

**Climate Change effect on Water Supply
Sanitation and Hygiene (WASH) sector**

ABSTRACT

To continue the exiting ecosystem and healthier future for our upcoming generation. Current generation indeed need to be aware of mitigation and adaptation action to be taken for the sake minimization of climate change effect at local, regional or global level. For the mandatory operationalization, global governance is must; so that harmonisation, coordination and collaboration can start from all levels. In addition, all kinds of development sector should establish a climate change mitigation and adaptation plan. Effects climate change has not only brought a warmer world but also create an anthropogenic effect on the society likely health, social, economic and humanitarian injuries. Disasters such as landslide; flooding, tsunami sometimes cause to life casualties. In developing world, focus to be taken for proper WASH services i.e. waterborne diseases like diarrhoea, dysentery and cholera may cause many illnesses that lead the loss of human.

Keywords: Water Supply, Sanitation, Hygiene, Climate Change, Adaptation, Defecation and Ecological Sanitation

1. INTRODUCTION

The main consequences indicating the climate change is warming or cooling. It is expected that the trend of global temperature is rising i.e. global warming; the effect can be realised locally. It can be evaluated observing long trend of temperature rising, which harm the local ecosystem. The affect in local level is not only because of their own cause, but also consequences of global phenomenon. Climate change will have significant impact on water and sanitation resources; which is directly related to livelihood. It has already visualised some of the settlement areas around Himalayan region/periphery already started suffering from water scarcity. The impact on water resources includes water shortages in dry seasons, while rising temperatures is causing faster melt and retreat among glaciers, which may cause sudden flooding following glacial lake outbursts. Increases in seasonal temperatures will likely to affect agricultural production and yield. Rising temperatures, glacial retreat, and changes in water availability and quality will lead the changes in natural biodiversity. Changes in water quantity and quality due to climate change are to affect food availability, stability, access and utilization. National withdrawals of groundwater and tapping of surface water to satisfy demands have grown dramatically: This rapid growth in water demand is due to the increasing reliance on irrigation to achieve food security, the growth of industrial uses, and the increasing use per capita for domestic purposes (Regmi etl. 2010).

47 It is felt that longest drought after so many years, high or partial rainfall or flood in so many
48 years, high or lower temperature in so many years. Those extreme events may not be the
49 climate change; it is a hydrological cycle that repeats. In this scenario, prediction of climate
50 change effect can be differentiated local environmental changes, makes confusion as it
51 combines with the climatic cycle; the phenomenon is called climate change. It is basically
52 due to the increased amount of greenhouse gases in the atmosphere that intensified the
53 greenhouse effect; which is the cause of human activities that release Green House Gases
54 (GHGs). Those GHGs are Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O),
55 Chlorofluorocarbons (CFCs) and Ozone (O₃). From the current estimate based on the
56 projected data, the mean temperature of earth will increase by 0.20 centigrade per decade.
57 This data can be projected 2°C rise in earth average temperature by the year 2100, similarly
58 corresponding rise in mean sea level by 6 cm/decade (Khatri, 2012). The global climate is
59 the average of all regional trends, and in this scenario; so scientists have concluded that
60 Earth's temperature i.e. climate, as a whole, is warming up
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63 **2. METHODOLOGY**

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65 The adverse effects of this industrialisation include the degradation of air and water quality
66 and the increase in greenhouse; the poorest / under development countries' people likely in
67 Nepal will suffer from its effect earliest and most, because of their geographical locations,
68 low incomes, and limited institutional capacity, as well as their greater reliance on climate-
69 sensitive sectors like agriculture. So, the main objective of this study is to find, support and
70 significance effect of climate change in WASH sector management.

71 This study is done on desk, consultation with experts, participation of research related
72 national and international seminars and workshops. It is done by the theoretical review of
73 different types of WASH and climate change models. Field research survey is essential to
74 identify the scenario present in a study area, to record the locations. During the field visit,
75 different sites have observed to assess the physical and operational status of the different
76 WASH systems. Information on condition of WASH and climate change situation - social as
77 well as economic life style of people is done; which provided an immediate and vivid
78 understanding of the problem. It also focuses on capacity to represent, understand, predict
79 or manage the behavior of environmental systems at all level, and to communicate those
80 improvements to a wide scientific and professional society.

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82 **3. RESULTS AND DISCUSSION**

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84 **3.1 WASH Sector**

85 Countries itself and its people cannot mitigate effect of climate change in their locality. It is
86 the global phenomenon and need to take action at global level. But the local adaptations
87 need to take at local level and start it globally. For that collective action is needed to mitigate
88 by reducing the carbon foot print. The development technology and their implementation
89 criteria need to be change from the beginning, policy and implementation guideline has to be
90 reviewed i.e. easy and sustainable water supply system is needed to make in practice; which
91 needs minimum investment for the scheme sustainability. Likely, Sanitation system needs to
92 be focused on climate change prospective; which options may have potentiality of less
93 carbon emission. Similarly, need to encourage the preventive measure like water safety.
94 Similarly, onsite pit latrine is best for sanitation. If we see from climate change point of view

95 aerobic treatment system is better, oxidation pond is even better and anaerobic treatment
96 system with methane burning is even better and connection to bio-gas plant have
97 significance help.

98 The climate change impacts and its adaptation/ resilience strategy in Water Supply
99 Sanitation and Hygiene (WASH) sector is considered as one of the major components. In
100 every aspects of WASH infrastructures intervention, climate change issues are importantly
101 considered. WASH program on environmental management like source conservation,
102 promotion of EcoSan and DEWATS technologies, and holistic WASH planning and water
103 management at local levels. It is necessary to think that development in different governance
104 level i.e. global, regional and local level, for its effective implementation.

105 **3.1.1 Management of sustainable water supply system**

106 Proper and sustainable management of drinking water sources like source and pond
107 protection. Similarly, much more effort being made for the improvement of water quality in
108 urban and semi-urban areas; even though, it has not been properly assured and ensured
109 that water is safe. As a result people used to boil water for drinking. In consequences, more
110 energy is being used and during heating more carbon is generating. So, we need to focus on
111 water safety plan; ensuring the direct drinking quality. In addition, we can focus on solar
112 lifting water supply system in rural as well as urban. In addition, when the quality water
113 supply at nearer location of house, people will be saving of considerable amount of time;
114 which they need to devote for fetching of drinking water. Those save time can be used
115 income generation activities.

116 **3.1.2 Rainwater harvesting (RWH)**

117 When there is sufficient rainfall pattern, but only in certain months. So the rainwater can be
118 collected in certain areas in Reservoir tank or cost-effectively on ponds. Later on, stored
119 water can be used for drinking, domestic use and vegetable farming. It is estimated that
120 about 10 litre per person per day of water can be also collected from roof top. Because of
121 growing population in the world, RWH is popular day by day. It is also cost effective and
122 climate change friendly techniques; which also can help to uplift the poor by vegetable
123 farming. It also provides water at nearer location and collected water will use for the small
124 farming.

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127 **3.1.3 Sanitation and hygiene behaviour**

128 A sustainable sanitation system has to not only be economically viable, socially acceptable,
129 technically and institutionally appropriate, which protect environment and natural resources.
130 Sanitation can act at different levels, protecting the household, the community and society.
131 Further down effects of waterborne sewage contamination affect the entire society by ill
132 health and environmental damage. For countries with very low access to basic sanitation,
133 the effective management of excreta at the household level may have the greatest health
134 implications and benefits but may also be the biggest challenge. The sanitation system is to
135 protect and promote human health by providing a clean environment and breaking the cycle
136 of disease. In the case of latrines it is easy to see that this sanitation system acts at a
137 household level.

138 **3.1.4 Promotion of Ecological sanitation (EcoSan)**

139 The Sanitation based on the principle that urine and faeces are not simply waste products of
140 the human digestion process, but also an asset to contribute for better health and food
141 production and reduce pollution; if it managed properly. It is effective fertilizer; which
142 contains all kinds of manure for plants. It promotes sanitation and recycle of nutrient; when
143 urine mixed with 1:4 water and used with drip irrigation system fulfils both water as well as
144 fertilizer needs. The collected Urine and stored until it can be used as a fertilizer on plants or
145 crops. The faeces drop into a pit, vault or container to which a handful of either ash or lime is
146 added. This has the effect of drying the faeces; which has a positive impact on reducing
147 smell and destroying pathogens. Some form of alternating double or multiple storage system
148 is required to avoid mixing fresh and composted manure.

149 **3.2 Use of Drip Irrigation Technology**

150 Small-irrigation technology like drip irrigation provides water directly to the plant root at
151 required time through plastic tubes, thereby preventing losses due to evaporation. This type
152 of technology is 90% efficient, and therefore requires less amount of water for growing of
153 such plants likely vegetables. This kind of technology is widely used in dry Arabian countries;
154 where water is much scarce; such technology is already started different parts of the Nepal.
155 One of the research interventions based on successes from Asia is from small-scale drip
156 irrigation; which shows the improvement of household nutrition in rural parts through better
157 vegetable production.

158 **3.3 Saving of Energy**

159 Solar panel / battery can be used for the lighting at home, likely solar water panel and heater
160 is very effective in Nepal for warm the water; which is gaining in popularity. It can be used for
161 lighting and lifting water from nearby water sources i.e. from springs/streams for drinking and
162 drip irrigation purposes. It will reduce the hardship in water supply and upliftment of
163 livelihood condition of rural poor. In addition, it saves Energy to meet the demand.
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165 **4. CONCLUSION**

166 Urban areas with high dense are the biggest emitters of Green House Gases (GHGs); which
167 produce the maximum amount of industrial and vehicle emissions. Those cities produce a
168 "Heat Island Effect"; refers in urban settings where buildings and asphalt roads absorb and
169 thereafter release more solar energy and thus increase the surrounding air and surface
170 temperatures. Although they do not directly contribute for global warming but increases the
171 demands for air conditioning, thereby increasing the emissions of GHGs.

172 Climate change's impact has happened in some of the factors of our day to day necessity
173 daily like shelter, water, food, air etc. The global warming of the earth is gradual, but its
174 effect for extreme weather events storms, tsunami, droughts and floods could be happened
175 and its consequences will be felt dramatically. The present scenario and trend of
176 development planning options are based on economic and social aspect. To make the
177 ecosystem sustain and make our generation longer with comfort; we need to take action
178 globally. So, harmonisation, coordination and collaboration need to be done at all level.

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198 **ACRONYMS, ABBREVIATIONS**

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200 WASH – Water Supply Sanitation and Hygiene

201 GHG – Greenhouse Gas

202 CFC – Chlorofluorocarbon

203 SDG – Sustainable Development Goal