tension between regions or nations. In fact, over 20 countries depend on the flow of water from other nations to replenish their water supply (Suleymanova, 2002).

Another factor that negatively affects the actual global supply of water is rapid urbanization. The population in developing countries is growing, and the proportion of this population living in the city is increasing even more, mostly in urban fringe areas of shanty towns (Suleymanova, 2002). This makes it extremely difficult to provide clean water to this large population.

Box 4: Politics, Water Supply and Disease - The Cholera Outbreak in Zimbabwe

The current cholera outbreak in Zimbabwe began in August 2008. Cholera, which causes diarrhea, is mainly transmitted through contaminated food and water (WHO, 2008c).

Zimbabwe is currently in the midst of an economic and political crisis. Robert Mugabe's party gained control of the water supply in certain regions by nationalizing it. Recently, the government interrupted water supply in certain regions, such as Harare (The Times Online, December 2, 2009), because it has been unable to continue treating the water. Since cholera outbreaks are associated with inadequate environmental management (WHO, 2008c), it is not surprising that Harare is one of the areas hardest hit by the disease.

Although cholera is usually treatable, efforts to stem the epidemic have been complicated by the state of this country's health care system, in the form of non-functioning hospitals and critical staff shortages (BBC News, December 4, 2008). In a tragic turn of events, cholera patients are dying of thirst, as hospitals and clinics have lost running water (The Montreal Gazette, December 20, 2008).

Further complicating the fight against the outbreak is a lack of political will. Although Zimbabwe's deputy health minister has recently appealed for medical supplies and aid to treat cholera (BBC News, December 4, 2008), Robert Mugabe asserted as recently as December 2008 that there was no cholera in Zimbabwe, despite a death toll of more than 780 at that time (The Times Online, December 12, 2008).

Environmental Factors

The rise in food prices previously discussed is also related to environmental factors. In fact, global warming causes uncommon meteorological phenomena, like the occurrence of extreme drought in Australia and in many other countries. These effects likely lower their ability to produce food through agriculture.

Water availability is also dependent on climate, a perfect example being the frequency of monsoons and their effect on freshwater resources. In fact, the supply of freshwater for much of the developing world comes mainly in form of seasonal rains, like the monsoons in Asia. Such

intense rains often run off too quickly for efficient use. Therefore, when those seasonal rains are disturbed, like in the presence of natural phenomena such as El Niño, the distribution of freshwater is highly endangered (Suleymanova, 2002). In some countries, such as Saudi Arabia and Kuwait, the actual usable water supply does not even meet the needs of the population because of the lack of a freshwater basin and the dryness of the climate (Suleymanova, 2002). Those countries rely on importation and desalination plants to meet their water needs.

Another important issue is the quality of water available for consumption. In fact, the lack of appropriate sanitation systems in developing countries makes common water-borne diseases like cholera, hepatitis, dengue fever, malaria and other parasitic diseases (Suleymanova, 2002). Since water treatment costs money, this vulnerable population is also at risk for contamination with pollutants of all kinds. Examples such as the release of agricultural chemicals, urban drainage and industrial effluents are factors that affect the well being of these fragile societies.

Factors that can Impact Future Access to Food and Water

Climate Change

Food and water security implies "access by all people at all times to enough food [and water] for an active, healthy life" (Kumar, 2007). Nevertheless, climate change, a timely topic of particular relevance for human health, combined with already over-exploited natural resources, has had and will continue to have a significant impact on food security and malnutrition. The profound modifications in global temperatures, regional weather patterns, and physical and biological systems impact the four key dimensions of food and water security – availability, stability, access, and utilization.

The impacts of climate change on food production are already visible: increased heat stress on crop development; amplified erosion and flood risks due to changes in distribution of rainfall; and coastal degradation and salt-water intrusion caused by the rise in sea levels. In fact, the availability of agricultural products is directly affected by climate change through its impacts on crop yields, crop pests and diseases, soil fertility and water-holding properties (Schmidhuber and Tubiello, 2007). Thus, the increased frequency of extreme climatic events (sea-level rise and flooding of coastal lands; higher temperatures and water scarcity; and damage to forests,

fisheries and aquaculture) has an undisputable impact on food security. More frequent crop losses, elevated risks of fires, insect outbreaks and wind damage due to extreme weather events will affect the stability of food supplies (IPCC, 2007). An amplified incidence of pests and diseases that will negatively affect crop production, as well as the loss of cultivated land and nursery areas for fisheries through inundation and coastal erosion, will further exacerbate the disparities in food access. Thus, agricultural output in developing countries is expected to decline by 10-20 percent by 2080 due to climate change (Cline, 2007).

Furthermore, the world population will increase by 37%, to 9.2 billion people, by 2050. Demographic growth will inevitably lead to more demand and the need to increase food production will require expanding the area of cultivated land. This will cause cultivation of fragile land, destruction of forests and wildlife habitat, causing biodiversity loss and additional greenhouse gas emissions (Cohen *et al.*, 2008). Thus, in a catch-22 situation, land degradation due to deforestation and expansion of agriculture and livestock production, will further accelerate climate change.



Moreover, climate change will have a major impact on water security and consequently, on food availability. We currently face more intense and longer droughts as well as more frequent heavy precipitation events (Cohen *et al.*, 2008). Flooding, tropical cyclones and higher temperatures are likely to exacerbate in the future, thereby raising the incidence of infectious and diarrheal diseases that in turn lower people's capacities to absorb food effectively (National Research Council, 2001). Also, droughts and water scarcity diminish dietary diversity and reduce overall food consumption, leading to malnutrition. Water supplies stored in glaciers and snow covers are also expected to decline in the future, further reducing water availability. Thus, in Africa, by 2020, 75-250 million people will be exposed to increased water stress due to climate

change, while severe food shortages due to deficiencies in crop production are expected (Cohen *et al.*).

While changes in climate will affect global agriculture and the world's food supply, developing countries will bear the brunt of these effects. For example, the number of undernourished people in Sub-Saharan Africa may triple between 1990 and 2080, reaching 410 million people (von Braun, 2008). Many low-income communities depend directly on agriculture, forestry, fisheries, aquaculture, and climate-sensitive resources. They also have inadequate complementary services, such as health, education, and insurance services (McMichael *et al.*, 2003). Moreover, given the geographic vulnerability and low adaptive capacities of low-income groups, climate change will disproportionately affect them. Impaired access to food and water will also erode long-term opportunities for human development and could exacerbate inequalities within countries (UNDP, 2007).

Financial Speculation

In addition to climate change, financial speculation may impact the future availability of food and water. Speculation means buying a good not for its actual value but for its possible increase in value; speculators thus purchase goods hoping to quickly resell them for a profit. This type of financial activity is considered risky for investors, which is why speculating on a finite or scarce resource, such as oil, water or food, may be attractive: the price will surely rise as the amount of the resource diminishes.

In 2008, there was a price hike for oil, metal, and food such as rice and wheat. This led to the idea that speculators were partly to blame. Some countries, worried about their own population's access to food, restricted exports, which prompted domestic panic behaviour such as hoarding and an even sharper price hike (IMF, 2008). However, most studies have found that there is little evidence to show that speculative activity has impacted on food price (Gilbert 2007 in Mitchell, 2008; and IMF, 2008). On the contrary, it has been shown that speculative activity tends to follow price movements, and not vice versa (Helbling, 2008).

Still, experienced interest groups argue that speculation tends to push prices upwards and that the elimination of speculative position limits and absence of buffers are harmful (IATP, 2008 and IMF, 2008). Transaction fees to decrease speculator activity and generate

development/food aid revenue have been both strongly supported and avidly opposed (ECB, 2004 and SOP, 2006).

There is agreement that a correlation is possible, keeping in mind that “For speculation to have a persistent effect on commodity prices, it must be accompanied by increasing physical hoarding of the commodities to keep spot markets in balance because consumption would decline at the higher prices” (see Krugman, 2008 in IMF, 2008). Speculative activity may also lower and stabilize prices by providing liquidity (Helbling, 2008 and Millman, 2008). In addition, it is yet to be determined whether the inclusion of food into commodity bundles markets causes a problem (IATP, 2008).



Oil speculation has also made us look toward food crops for fuel, both reducing the availability for consumption and raising prices, despite increased production. This trend is expected to increase (IMF, 2008). However, should speculation continue to push oil prices upward, oil-tied food producers would face serious difficulty (Mark, 2006), operating at a much smaller profit or a loss. A reduced incentive to produce could lead to short- to mid-term shortages until brokers offer higher prices. These higher prices would be passed on to consumers.

It is likely that trading water rights as a demand strategy could overtake supply strategies, the latter being increasingly complex and expensive. With supplies continually “shrinking,” (Griffin, 2006), speculation pushing prices up would rather encourage conservation or deprive those who would have to go without.

The status of water as a public good and anti-speculation laws have restricted water rights to use and management, though increasing scarcity will lead to pressure for privatisation as financial speculators push to come into the picture (Zellmer, 2008). “Low-income people, particularly those living in rural areas of developing countries, would be severely affected, as

would those relying on subsistence and traditional agriculture” (Matoussi, 1996). For both efficiency and equity, rules and regulation, as well as timely reinforced implementation would be needed (ACTS, 2004-2008; ADB, 2007; Matoussi, 1996, and McLean and Voss, 1996).

The shifting prices of food crops, which require water for production, are unavoidably impacting the value of water in a private water market (Taylor, 2008). Water ownership by speculators could improve the quality of water that is available for human consumption through self-interested stewardship.

Possible Conflicts

The issues surrounding access to food and water are complex and varied, spanning theoretical disagreements in policy development to international violent conflicts. Consensus and action by organizations such as the WHO are critical and time-sensitive. Climate change leading to shorter growing seasons, severe drought, glaciers melting, deserts forming, and extreme weather will continue to impact access to clean water and arable land for food production and will lead disproportionately to violent conflict in areas of poverty and unrest that lack the governance and economic resources for adaptation (Smith and Vivekananda, 2007).

In 1975, the Indian Farakka Barrage was completed, diverting water from the Ganges River preferentially to its Indian tributary away from Bangladesh. Bangladesh already suffers from a shortage of arable land. One third is flooded during the rainy season, and this project led to salt water intrusion of coastal rivers, decreased fishing, summer droughts, loss of land to the sea because of reduced sediment carried to the delta, and worsened flooding during cyclones. As a result, 12-17 million Bangladeshis migrated (often illegally) to India. Tensions between Indians and Bangladeshis first led to violence in the 1980s. Inevitable further decreases in access to water due to climate change can be expected to destroy the livelihoods of a growing number of Bangladeshis, increasing migration and exacerbating violence in India and Bangladesh, which has been forced to declare an official State of Emergency (Smith and Vivekananda, 2007).

The recent increase in food prices in the world calls attention to a second type of conflict, between wealthy investors, corporations, and governments seeking to profit from rising food prices through speculation and the individuals facing malnutrition, disease, and starvation from these food shortages (Young, 2008). When large amounts of land are purchased in developing

nations in order to secure the long-term food supply elsewhere or turn a profit, the local farmers without official titles are left empty-handed. For example the South Korean firm Daewoo Logistics recently announced plans to buy a 99-year lease on a million hectares in Madagascar, a deal 10 times larger than typical arable land sales in the area. Although this deal recently fell through due to a backlash against ‘neo-colonialism’ (Ryall and Pflanz, 2009), it follows Abu Dhabi investors’ acquiring thousands of hectares in Pakistan, UAE interest in Kazakhstan, and Chinese plans in Southeast Asia due to, not land, but water shortages and their effect on food sustainability (Borger, 2008).



Religious and historic loyalties further complicate the issues of land ownership related to access to food and water. For example, all water resources in the Gaza Strip and West Bank territories are currently under

Israeli state control. Israelis consume five times more water than Palestinians, to whom permits required to build or repair wells are rarely granted. Many Palestinians must rely on water trucked in from distant wells during the summer months (Cookburn, 2002).

It takes 2,500 gallons of water to produce 1 pound of meat. That equals the total water consumption of a typical American family for one month and is 100 times more than the amount of water it takes to produce one pound of wheat (Robbins, 1987). The numbers are similarly shocking for arable land usage. Considering that the amount of meat imported annually by the U.S. from Costa Rica, El Salvador, Guatemala, Nicaragua, Honduras and Panama equals 200,000,000 pounds, the negative effects on arable land availability are transferred to these developing nations (Robbins, 1987).

Box 5: Blue is the New Gold - Selling Canada's Water

Underlying the many conflicts related to food and water is the assumption that they are free-market commodities and not basic human rights. Yet their inherent nature as essential to human life and health sets them apart from oil, minerals, and other similarly traded resources. The Universal Declaration of Human Rights states in article 25 that “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services” (UN, 1948). Water, unlike food, is not explicitly stated, although it could be considered implicit is the expression “standard of living adequate for the health and well-being”. In November 2002, the United Nations Committee on Economic, Social and Cultural Rights decided that access to adequate amounts of clean water is a fundamental human right, noting that “the human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights” (United Nations Committee on Economic, Social and Cultural Rights, 2002). Thus, some argue that one cannot ‘own’ water.

Approximately 20% of the world’s freshwater supply is in Canada (Patterson, 2007). Under NAFTA, water is already considered a commodity (Inside the Bottle, 2008), and indeed bottled tap water has become as ubiquitous in stores as bread or milk. In Canada, no law prohibits bulk water sale or water export (Patterson, 2007), but private initiatives to sell water from Canadian lakes abroad met with such public outcry that they fell through (CBC News Online, 2004). In the words of the proponents of the initiative: “The water is just running into the Atlantic Ocean, no one is getting one nickel out of it. Why shouldn't it help us?” (CBC News Online, 2004). The idea of selling water has even been examined in trilateral talks between the United States, Canada and Mexico (Patterson, 2007). Opponents of such commerce include the Canadian Environmental Law Association, which stated that: “Water is an essential need, a public trust, not a commodity. It belongs to everyone and to no one” (CBC News Online, 2004).

Water-rich nations, such as Canada, are likely to be major players in efforts to regulate global water distribution. Consequent to its abundant water supply, Canada increasingly faces conflicts between economic and public interests relating to the sale of water on a large scale. Canada has the opportunity of leading by example; resolving these conflicts should be done with utmost care and with the global situation in mind.

How can the WHO Contribute to Universal Access to Safe Food and Water?

The World Health Organization's activities are focused on six core functions which involve policy and advocacy positions, research and development, promotion of change to better cooperation and action, national and global partnerships, implementation of standards and, finally, development and testing of new technologies, tools and guidelines (WHO, 2009b). In addition to these functions, the WHO also invests specific action in order to achieve the Millennium Development Goals (MDGs) (WHO, 2005b). The MDGs originate from the Millennium Declaration which was signed in September 2000 by 189 Member States of the United Nations. These goals were set to be reached by 2015 and the WHO works actively towards the achievement of those pertaining to health issues (WHO, 2005b).

Access to Food

The actions undertaken by the WHO concerning universal access to safe food have lately been greatly influenced by the recent global food crisis. The WHO's response to this major problem has been guided by 3 fundamental health and nutrition considerations (WHO, 2009c):

- "The need for underscoring the human face of the food crisis, of monitoring its impact on nutrition, health and poverty as well as the effect this may have in reducing or delaying the attainment of the health and nutrition related Millennium Development Goals (MDGs).
- The importance of providing sound information and analyses for targeting the most vulnerable groups within the most vulnerable countries and among the most vulnerable populations. There are already countries with high levels of acute and chronic malnutrition and it is conceivable that the food crisis will hit hardest there.
- The critical importance of providing health and nutrition inputs for developing and/or scaling up food aid as well as social protection activities connected with nutrition for shielding the most vulnerable groups. " (WHO, 2009c)

These considerations guided the WHO in numerous actions, including a participation in the redaction of a Comprehensive Framework for Action (CFA) (High Level Task Force on the Global Food Crisis, 2008). The CFA was developed by the High Level Task Force on the Global Food Crisis, led by the United Nations Secretary-General and formed by the Bretton Woods

Institutions and different relevant UN entities to coordinate their response to the food shortage and to ensure universal long-term access to safe food. The specific role of the WHO in the High Level Task Force is to provide health and nutrition inputs (WHO, 2009c).

The WHO response also includes an action plan to solve the major health-related problems following the food crisis. These include:

- "underscoring the human dimension of the food crisis throughout interventions;
- monitoring impacts on nutrition, health and poverty;
- ensuring that the most vulnerable groups are helped, protected and granted food and nutrition security;
- providing health and nutrition assistance;
- preventing the loss of health progress in affected areas;
- linking programme responses to the food crisis to long-term food and nutrition policies. " (WHO, 2009d)

In order to ensure the protection of the most vulnerable populations in the face of the food crisis, the WHO intervenes in various ways, including by providing healthy food baskets, by paying particular attention to community nutrition (infants, young children and their mothers) and by supporting patients affected by TB and HIV-AIDS (WHO, 2009d).

Beyond the food crisis, the WHO also protects access to safe food by the adoption of a Global Strategy for Food Safety, which aims to "reduce the health and social burden of foodborne disease" (WHO, 2002). The diverse activities conducted by the WHO include the monitoring of foodborne diseases, the promotion of food safety as an essential public health function and the establishment of international standards concerning food quality. WHO also supports Member States in their control of food safety in the context of new technologies and globalization of the food industry (WHO, 2002).

Access to Water

In terms of water and sanitation, the WHO respects its six core functions (WHO, 2009b). For example, one way used to promote research is through the publication of the Journal of Water and Health which deals about many subjects such as epidemiology, water and wastewater treatment and water-based diseases (WHO, 2009e). The WHO has also elaborated specific guidelines for drinking water quality; data and support is provided and made accessible to all groups and countries (WHO, 2006b).

The WHO's water, sanitation and health policy concentrates on three main points: MDGs, the Commission on Sustainable Development and the International Water for Life Decade.

Millennium Development Goals

Within the MDGs' framework, the WHO works towards the improvement of health through safe drinking water and basic sanitation (WHO, 2009f). In order to achieve this, the WHO - in partnership with UNICEF - has established the Joint Monitoring Program for Water Supply and Sanitation (JMP). This program aims towards monitoring the status/progress of access to water and sanitation in relation to the MDGs. It also provides support to countries in their efforts to achieve water and sanitation targets (WHO, 2008d). Additional WHO efforts concentrate on the promotion and the support of better hygiene behaviours, affordable, effective and environmentally-friendly technologies and water treatment (WHO, 2009f).



The seventh MDG's main target aims to "integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources" (WHO 2005b, p.11). Within its policy on water and sanitation, the WHO supports Integrated Water Resources Management (IWRM) plans. This is done at regional, national and international levels, permitting specific and appropriate actions (WHO, 2009g).

Finally, within its water and sanitation policy, the WHO supports cleaner water as a mean to promote safer healthcare and to achieve the concerned MDGs. More specifically, the WHO works towards developing tools and guidelines for safe healthcare settings by exploring new technologies and by supporting initiatives to its sustainable establishment (WHO, 2009h).

Commission on Sustainable Development

Established in 1992, this commission's work involves different water issues within its framework (WHO, 2009c). Its function is to keep track of the United Nations Conference on Environment and Development and also to oversee the implementation of the Earth Summit agreements at all levels (WHO, 2009c). A concrete action undertaken by the Commission was to evaluate the costs and benefits of water and sanitation improvement on a global scale. For example, this study determined that every dollar invested in the improvement of access to water and sanitation returned 5 to 28 dollars, mostly due to a gain in productivity and to lower health care costs because of reduced illness (WHO, 2009i).

Water for Life Decade

This initiative was issued by the United Nations General Assembly. Inaugurated 10 years before the MDG deadline, it specifically calls upon the international community to put efforts into reaching MDGs concerning access to water and sanitation. The WHO's involvement into supporting this initiative is through the JMP (WHO, 2009j).

Other initiatives

Other initiatives have been put up front in the eventuality of emergencies and disasters. They mostly are plans of action and guidelines. For example, the Pan American Health Organisation (PAHO), one of the six regional offices of the WHO, produced a document giving accurate information for such cases (PAHO, 2002).

Finally, the Water Supply and Sanitation Collaborative Council (WSSCC) is hosted by the WHO and has been created in response to the UN General Assembly resolution A/RES/45/181. Its mission is to work towards better access to water and sanitation (WSSCC, 2009a). This Council takes concrete actions in the different countries in which it has office. For example, in Malawi, an extensive study on the water access points in the country lead to the institutionalisation of these water points (WSSCC, 2009b).



Glossary of Terms

BLACKWATER	Water that has come into contact with human or animal excreta, and waste from food preparation which is commonly referred to as sewage (WHO, 2009k). Also, source-separated wastewater from toilets, containing feces, urine and flushing water (WHO, 2009k).
CAPACITY	The quantity of solid waste that can be processed in a given time under certain specified conditions, usually expressed in terms of mass per 24 hours (WHO, 2009k).
CHEMICAL HAZARD	Chemical contaminants in food are a significant source of foodborne illness, and include natural toxicants such as mycotoxins and marine toxins, environmental contaminants such as mercury, lead, radionuclides and dioxins, and naturally occurring chemicals in plants, such as glycoalkaloids in potatoes (WHO, 2002).
DALY (DISABILITY-ADJUSTED LIFE YEARS)	The DALY is the sum of years of life lost by premature mortality (YLL) and years of healthy life lost in states of less than full health, i.e., years lived with a disability (YLD), which are standardized by means of severity weights (WHO, 2009k).
DISINFECTED WATER	Filtered water having received a disinfecting chemical, usually chlorine, and held in the acid range for a period of 30 minutes in a baffled basin to control short-circuiting (WHO, 2009k).
DRINKING WATER	Water that is intended for human consumption and suitable for all usual domestic uses, complying with the requirements of the WHO Guidelines for Drinking-water Quality or appropriate national standards established by the regulating authority (WHO, 2009k). Water that meets or exceeds all applicable federal/provincial/local requirements concerning safety. Also known as potable (drinkable) water (WHO, 2009k).
ENVIRONMENTAL BURDEN OF DISEASE	The environmental burden of disease quantifies the amount of disease caused by environmental risks. It can be expressed in deaths, incidence or in Disability-Adjusted Life Years (DALY) (WHO, 2009l).
ENVIRONMENTAL HEALTH	The physical, chemical, and biological, and related factors external to a person, that impact behaviours relating to health. It encompasses the assessment and control of those environmental factors that can potentially affect health, specifically targeting disease prevention and the creation of health-supportive environments (WHO, 2009k).

ENVIRONMENTAL HEALTH INDICATOR	An expression of the link between environment and health, targeted at an issue of specific policy or management concern and presented in a form which facilitates interpretation for effective decision-making (WHO, 2009k).
ENVIRONMENTAL HEALTH MANAGEMENT	The intentional modification of the natural and built environment in order to reduce risks to human health or to provide opportunities to improve health (WHO, 2009k).
ENVIRONMENTAL SANITATION	A range of interventions designed to improve the management of excreta, sullage, drainage, and solid waste (WHO, 2009k).
FAMINE	Widespread scarcity of food in an area that causes starvation and death in a large portion of the population.
FIELD CAPACITY	The quantity of water which a soil is capable of retaining after saturation and against gravity, for a period of time, is called the field capacity (WHO, 2009k).
FOOD INSECURITY	The condition of uncertain access to food of sufficient quality and quantity.
FOOD POVERTY	Hunger occurring when enough food exists in an area but some of the people cannot obtain it because they lack money, are being deprived for political reasons, live in a country at war, or suffer from other problems such as the lack of transportation.
FOOD PRICE CRISIS	A dramatic rise in world food prices, causing political and economic instability and social unrest in both poor and developed nations (Walt, 2008).
FOOD SAFETY	Assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (WHO, 2009k).
FOOD SECURITY	Conditions whereby people have both physical and economic access to food at all times (WHO, 2009k)
FOOD SHORTAGE	Hunger occurring when an area of the world lacks enough total food to feed its people.
FOODBORNE DISEASE	Any disease of an infectious or toxic nature caused by consumption of food (WHO, 2009k).
GLOBAL WARMING	Observed and projected temperature increases (WHO, 2009k).
GROUNDWATER	Water contained beneath the surface in rocks and soil and that accumulates underground in aquifers (WHO, 2009k).

HUNGER	Lack or shortage of basic foods needed to provide the energy and nutrients that support health.
IMPROVED WATER SOURCES	Improved drinking water sources are defined in terms of the types of technology and levels of services that are more likely to provide safe water than unimproved technologies. Improved water sources include household connections, public standpipes, boreholes, protected dug wells, protected springs, and rainwater collections (WHO, 2006c).
MALNUTRITION	Poor nutrition caused by an insufficient, excessive, or poorly balanced diet or by a medical condition, such as chronic diarrhea, resulting in inadequate digestion or utilization of foods (Dictionary.com, 2009).
MICRO-BIOLOGICAL HAZARD	Pathogens such as <i>Salmonella</i> , <i>Campylobacter jejuni</i> and enterohaemorrhagic <i>Escherichia coli</i> , and parasites such as <i>cryptosporidium</i> , <i>cryptospora</i> , trematodes, that cause foodborne illness (WHO, 2002).
POPULATION HEALTH	The science and art of preventing disease, prolonging life and promoting mental and physical health and efficiency through organized community efforts for the sanitation of the environment, the control of communicable infections, the education of the individual in personal hygiene, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and the development of social machinery to ensure every individual has a standard of living adequate for the maintenance of health and longevity (University of Ottawa School of Medicine, 2008)
RAW WATER	Water that comes to the plant inlet from the source - river, lake or reservoir (WHO, 2009k). Water in its natural state (source), prior to any treatment for drinking (WHO, 2009k).
RECLAIMED WATER	Water that has been treated so that its quality is suitable for particular specified purposes, such as irrigation, toilet flushing or possibly drinking. Also called recycled water (WHO, 2009k).
SUSTAINABILITY	A resource or system that meets present needs without compromising those of future generations. Example: a continuously maintained forest where mature trees are harvested and new trees are replanted to filter pollutants and provide continued resources and products for future generations (Centerline Designs, 2008).

WASTEWATER	Liquid waste discharged from homes, commercial premises and similar sources to individual disposal systems or to municipal sewer pipes, and which contains mainly human excreta and used water (WHO, 2009k). The used water and water-carried solids from a community (including used water from industrial processes) that flow to a treatment plant (WHO, 2009k).
WATER SCARCITY	An imbalance between the availability of water and the demand for water by the community. Degradation of groundwater and surface water quality, intersectoral competition, and interregional and international conflict all contribute to water scarcity (FAO, 2008b).
WATERBORNE DISEASE	Any disease of an infectious or toxic nature caused by consumption of or exposure to contaminated water (WHO, 2009k).
ZOONOSIS	An infectious disease that is transmissible under natural conditions from animals to humans (WHO, 2009k).

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