21st Century

WATER and SANITATION

in Cities

zoom

WEBINAR

REPORT

6 May 2021

HPA

Hydropolitics Academy,Turkey would like to thank all of the speakers and atendees for their contrubution to the webinar

PRESENTATIONS AND VIDEO RECORD ARE AVAILABLE FROM BELOW LINK

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May 7 2021

WEBINAR on

21st Century,

Water & Sanitation in Cities

CONCEPT NOTE

Hydropolitics Association (HPA) is pleased to announce a special programming to highlight the impacts of climate change, rapid growing population,subnational hydropolitics on water and sanitation services in Cities .

COVID-19 exposed vulnerabilities and deep-rooted inequalities in cities that will worsen as urbanisation continues and migration flows accelerate. Climate action failure will add to the mounting pressure on urban spaces.

With careful planning, adaptation and the necessary investments, cities can become the new sustainability hubs of the future.

2020 was the warmest year on record. Extreme heat and mass migration from rural are seriously thretening cities in developing world in terms of sustainable water and sanitation services.

What are the emerging initiatives to prevent further insecurity and risks in cities.

To address these challenges and more, HPA will bring together leading experts and academics in a roundtable discussions webinar.

Hydropolitics Academy Webinar on: "21st Century, Water and Sanitation in Cities" May 6, 2021

21st Century

Water and Sanitation in Cities

Hydropolitics Association : https://www.hidropolitikakademi.org/en/about-us/27435/vision--mission

Introduction:

Objectives of the Webinar:

1. Create an understanding about rising global risks in cities and their water and sanitation services
2. The main issues facing urban water supply and sanitation , in different regions, presented through three case studies: Istanbul as a world metropolis, Amman as a city in a water poor region, and Sao Paulo with very high population and increasing water supply need , in South America .
3. The main issues facing urban water supply and management, technical and organisational, resource and availability, economic considerations, and research and development, and the Covid 19 pandemic.
4. A roadmap for the future: Integrated Water Management, Nature Based Development, Water Demand Management and non -conventional water resources,

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BIO's OF SPEAKERS

Prof. Dr. Tony Wong

Vice-President at Monash University,AUSTRALIA

Chief Executive of the Cooperative Research Centre for Water Sensitive Cities

Prof.Dr. Tony Wong works in the Office of the Provost and senior Vice-President (Research) at Monash University, Clayton Campus. Tony is the Chief Executive of the Cooperative Research Centre for Water Sensitive Cities (CRCWSC), with research hubs in Brisbane , Melbourne, Perth and Singapore . Tony is internationally recognised for his research and practice in sustainable urban water management, particularly Water Sensitive Urban Design. His expertise has been gained through national and international consulting, research, and academia and has led a large number of award-winning urban design projects. He was the Institution of Engineers, Australia 2010 Civil Engineer of the Year, cited as having defined "a new paradigm for design of urban environments that blends creativity with technical and scientific rigour'.

Panchali Saikia

Programme Officer, Water and Sanitation SIWI

Ms Panchali Saikia joined SIWI as a Programme Officer in April 2018. She has Masters in Political Science from University of Delhi (India), with 8+ years work experience. Her expertise lies in international relations, institutions and gender in water governance and transboundary rivers.

Prior to SIWI, Panchali worked for 5 years with the International Water Management Institute (IWMI) regional office in New Delhi. She has worked on research projects across South Asia, Southeast Asia and Central Asia, along with field work in these regions. As a qualitative researcher, her project experiences range across areas of natural resource management, feminization of agriculture, gender and institutions in water management, governance and policy analysis. Panchali has a number of research publications in edited volumes.

An Indian national, she speaks English, Hindi, Bengali and Assamese.

Dursun Yıldız CE Hydropolitics Expert

President of Hydropolitics Academy of Turkey

Part Time Lecturer in International Water Resources Department of İzmir Institute of Technology .Turkey

He is orginally a civil engineer.He began to work in State Hydraulic Works in 1983. During his DSİ carrier he participated in post graduate professional education and investigation programs in Holland-Delft, the USA Bureau of Reclamation and US Army Corps of Engineers. In 2000 he completed his MSc degree on the topic of water politics in Hacettepe University Hydropolitics and Strategy Research Center. He experienced in water, hydro energy management, and consultancy for 25 years, wrote seventeen books and besides published several papers and technical reports on the topics of hydraulic engineering,water management,hydropolitics,hydro diplomacy in national and international periodicals. He has awarded the Successful Water Researcher Prize of the Year of 2008 by Agriculturers Associations of Türkiye. He has also awarded Successful Water Expert Prize by Central Union of Irrigation Cooperatives in 2016 . He is founder of the Hydropolitics Association in 2015 and president of it. He is also managing his own Engineering and Consultancy Company since 2008.

He is a member of the Scientific Committee of the Turkish Foundation for Combating Soil Erosion (TEMA). He is editor of the **International Journal of Water Management and Diplomacy** published by Dergipark. Currently, he is a Part Time Lecturer **in International Water Resources Department of İzmir Institute of Technology, Turkey.**

Kamal Jalouqa, MA in Development Studies, Jordan

Developmant Planning, 1983, BCP, City Planning, 1978. Worked on major regional, metropolitan and sector development studies and major projects like industrial estates, airports and infrastructure in Jordan, Palestine, Iraq, Saudi Arabia, UAE, Pakistan and Sudan. Former president of the Jordanian Planning Forum and active in non profit organisations. Former Industrial Professor at German Jordanian University and part-time lecturer at Jordan University.He is also member of Hydropolitics Association in Ankara, Turkey.

Leandro Fernandes Miyazaki Penha - São Paulo/SP - Brazil

leandro.miyazaki1@gmail.com

Researcher in Integrated and Adaptive Water Resources Management and Environmental Science and Technology

EDUCATION University of Sao Paulo - MSc, Physical Geography APRIL 2021 - CURRENT Federal University of ABC - BS, Environmental and Urban Engineering JUNE 2018 – CURRENT University of Sao Paulo - BS, Geography FEBRUARY 2013 - DECEMBER 2017 Sao Paulo State Technological College - Associate's degree, Logistics and Transportation JULY 2009 - JULY 2012

EXPERIENCE Hexagon Brasil - GIS Solution Analyst I APRIL 2021 - CURRENT Hexagon Brasil - GIS Intern AUGUST 2020 - APRIL 2021 Companhia Catarinense de Águas e Saneamento (CASAN) Project:

Water and sewage related data processing and analysis; assists populating Oracle database with technical (pipe networks, treatment plants), commercial (zones, blocks, parcels) and environmental data (water concession agreements); assists correcting and transforming CAD datasets to GIS; assists georeferencing CAD datasets in GIS.

CGAgeo Meio Ambiente e Geologia - Environmental Engineering Intern JANUARY 2020 - MAY 2020 Control of analytical results from laboratory; evaluation of analytical results and comparison to both national (CETESB) and international (U.S.EPA) screening levels; assisted collecting and systematising information/data to field work activities; elaborated potentiometric and plume maps; assisted preparing reports based on current environmental policies regarding contaminated sites (DD nº 038/2017/C - CETESB).

IBOPE Inteligência - GIS Intern JULY 2015 - AUGUST 2016 Created maps for market research studies; Assisted creating routes and isochrones to determine enterprises' influence areas; Georeferenced satellite images; Assisted plotting fieldwork data; Geocoded telephones and addresses data.

IGNEM Consultoria e Projetos Ambientais - Geography Intern JULY 2014 - MARCH 2015 Analysed aerial photographs and satellite images; Applied thematic cartography techniques to land use mappig, vegetation characterization, and declivity analysis; Assisted environmental survey on illegal native plants suppression and contaminated sites issues; Assisted preparing reports based on current environmental policies

SUMMARIES OF THE PRESENTATIONS

Water for Liveability: transforming water management in cities

Professor Tony Wong
Monash University

There is a growing trend in urban water management – shifting to managing water for life to managing water for liveability. This presentation explores how contemporary water management contribute to liveability, with two case study examples, one in a city in the developed world and another in the developing world.

Throughout history, cities and towns developed by drawing upon ecosystem services in their environment. However, instead of working towards a healthy co-existence, our traditional development methods significantly replace the natural capital within the city footprint with technocratic solutions based around very narrow reductionist concepts of utilities. Over the past decade, many city planners, water practitioners and researchers have collaborated to envision the concept and principles of "water sensitive cities", and these principles are now emerging in city design policies.[1] Embodied in concepts such as integrated water cycle management[2], it is a vision of holistic urban water management across the physical and social dimensions of: water availability and fit-for-purpose uses; safety from flooding hazards; safety from water-borne diseases and urban heat; health and wellbeing associated with environmental biodiversity and ecological health; and social cohesion associated with the amenity value of public spaces. It aligns with the planetary health framing[3] and the water sensitive cities vision and approach is relevant across all climatic zones.

Two key principles of water sensitive cities are that "our cities are water supply catchments" and "our cities provide ecosystem services". In essence, water sensitive cities efficiently use diverse water resources available within their boundaries including recycled water and stormwater; enhance and protect the health of urban waterways and wetlands; and mitigate against flood risk and damage. Water sensitive cities create public spaces and green infrastructure that harvest, clean and recycle

[1] Wong THF, Rogers B and Brown RR. (2020), 'Transforming cities through water sensitive principles and practices', *Perspective OneEarth,* 3(4), pp. 436-447, https://doi.org/10.1016/j.oneear.2020.09.012.

[2] Wong THF. (2016), *Human Settlements – A Framing Paper for the High-Level Panel on Water. Australian Water Partnership*, https://waterpartnership.org.au/wp-content/uploads/2016/08/HLPW-Human-Settlements.pdf.

[3] Horton R and Lo S. (2015), 'Planetary health: a new science for exceptional action', *The Lancet*, 386 November 14, http://dx.doi.org/10.1016/S0140-6736(15)61038-8.

water, increase biodiversity, sequester carbon, and reduce urban heat island effects. Thus, the trend towards managing water for liveability is in fact not as superficial as simply to deliver an attractive city – important as it may be. In many parts of the developed world are investing in re-establishing ecosystem services within the city, to use design innovation to transform our cities into an ecological engine that provides ecosystem services for both the built and natural environment.

In the developing world, contaminated water sources and living environments profoundly affect the health and wellbeing of people living in slums or informal settlements. These people are among the most disadvantaged urban dwellers, lacking conventional trunk infrastructure approaches of the 20th century, and also bearing the brunt of increasingly severe droughts and floods.[4] No access to clean water and safe sanitation, poor drainage and floods expose residents to multiple faecal contamination pathways. Frequent floods continually re-expose residents to environmental faecal contamination, with their vulnerability exacerbated by climate change and the extremes it brings. Framed by planetary health principles, a water sensitive cities approach developed alternatives to current sanitation solutions for informal settlements.

The water sensitive interventions, formulated through a community co-design process, combine traditional approaches to water, sanitation and drainage services with nature-based technologies that can fit into dense urban communities. This effort combines expertise from a vast range of disciplines including epidemiology, water engineering, ecology, landscape architecture, urban water governance and behavioural science. The interventions concurrently address water scarcity, non-existent or inadequate sanitation services, flooding and associated contamination, and a degraded water environment from poor land use and industry practices.

To reach full presentation please click on

https://hidropolitikakademi.org/tr/detail/28654/international-webinar--on-water-and-sanitation-in-cities-6-may-2021

[4]CRC for Water Sensitive Cities. (2018), *Strengthening the delivery of WASH in urban informal settlements: addressing multiple exposure pathways in urban environments*, Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

Water and Sanitation Services in Growing Cities

Panchali Saikia

The presentation will briefly share insights on the current scenario on urban WASH services and how improved water governance will help drive towards inclusive, safe, and resilient cities. While water acts as a connector across sectors and stakeholders in an urban system, water governance is the catalyst and ultimate driver for enhancing urban resilience.

By 2050 roughly two-thirds (68 per cent) of the world's population will be living in urban areas and a vast majority of them will be living in increasingly water-stressed areas. Alongside, the climate change impacts, increasing risk of droughts, floods and health crises like COVID-19, urban inequalities in access to water and sanitation services, degraded ecosystem, and decline in freshwater availabilities will further accelerate the water stress in cities.

Therefore, it becomes critical to understand a city's current governance capacity is critical, i.e., who makes the decisions, how are those decisions made, who gets to participate in decision-making, and who benefits or is affected as a result. It is important that this understanding informs resilience-related city water governance functions such as planning and preparedness, policy and strategies, post-disaster management, response and recovery measures, coordination, capacity development, financing, regulations, and monitoring. Thus, water governance can be defined *as a combination of these functions, performed with certain attributes, to achieve one or more desired outcome s, all shaped by the values and aspirations of individuals and organisations (Jiménez, 2020)*. The speaker will further share insights on: **what is water governance, what it means in the context of urban waters, how it can be applied in practice and how it can help build urban water resilience through the example of innovative governance based tool-CWRA.**

Governance based tools for cities: City Water Resilience Approach (CWRA)

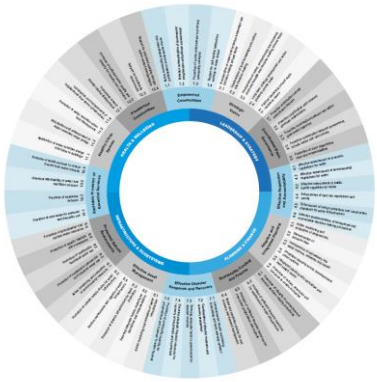
Amid global unpredictability and vulnerabilities, city government and leadership are increasingly recognising the need for innovative tools that improve understanding of their risks and help plan and prioritise action and investments to become more resilient.

City Water Resilience Approach (CWRA) addresses this demand and enables cities to take a holistic view of their water systems, inform decision-makers of a strategy to take forward, and collaboratively build resilience to local water challenges. It provides a detailed process coupled with a set of tools and resources, which guide cities to make better planning and investment decisions for their city's water systems to be able to thrive and survive water-related shocks and stresses and improve water security for its inhabitants. The speaker will present the CWRA method and tools.

The tools include

1) OurWater digital tool: to map the natural urban systems, infrastructures, and stakeholders; 2) City Water Resilience Framework (CWRF): to assess a city's existing water resilience capacity and develop action plans to improve water resilience.

CWRA can be adopted by a wide range of stakeholders, including municipal and national government, water utilities, river basin authorities, private sector, and civil society groups. It is scalable from towns through to megacities – establishing a process for us all to shape a better world where we are improving public health, enhancing communities' resilience to climate change and other water-related risks, and creating natural and social value through water that results in a more inclusive and sustainable society.



City Water resilience Framework (CWRF) Water Resilience Assessment tool

CWRA was co-created through a robust peer-reviewed process together with eight partner cities: Cape Town, Mexico City, Miami, Amman, Thessaloniki, Manchester, Hull, and Rotterdam.

It was piloted in the city of Cape Town and Miami. The presentation will share the results of the application in these two cities. In Cape Town, it helped explore key themes first presented in its new Water Strategy, which makes a firm commitment to be a water resilience city by 2030. Action developed through CWRA provides a pathway for the city to achieve these goals. In Miami, it helped strengthen its existing Resilient305 Strategy, particularly the water dimension.

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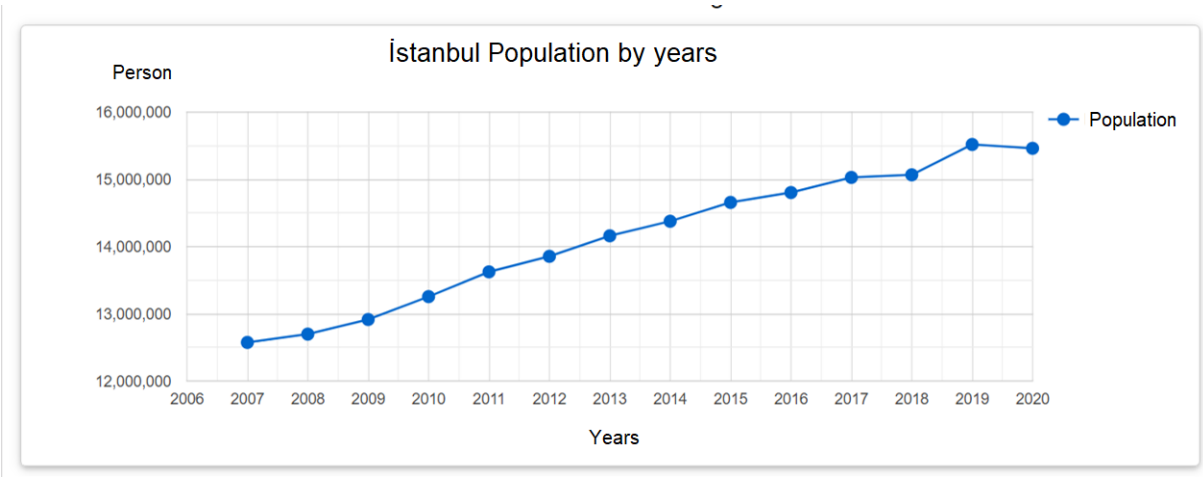
Water and Sanitation Management in İstanbul

Case Study by Dursun Yıldız

Nearly all of Istanbul's drinking water (97%) comes from surface water stored in reservoirs. Its most important water sources are the Omerli-Darlik system on the Asian side and the Terkos-Alibeykoy system on the European side. Both systems consist of dams, reservoirs, water treatment plants, and pipelines. Many of the reservoirs that supply Istanbul are located within the metropolitan area and are exposed to pollution from settlements without adequate sanitation. Water quality is theoretically controlled by conservation zones around the reservoirs which limit construction and industrial activities in four concentric buffer zones with increasingly strict regulations the closer the zones are to the reservoirs[5],[6]



However, over time, the infrastructure in İstanbul failed to improve and ghetto neighborhoods made the distribution of services harder. The need for a new administration with broader authority and abilities was seen as İSİ failed to meet the

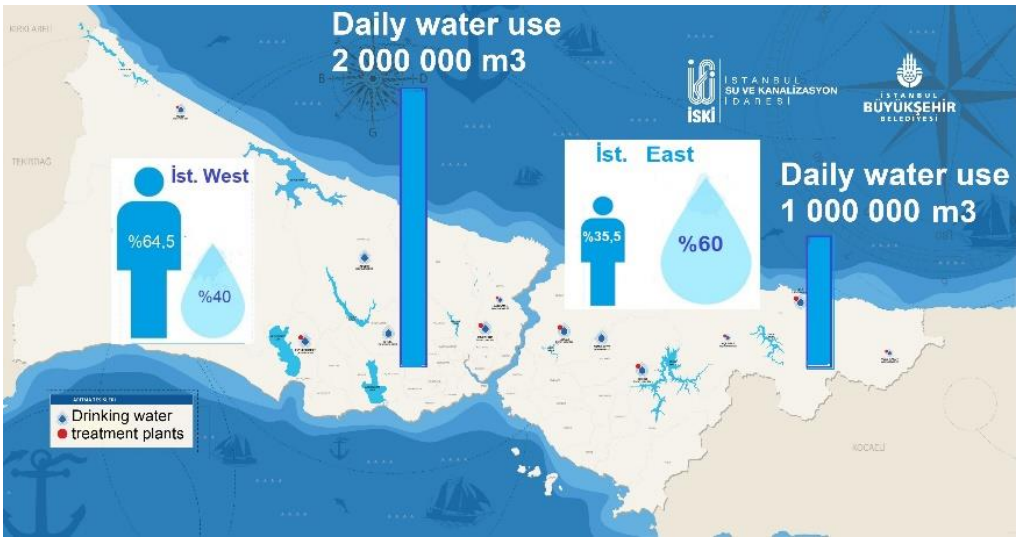
[5] Ali Demirci and Anya Butt: Historical Overview and Current Trends in Istanbul's Water Supply Development, Globalization And Water Resources Management: The Changing Value of Water, August 6–8, Awra/Iwlri-University of Dundee International Specialty Conference 2001. Retrieved September 14, 2010.

[6]German) Şenda Kara and Frank Alleweldt:Trinwasserversorgung und Stadtexpansion:Der Fall Istanbul (Drinking Water Supply and Urban Expansion:The Case of Istanbul), in: Wasser - Abwasser 136 (1995), Nr. 7, pp.)

increasing population's water and sewerage demands. The name of the new administration founded in 1981 is İstanbul Water and Sewerage Administration (İSKİ).

Because of the rapid population increase in Istanbul, additional water resources were needed. Therefore the Melen System was developed to cover the long-term water demand of İstanbul. The first stage supplying 268 million m3 was completed in 2007. A second and third stage is expected to bring a total of 1,180 billion m3 for all three phases to meet the water demand of the city until the year 2040, doubling the amount of water supplied before the Melen system. Also, a 5.5 km tunnel under the Bosporus transfers water to the European side[7]. According to monitoring by four metropolitan agencies drinking water quality is good, reportedly surpassing Turkish as well as EU standards. According to a 2004 survey, 35% of customers stated that they drink water from the tap, up from only 10% in 2000. During that period water quality had improved due to network repairs and the completion of new drinking water treatment plants.[8]

Although the data do not indicate a clear long-term declining trend in rainfall, extreme events – especially two-year droughts – seem more pronounced than in the past. In 2006, rainfall was the record low for the previous 50 years, Furthermore, the water level in reservoirs serving the city plummeted to around 25% of full capacity in 2007 and 2008.In 2020, rainfall was under the normal level and it continued in the 2021 water years resulting out of use of some dams in the European side of İstanbul. The total water volume rate in the dams dropped as of % 19.



Population and water resources are unevenly distributed throughout Istanbul. About 60% of the water in Istanbul is on the Asian side. However, 65% of the population lives

[7] XIVst Regional Directorate of State Hydraulic Works -Istanbul. Retrieved September 14, 2010.

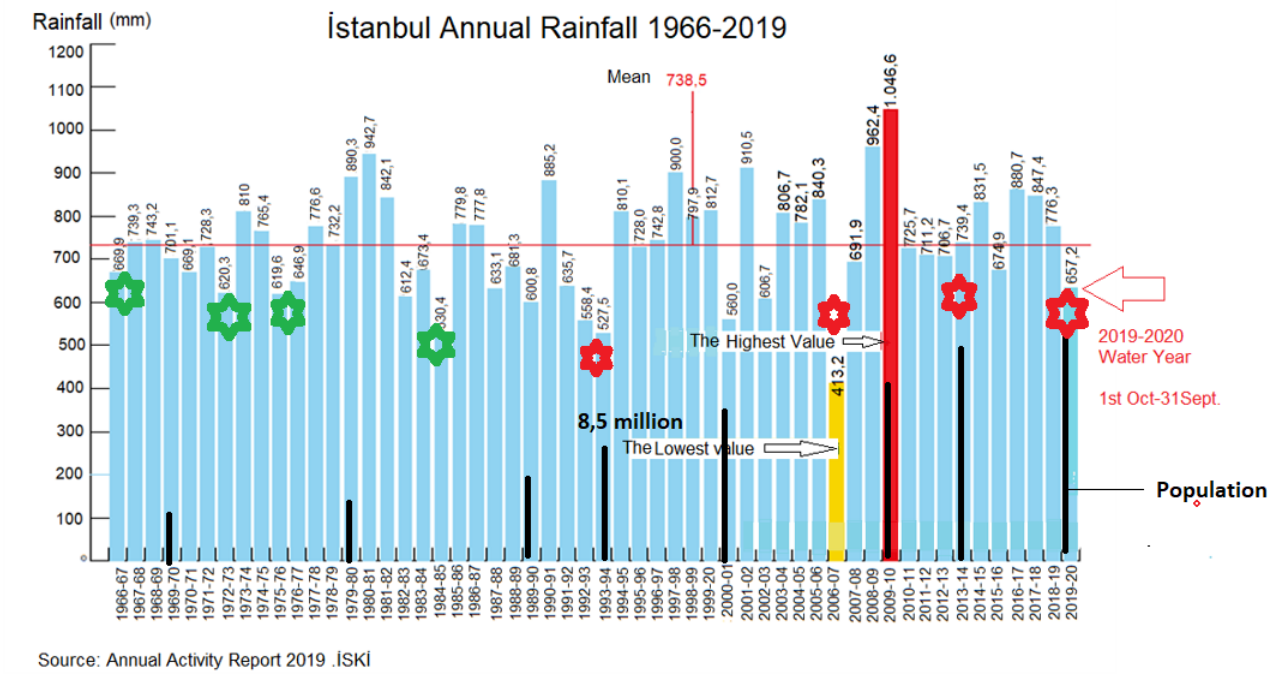
[8] Altinbilek, Dogan. "Water Management in Istanbul". International Journal of Water Resources Development. 22 (2): 241–253. doi:10.1080/07900620600709563.

on the European side of the city. Due to the increase in population and changes in precipitation rates, the need for water has increased in recent years.

Therefore, the idea of the Melen project was developed at the beginning of the 2000s, It was aimed to bring water from Melen Creek, which is about 180 km away from Istanbul. The first water in Istanbul was launched in 2007 with the Melen Project. The Greater Melen Project (GMP) is a large-scale interbasin water transfer project that provides domestic and industrial water requirements of Istanbul for 2040

Due to the increase in population and changes in precipitation rates by years, Istanbul faced a water shortage threat in 2007,2014, years. But partially completed Melen Project helped İstanbul to overcome these critical periods.

In the year 2019, annual total rainfall was lower than the mean value in İstanbul. This meteorological drought period has continued in 2020 and Istanbul entered the new water year 2021 with a very low water storage rate in the dam's reservoir



Source: Annual Activity Report 2019 .İSKİ

In contrary to expectations, the meteorological drought period has continued in the last four months of the last year. The total amount of water in the dam's reservoir was decreased by 20% in total. Fortunately, precipitation started with a delay of 3 months and the amount of water in the dams started to increase in February 2021.

With this population and water use trend, Istanbul falls to water shortage when annual rainfall is lower than average level during consecutive two years.

But it should be noted that, although the amount of rainfall in various years until 1994 was very low, it did not cause a serious water shortage. The water shortage occurred in 1994 due to increased population with 500 mm of precipitation for 2 consecutive years. Later, due to the rapid increase in the population and the low annual precipitation, water shortages occurred again in 2007, 2014, and 2020. However, the total occupancy rates in the dams increased up to 81% in April 2021, it was observed that this accumulated water volume rate tended to decrease over the previous years.

During these drought periods deficiency of water budget has always occurred in İstanbul West. The deficiency in the water budget of Istanbul West was provided from Melen and Yeşilçay systems.

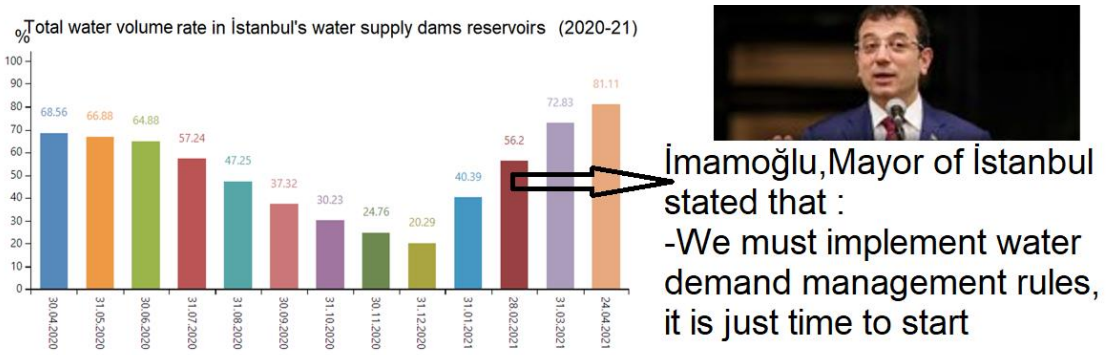
Water has transferred to the European side with a 6 m diameter tunnel that goes 135 m below sea level crossing the two continents. This tunnel has a capacity of 3 million m3 of water per day.

Melen and Yeşilçay System has partially served Istanbul since 2007. Since then most of the years' one-third of annual water demand was supplied by Melen and Yeşilçay System to Istanbul. But last year this rate was increased by 50 %.

The last part of the Melen Water Supply system, Melen Dam is expected to be completed by the end of 2017 It would have a huge storage capacity of 694 million-cubic-meter that equals 75 percent of the total capacity of all İstanbul Dams

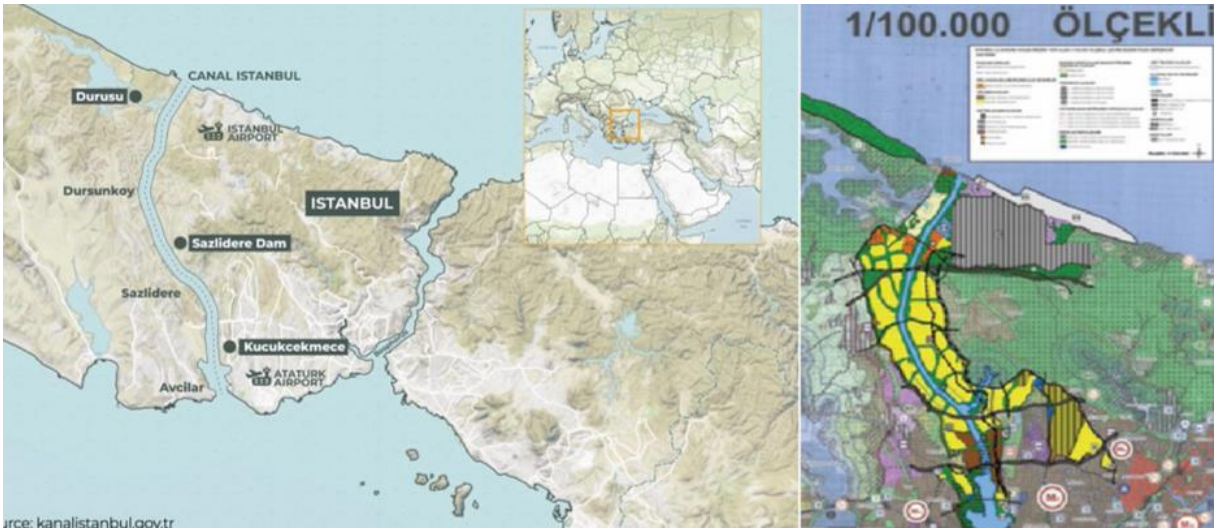
Although the dam construction to a large degree was completed in 2019, due to cracks as a result of insufficient ground reinforcement work, filling of the dam reservoir couldn't be started. Therefore the waters taken from Melen River need to continue to be pumped with a large number of pumps, each having a maximum pressure height of 220 meters.

The total pressure height needed to transfer 1,2 million m3/day from Istanbul East to West is about 300 m



Although the water level was rising in the dams in February 2021, the Mayor of Istanbul Mr. Imamoğlu made a statement saying that we must implement water demand management rules, it is just time to start. But it was not executed properly.

While İstanbul is waiting for the completion of the Melen dam to avoid the threats of possible dry periods in coming years, other challenges come out.



If İstanbul Canal Project will be implemented, It will largely and seriously affect the Istanbul West water supply plan. Many existing water infrastructure and facilities will be disabled and rebuilt due to the construction of the Istanbul Canal.

In addition, it is estimated that the additional population that will come to the residential areas in the zoning plans will reach 1.5 million people.Authorized organizations planned some more dams on both sides of İstanbul to provide water for rising demand.

In contrary to the rising water demand part, additional dams planned in İstanbul west has a storage capacity of 120 million m3 while Istanbul east has 422 million m3

Not only in İstanbul but also several metropolitan cities in the world, transferring their additional water demand from other river basins are common.

But This global trend likely to create water allocation disputes between cities and regions. That means that in addition to international hydropolitics subnational hydropolitics will be needed soon

Sanitation

In 2021 Istanbul's wastewater system consisted of 14 990 km of sewers, 17 pumping stations, 67 wastewater treatment plants. 95% of the wastewater collected was being treated. Treated wastewaters are discharged into the Bosphorus. They are discharged into the lower layer, where the flow is towards the Black Sea in the North.

As of 2021, %, 2,5 percent of treated wastewater is reused in İstanbul.

Lessons Learned

- Istanbul sets a good example to the challenges faced in water supply in heavily populated cities,
- Right in time measures in water management are vital to managing future risks
- Problems caused by lack of implementation of water demand management could be compensated by some expensive engineering solutions
- Water demand management needs to be implemented when water is available
- Even though Istanbul has had water supply problems periodically, sustainable water governance to Istanbul has not been the subject of scientific and innovative management concepts.
- The most important reason for this has been the policy of providing water to the rapidly increasing population.
- The Istanbul Metropolitan Municipality has tried to meet the water demand of the increasing population with only a supply management concept
- It resulted in water transfer from other river basins with higher cost

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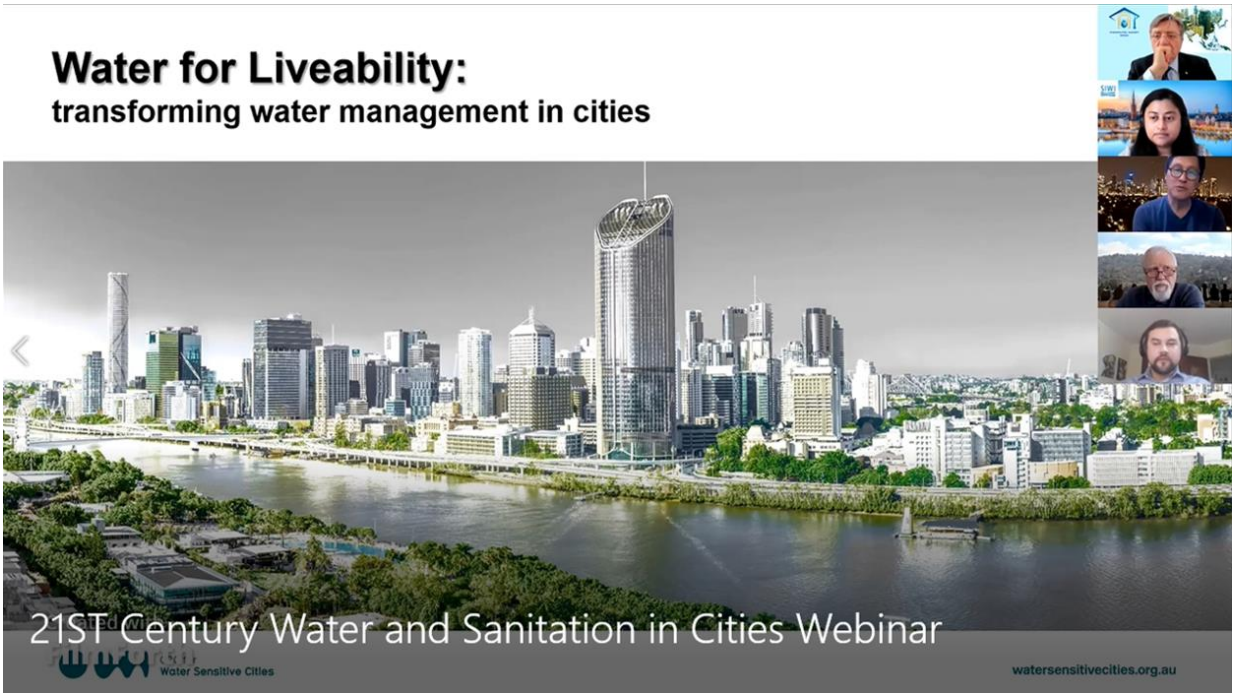
- **In İstanbul rising water demand and supply management trends point towards unsustainable use of water**
- This paradigm needs to be shifted

The reuse, Reduce,Recycle, Recover approach is needed

İstanbul Canal Project, frequent meteorological drought periods , developed smart water technologies, and new water management concepts force paradigm shift in İstanbul's water and sanitation management

Considering innovative smart water management concepts Istanbul Water and Sanitation Governance can be replanned as East and West İstanbul taking into account reuse, reduce, recover, recycle of water potential



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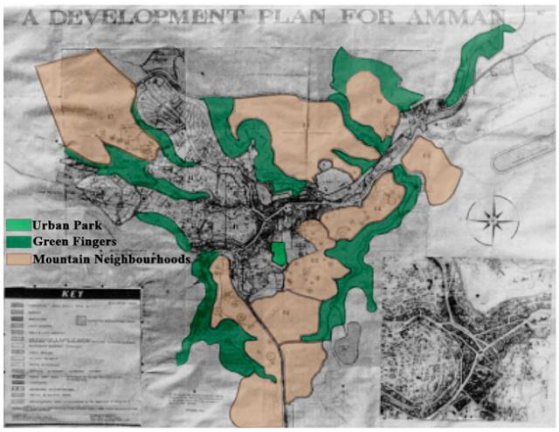
Water and Sanitation Management in Amman -Jordan

Case Study outline by Kamal Jalouqa:

Water is life for humans, the natural habitat, economic development in agriculture, industry and construction and life on earth in general. Human habitation will be basically urban in 2050, and UN estimates report that 54 percent of people in the world lived in urban areas in 2016. Using UN Urbanization Prospects projections, in 2018 this is estimated to be just over 55 percent of the world. The UN figures are the most widely referenced and cited on global urbanization. The way existing and planned human settlements should always take the water dimension into account. But is it the case? Research shows that it is not!!, and water is brought to cities at a later stage in the planning–development process.

Amman Case study:

1- Modern Amman developed on the site of one of the oldest human habitation, as the findings of the Ain Ghazal archaeological site reveals. The city later thrived in Ammonite, Greek, Roman and early Islamic periods. The source of livelihood for the city's development and flourishing could always found in the abundance of water springs that ran in a stream passing in the middle of the city. The city was abandoned for six centuries due to shift of statehood and probably a major earthquake, and it was open its arms to human habitation again in 1878 upon the arrival of Circassian migrants upon their eviction from their historical motherland in the Caucasus by Tsarist Russia. Today Amman is a city of four million inhabitants, and it's most obvious threat is WATER.



2- Amman's population was about half a million in the early 1950, and the first urban plan for future development of the city considered the protection of the local watersheds and replenishing of the Amman aquifer as a priority:

3- As Amman developed in population, institutionalization and diversity, the urban-water continuum needed a serious rethink! The city plan of 1987 led to the establishment of the Greater Amman Municipality through the amalgamation of the city of Amman and 21 town municipalities and village councils. The greater city was now managed by a greater city council and 26

local municipal districts, in a two tier management system. This development brought with it the introduction of computer based applications like GIS and related decision mechanisms, and lately a Smart City Plan. Water resources management was left to the central government Water Corporation, Water Authority, and the Amman Region Water Company Miyahuna. Water resource planning and the protection of the Amman water shed were integrated in the 1987 Greater Amman Comprehensive Plan, but developed separately at a later stage, although in parallel mutual consideration of urban development and the water utility. The Amman water shed was pushed to a second priority due to urban development and increased demand for water.

4- At present Amman's population of four million is serviced with drinking water from local resources augmented with water carriers from remote resources, such as the Jordan river (40 Km), Suwaga (30 Km), Maeen-Moujeb (60 Km), Karak governorate (70 Km) and Disi (320 Km). Development was confined to existing zoned lands, which was estimated to house 10 Million inhabitants if developed to full capacity. The area was fully serviced with water and waste water networks, treatment plants and water is serviced on a weekly basis, necessitating all households to have a roof top tank to sustain their water needs.

5- Water needs of the population, although seem to be fairly managed at present, don't promise a long term sustainability due to Climate change and shifts in rain intensity, non-replenishing aquifers, and degrading quality due to over drain. The future seems grimy, and structural changes need to be introduced. In the utilisation side, demand management need to be intensified and water saving procedures need to become the rule-not the exception at the household, network and industrial users. Saving 50 percent at the user side means that an additional and significant amount of water can be made available (100-120 Million Cubic Meters per Annum)

The presentation will examine these facts, supported by maps, charts and tables. A list of references will also be included at the end.

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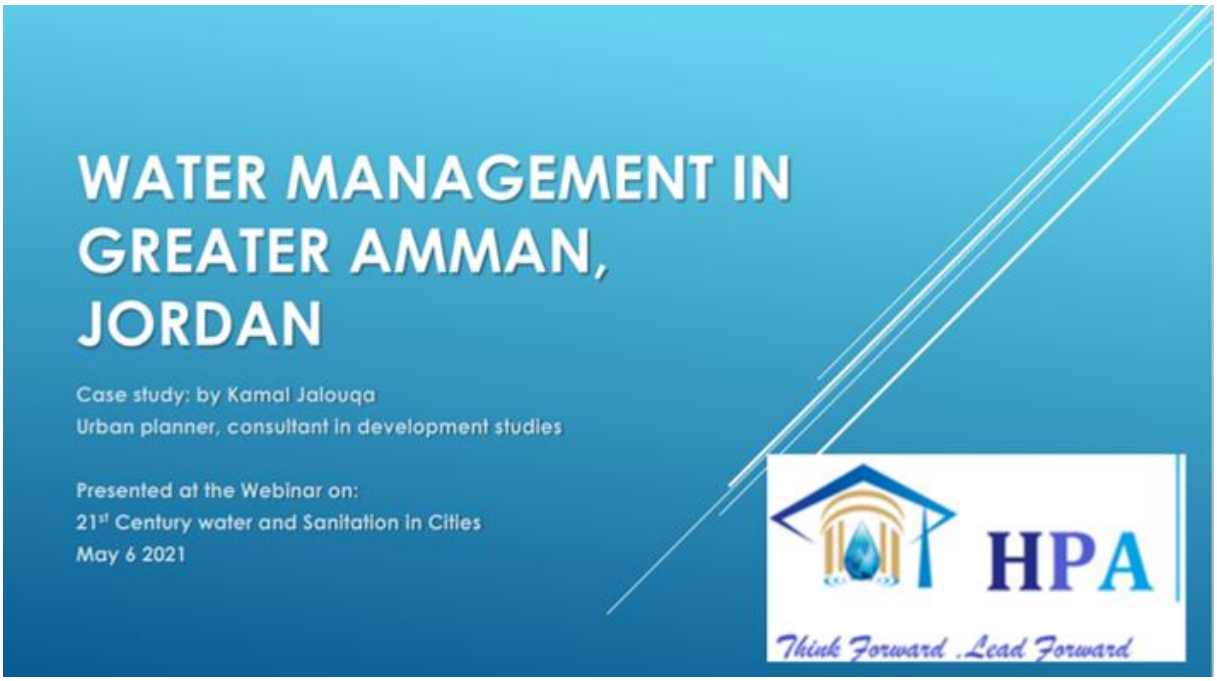
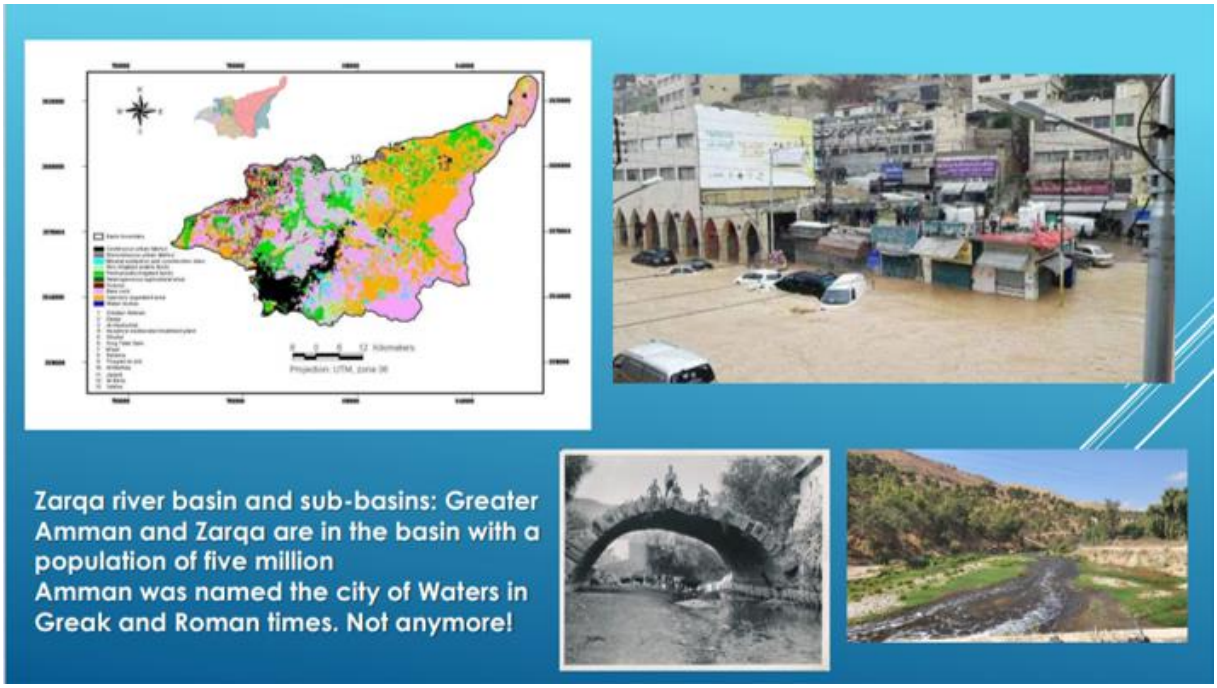
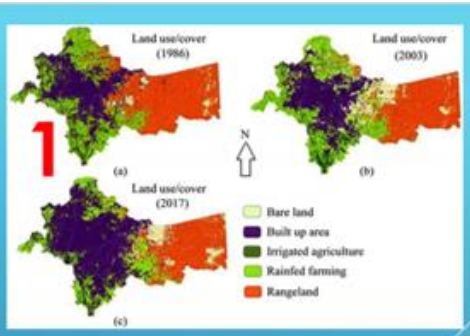
Hydropolitics Academy Webinar on: "21st Century, Water and Sanitation in Cities" May 6, 2021

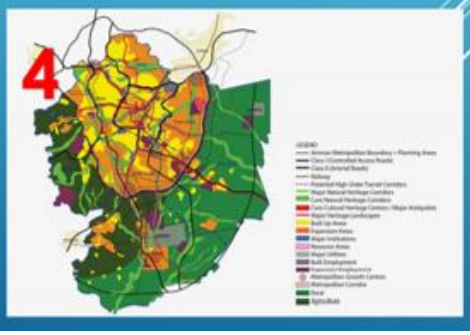




Urban development and planning:

1- Urban development 1986, 2003, 2017
2- The plan of 1955 protected recharge areas
3- The plan of 1987, densification of Zoned areas for efficient land & infrastructure utilization
4- The Plan of 2010, utilise existing capacity & infrastructure





Water supply to the population:

1- Water is pumped on a weekly basis, 12-18 hours one a week.
2- 98 of the households are connected to water network, 92 to sewer network.
3- All households and building have tanks on the roof for a full week consumption, water saving is a publicly adopted policy.
4- Water is pumped to the city from local and remote sources: 50, 70, and even 320 Km away
5-Water supply utility: till mid 1970s Municipal, 1978 Regional water corporation, 1990 till present water utility consortium.
6- Water sources are at risk in quantity and quality, some sources already have RO plants

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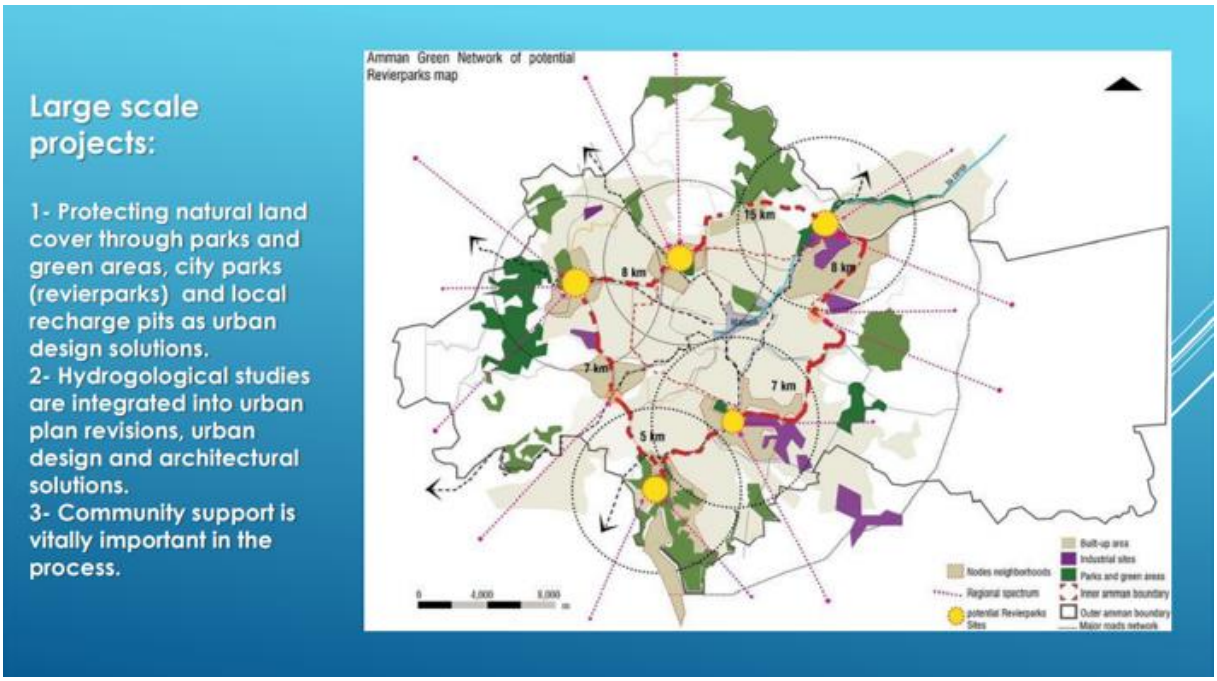

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Water and Sanitation Management in Sao Paulo

Case Study outlined by Leandro Miyazaki:

The Sao Paulo Metropolitan Region (RMSP), that houses 22 million inhabitants (IBGE, 2020), is the largest one in Brazil, 2nd in the Americas, and 10th in the world. Although since the 1990s integrated water resources management has been globally recognized and employed, including the state of Sao Paulo (Law 7663/1991), it still resulted on a period that was known as water crisis, that affected the lives of a large part of the population, between 2014 and 2016.

According to Law 7663/1991, the Sao Paulo state was divided into 21 basins, being the RMSP almost entirely located in the Alto Tiete basin (35 of the 39 cities). The Alto Tiete basin is, when compared to all other basins, the one with the lowest water supply rate per capita (130.68 m³/year). In this context, with a large population and the lowest water supply rate, the task of water supply can be challenging.

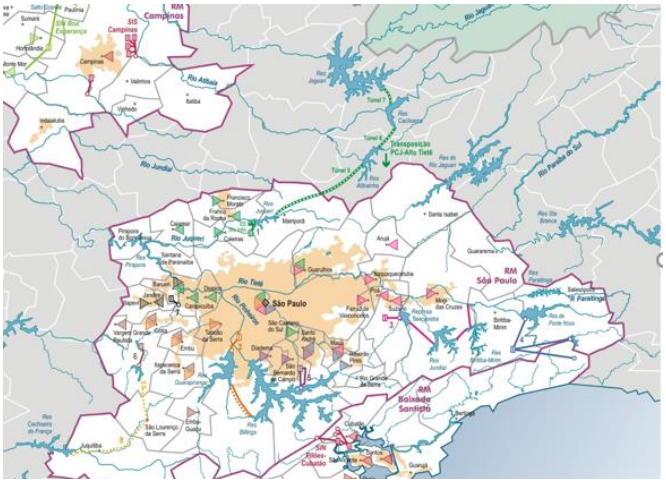


Figura 1 - Water Production Systems in Sao Paulo

During the water crisis, with the collapse of the main production system (Cantareira), which supplied around 9 million people at the time, what was seen were more discussions about emergency actions, such as decreasing water pressure and awareness of water waste (promoted mainly by the media), and less emphasis on integrated water resources management, that is, on what were the origins of the crisis.

While the Sao Paulo state government and the Sao Paulo State Basic Sanitation Company (SABESP) started intense awareness campaigns against water waste and emergency works to connect the water production systems, little has been discussed about the depollution of Sao Paulo main rivers (Tiete and Pinheiros) and the Billings reservoir, the largest one in the RMSP. In this sense, the presentation will examine these facts, supported by maps, charts and tables. A list of references will also be included at the end.

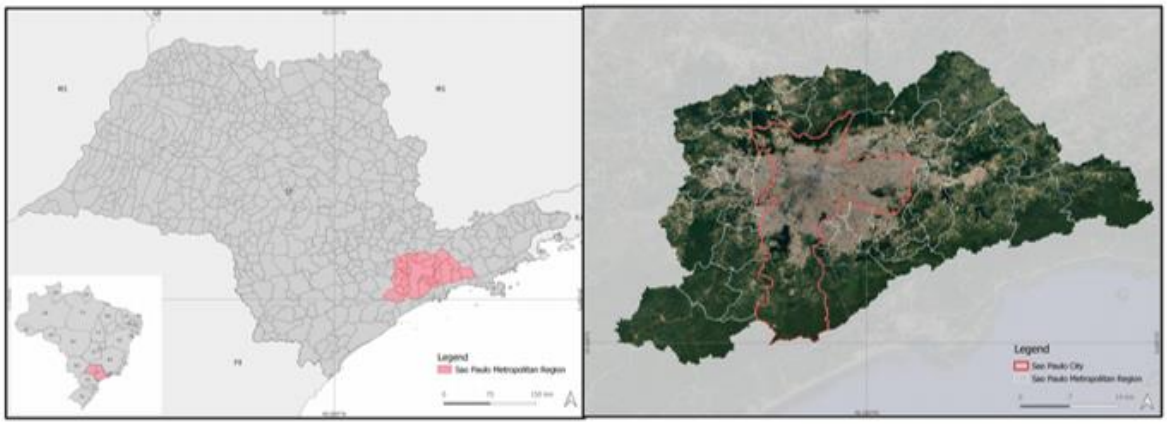
Water and Sanitation in the Sao Paulo Metropolitan Region (RMSP)

Leandro Miyazaki

MSc Student in Physical Geography at University of Sao Paulo, Brazil

Hydropolitcs Academy, Turkey, May 6, 2021

Sao Paulo Metropolitan Region (RMSP)

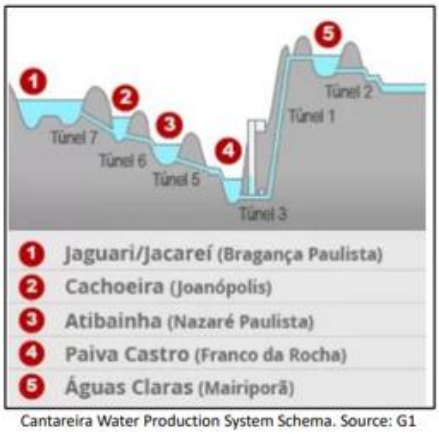


- 39 cities;
- 22 million inhabitants (12.3 million in Sao Paulo City);
- Largest industrial complex in Brazil;
- High demand for water and large amounts of sewage produced;
- Sao Paulo State Basic Sanitation Company (SABESP).

Water Production Systems

Water Production System	Total Volume (hm3)
Cantareira	982,04
Alto Tietê	560,35
Guarapiranga	171,20
Cotia	16,50
Rio Claro	13,66
São Lourenço	88,82
Rio Grande (Billings)	112,19
	1944,77

Source: SABESP (2021)



Cantareira Water Production System Schema. Source: G1

Cantareira is the largest one and supplies 9 million inhabitans in the RMSP

http://mananciais.sabesp.com.br/HidroMapas for current status on reservoir level in the RMSP

Water crisis between 2014-2016

Cantareira Water Production System. Source: G1

Cantareira Water Production System. Source: Reuters

Cantareira System collapsed;

Use of technical reserve from may 2014 to december 2015 – emergency construction work.

Water crisis on the media

Tabela 1 – Classificação temática de matérias jornalísticas sobre a crise hídrica de abastecimento da RMSP (dez. 2014/abr. 2015)

tema das matérias	no – %	subtemas	no – %
z	277 81,2%	nível dos reservatórios: choveu/não choveu	49 – 14,4%
		medidas governamentais: restrições	62 – 18,2%
		obras emergenciais	33 – 9,7%
		iniciativas individuais/locais/efeitos	87 – 25,5%
		outras (pontuais)	46 – 13,5%
causas da crise	64 18,8%	clima/devastação/natureza	30 – 8,8%
		governo estadual/Sabesp	29 – 8,5%
		matérias amplas/especialistas/históricas	2 – 0,6%
		outras	3 – 0,9%
total	341		

Source: Rodrigues & Villela (2015).

81,2% was about how the crisis was being managed:

- 25,5% local initiatives and effects, such as water waste;
- 18,2% emergency government measures, such as reduction on water pressure;
- 14,4% reservoir level (if it rained or not)

18,8% was about the causes of the crisis

- 8,8% natural causes
- 8,5% management (Sao Paulo State government and SABESP)

Question: Does the main responsibility relies on citizens?

Possible causes

Overuse of Cantareira System for at least 15 years until 2014 (maximum operation);

Changes on land use led to less water infiltration:

- In 2003, 70% of the basin was considered of antropic use,
  - 51% were grazing land

Population growth X water treatment production capacity:

ano	população (mi. habitantes)	capacidade máxima de produção (m³/s)	produção *per capita* (m³/s/mi. hab.)
1958	3,5	8,3	2,37
1980	12,5	59,7	4,77
2000	17,9	64,0	3,57
2014/15	20,9	69,7	3,33

Source: Rodrigues & Villela (2015).

SABESP change from public to a publicly traded company (1995) = water was not anymore a common good but profitable resource

What is the situation now?

- Cantareira System is still the main production system
- Billings Reservoir is larger than Cantareira (1.200hm3 X 982,04hm3) but only 9.2% is used (Rio Grande)
- Water losses is now 30%

  (SABESP):

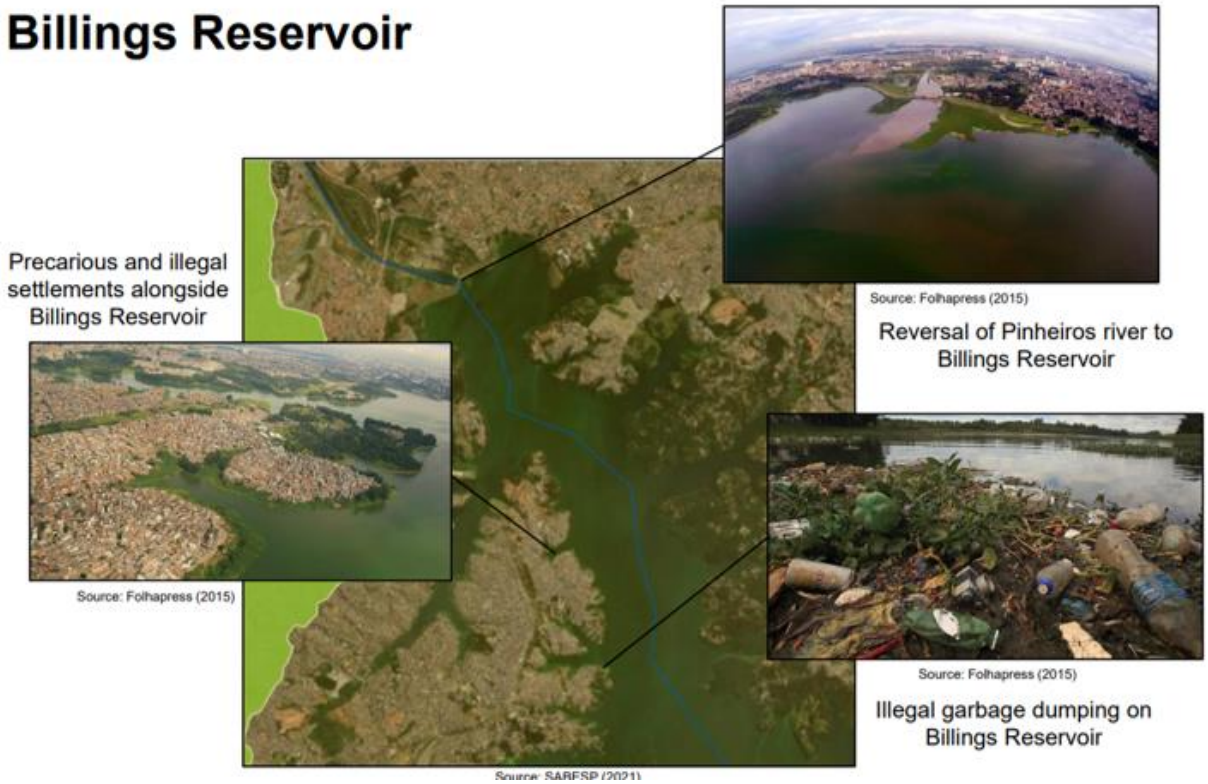
  - 19.5% due to leakages
  - 10.5% due to fraud and/or theft

Source: SNIS (2020).

- Pollution is still a challenge: Tiete and Pinheiros rivers and Billings Reservoir

Tiete and Pinheiros Rivers

Image Sources: Agência Brasil, R7, Folha (2020)



Conclusions?

- Pollution = management crisis
- Water supply X demand = management crisis
- Emergency constructions works = management crisis
- Integrated Water Resources Management
- Adaptive Water Resources Management

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Hydropolitics Academy

Webinar: 21st Century Water & Sanitation in Cities

Webinar Summary

The webinar was held at the Zoom platform on May 6th, 2021, with the participation of 42 academics, experts, and actors in the water resource management sector and urban development in general. It started with an introduction by the moderator, Kamal Jalouqa, who explained the importance of the subject of urban water in these times of urbanization, climate change, and limited potable water resources in almost every region of the world, and the need for immediate action to maintain a sufficient level of water supply to inhabitants and the sectors of the urban community. Jalouqa also explained how the water resource basins and sources played a significant role in defining the extent and locations of urban spatial and functional components, and how the urban planning and design tools can in turn help reconstitute the ecological system in cities. The Webinar was implemented interactively, and the following is a summary of the speaker's presentations and participant remarks.

Water for Liveability: transforming water management in cities

Professor Tony Wong, Monash University, Australia

Professor Wong gave a very interesting presentation on the importance of liveability that will be maintained with a continued water supply, sustaining the ecological system, and public acceptance of There is a growing trend in urban water management, shifting from managing water for life to managing water for liveability. And that water supply should be aimed at sustaining high levels of liveability with low impact on the ecological system in which cities are situated. He did so by explaining the functionality of the concepts related to liveability and by giving examples from stormwater harvesting in Singapore and urban design solutions for informal settlements in Makassar, Indonesia. Using mimicry of the ecological system and urban design as tools. The aim of research in this respect is to reach the ecological literacy of communities to improve sustainability and liveability in cities.

Water and Sanitation Services in Growing Cities

Panchali Saikia, Stockholm International Water Institute SIWI.

Another comprehensive presentation exhibits the activities of SIWI in transforming globally accepted policies into applicable goals and projects especially in creating liveable urban environments. The presentation shared insights on the current scenario on urban WASH services and how improved water governance will help drive towards inclusive, safe, and resilient cities. While water acts as a connector across sectors and stakeholders in an urban system, water governance is the catalyst and ultimate driver for enhancing urban resilience.

The presenter explained the concept of the City Water Resilience Approach (CWRA) that addresses the demand and abilities of cities to take a holistic view of their water systems, inform decision-makers of a strategy to take forward, and collaboratively build resilience to local water challenges. It provides a detailed process coupled with a set of tools and resources, which guide cities to make better planning and investment decisions for their city's water systems to be able to thrive and survive water-related shocks and stresses and improve water security for its inhabitants, giving pilot projects in the city of Cape Town and Miami.

Water and Sanitation Management in İstanbul (Case study)

Dursun Yıldız, president Hydropolitics Academy, Ankara, Turkey

The presenter explained the water resources that serve the city of Istanbul in relation to the population densities in both European and Anatolian parts of the city and how long can current water supply management policy be sustainable for İstanbul's Future

Mr. Yildiz showed with charts and tables that nearly all of Istanbul's drinking water (97%) comes from surface water collected in several reservoirs, and that the most important water sources are the Omerli-Darlik system on the Asian side and the Terkos-Alibeykoy system on the European side. Both systems consist of dams, reservoirs, water treatment plants, and pipelines. Many of the reservoirs that supply Istanbul are located within the metropolitan area and are exposed to pollution from settlements without adequate sanitation. Water quality is theoretically controlled by conservation zones around the reservoirs which limit construction and industrial activities in four concentric buffer zones with increasingly strict regulations the closer the zones are to the reservoirs[9,10]

The presenter went on by explaining the effects of the declining trend in rainfall, extreme events – especially two-year droughts, which seems to be more pronounced than in the past due to climate change and population growth, especially in the European sectors. And that additional developments like the construction of the Istanbul Canal, which will attract an additional 1.5 Million inhabitants will make the situation even more stressful.

Mr. Yildiz concluded by proposing some measures that will help in making the water management situation in the city more sustainable. Among these measures water demand management and the use of smart water management systems and making them part of decisions for all the stakeholders.

Amman Case Study by Kamal Jalouqa, the Development planner. The presenter served in the municipality of Amman, and later in the Greater Amman Municipality that was created upon a proposal by the Greater Amman Comprehensive Plan in 1987, the planning project that he managed. The presenter explained the situation of water

resources in the city that was once called the city of waters, but not anymore, as the situation of urbanization and the stressed water conditions. Jalouqa went on to explain the relationship between water resource management and urban development planning. And that the first modern-time plan of the city, which was prepared in 1955 respected the recharge areas of, the watershed that supplied the mainsprings which served the water needs of the population until the mid-1960's when the city started importing water from neighboring watersheds, and later on from resources which are 40, 60. 100 and even 320 Kilometers away. The presenter went on explaining how development detailed plans prepared later on covered the areas which were suggested to be reserved for watershed replenishing, and excessive zoning that consumed good agricultural lands that were estimated to serve a population of 10 million inhabitants, while the actual in 1987 was about one million, in 2000 2 million, and 4 million at present time due to forced migration from neighboring conflict zones. He concluded by giving some urban design solutions that would maintain the natural ecological system and considering the involvement of the municipality in the planning and operation of the water utility, which was given to a consortium of national and international companies.

Case Study of Sao Paulo, Water, and Sanitation in the Sao Paulo Region.

Leandro Miyazaki, Brasil

Mr. Mitazaki started the case study by saying that the Sao Paulo Metropolitan Region (RMSP), which houses 22 million inhabitants (IBGE, 2020), is the largest one in Brazil, 2nd in the Americas, and 10th in the world. Although since the 1990s integrated water resources management has been globally recognized and employed, including the state of Sao Paulo (Law 7663/1991), it still resulted in a period that was known as water crisis, that affected the lives of a large part of the population, between 2014 and 2016. According to Law 7663/1991, the Sao Paulo state was divided into 21 basins, being the RMSP almost entirely located in the Alto Tiete basin (35 of the 39 cities). The Alto Tiete basin is when compared to all other basins, the one with the lowest water supply rate per capita (130.68m3/year). In this context, with a large population and the lowest water supply rate, the task of water supply can be challenging.

San Paulo has seven reservoirs with a capacity of 1.9 Billion Cubic Meters, and although water scarcity is still a problem these days. Water available for supplying the city is around 59 percent of the total capacity. The reason for that is related to degrading water quality as some of the main resources are highly polluted and cannot be pumped to the users. As water-related complaints always appear in the Media mostly due to pollution and low pressure in the networks. During the water crisis, with the collapse of the main production system (Cantareira), which supplied around 9 million people at the time, what was seen were more discussions about emergency actions, such as decreasing water pressure and awareness of water waste (promoted mainly by the media), and less emphasis on integrated water resources management, that is, on what were the origins of the crisis.

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Participant remarks:

Jean Louis Olivier
Water supply and sanitation in Cities as everywhere (that has always been essential and vital) used to take into consideration geography and history as well as socio-economic and cultural conditions. Nowadays water and sanitation in Cities have also to take into consideration new challenges like Rapid demographic and urbanization growth, specifically along the seashores everywhere, Strong quantitative and qualitative impacts of climate change on surface water resources: flooding, droughts, typhoons, increasing temperature, the elevation of level and acidification of oceans, New chemical production, and dispersion worldwide in air, soil, and water, of micro and nano pollutants (plastics, ...), Economic development and scientific innovation, taking advantage of new technologies. In the global context, water and sanitation in cities become more complex and need careful adaptation and long term planning through - Diversify surface and groundwater resource mobilization for quantitative and qualitative safe supply, at the regional planning level: - Develop urban and industrial used water collection and minimum treatment, - Organize appropriate rainwater management in cities, - Develop solid waste collection and recycling as much as possible, - Take into consideration poor people needs and informal habitats.
In this perspective, water sector funding, both public or private, must be strengthened; and services management and tariffs are essential.

Sarah Hoeflich: The role of local governments should be intensified in water resource and sanitation management**,** and that can be done in cooperation with organizations like United Cities for Local Governance UCLG. Remunicipalization of water resource management should be reintroduced, because leaving the subject totally in the hands of the private sector may leave the urban poor underprivileged in terms of access to water.

Lessons learned from the Webinar:

1- Water played a significant role in the spatial decisions of urban development and cities were located near water sources. As cities grow the local water sources become insufficient and water will be brought in from remote locations, or by desalination of seawater. Water demand management can save water resources, making it possible to service additional population without the need to import water from remote or unconventional resources
2- Water resource and sanitation demand management are needed to reach maximum resource use. As additional water is needed to meet the demand of continued urbanization, more innovative methods are needed to restore the natural ecological system: urban replanning and design, smart solutions, and public involvement in decisions are some of the available tools.
3- Water supply management and city growth planning need to be integrated, and cities must consider remunicipalisation of utility setups and operations to enable the city administration to provide innovative methods, projects, and stakeholder satisfaction to both urban growth and water supply.
4- Universities, research centers and global, national, and local authorities should make use of the resulting recommended policy and tools. Special care in this respect should be given to help underdeveloped countries, regions, communities and individual families and economic sectors to reach a liveable ecological urban situation.

5- Water should be considered as a tool and necessity for liveability, not only as a material need for life. The general public and its representative organizations must intensify work to recreate a liveable environment for all citizens and urban functions.

Webinar recording link: https://www.youtube.com/watch?v=RV63lUsF85Y

21st Century
Water and Sanitation in Cities

zoom

How rising global risks are changing our cities?

WEBINAR

REPORT

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