# Time & Tide

A select history of water and people



Ver millennia, our relationship with water has been richly kaleidoscopic – somatic, cultural, and spiritual. About 60% of our body is water, the food that we eat comes from a magic alchemy of water, sunlight and soil. Water has been an integral part of our daily lives from the very beginning – in food, drink, cleansing, in rituals of birth and death, and everything in between. It's not surprising therefore, that many of the great, early civilizations flourished around rivers – the Tigris, the Euphrates, the Indus, the Nile, and the Ganges .

The answer to how we can resolve the emergent water crisis, perhaps lies in our learnings from the past. In tribute to humanity's ever evolving relationship to water, our report carries a special feature highlighting several sterling narratives on this aspect. The ingenuity of the Mayans, the engineering genius of the aqueducts of ancient Rome, and a 5,000 years old drainage system in Harappa that is marveled at even today; these are just a few examples of the featured stories that serve to inform and inspire. Time and Tide' tries to capture a small part of this long history, as the human race tries to keep the global water crisis at bay.

Scarcity of water tops the World Economic Forum's suggested list of risks to our planet. At Wipro, our engagement with water goes back more than a decade and spans a range of initiatives both, within our campuses, as well as outside with the larger community. Our initiatives around water efficiency, recycling and harvesting have resulted in a cumulative savings of more than 3,000 million liters over the last four years. In parallel, acting on the fundamental axiom that water is a collective resource that needs collaborative governance with other stakeholders, we started a program three years back in our campuses in Bangalore (Sarjapur) and Chennai, that sought to critically understand the larger picture of our water trail.

Water is the ultimate renewable resource as it cycles perennially through land, the oceans and the atmosphere. Yet, its delicate balance across geographies and seasons is disrupted easily, affecting the fates of millions. We hope that this leaflet is a small step towards information, education, and bringing about progress towards the changes that we want in our future.



# of water around

# North America

▶ ca. 500 AD, Yucatán Peninsula

the Mayans as the Yucatán Peninsula had little surface decided to build wing dams and closings dams to control water. They devised several water supply technologies to river flow, followed by levees to check flooding. Not adapt to this environment. Cenotes or underground caves, everyone was happy with the growing intervention were prized sources of water, so much so that the Mayans conservationists voiced their concerns initiating the kept their existence a secret from colonial powers. Above continuing battle for control over the Mississippi. the cenotes, on the surface, they had aguadas — reservoirs made in the craters they dug, using the mud to build their homes. In other places, elaborate cisterns called *chultuns* were engineered to re-direct run-off rainwater to various icatán towns. These simple, low cost sustainable method are as relevant today when water shortage isn't limited to A network of tunnels and aqueducts in the Big Apple meets naturally arid regions.

#### The Great Lakes and America's first people ▶ 1500 AD, USA, Canada

The Great Lakes, a chain of five lakes — Superior, Michigan, potable water across the five boroughs of the city. Huron, Erie, and Ontario — together form the largest group of freshwater lakes on earth. Stretching from New York to tribes. The first "foreigners" entered these lands in the 1500s, bringing with them new items of trade, strange Revolution saw relocation and assim S government both forced on and subsequently rejec by the natives. For the last 25 years, the Great Lakes Indian Tribes have been fighting for their political sovereignty with significant success.

#### Present day Mexico City rests on a dry lake, drained of its former glory ▶ 1521 AD, Mexico City

ousands of years ago, a large lake called Texcoco occ area served as a cradle for successive Mesoa civilizations. The Aztecs arrived in the 13th century made Tenochtitlan their capital. They built a network canals and dykes, fertile gardens and massive temples. In sheer size and appearance draws tourists from the world **The pristine waterfalls of Igazu** 1521, the invading Spaniards destroyed the city, building a 👘 over, who come to see the great dam America built way 🛛 💛 have awed tourists for centuries new capital in its place. Mexico rested on drained canals back in 1935, while in the depths of the Great Depression. NA 56 > 1541 AD, Brazil-Argentina border and lakes of Tenochtitlan, and wasn't a patch on its predecessor. Water shortage was a direct consequer something which the city is still grappling with.

## The development of the Mississippi ▶ 1673 AD, USA

The banks of the Mississippi have been home to erations of natives, who lived, farmed and built their lives along it. The French were the first among many foreigners to foray into the Upper Mississippi region, Ancient Mayan water technology turning the river into a pulsating trade and transport route Fortunes changed when railroads and ships came into the picture, sidelining river transport which was already Water had always been a pressing concern for considered risky. It was then that the US government

#### New York City, home to the world's largest water supply system ▶ 1842 AD, New York City. USA

the daily water needs of eight million New Yorkers with ease. In 1842, the Old Croton Aqueduct was built, carrying almost 90 million gallons of water into the city per day. The following years saw newer reservoirs and the New Croton Aqueduct in 1890. The consolidated distribution system in

## Hoover, the world's tallest dam 1935 AD, Arizona-Nevada border, USA

The Hoover Dam stands 725 feet tall with a base diseases, and an alien culture. Over the years, the Native <u>comparable to the length of two foot ball fields. It took five</u> mericans became pawns in the war for the control of years and 21,000 men to build the dam, which confines the colonizing Europeans. The years after the American southern California and Arizona from disastrous floods. Its keep dwindling.

A network of fountains supplied clean water to the ancient city of Machu Picchu ▶ 1450 AD. Machu Picchu. Peru



After over 11 million years, the Amazon has begun to shrink ▶ 1541 AD, Amazon

If one goes by the geological clock, the desire to control the Amazon is relatively new. For the basin of the world's longest river has been inhabited for ten thousand years - by tribes, both big and small. Foreigners came in 1541 **Still functional toda** and yet it was only when the value of natural latex was realised that the world turned its eyes to the Amazon. The emand continues to be high, with Brazil controlling the While the rich and the poor of ancient Rome led very world rubber monopoly. In an effort to secure this control, different lives, they did have equal and uninterrupted the government is building roads through the jungles of access to one thing: water. The Romans were skilled Amazon today, causing widespread deforestation in the engineers and conceptualized an elaborate system of North America, first bullied and then appeased by the rough waters of the Colorado River to Lake Mead, protecting process. As the tree cover thins, the waters of the Amazon winding aqueducts which carried water to all parts of this



Paraguay and Brazil equally rea the benefits of the Itaipu Dam which they iointly built ▶ 1991 AD, Paraguay and Brazil

📕 Hamza, an undergrou<u>nd river,</u> as long as the Amazon, but wider ▶ 2012 AD. Brazil

he Rio Hamza was probably one of Amazon's best kept secrets, until it was discovered in 2012. Flowing four kilometres under the Amazon, the "underground" River Hamza equals it in length but is at least a hundred times wider. Named after and discovered by Valiva Mannathal Hamza and his team at the National Observatory in Rio, the river flows west to east, from the Andean foothills to the Atlantic coast. The fact that it flows in the same direction as the Amazon, is enough to gualify them as twin rivers, it comes to width and flow speed.

Many believe that submerge ancient cities lie beneath the waters of Lake Titicaca ▶ Present day, Bolivia-Peru border

## 2000 year old Roman aqueducts are ► ca. 300 BC, Rome, Italy

ancient city. Be it a private villa, or a public bath, water eached these places from a seemingly invisible network nd aqueducts built from a special combinatior of stone, brick, and cement. Ducts concealed in colossal









bridges and arches, crisscrossed the city, feeding water int fountains and fields. Today, one can still find the reside of Rome, just like their ancestors, filling bottles from th Trevi Fountain, which gets its water from the Acqua Vergin revived during the Renaissance.

In medieval Europe, technolog replaced manual labour as waterwheels began to crop up in the countryside ▶ ca. 1100 AD, England, Germany, France

In 19th century England, the rive Thames was filthy and homes lacked plumbing and running wate ▶ ca. 1800 AD, England

#### The Rhine. lifeline of the Roman Empire

Present day, Central and Eastern Europe

The Rhine, the second longest river in Europe, was one bridged and crossed by the great Julius Caesar. This eas the empire declined, many powers fought to contro While centuries of political realignments contin changed the borders of the countries along the Rhine, th castles along the river survived them all. Built by Rom emperors to protect their lands, they tell the history of region nourished by the mighty river.

#### The Danube has seen the rise and fall of many empires

Present day, Central and Eastern Europe

Once an invincible frontier for the mighty Roman Emp the Danube today forms the boundaries of eight differe European countries. It is the longest river of the Europe flowing for almost 3,000 km before it finally drains Black Sea, While the Rhine has always been given ecor precedence over the Danube, the latter did support th growth of two major empires: the Austrian and Hun

> ousands flock to Lourdes every year for a touch of its "miracle water" Present Day, France



## frica

The Masai of Kenya worship Engai the rain god, who has both a structive and benevolent side

Aquifiers have been installed across Libya to access its precious underground fossil water ▶ 1983 AD. Libva

How Namibia secured her water supply ▶ 2002 AD, Windhoek, Namibia

Namibia, droughts are commonplace and rainfall, scarce, Vater shortage is a perpetual concern in its capital, ndhoek, which has battled the problem with a secret apon: waste water reclamation. It was first put into ctice in 1968 with the building of the Goreangab Water mation plant. The city continues to innovate in the of climate change. Built in 2002, the New Goreangab amation Plant is a great example of internationally <u>pliant advan</u>ced technology in water reclamation

#### Political interests dominate the Nile Present day, Egypt/Ethiopia

he world's longest river flows through eleven African ntries many of which have been involved in protracted <u>ients over it. Egypt and Sudan signed an</u> ent in 1959, settling issues over water sharing rights good. However, new projects are still a cause of conflict mong most Nile basin countries, who are already gling to meet their water needs. While Egypt functions ally, diverting billions of cubic meters of Nile water the Sinai desert, Ethiopia is busy signing water sharing ements with other nations.

#### Lake Chad shrinks to a twentieth Of its original size Present day, West Africa

begin to evaporate, communities and countries fight over e remains. Besides an imbalance in the demand-supply ), climate change is a major contributor to the plight of ake Chad today. Loss of jobs and increasing poverty are rect outcomes, forcing many communities to migrate to

## Asia

In Chinese mythology, weather and acres of land surrounding it. water are commanded by firening dragon

#### The world's first civilization thrived on the banks the of Tigris-Euphrates ▶ 5000-3500 BC. Mesopotamia

fed and watered by the Tigris and Euphrates rivers. In system which efficiently met its water requirements. accelerating trade and transport. Today, both rivers have castle. been dammed for electricity and other purposes. As a result, desert land has expanded and the rivers have become a 🦉 source of political tension

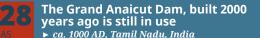


#### The Indus Valley's efficient drainage system ▶ ca. 3000 BC. Mohenio-daro. Dholavira. Present day Pakistan and India

In the ancient city of Mohenjo-daro, the people of the Indus has generations swearing by its purity and healing properties. Valley Civilization lived in mud houses along right angled The high quantity of magnesium, calcium salts and fluorides treets with indoor bathrooms that connected to a network make it germ-free and potable, without ever having to treat of well-planned drains. Wooden screens kept solid waste it chemically. Surrounded by glass panels in a basement out of the system, and covered drains were punctuated with room, the well is under constant surveillance; the water, pH removable slabs to allow easy cleaning. At Dholavira in levels and electric cond present day Kutch, known for its arid climes and salt pans, monitor. Thousands of pilgrims come here every year, potable water was accessed through an intricate system of satisfying their thirst for both water and blessings. stone canals and deep reservoirs

#### The mystery of the Saraswati ▶ 1500 BC, Rajasthan, India

Saraswati used to flow through the Thar 🛛 desert back when it was a fertile land inhabited by 🛛 🍒 flourishing civilizations. Sometime around 3000 BC, the river began to dry up giving way to a vast desert of three rivers in north India, which is the site for the through a \$62 billion project. This will ease the water crises nistoric Maha Kumhh Mel



While the Early Cholas ruled ancient India only for a century, they created something which has lasted many more. The Grand Anaicut dam, built by them in the 2nd century AD, diverted waters of the Kaveri river, irrigating

the surrounding areas of the Chola dynasty. Years later, engineers used it as a prototype to build other dams. What's feet high, is still fully functional today, irrigating 1,000,000

#### An advanced hydraulic enginee system existed on an ancient rock in Sri Lanka ▶ 475 - 495 AD. Sri Lanka

Atop a 200 meter vertical column once lay Sigiriya, the ancient capital of Sri Lankan king, Kashyapa. Today only Mesopotamia, which literally means, 'the land between the ruins survive of this 5th century architectural marvel, but rivers', was home to possibly the world's first civilization. thousands of years ago. Sigiriya had an advanced hydraulic heavily, spilling beyond their Reservoirs, cisterns and canals ensured that plenty of water banks, leaving behind rich, cultivable soil once they reached the castle. Much of this inflow was used to receded. The rivers also carried goods and people. landscape the Water and Boulder Gardens surrounding the

#### Water never runs drv in Mecca's amous Zamzam wel ▶ 771 AD, Saudi Arabia

Legend has it that the Zamzam well in Mecca has never run dry, ever since it miraculously guenched the thirst of Prophet holy Kaabah, and excavated by hand, the 35 meter deep well

> wells were ideal pitstops for tired travellers in ancient India ▶ 1499 AD, India

## Redirecting rivers in China ▶ 1952 AD, China

The Chinese government's South-North Water s the waters of the once large Lake Chad in West Africa to its decline. Although physically absent, the Saraswati is Transfer initiative diverts large volumes of water from the the third river of the *Triveni Sangam*, or the holy confluence Yangtze River in the south to the Yellow River in the north in cities like Beijing and Tianjin in the north but at least 330,000 people will lose their homes and jobs down south. **The Grand Anaicut Dam, built 2000** Pollution levels will rise and water will become unfit for onsumption. Though the transfer has already started, the emphasis on sensible approaches like rainwater harvesting by some has inspired locals to adopt it in their daily lives.

#### 21 million Chinese get their drinking water from rainwater harvesting in Gansu ▶ 1980 AD, Gansu, China

Gansu was such a success that it quickly spread to other long, dry expanse of desert land in between. parts of the country and the world. Today China, a country often criticised for its environn mental excesses, is givir lessons in water management to Nigeria, Saudi Arabia Algeria.

In the conflict-rayaged middle eas the lordan River is an arbiter of cooperation ▶ 2010 AD, Jordan, Syria, Israel

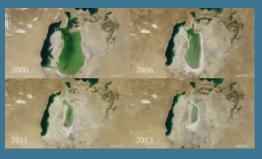
In the centre of the Middle Eastern conflict, the Jordan Riv has been exploited by Israel and its neighbours. Wit multiple dams channelling water into the farms in Jord Syria and Israel, what is left of the lower Jordan is sludge, often toxic. Since 1950, 30 out of 32 military conflicts over water have been along the Jordan River. What's hearte is that even in the midst of war, Jordan and Israel agreed on a water sharing framework in the 1970s. While hostili ration over water continues — even if Palestinians water i back from Israel's Merokot.

water runs deep Present day, Rajasthan, India

Across the Thar, besides palar pani (rain water) and patal The world's deepest lake is home pani (underground water), villages are nourished by rejwani *pani* (surface water that doesn't make it to the water table). to unique species of flora and fauna Present day, Siberia formed almost 30 lakh years ago. The layer hardens whe it comes in contact with water, keeping it from trickling Discovered in the 16th century, the beautiful Lake Baikal is down to the water table while the sand prevents the trapped the deepest lake in the world at 1.637 meters deep. It is home ting back into the atmosphere. The 🔰 to diverse flora and fauna, most of which isn't found cavity of a specially constructed *kuin*, a small and narrow anywhere else in the world. The Baikal is so loved that the well, turns the humidity into drops of water. The *kuin's* Russians make it a point to go see it at least once in their life. circumference is kept to a minimum to prevent evaporation. The surface area of the Baikal Lake covers a large part of In places like Jaisalmer, which witnessed its lowest annual 👘 Eastern Siberia, but an even larger part of its citizens' hearts. average rainfall last year at 7mm, *kuins* serve as efficient water retainers. Like a *kuin*, Lake Jaseri has a *bittu ro ballyo*, lions visit the mighty Gange owing through the heart of India. or a layer of stone which prevents rain thereby maintaining a fixed water level all year around. Present day, India

## The shrinking Aral Sea ▶ Present dav. Russia

In 1991, the Soviet government collapsed, and took, along with it, the rich waters of the Aral Sea. Located Farmers of Gansu in China have been collecting rainwater between Kazakhstan and Uzbekistan, this large water body for their daily use for thousands of years. But its full gave life to the deserts of Central Asia, and was home to at potential was realised only in 1980, when the Gansu least a hundred varieties of aquatic species. Today, it has Research Institute for Water Conservancy introduced new lost 80% of its volume, and is almost one fifth its origin. methods of rainwater harvesting which trumped traditional size. It started when the Soviets diverted River Amu and ones. Clays roofs and courtyards gave way to cemented River Syr — the two sources of water for the Aral — for ones, and cellars were dug up to collect run-off rainwater. irrigation. With its water supply cut off, the Aral Sea started The people of Gansu survived a historic drought in 1995, evaporating and its animal species slowly disappeared relying solely on harvested rainwater. The water project of Today the waters of the Aral sea have bifurcated, leaving a



ainwater harvesting in a raditional sumo arena Present day, Tokyo, Japan

flare up regularly between Israel and Palestine today, their It was a sumo wrestling arena that led the way to conscious end up buying underground water from their own land in Tokyo has a 8,400 square meter rooftop, which acts as catchment surface for collecting rainwater. Other public facilities have introduced similar systems throughout the In the deserts of Rajasthan, rain capital. Today many households across the capital have, installed the rojison, a unique water utilization facility which uses a hand pump to collect rainwater for gardening, fire-fighting and consumption.

Australia

The rainbow serpent tickled a fr to produce streams and lakes, s poriginal Dreamtime myths ► Australia

New Zealand's first public water upply project couldn't cope with fising demand ▶ 1874 AD. Wellington. New Zealand

reservoir was a boat-shaped dam in the suburb of Karori Antarctica, by an ocean. Thanks to this difference, there are which diverted the waters of the Te Aro Stream via a series — several other contr of cast iron pipes. Another dam, the Lower Karori, built on 🔰 than the ice at the South Pole, and its biodiversity is less he Kaiwharawhara Stream was completed in 1878, spelling 🚽 endemic. But perhaps the starkest contrast of them all i the end of Wellington's water woes — but not for long as it age: glaciation and winter ice cover developed in the Arctic demands.

#### ellington's second attempt at ate water supply fails with 🛛 🛨 🔍 its two ends iomata dam ▶ 1884 AD, Wainuiomata, New Zealand

Fhings didn't quite go according to plan as the dam was 🔰 surface water but large saline lakes exist in its oasis areas water supply and distribution in the years to come. sheets and glaciers.

#### ustralia tackles water shortage with citizens' cooperation Present day, Australia

Australia, in her entire history, has never dealt with a water crisis. But water is far from easily available in the land As the earth's climate undergoes a slow but dramatic change down under. It is the driest continent on earth, and this masses of glaciers and ice sheets have begun to melt and droughts and increasing aridity, limited resources and water, which many areas rely on, will soon reduce as the up and take notice. Citizens and companies, are consciously increase in sea water levels the world over. With levels risin usage. Active steps in water preservation such as seawater inundation especially in the coastal regions — evacuation desalination, recycling wastewater and rain water looms large in the future of some island nations of the world. harvesting are being undertaken by the government.

The health of the Murray and Darling rivers suffers while their erted waters bring prosperity to their banks Present day, Australia

# Antarctica 8 the Arti

The two ends of the polar region 🕑 are truly poles apart ▶ Present day, Both the Arctic nd the Antarctic

While the term 'polar regions' and an atypical climate club the Antarctic and Arctic regions together, the two ends of the earth are quite different. The biggest difference is Started in 1871, Wellington's first public water supply geography; the Arctic is surrounded by land while couldn't keep up with population growth and industrial 👘 only two million years ago, as opposed to Antarctica where it did almost 14 million years ago.



# The world's freshwater, frozen at

▶ Present day, Both the Arctic nd the Antarctic

Grappling with the water supply failure in Wellington, the The glaciers and ice sheets found at the Poles is home to government of New Zealand looked at Wainuiomata, about almost 78% of the earth's freshwater with another sizeable 27 kilometres away from the city. A small dam, with a chunk in Greenland. Approximately 7,000,000 cubic metres pipeline carrying water to Wellington was built in 1884. of freshwater covers the glo<u>be today. Antarctica has little</u> ravaged by floodwaters more than once. A huge financial with some coastal ponds in the peripheral regions. 68% of ed to many controversies about polar freshwater lies frozen and locked beneath its ice

> Global warming and melting polar ice Present day, Both the Arctic

poses a big challenge for water management. Instances of slowly disappear, particularly at the Polar Regions. Run off rowing demands have nudged the folks of Australia to sit 🔰 glaciers melt and disappear. An indirect impact is the trying to restrict their residential and commercial water by about 3.1mm per year, there is widespread fear of



