
Water Security of Ankara City in Turkey: Existing Challenges and NbS Practices

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Introduction

- ❑ Climate change, pandemics and other related forces are posing significant challenges on water security in the world.
- ❑ Ankara, the capital of Turkey is located at the central Anatolian region are also posing significant challenges on water and its security.
- ❑ After the WWII with the pace of industrialisation, socio-economic development Ankara's population had grown to 286,781 by 1950, it reached 4,587,558 in 2014 and in 2021 the population reached to 5,663,322 (Turkish Statistical Institute, 2021).

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- ❑ Ankara poses a cold semi-arid climate, has a middle latitude steppe climate, snowy winters, and hot and dry summers (MoEU, 2018).
 - ❑ It is one of the lowest precipitating areas in Turkey (MoEU, 2018).
 - ❑ Lack of snowy days in winter, there is a shortage of potable water and industrial water.
 - ❑ Water management, heat waves, and lack of green spaces (mainly at çankaya district): key challenges for Ankara

Methodology

- ❑ This study is based on **primary survey through 13 KII** (4 from Ankara Metropolitan Municipality, 4 from Ankara Water and Sewerage Administration and 5 from State Hydraulic Works) by using a semi-structured questionnaire and
- ❑ **Secondary survey** based on published reports from respective organisation, peer reviewed articles, books, newspapers etc.

Existing State and Challenges on Ankara



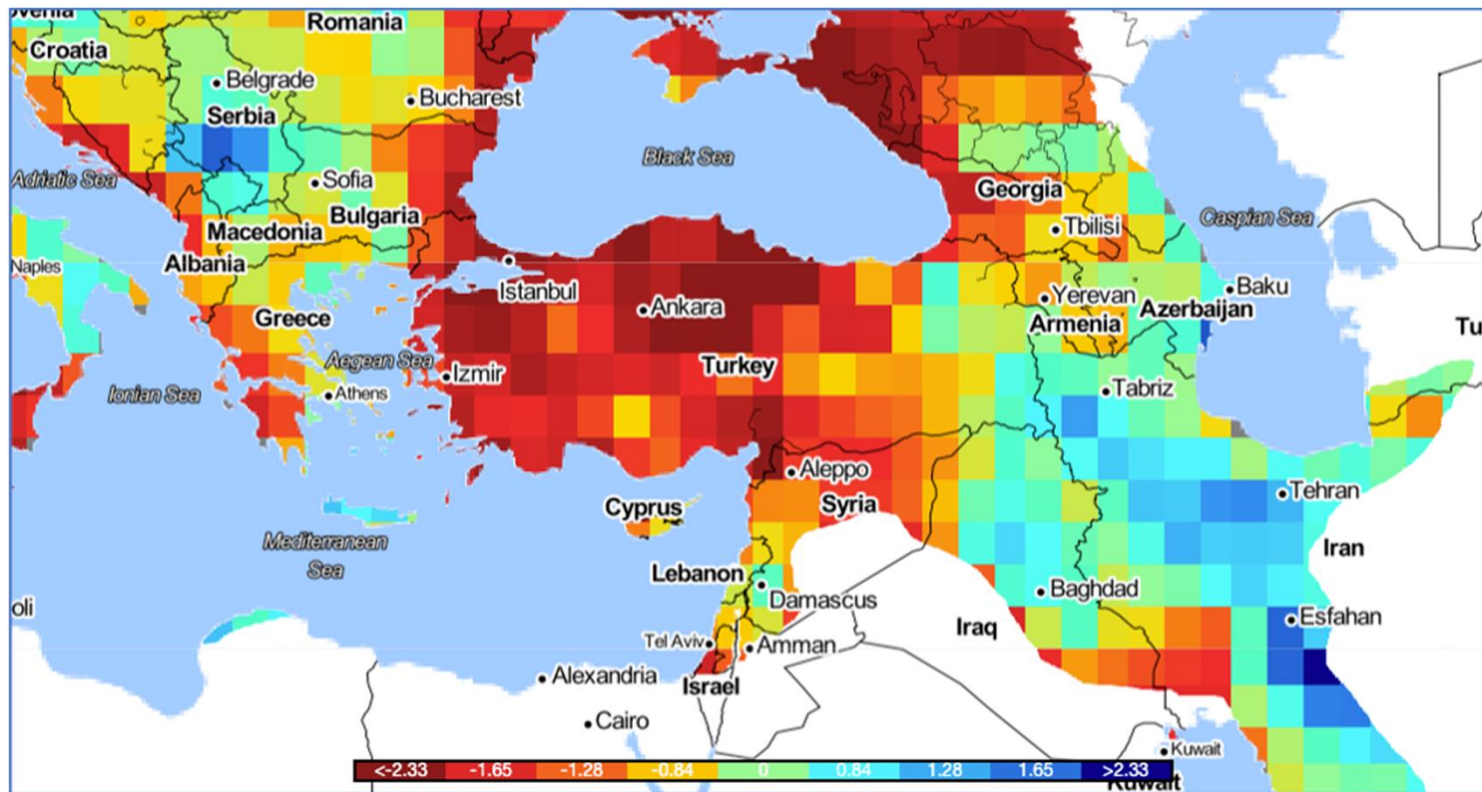
Figure : Topographic map of Ankara

- ❑ Ankara's steppe vegetation has characterised semi-arid condition and gypsaceous and marley-gypseous soils visible in Çankırı and Beypazarı district.



Exisitng State and Challenges

Figure : December 2020 SPEI (Standardised Precipitation-Evapotranspiration Index) (12-month) for region in and around Turkey.

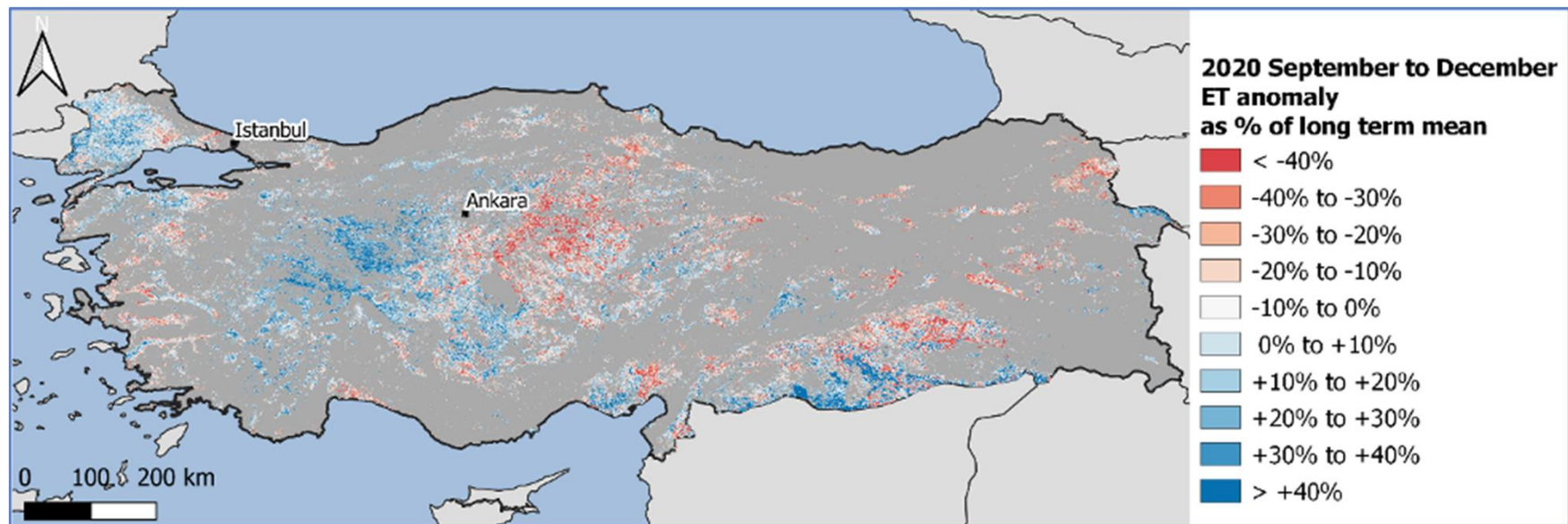


Source: Iceland et al. (2021)

□ Precipitation records for Ankara in 2020 show much drier in the country.

Exisitng State and Challenges

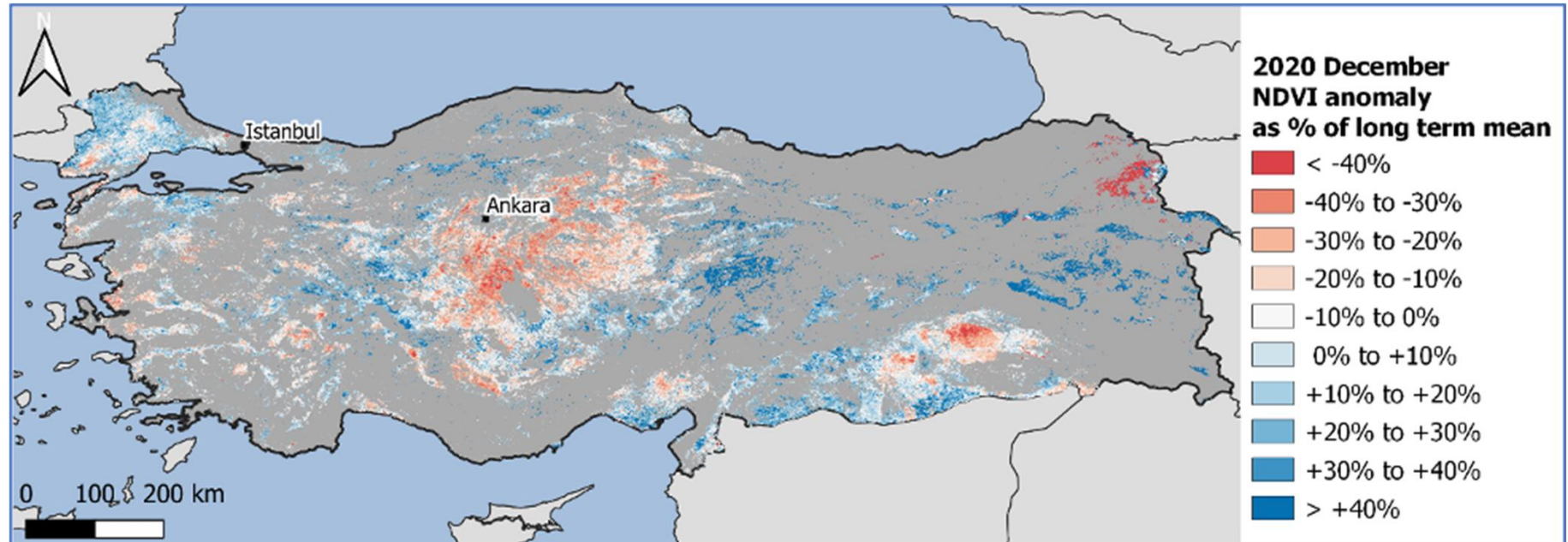
Figure: September – December 2020 Evapotranspiration anomalies in Turkey.



Source: Iceland et al. (2021)

Exisitng State and Challenges

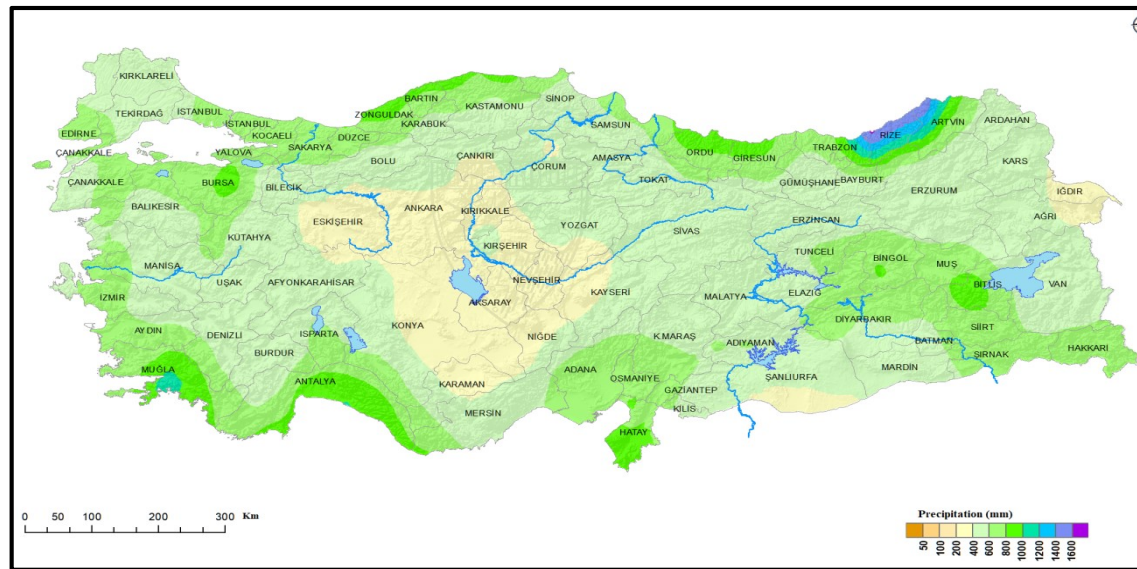
Figure: December 2020 NDVI anomalies in Turkey.



Source: Iceland et al. (2021)

Existitng State and Challenges

Figure: Precipitation level during October 1, 2020 – July 31, 2021



Source: General Directorate of Meteorology, 2021

Study represents that there is a general increase in temperature trends, while 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 (Ahsan, 2020; Köle, 2012). However, the temperature will be increased in the above reference period 0.79%, 1.63% and 2.63% respectively.

Exisitng State and Challenges

Table: Amount of water reserve from 2007 to 2021 in Ankara

Year	Water reservation (m ³)
2007	158,780,975
2008	200,948,671
2009	627,056,100
2010	638,059,813
2011	324,211,194
2012	486,014,705
2013	372,070,717
2014	270,337,026
2015	500,252,056
2016	369,095,205
2017	383,189,314
2018	384,897,018
2019	495,799,679
2020	508,687,470
2021	338,973,755 (until June 2021)

- As per *Başkent bülteni* (Ankara Metropolitan Municipality Buletin. January 2021), now a days water occupancy rate in the barages only 20.91% and it seems only 110 days water left.
- Per capita water comsumption 250 liter/day (In 2014 it was 211 liter/day).

**Source: Ankara Water and Sewerage
Administration. 2021**

Exisitng State and Challenges

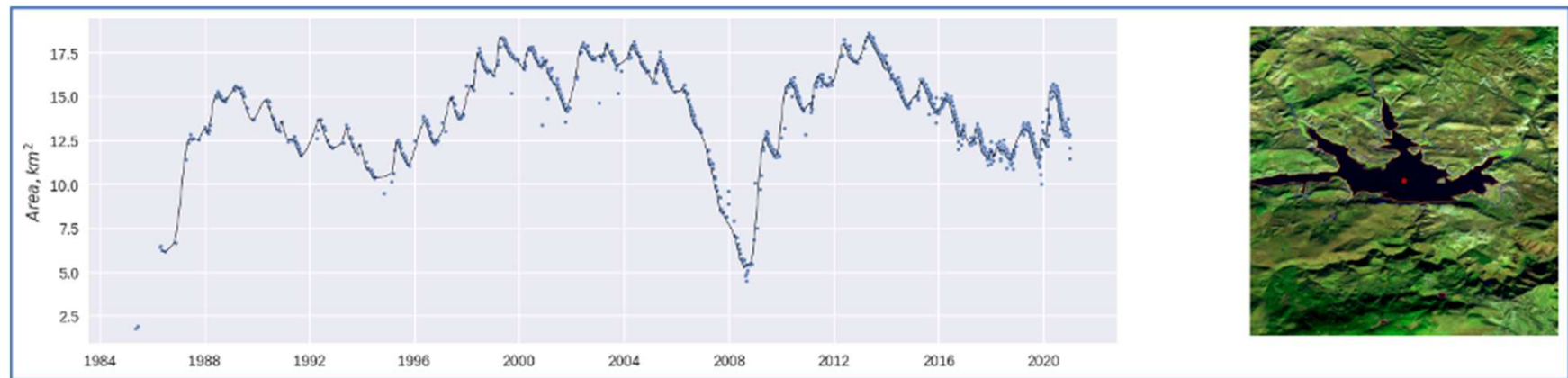
Table: Water intrusion to dams in the first 6 months 2020 and 2021 (m3)

Period	2020	2021	Change
January	16,623,203	16,261,220	-361,983
February	94,521,666	42,388,031	-52,133,635
March	157,335,125	65,961,475	-91,373,650
April	105,472,350	166,728,560	61,256,210
May	30,863,147	26,092,360	-4,770,787
June	59,555,050	21,542,109	-38,012,941

Source: Ankara Water and Sewerage Administration. 2021

Existing State and Challenges

Çamlidere Dam (Ankara) surface area, 1984 – 2020.



Source: Iceland et al. (2021)

- ❑ 2007 and 2008 was the worst climate change hit in Ankara and it seems 2020 was much impacted by drought.

Existing State and Challenges

Table: Streams within Ankara province boundaries

Stream Name	Length within the Provincial Boundaries (Km)	Tributary Stream
Sakarya river	126	Sakarya River
Porsuk stream	19.6	Sakarya River
Çubuk stream	35.8	Ankara Stream
Ova stream	62	Ankara Stream
Kusunlar creek	5.3	Ankara Stream
Hatip stream	29.5	Ankara Stream
Köstebek/Nallı creek	47.8	Ankara Stream
Yeşilöz creek	36	Ankara Stream
Boğmaç creek	5.27	Sakarya Nehri
Ankara stream	111.5	Ankara Stream
Yukarı Çavundur creek	0.9	Çubuk Stream
İmrahor creek	23.9	Ankara Stream
Kızıl creek	7.2	Sakarya Stream
Kirmir stream	93.8	Sakarya Stream

Source: Ministry of Environment and Urbanisation, 2013

Findings from Key Informants Interview

Existing measures to overcome water security challenges due to COVID-19	Existing measures to overcome water security challenges due to climate change	Water (Demand and Supply) issues be more sustainably responsive to the needs of citizen	Adaptation finance and implementation
- Uninterrupted delivery of quality/healthy water supply - Regular treatment of water - Regular control of water consumption - Rainwater harvesting started to establish in the districts connected to COVID-19 cases - Underground giant reservoir have been installed in Pilot areas. - Ankara, the first municipality to declare that water subscriber's would not be cut off during pandemic. - «Su ver» (Give water) campaign started - Online awareness program to save water. - Accelerated loophole solution and pipe changes program during lockdown.	- The existing measures are not enough to cope with climate change - Lack of enough awareness program. - Lack of integrated approach	- Intensive public awareness through media, press, education etc. - Major focus should be given to children and youngs - Awareness should take in a comprehensive way. - Development of OS and Android based apps	- Innovative and up-to-date modern practices and management could be deployed. - Deploying and financing nature-based solutions - International organisations are also providing finance through different projects but not enough. - Local authorities are implementing small budget projects but there need big budget projects.

Nature Based Solutions and Green Infrastructure in Ankara

6 BIOLOGICAL PONDS IN ÇANKAYA, ANKARA

- Ankara's first biological pond located at Ahlatlıbel Atatürk Park with an area of 518 m².
- Then 1500 m² at Uğur Mumcu Park, 500 m² at Yaşar Kemal Park, 426 m² at İlhan Cavcav Park, 1384 m² biological pond in Zafer Park and the largest in İsmet İnönü Park around 1495 m².



İsmet İnönü Park (Photo: Çankaya Municipality)



Biological pond practices in the park (Photo: DKM Archive)

Nature and Cities project- Çankaya. Ankara

Nature Based Solutions and Green Infrastructure (Example: **Ismet inönü park)**

- ☐ Protecting an area with high commercial value by turning it into a green area
- ☐ Preserving the existing ecosystem with biological ponds that provide habitats. as well as save in maintenance and conserve water
- ☐ Protecting the local ecosystem and saving water. mitigating the flood risk with the use of local plants and shrubs.
- ☐ Controlling the surface flow with the use of permeable material and contributing to the water cycle
- ☐ Providing a refreshing environment for residents and parks in the summer months and preventing the formation of heat islands in the area by protecting the existing trees and especially planting trees along the bike

Source: Arslantaş. Sanalan and Çil (2020)

Nature Based Solutions and Green Infrastructure in Ankara

- ❑ The Turkey Resilient Landscape Integration Project (TULIP) is aimed at improving livelihoods and resilient infrastructure services for rural communities in the Bolaman River Basin, located in the eastern Black Sea Region. and Cekerek River Basin in central Anatolia Region➔ with a focus on Nature-Based Solutions
- ❑ Nature4Cities* (N4C) is one of the projects of NBS-related Research and Innovation in Europe. First European project about Nature Based Solutions for renaturing Cities (Çankaya Municipality, Ankara)
- ❑ Nature4Cities concept is based on: (1) the building of a NBS knowledge base and associated integrated analysis framework, (2) the development of a holistic assessment methodology, (3) the adaptation of existing technologies for urban data management and citizens' participatory engagement. and (4) the co-development and demonstration with partner cities (Città Metropolitana Di Milano (IT), Çankaya (TR), Szeged (HU), Alcala de Henares (ES)).

Measures to overcome situation on climate change wrt water security	Measures taken on Covid-19 vis-à-vis water security
-Need collective movement and integrated approach -The national climate change action plan should be detailed, audited and reported on the basis of institutions. -The central planning institutions should maintain their status quo. -Nature based solution programs should be developed. -Manage water by demand oriented not by supply oriented -Must reduce human interventions (infrastructure, settlement development etc.) in the water basins or wetland areas.	- Central government should control and take necessary steps. - A movement or campaign with local government could be fruitful. - All kinds of medical, hydrological and agricultural measures should be taken. - Measures needed to encourage healthy, more accessible and economical use of water. - Intensify inspections of household water use.

Conclusion

- ❑ Authorities are taking number strategies/plans/programs to overcome water both disruptive and regular challenges. Human interventions as well as pandemic related intervention should follow an collaborative, intelligent and robust decision making approach.
- ❑ In Ankara, 6.44% of municipal water is using for irrigation in green areas but alternative sources like gray water should be used through sustainable systems.
- ❑ In addition, it has seen that a significant amount of savings can be made at the rate of 69.42% of municipal water consumed by domestic use in Ankara.
- ❑ The measures can be such as renewal of networks, changes in tariff structure, investments in maintenance, mechanisms developed for rapid leak detection, awareness training for the sustainable use of land and water resources, practices for the use of water-saving technologies, climate justified technologes, and efficient water use in industry.

Major recommendations:

- ❑ A collaboration within government bodies is required. For instance. Ankara Water and Sewerage Administration (ASKI) General Directorate and Ankara City Council will cooperate for nature based solution practices as well as to create public awareness on the issues of «water right. water management and water conservation» and will sign joint works.
- ❑ Developing strategic measures at local level with the participation of local people including child and youth.
- ❑ Involving community people to raise awareness (major attention should give to child and youth level).
- ❑ Need more green dialogue with stakeholders (example: Nature and cities project)
- ❑ Expand nature based solution practices.

THANK YOU

Q&A