

CLIMATE CHANGE ADAPTATION-BASED STRATEGIES ON WATER AND ITS SECURITY: A STUDY ON DHAKA AND ANKARA

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Abstract

Adaptation strategies on climate change are one of the policy actions that can help to inform and assist individuals as well as addressing anticipated threats of climate change. These strategies can be non-regret strategies (supply and demand side), climate justified strategies to identify and resolve threats and ensuring potential alternatives as well as coping with uncertainties, increasing water supply, managing demand and use. Dhaka, the capital of Bangladesh and Ankara the capital of Turkey are facing water related challenges due to climate change impact. Therefore, various considerable adaptation-based strategies on water sector have been taken from the national to city level to ensure water security but still the adaptation practice is quite insufficient. Based on secondary based research, this study has reviewed the existing policies and strategies on water and its security, and highlighted needed adaptation-based strategies to perform. Finally, this study proposed that an effective multi-stakeholder collaboration are necessary to maintain proper co-ordination with a long term integrated adaptation program, improve water use efficiency through education and awareness campaigns, strengthen water conservation programs, impose legal restrictions, introduce incentives for consumer etc. to make Ankara and Dhaka a water secured city.

Keywords: Capital City, Climate Change, Water Security, Adaptation-Based Strategies.

SU VE SU GÜVENLİĞİ KONUSUNDA İKLİM DEĞİŞİKLİĞİNE UYUM TABANLI STRATEJİLER: DAKKA VE ANKARA ÖRNEĞİ

Öz

İklim değişikliğine uyum stratejileri; iklim değişikliğinin yol açtığı tehditleri ele almanın yanı sıra insanları bilgilendirmeye ve onlara yardım etmeye dayanan politika eylemlerinden biridir. İklim değişikliği tehditlerini tanımlamak, çözmek ve potansiyel seçenekler sağlamak ve bunun yanı sıra su arzını artırmaya, talebi ve kullanımı yönetmeye yardım etmek için pişman-olmama stratejileri (arz ve talep taraflı), iklim haklı stratejiler yoluyla çözülebilmektedir. Bangladeş'in başkenti Dakka ve Türkiye'nin başkenti Ankara iklim değişikliğinin etkisiyle su ile ilgili zorluklarla karşı karşıyadır. Dolayısıyla, Dakka ve Ankara'daki mevcut stratejilerin neler olduğu ve bu stratejileri formüle etmek için uyum temelli stratejilerin gerekli olduğunu açıklayan su sektörüne yönelik mevcut şehir düzeyinde uyum stratejileri ele alınmıştır ancak uyum uygulamasının hala yetersiz olduğu görülmektedir. İkincil temelli araştırmalara dayanan bu çalışmada, Dakka ve Ankara şehrindeki iklim değişikliği etkisine bağlı olarak mevcut eğilimler, suya dayalı uyum-tabanlı stratejiler ve güvenlik konuları ele alınmıştır. Son olarak bu çalışmada, her iki başkentte de sorunu çözebilecek uzun vadeli entegre uyum programı ile uygun koordinasyonu sağlamak için çok paydaşlı iş birliğinin gerekli olduğu, modern tekniklerle su koruma programlarını güçlendirmesi, eğitim ve bilinçlendirme kampanyaları ile su kullanım verimliliğini artırmaya çalışması, su kullanımını azaltmaya yönelik yasal kısıtlamalar getirilmesi, yasal kısıtlamalar empoze etmesi, tüketici için teşvikler sunulması önerilmektedir.

Anahtar Kelimeler: Başkent, İklim Değişikliği, Su Güvenliği, Uyum-Tabanlı Stratejiler.

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INTRODUCTION

Without an iota of doubt, the global community now recognizes the challenges arising from climate change. Achieving water security is one of such challenges where climate change is considered one of the threats for water security (Vural, 2018:61,62). Adaptation is an adjustment option that can overcome the water security challenges by reducing damage, protecting ecosystems, economy, livelihood etc. (IPCC, 2014:5). In this study, the climate change adaptation-based strategies refer to managing risk and enhancing resilience on water sector. Therefore, strategies such as increasing supply, managing demand, facilitating allocation of water resources, improving flood protection, coping with uncertainties, improving information, making robust decision etc. all help towards a safe and secured water sector (Ahsan, 2017: 485).

Bangladesh is the ninth climate change risky country whereas Turkey ranks 72nd as per the Climate Risk Index for 2017 in the world (Eckstein, Hutfils and Wings, 2018:28,31). Though the main climate change impact occurs in water sector there is no explicit strategy on climate change impact on water sector in both Bangladesh and Turkey. However, both governments have formulated a number of adaptation strategies, plans, programs and policies for climate change. The capital cities like Dhaka in Bangladesh and Ankara in Turkey are now experiencing challenges on water sector. Changing climate, rapid urbanization, industrial growth, socio-economic development etc. are contributing to such challenges in these two big cities due to lack of availability, access to inadequate quantities and use of low quality of water.

Therefore, this study is about a number of climate change strategies of water sector in the two capital cities – Dhaka and Ankara.. The study mainly deals with the broad research question of what different adaptation-based strategies are available and how the city management is responding to climate change impacts on water sector by applying different adaptation strategies. The aim of this research is to examine water sector adaptation strategies by which adverse effects can be reduced, new and potential opportunities and strategies can be seized for Dhaka and Ankara dwellers and vulnerable people can enjoy adequate privilege. Secondary data has been considered in order to present an in-depth literary portrayal of the current issues and challenges of the chosen study topic. In this respect, peer review journal articles, policy, strategy, program and projects documents from government, non-government and international non-government organizations have been consulted. Finally, research validity has been ensured for all data collection methods through the triangulation of sources.

1. CLIMATE CHANGE AND WATER SITUATION IN DHAKA AND ANKARA

Both Dhaka and Ankara are among the fastest growing cities of the world with a total population estimated at more than 13.14 million in Dhaka (BBS, 2015: 27) and 5.5 million in Ankara (Turkish Statistical Institute, 2018: 6). Considering metropolitan area, Dhaka's population was 12.516 million in 2011 and it is projected to be 14.77 in 2031 (BBS, 2016:27) whereas Ankara's population was 4.8 million in 2016, has increased to 5.5 million in 2019 and it is projected to be 6.1 million in 2023 (Turkish Statistical Institute, 2018). Dhaka is one the most vulnerable cities in the world. It ranks as an Extreme Risk city as the changing temperatures and weather systems according to Maplecroft's (a specialized British firm in risk analysis) and Climate Change Vulnerability Index (CCVI). Ankara is considered a highly risky district in terms of drought in Turkey (Türkeş, 2017: 64). Both capitals are located at the center of the country poses tropical climate and continental climate respectively but hot, dry summers, incessant rainfall, flood, heat waves, droughts are negatively influence human life.

Dhaka experiences a hot, wet and humid tropical climate whereas Ankara experiences too much water during incessant rain. Both cities are experiencing floods that are mainly caused by unpredictable heavy rainfall, inadequate infrastructure, insufficient drainage system and drainage congestion (Ahsan, 2017: 485), global climate change impact has added its intensity and so on. Both Dhaka and Ankara are not directly impact with sea level rise as the consequences of climate change, however its indirect impact are quite high in Dhaka, for instance, sea level rise creates migration crisis in Bangladesh and Dhaka is the major destination of the vulnerable people (Ahsan, 2019: 106,147) therefore, climate change impact ultimately pressurizes water accessibility, availability and use of existing city dwellers and incoming climate migrants. Ankara on the other hand, has no evidence of adverse impact from the rise of sea level water. Again, Dhaka's poor, inadequate, unplanned infrastructure especially water supply, drainage, sanitation can barely support the existing population. However, Ankara is developing rapidly through its planned development and strategic process.

Ankara is located in central Anatolia region, is semi-arid and lowest precipitating area of Turkey (ÇŞB, 2018: 29). During dry season, Ankara is also considered one of the direst areas in Turkey. In 2007, Ankara faced water supply crisis during a drought. Statistics shows that Ankara can presume a drought once

every four years and that the return period for a severe drought that affects 50% of the region is five years (Franz, Tigrek and Kibaroglu, 2012:288-289). Around 98.5% Ankara city's water supply is dependent on surface water resources (Köle, 2012: 29). However, Dhaka is not only experiencing abundance of water but also huge scarcity of water; too little in the dry season and too much during monsoon (Ahsan, 2017: 485). Around 79% to 80% of the Dhaka city's water supply is dependent on groundwater resources (IWM and DevCon, 2014: ii). The groundwater level is depressing rapidly due to over extraction for industry, domestic use, public supply in this over populated, over industrialized city. Every year the groundwater table is dropping down around one to three meter due to extreme amount of withdrawal (DWASA, 2013, Alam, 2012). The continuous declining groundwater table makes pumping of groundwater costlier and technically difficult which results in lower water security of the poor dwellers of Dhaka city (IWM and DevCon, 2014:86). Therefore, the city's institutional systems, inter-dependences between multiple sectors, levels and risks in a dynamic physical, economic, institutional and socio-political environment remain to be the challenging tasks to achieve urban climate resilience.

2. RESULTS AND DISCUSSION

This study has focused on two different ways of adaptation-based strategies, one is “no-regret strategies” that have divided into supply and demand side and another is climate justified strategies that are justifiable that means these strategies are defensible during vulnerable period and reasonable in price. These strategies are aligned with the most acceptable on UN-Water proposed the water security definition which indicates the capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water that ultimately helps to preserve ecosystem, enhance peace and political stability (UN-Water, 2013:1). The “no regrets” strategies are the aspect of climate risk management means taking climate-related decisions or action that make sense in development terms anyway, whether or not a specific climate threat actually materializes in the future, which is achieved by building resilience to changing economic, social and environmental conditions (UNDP, 2010). Besides these strategies, this study has focused intelligent and robust decision-making strategy that can help to outline policy makers to outline water and its security challenges. It tries to highlight “deep uncertainty” in which stakeholders do not know or agree on the relationships among actions, consequences, and probabilities.

2.1. No-Regret Strategies (Supply Side)

For this study, supply is referred to be able to provide water to the city dwellers. When it comes to strategy perspective, this study has considered two main aspects one is maintaining status-quo (i.e. timely preparing strategies, action plans) another is improving surface and ground water bodies that aligns to supply side of no-regret strategies. Among the developing countries in the world, Bangladesh is one of the leading countries in respect of climate change adaptation and action. The Bangladesh government prepared National Water Policy in 1999 but there is no explicit information on the relation of climate change and water in it. Later on, two broad strategies were formulated by the government such as the National Adaptation Programme of Action (NAPA) and Bangladesh Climate Change Strategy and Action Plan. The NAPA was formulated under the guidance of UNFCCC in 2005. The purpose of the NAPA formulation was the development of a countrywide programme to encompass the immediate and urgent adaptation activities required to respond both current and anticipated confrontational effects of climate change. These strategies have focused on reducing poverty and securing livelihoods while addressing gender aspects in the implementation of the NAPA recommendations (Ministry of Environment and Forest, 2005). Adaptation needs of the urban people (mainly urban poor) have not paid explicit attention. Even, policy options have not yet implemented adequately. The Bangladesh government has prepared climate change adaptation policy framework entitled as the Bangladesh Climate Change Strategy and Action Plan in 2008. It has been updated in 2009. The six pillars of national strategy have directly and indirectly focused climate change adaptation on water (MoEF, 2009). Water supply and sanitation (WSS) sector development plan in 2011-2025 has focused to incorporate climate change adaptation strategies in water sector. Dhaka Water Supply and Sewerage Authority (DWASA) have prepared Master Plan in 2014. This master plan has suggested making storm water retention ability, incorporating rain water harvesting provisions within the building code as an adaptation measure for climate change (IWM and DevCon, 2014:91).

Turkey has not prepared any NAPA yet but it has prepared the First National Communication on Climate Change in 2007 and till now it has prepared 7th National Communication in 2018 under UNFCCC. This communication has mentioned that some actions on climate adaptation including local governments have been taken and put emphasize on various capacity development as well as project activities (ÇŞB,

2018:22). The National Climate Change Adaptation Strategy and Action Plan has prepared in 2011 (2011-2023) (edited in 2012), Ankara water and sewerage administration has prepared its strategy from 2010-2014 and 2015-2019. National Water Plan for 2019 and 2023 has prepared in 2019. In Climate Change Adaptation Strategy and Action Plan in Turkey, there is lack of clear information regarding the negative impact of climate change on water however it urges improving water legislation and the concept of adaptation to climate change shall be integrated into the legislation (MoEU, 2013:23). According to the National Water plan, Gerede-Ankara Drinking Water- 2 is the longest drinking water tunnel in Turkey, which is planned to meet the drinking water needs of city dwellers of Ankara by 2050 (Tarım ve Orman Bakanlığı, 2018:37) while DWASA has been preparing detailed and comprehensive Storm Water Drainage Master Plan for an efficient drainage network for greater Dhaka City, which will be treated as a basic document for storm-water/manmade drainage network plan for Detailed Area Plan 2016-2035. According to 2nd Forestry and Water Council 2017, Turkey's drinking and usable water potentiality has been determined but there is no clear information has been produced as to how this potential will be affected by the adverse effects of climate change on city water sector on the basis of quantity and quality.

Again, surface and ground water bodies improvement are the major no-regret strategies in supply side, for instance wetlands or dams supports to improve water quality, reduce depletion of ground water, provides flood protection and so on. Ultimately it makes a city more natural, stores a significant amount of carbon. During the late 70s, Dhaka city and its surrounding was blessed with the flowing water, aquatic biodiversity of over 250 canals. These canals act as a retention pond to store flood water. Now only 35 canals are surviving with unabated, unlawful encroachments by land grabbers, mindless dumping of solid wastes, pollution and complete negligence of their lawful protectors (Alam, 2018: 14). Even, most of them have lost all of its life saving matters, including water stream, and water quality and minimal amount of water to survive. In total, Dhaka lost 60% wetlands in the last 30 years due to unplanned urbanization, population growth, commercial and residential development, road construction, illegal land grabbing etc. as well as the groundwater table is dropping down due to extreme withdrawal (BSS, 2016).

The surface water area of Dhaka Central Region is about 13% of the total land area. The DWASA has got both the mandate and programs to protect the canals but no adequate reflection has found. According to DWASA Master Plan, the DWASA

is expanding its service area but the pace of industrial, domestic and other uses could not be covered as per population growth in Dhaka. To a projection estimated for the period of 2035 to 2060, there will be approximately 50% growth in demand on water (IWM and DevCon, 2014: v). On the other hand, the domestic water reservoirs in Ankara come from seven dams. However, to meet the large water demand for Ankara city dwellers, water is now being collected from the longest Kızılırmak River in Turkey. Ankara belongs to Sakarya Basin which contains the lowest water resources per capita among the basins in Turkey (Körbalta, 2019: 69). A study represents that there is a general increase in the temperature trends, while the decreasing trends are observed in Sakarya basin, and the projection for the period of 2010-2039, 2040 – 2069 and 2070-2100 represents that the precipitation will be decreased to 5.31%, 14.46% and 14.76% respectively (Köle, 2012:100). However, the temperature will increase in the above reference period by 0.79%, 1.63% and 2.63% respectively. Therefore, there will be an immense change in both precipitation and temperature in Ankara (Köle, 2012:101). The following table represents that in the last few years the water reservoirs are not increasing as per demand of the city population in Ankara. Therefore, the uncertainty of the risk on water due to climate change should be taken into consideration and government should give attention to adopt and use groundwater reservoirs as a strategic resource of option.

Table-1. Amount of Water reservation from 2011 to 2019 in Ankara (ASKİ, 2019: <http://www.aski.gov.tr/TR/Baraj.aspx>)

Year	Water reservation (m ³)
2011	560.327.000
2012	631.983.000
2013	581.622.000
2014	476.388.000
2015	553.934.000
2016	430.727.000
2017	322.155.000
2018	398.763.000 (05.09.2018)
2019	473.329.0 5.09.2019)

2.2. No-Regret Strategies (Demand Side)

Using soft adaptation strategies (such as education and awareness program) for climate change adaptation in water sector can lead to long-term behavioral and motivational changes. There is no explicit strategies on climate-water interaction education and awareness program despite some discouragement programs on illegal connection, water pollution control etc. in Dhaka, however some projects are being implemented in Ankara such as “Su Elçileri Eğitim ve Farkındalık Artırma Teknik Destek Projesi”, climate camps, voice of meteorology, İklimİN project, climate action week etc. which marked as an effective strategy to take positive action against climate change impact, cope with uncertainties at different stages, managing demand and use.

Again, the use of grey water in households and auto switching/smart pump controllers can conserve water. The DWASA opened first time Fresh water ATM booth to reduce clean water crisis in some pockets in 2017. Around 300 such ATM booths had been planned to be installed by September 2019 (Islam, 2019). The Management Information System of DWASA is going to use SCADA (Supervisory Control and Data Acquisition) technology to provide automated water production and distribution information. Other applications such as Smart Meter, e-billing, e-connection, e-supply chain management are started to be applied by DWASA to manage water demand in Dhaka city.

On the other hand, Ankara has introduced 63 ASKİMATİK in 2017 which are providing 7/24 hr. service that increases customer interest at a pace rate and now 70 places are providing this service (<http://sumatik.aski.gov.tr/i/191/hakimizda.html>). Though the main target is not an adaptation action for climate change but to effective use of adequate quantity of water, reduce water crisis, ensure citizen rights etc. Other applications such as Smart Meter, e-billing, e-connection, e-payment, e-supply chain management are being implemented by ASKİ (Ankara Su ve Kanalizasyon İdaresi) to manage, the use of water in Ankara city.

2.3. Climate Justified Strategies

There are two types of climate justified strategies such as rainwater harvesting and wastewater treatment and disposal that have been focused in this research. These strategies can be highlighted as reasonable and defensible in uncertain climate condition. Dhaka is blessed with rain almost all-round the year but more especially

from May to August have highest amount of rainfall. However, April and May are the wettest months in Ankara. It is estimated that the artificial recharge by harvesting rainwater from concrete rooftops of 60 per cent buildings in Dhaka may replenish 250 million liters of water per day (Alam, 2012). Therefore, the government of Bangladesh has planned to make rainwater recharging mandatory for building owners in Dhaka aiming to reduce water-logging and fight fast-depleting of groundwater level. A study estimated that the rain water harvesting method is capable to reach 70% of total domestic consumption in Ankara. It is also estimated that rain water harvesting and grey water reuse altogether can offer a chance of water savings between 40% and 46% (Aybuğa and İşildar, 2017: 215). The National Water Plan has given much emphasize and encouragement on the development of rainwater harvesting projects whereas Ankara has also given policy attention to rainwater harvesting as for future demand of the growing city population.

Dhaka city has only two waste water treatment plants called Pagla Sewage Treatment Plant and Saidabad Surface Water Treatment Plant (SWTP). Pagla Sewage Treatment Plant can treat only 40,000 cubic meters of wastewater, while the other is Saidabad Surface Water Treatment Plant (SWTP) can treat only 450,000 m³/d of wastewater. These plants are insufficient to ensure minimum level of security of Dhaka dwellers (IWM and DevCon, 2014:32). Thus, more treatment plants to a higher elevation in response to the impact of flooding and sea level rise are highly required. However, in Ankara, efforts on the treatment of domestic and urban wastewater in metropolitan cities have accelerated from 2008. According to TÜİK “2016 Municipal statistical survey”, the amount of wastewater treated per capita per year as per EU standards in Ankara only 4.2 m³ which is the lowest in Turkey (<https://www.egedebirgun.com/belediye-atik-su-istatistikleri-aciklandi/8345/>). Therefore, still a large share is beyond and inadequate treating of waste water in Ankara.

2.4. Intelligent and Robust Decision Making

Failure to adapt to climate change can jeopardize water security over the long-term and eventually make it costlier to improve, as time passes, for governments to adjust to changing circumstances (OECD, 2013). The city government of Dhaka with its limited financial capacity is executing plans, programs and policies but uncoordinated work and lack of actor-network connection reduces its sustainability and resiliency. The responsible authorities of Ankara have taken some needed

actions from time to time to executing plans, programs and policies but there is a need for strong coordinated work, actor-network connection to enhance robustness of decision making. For both Dhaka and Ankara, it has been found that inadequate dialogue and consultation among with the respective stakeholders exacerbated the crisis and prevented opportunities to reach participative and democratic management and use of limited water resource in the city (Franz, Tigrek and Kibaroglu, 2012: 288).

3. RECOMMENDATIONS AND CONCLUDING REMARKS

The climate change impact, excessive population growth, unplanned growth, rapid industrialization, centralization of activities etc. all provides lots of challenges for city of Dhaka and Ankara. Regarding the discussion above, the following no-regret strategies, climate justified strategies, and intelligent and robust decision making proposed in order to avoid a situation in which shifting to a different measure will no longer be possible towards ensuring water security in Dhaka and Ankara city.

For no-regret strategies on the supply side, both Dhaka and Ankara justify an effective multi-stakeholder collaboration, considering all concerned ministries and government and non-government organizations engaged in different positions to develop and implement adaptation program where city corporations in Dhaka and Ankara can take leading roles as they are performing major city water governance and services (Ahsan, 2017:491). The national government should play the lead role by formulating a strategic action plan in consultation with advisors, key personnel and other stakeholders. Following a government-devised action plan, the private sector, national and international NGOs will be able to develop more robust and effective partnerships. It will also ensure long-term solutions as well as achieving sustainable development goal (Ahsan, 2017:491).

The plan, policies and strategies of both Dhaka and Ankara city should give emphasize to conserve water retention area, canals, rivers and dams. Therefore, it requires proper execution of the concerned authorities. Again, imposing legal restrictions can reduce water use. Improving access to piped water will increase the resilience or adaptability of the lower income people in the aspect of climate change and the risk of natural disasters.

Rehabilitation of existing infrastructures and construction of new infrastructure are highly required to protect from adverse effect of climate change. Again, to

achieve water security and to cope with the climate induced impacts, the use of surface water needs to be increased and the dependence on groundwater need to be shifted. In order to ensure the proper use of existing surface water bodies the small-and large-scale treatment plants are highly needed.

For no-regret strategies in demand side, both cities should expand the use of soft technologies that can lead to long-term behavioral changes with significant adaptation potential. Both city administrations should strengthen water conservation programs or dam protection programs that seek to improve water use efficiency through education, awareness or campaign programs. For instance, the city people should get aware about mindless dumping of solid waste. As city authorities are the main responsible body of collecting solid waste, therefore, they should take more initiatives for awareness raising programs.

There is no explicit information regarding climate change impact and water metering in the strategy documents. Auto switching/smart pump controllers/water metering system/fresh water ATM booth system should be expanded to reduce water consumption and crisis as well as increase rational water use. The DWASA needs to enhance sustainable operation and maintenance of the use of District Metered Areas (DMAs) systems. In addition, it must be able to monitor water quality to detect and mitigate water pollution and salinization. Again, introduction of incentives for consumers can also provide benefits regardless of additional climate change stress. Awareness program against anticipated climate risk should be increased.

In case of climate justified strategies, encouraging rainwater harvesting and grey water reuse could help to achieve water security and to cope with the climate impacts; preparing utility planning storm water system may opt to expand the capacity of its collection system in anticipation of more extreme precipitation events. Therefore, harvesting rainwater in dams or water reservoirs in a planned way could help develop water supply conservation as a strategy for uncertainty. In addition, both cities should transform its building into green buildings to reduce carbon dioxide emission and energy consumption. Measures to augment supply through wastewater recycling or the encouragement of water markets that move water to high-valued uses may provide benefits regardless of anticipated climate change related impacts as well as resiliency. In this respect, city authorities and ASK/DWASA should take adequate priority-based actions and programs.

In case of intelligent and robust decision making, coordinative actions and efforts are highly needed against the measures of climate change impact. Climate adaptation experts should take part in the decision-making process to robust and scale up the adaptation efforts both government and non-government level. Though the responsible authorities of Ankara have taken some needed actions in time and Dhaka with its limited financial capacities have taken some actions, there needs strong coordinated work, actor-network connection to enhance robustness of decision making. Finally, this study recommends that there is a need not only to highlight the ability to adapt with different environment and climatic event but also to reduce urbanization pressures, to make alternative water supply options. Moreover, it is needed to preserve ecosystems, increase green space and reliable and efficient use of water in a sustainable way to make Dhaka and Ankara a water secured city.

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