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**COMBATING THE WATER CRISIS TO ENSURE A SUSTAINABLE
ENVIRONMENT**

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INTRODUCTION

If left unchecked, water scarcity and pollution will be detrimental to the human race in the next 100 years. Statistics offer a gloomy picture with numerous countries failing in their attempts to create proactive methods to mitigate water scarcity and pollution. Not only should countries enact water management programs and initiatives in their laws, they also need to realize that a failure to address the situation would be catastrophic.¹ The Human Rights Council (HRC) must recognize that water should also be discussed in the context of human rights and the environment, even though there is already a mandate included in the right to water. Water scarcity and pollution are problems faced by developed and developing countries that are affected by numerous waterborne diseases caused by contaminated water. Therefore, it is important for the HRC to recognize and engage world leaders in addressing water scarcity and pollution.² Countries need to take an aggressive approach towards saving the world's water resources in addition to reducing water pollution that is gradually threatening the lives of over 7 billion people. This can only be achieved if and when practical solutions are enacted and world leaders recognize the importance of water for industrial and domestic usage.

Water scarcity means that a region's water supply is insufficient to meet the needs of the people who live there. It is a phenomenon driven by two major factors: depletion of natural water sources and increasing freshwater usage.³ For instance, it can as a result

¹ Mekonnen, M. M., & Hoekstra, A. Y. Global gray water footprint and water pollution levels related to anthropogenic nitrogen loads to fresh water. *Environmental science & technology*, 12861, (2015).

² Vörösmarty, C. J., Hoekstra, A. Y., Bunn, S. E., Conway, D., & Gupta, J. Fresh water goes global. *Science*, 479, (2015).

³ Boulay, A. M., Hoekstra, A. Y., & Vionnet, S. Complementarities of water-focused life cycle assessment and water footprint assessment, 11, (2015).

of both economic and physical causes. It is no doubt that the reduction of the physical causes should be an objective or goal for all governments and nations.⁴

Due to water scarcity and pollution, agriculture and food production has been highly affected in major countries around the world.⁵ At the same time, the environment has remained technically unsustainable over the past 30 years in many countries such as China and Syria. As the global population increases so does the need to have a realistic and practical balance in managing and controlling water pollution and water scarcity. At the socio-economic level, water cannot be viewed independent from sanitation, food production and the environment. Indeed, water is the heart of any link between the environment and society.

Similarly, agriculture as the primary source of all food substance depends entirely on water for an adequate harvest. Thus, water needs to be incorporated in the conversation about achieving a sustainable environment.

I. Water Deterioration, Infrastructure and Destruction

Many countries under the Millennium Development Goals allocated systems and structures that typically failed in addressing water scarcity challenges. Despite the fact that over 70,000 hand pumps are under construction in many countries in Africa annually, a study by the World Health Organization discovered that over 40 percent of these pumps did not function.⁶ The situation represented a loss of approximately US \$1.5 million and \$1.8 billion in business investments.⁷ In addition, the total average cost

⁴ Boulay, A. M., at 67.

⁵ Schwarzenbach, R. P., Egli, T., Hofstetter, T. B., Von Gunten, U., & Wehrli, B. Global water pollution and human health. *Annual Review of Environment and Resources*, 35, 110, (2010).

⁶ Vörösmarty, C. J., at 479.

⁷ Boulos, P. F. Smart water network modeling for sustainable and resilient infrastructure. *Water Resources Management*, 3177-3188, (2010).

worldwide of water facilities has remained high at over US \$145 billion annually.⁸ The sad reality is the challenge will get out of hand if water infrastructures are not well maintained. For example, to address water scarcity in homes in the USA, a capital investment of approximately US \$200 billion is needed by the year 2040.⁹ However, a continuation of the current situation will result in an underfunding of US \$145 billion.¹⁰

Until the Sustainable Development Goals¹¹ started in the year 2016, the international community focused less on water scarcity and more on measures that included recycling, treatment and efficiency. However, water scarcity and pollution remains a huge problem around the world. For instance, poorly treated waste water is still a major problem for developing countries in Africa.¹² In regions that use wastewater instead of freshwater, children have a higher risk of gastroenteritis.¹³

Furthermore, a single air strike in Syria destroyed water supplies for over 4.5 million people leading to further escalation of water scarcity and pollution.¹⁴ Since the year 2010, water infrastructure has been a combat target in countries such as Libya, Ukraine, South Sudan, India, Syria, Yemen, Iraq, and Somali.¹⁵ Military engagements

⁸ Vörösmarty, C. J., at 478.

⁹ Schwarzenbach, R. P., Egli, T., Hofstetter, T. B., Von Gunten, U., & Wehrli, B. Global water pollution and human health. *Annual Review of Environment and Resources*, 121, (2010).

¹⁰ *Supra* at 110.

¹¹ The SDGs are part of Resolution 70/1 of the United Nations General Assembly: "Transforming our World: the 2030 Agenda for Sustainable Development". That has been shortened to "2030 Agenda". The goals are broad and interdependent, yet each has a separate list of targets to achieve. Resolution adopted by the General Assembly on 25 September 2015, A/RES/70/1, (2015).

¹² Agunbiade, F. O., & Moodley, B. Occurrence and distribution pattern of acidic pharmaceuticals in surface water, wastewater, and sediment of the Msunduzi River, Kwazulu-Natal, South Africa. *Environmental toxicology and chemistry*, 41, (2016).

¹³ Vörösmarty, C. J., at 479.

¹⁴ Boulay, A. M., at 11.

¹⁵ de Loë, R. C., & Patterson, J. J. Rethinking water governance: Moving beyond water-centric perspectives in a connected and changing world. *Natural Resources Journal*, 57(1), 82, (2017).

have thus stood out as major contributors to water scarcity and pollution, further leading to an intensification of the situation in many countries.

Lastly, the majority of the water infrastructures keeping the ecosystems thriving and supporting large populations in different countries have become stressed. Lakes, aquifers and rivers are gradually drying up¹⁶ and over half of the global wetlands are gone.¹⁷

II. Water and Agriculture

Agriculture takes in large volumes of water compared to other consumers, leading to further inefficiencies. At the same time, climate change is altering patterns of water and weather all over the world, leading to droughts and shortages in major areas and flooding in some regions.

Water scarcity and pollution has a direct effect on agricultural production. Scarcity and contamination of water leads to low food harvests.¹⁸ The International Water Management Institute argues that agriculture contributes to over 100 percent of food production. However, with continued erratic water patterns and contamination of water resources, the agricultural sector is gravely affected which leads to reduced food for the population. With over 70 percent of water going to agricultural use, industrial and domestic uses are in high competition for the limited water resources remaining.¹⁹

The former United Nations Secretary General, Ban Ki-moon argues that,

“Water is a precious resource, crucial to realizing the Sustainable Development Goals.” Ban Ki-moon further states that “water is the essence for food security

¹⁶ Vörösmarty, C. J., at 478.

¹⁷ *Supra* at 479.

¹⁸ Vörösmarty, C. J., at 479.

¹⁹ Kummu, M., Guillaume, J. H. A., de Moel, H., Eisner, S., Flörke, M., Porkka, M., ... & Ward, P. J. The world's road to water scarcity: shortage and stress in the 20th century and pathways towards sustainability. *Scientific reports*, 121, (2016).

and agricultural production. It is the lifeblood of ecosystems, including forests, lakes, and wetlands, on which the food and nutritional security of present and future generations depend on.”²⁰

As the global population approaches 10 billion by the year 2015, the demand and need for food is expected to increase by over 60 percent.²¹ The World Health Organization (WHO) argues that,

“Two thirds of the world population will be living in water stressed countries by the year 2025 due to decreased food production if the current trend of water scarcity and pollution continues. In order to achieve a zero hunger world by 2030, we need to take action now.”²²

WHO outlines agricultural measures that include improving farming methods that use limited water and using strategic cropping methods. For example, producing 1 kg of lentils uses about 1250 liters compared to 13,000 liters used in the production of 1 kg of beef.²³ Over the years, attempts to cut down on food waste and loss has played a major role in using water efficiently. Approximately one third of global food is either wasted or lost, translating into large volumes of wasted water.²⁴ The WHO argues that food thrown away is a waste of resources.²⁵

III. Current Environmental Crisis

Lack of water aggravates the environment with constant soil salinization. As such, sustainable water management has a direct effect on the efficient use of water and land

²⁰ Vörösmarty, C. J., at 479.

²¹ Chapagain, A. K., & Orr, S. An improved water footprint methodology linking global consumption to local water resources: A case of Spanish tomatoes. *Journal of environmental management*, at 1220, (2009).

²² Han, D., Currell, M. J., & Cao, G. Deep challenges for China's war on water pollution. *Environmental Pollution*, 218, 1232, (2016).

²³ Chapagain, A. K., at 1226.

²⁴ Liu, J., Wang, Y., Yu, Z., Cao, X., Tian, L., Sun, S., & Wu, P. (2017). A comprehensive analysis of blue water scarcity from the production, consumption, and water transfer perspectives. *Ecological indicators*, 72, 870-880.

²⁵ Id.

resource planning, productivity and conservation.²⁶ In addition, drought is often associated with unpredictable food production, diminished water resources, severe water scarcity, and minimized capability of the ecosystem. Further, the quality of water is not appropriate for agricultural use due to pollutions.²⁷ The following are examples of current environmental water crises, both at the local and national level.

A. Water Pollution

1. The Flint Water Crisis

The Flint water crisis in Michigan is a result of poor decision-making and environmental injustice. The tragedy started in 2014 when the city's administration changed the region's drinking water supply to the Flint River from the Detroit system.²⁸ The move was seen as a cost-saving measure, but it has negatively impacted the environment and led to a severe water crisis. Discolored, foul smell and off-tasting water used by many households gradually started causing skin complications, hair loss, and stomach problems.²⁹ However, the crisis worsened in 2014 due to inappropriate action because the river served as an unofficial dumping site for local industries.³⁰ With an increased population, a lot of pressure was put on the water source. The then governor, Rick Snyder, set up a committee led by an emergency manager to look into the crisis.³¹ The action to change the water drinking supply cost the state a large amounts of money in the treatment of water, but it also increased water scarcity and produced an unhealthy,

²⁶ Pellicer-Martínez, F., & Martínez-Paz, J. M., The Water Footprint as an indicator of environmental sustainability in water use at the river basin level. *Science of the Total Environment*, 561-574 (2016).

²⁷ Han, D., supra note 7 at 1222.

²⁸ Butler, L. J., Scammell, M. K., & Benson, E. B. (2016). The Flint, Michigan, water crisis: a case study in regulatory failure and environmental injustice. *Environmental Justice*, 95, (2016).

²⁹ Id.

³⁰ Id.

³¹ Baum, R., Bartram, J., & Hrudey, S. The Flint water crisis confirms that US drinking water needs improved risk management, 67, (2016).

unsustainable environment. The change in water led to the death of 12 individuals and caused 87 more to become severely ill between the period 2014 and 2015.³² In addition, the tragedy led to the third largest outbreak of Legionnaires disease in the United States.³³ Today, The Flint water crisis continues to be an issue, with thousands of people left without portable water to drink.

2. Syria's Water Crisis

Water control and scarcity has been the center of a long-standing conflict in Syria. From damaged environmental sources, diseases and a decrease in food production, the country has grappled with a number of issues pertaining to water scarcity and pollution.³⁴ Since the major droughts that faced the country from 1990 to 2005 in addition to the Arab uprising, the country continues to face difficulties regarding environmental sustainability and disease control. Many people have moved to major cities like Homs, Hama, Ezzor, Daraa, Damascus, and Aleppo. By the year 2010, the United Nations declared the region “wanting” in terms of water scarcity and environmental usefulness.³⁵ Water has played a significant role in the rise of clashes and conflict in the region.

Rebel groups have emerged to take control of water sources thus weaponizing water in the country. When rebels overran government forces in 2012 and captured the Tishrin hydroelectric dam on the Euphrates River, large amounts of water went to waste with many locals missing out on the precious commodity.³⁶ The Syrian government, in turn, contaminated the water and later bombed the source, further worsening the water

³² Butler, L. J., at 96.

³³ Id.

³⁴ Wichelns, D. Volumetric water footprints, applied in a global context, do not provide insight regarding water scarcity or water quality degradation. *Ecological indicators*, 424, (2017).

³⁵ Feitelson, E., & Tubi, A. A main driver or an intermediate variable? Climate change, water and security in the Middle East. *Global Environmental Change*, 41, (2017).

³⁶ Id. at 45.

crisis. It became a tactic in which a large section of the country went without water since the government withheld water sources.³⁷ Islamic groupings also shut down the main water channel that originated from Taqba Dam to Aleppo, which the government had taken control over. With the participation of ISIS, that demanded payment for water usage by the locals, the water crisis in the country has not only been politicized but also militarized, making life difficult for the locals. Actions by the government and militia groupings have made environmental factors worse with increased drought frequency and desertification.³⁸

B. Unsustainable Farming Methods

1. China

China is facing a growing water crisis, and its current measures to mitigate the situation may never support the rising crisis. Agriculture is the core of the economy of China, especially in the North. However, the country's water sources are located in the South.³⁹ By the year 2014, the Northern parts of the country held approximately two-thirds of the country's agriculture. However, this was only supported by a small percentage of water. With over 20 percent of the global population, China only has 7 percent of usable water.⁴⁰ The situation is further made worse by the country's rising middle class and high water demand.⁴¹

³⁷ Wichelns, D. at 423.

³⁸ Falkenmark, M. Global water issues confronting humanity. *Journal of Peace Research*, 179, (1990).

³⁹ Galli, A., Wiedmann, T., Ercin, E., Knoblauch, D., Ewing, B., & Giljum, S. Integrating ecological, carbon and water footprint into a "footprint family" of indicators: definition and role in tracking human pressure on the planet. *Ecological indicators*, 101, (2012).

⁴⁰ Duan, L., Hao, J., Xie, S., & Du, K. Critical loads of acidity for surface waters in China. *Science of the total environment*, 3, (2000).

⁴¹ Zhao, X., Liu, J., Liu, Q., Tillotson, M. R., Guan, D., & Hubacek, K. Physical and virtual water transfers for regional water stress alleviation in China. *Proceedings of the National Academy of Sciences*, 1034, (2015).

The World Bank in its 2009 report noted that China is deprived of large volumes of water since pollution has made freshwater useless, especially for domestic and industrial use.⁴² At the same time, climate changes are gradually making the situation worse. The country's South-North Water Diversion Project, which was intended to address the entire shortage of water in addition to coming up with measures of mitigating the water crisis, failed in its attempt to introduce modern farming methods such as reinforcing the artificial economy and encouraging water-intensive agricultural and industrial use, thus promoting insatiable demand for water.⁴³ For irrigation systems to be sustainable, they require proper management to avoid salinization and must not use more water from their source than is naturally replenishable. Otherwise, the water source effectively becomes a non-renewable resource.

Improvements in water well drilling technology and submersible pumps, combined with the development of drip irrigation and low-pressure pivots, have made it possible to regularly achieve high crop yields in areas where reliance on rainfall alone had previously made successful agriculture unpredictable.⁴⁴ However, this progress has come at a price. In many areas, such as the Ogallala Aquifer, the water is being used faster than it can be replenished. Several steps must be taken to develop a drought-resistant farming system even in "normal" years with average rainfall.⁴⁵ These measures

⁴² Falkenmark, M. Global water issues confronting humanity. *Journal of Peace Research*, 186, (1990).

⁴³ Galli, A., Wiedmann, T., Ercin, E., Knoblauch, D., Ewing, B., & Giljum, S. Integrating ecological, carbon and water footprint into a "footprint family" of indicators: definition and role in tracking human pressure on the planet. *Ecological indicators*, 107, (2012).

⁴⁴ Jingping, Z., & Zhongjing, W. A Research on Modern Water Crisis in Arid Area in China: Technology, System and State's Intervention: Take the Taolai River Valley in Gansu Corridor for example. *Researches in Chinese Economic History*, 20, (2016).

⁴⁵ Zhang, C., Zhong, L., Fu, X., Wang, J., & Wu, Z. Revealing water stress by the thermal power industry in China based on a high spatial resolution water withdrawal and consumption inventory. *Environmental Science & Technology*, 1643, (2016).

include both policy and management actions: improving water conservation and storage measures, providing incentives for selection of drought-tolerant crop species, using reduced-volume irrigation systems, managing crops to reduce water loss, or not planting crops at all.

2. California

California's drought is a recurring climatic situation. According to climatic statistics, the period between 2011 and 2015 was the worst in the region's history since the drought was first recorded in 1895.⁴⁶ In addition, the highest hottest temperatures were recorded in 2014 and 2015 in the northern regions where the water supply originates.⁴⁷ The Federal government allocated \$3 billion towards addressing the situation that gradually degenerated into a severe water and drought crisis.⁴⁸ Businesses and agricultural activities were affected with suburban regions suffering most from the situation. To remedy the situation, urban areas were forced to cut the water use by 25 percent during the period of 2013 and 2016.⁴⁹ Rural areas such as the Sierra Nevada and San Joaquin Valley had a severe water crisis that led to increased food shortages with more than 2,000 domestic water sources going completely dry.⁵⁰

⁴⁶ Mann, M. E., & Gleick, P. H. Climate change and California drought in the 21st century. *Proceedings of the National Academy of Sciences*, 3848, (2015).

⁴⁷ Id. at 3849.

⁴⁸ Cheng, L., Hoerling, M., AghaKouchak, A., Livneh, B., Quan, X. W., & Eischeid, J. How has human-induced climate change affected California drought risk?. *Journal of Climate*, 114, (2016).

⁴⁹ Mann, M. E., at 3859.

⁵⁰ Cheng, L., at 115.

The agriculture sector suffered the most from the persistent drought. Agriculture accounts for over 80 percent of water use in the state.⁵¹ Due to the drought, farmers only used about 50 percent of the 80 percent of the water they usually use.⁵² At the same time, farmers also reduced the amount of acreage by approximately 6 percent.⁵³ Higher costs and land fallowing led to over a US \$2 billion loss in the farming sector, in addition to over 10,000 part and full-time jobs.⁵⁴ Despite the fact that California does not depend much on farming for its food production, the impact of the water setback and cutbacks have caused other sectors to suffer, such as, the transportation sector, fertilizer sales, and production industries.⁵⁵

At the same time, the environment is severely suffering from the situation. Native fish are on the decline with over 18 species such as steelhead and salmon nearing extinction.⁵⁶ Migratory birds and wildlife have continued to suffer as the drought continues.⁵⁷ Dense forests are at a continued risk of wildfires with the state facing a challenging tradeoff that includes maintaining a consistent water reservoir to keep up with the needs of the state.⁵⁸ Meanwhile, the state has tried to relax some of its use of water to preserve the little water available for both household and industrial usage.⁵⁹

C. Successful Water Management Measures

⁵¹ Id. at 115.

⁵² Asner, G. P., Brodrick, P. G., Anderson, C. B., Vaughn, N., Knapp, D. E., & Martin, R. E. Progressive forest canopy water loss during the 2012–2015 California drought. *Proceedings of the National Academy of Sciences*, E254, (2016).

⁵³ Id. at E250.

⁵⁴ Id. at E251.

⁵⁵ Cheng, L., at 118.

⁵⁶ Id. at 119.

⁵⁷ Asner, G., at E249.

⁵⁸ Id.

⁵⁹ Teodoro, M., & Zhang, Y. Privatization as Political Decoupling: Water Conservation and the 2014-2017 California Drought. (2017).

1. Netherlands

Even though the Netherlands have a water scarcity problem, it has a high chance of water pollution. However, the country has in place strategic measures of high technology that has enabled it to conserve and protect its waters and water resources.⁶⁰ The Netherlands is impacted by water bodies from all regions in Europe. About 430 municipalities have the responsibility of overseeing the water boards and sewers.⁶¹ Numerous ministries take responsibility for policy-making concerning water usage, agricultural water, farming methods, and wastewater bodies.⁶² At the same time, Nonprofit organizations, institutes, and business associations overlook water boards and companies mandated to oversee the general landscape of the country.

Water treatment plants have full-time employees who are dedicated towards ensuring that water projects, practices and programs run as scheduled and maintenance is carried out in accordance with the laid down frameworks. For example, the Dutch benchmarking program is aimed at ensuring proper water activities are enacted towards water availability and sanitation.⁶³

The Netherlands has delegated water treatment responsibilities both locally and nationally. Locally, 27 regional water agencies are in charge of water treatment and overlooking hygiene and pollution.⁶⁴ Further, municipalities have the responsibility of sewage, thus taking care of pollution. At the national level, the country's regulation and

⁶⁰ Mekonnen, M. M., & Hoekstra, A. Y. A global assessment of the water footprint of farm animal products. *Ecosystems*, 405, (2012).

⁶¹ Kleijn, D., & van Zuijlen, G. J. The conservation effects of meadow bird agreements on farmland in Zeeland, The Netherlands, in the period 1989–1995. *Biological Conservation*, 446, (2004).

⁶² Galli, A., Wiedmann, T., Ercin, E., Knoblauch, D., Ewing, B., & Giljum, S. Integrating ecological, carbon and water footprint into a “footprint family” of indicators: definition and role in tracking human pressure on the planet. *Ecological indicators*, 109, (2012).

⁶³ Kleijn, D., at 449.

⁶⁴ Id. at 450.

policy towards water management is enacted in their laws (the Water Supply Act 2005) and is in line with the country's water Boards Act of 2005 and Decree on Water Supply.⁶⁵ The two ministries in charge of water management are the Ministry of Housing, Spatial Planning and the Environment and the Ministry of Transport, Public Works and Water Management. The above ministries work hand in hand in all matters relating to water usage thus boosting water management services and usage.⁶⁶

The division of the responsibilities at different levels has led to the Netherlands' successful water management due to the policies and frameworks of management put in place within their laws and administration.⁶⁷ All the numerous bodies have different functions, duties, and responsibilities thus ensuring that water is given top priority as an important national commodity.⁶⁸

2. Norway

Norway's citizens have access to clean drinking water that is free from contamination. The country's national and local administration has put in place measures and practices that have reduced the levels of heavy metals, pesticides, pollutants and unwanted substances.⁶⁹ The country has two groups of water facilities that have helped in the preservation and control of pollution.⁷⁰ Over 1,500 plants are registered in the country

⁶⁵ Koop, S. H., & van Leeuwen, C. J. The challenges of water, waste and climate change in cities. *Environment, development and sustainability*, 389, (2017).

⁶⁶ Kleijn, D., at 450.

⁶⁷ Id. at 447.

⁶⁸ Galli, A., Wiedmann, T., Ercin, E., Knoblauch, D., Ewing, B., & Giljum, S. Integrating ecological, carbon and water footprint into a "footprint family" of indicators: definition and role in tracking human pressure on the planet. *Ecological indicators*, 108, (2012).

⁶⁹ Bakken, T. H., Modahl, I. S., Engeland, K., Raadal, H. L., & Arnøy, S. The life-cycle water footprint of two hydropower projects in Norway. *Journal of Cleaner Production*, 241-250, (2016).

⁷⁰ Koop, S.H., at 391.

with data collected and stored via the MATS system, which collects and analyzes state water usage.⁷¹

Nine out of ten individuals get high-quality water from the waterworks. Norway's Institute of Public Health ensures that water meant for household use is disinfected.⁷² According to the Institute's statistics, only about 2,000 people received unpurified water in the year 2015.⁷³ The Institute approximates that by 2025, its entire population will have access to clean drinking water.⁷⁴ The country has also made great strides in improving its water treatment plants.

IV. RECOMMENDATIONS

With over 1 billion people lacking clean drinking water in addition to the inadequate water supply for agricultural use, there is an urgent need to find lasting solutions to the current water crisis. In combating water scarcity and pollution, particular attention needs to be put on the environmental applicability of water. These include establishing a balance in environmental use of resources, strengthening erosion measures, combating water and soil salinization, and reducing water wastes. This requires measures and strategies for reducing water scarcity and pollution:

Human Rights Advocates (HRA) urges the Council:

1. Request that the Special Rapporteur to include water issues as they relate to the environment, including the following:

⁷¹ Stagge, J. H., Kohn, I., Tallaksen, L. M., & Stahl, K. Modeling drought impact occurrence based on meteorological drought indices in Europe. *Journal of Hydrology*, 51, (2015).

⁷² Stagge, J. H., at 48.

⁷³ Id.

⁷⁴ Galli, A., at 106, (2012).

- a. Improve water infrastructures, including pumps, diversion, treating, building, and delivering safe drinking water to the population;
 - b. Improve modern farming methods for agricultural practices such as the use of surface water intakes and modern irrigation methods; and
 - c. Involve civil society in the discussion regarding the impact of water and the environment including water conservation, drought mitigation, climate change and improvement on water catchment, rainwater harvesting, and water equity.
2. Urge States Parties to pay special attention to contamination of water as it relates to the environment.