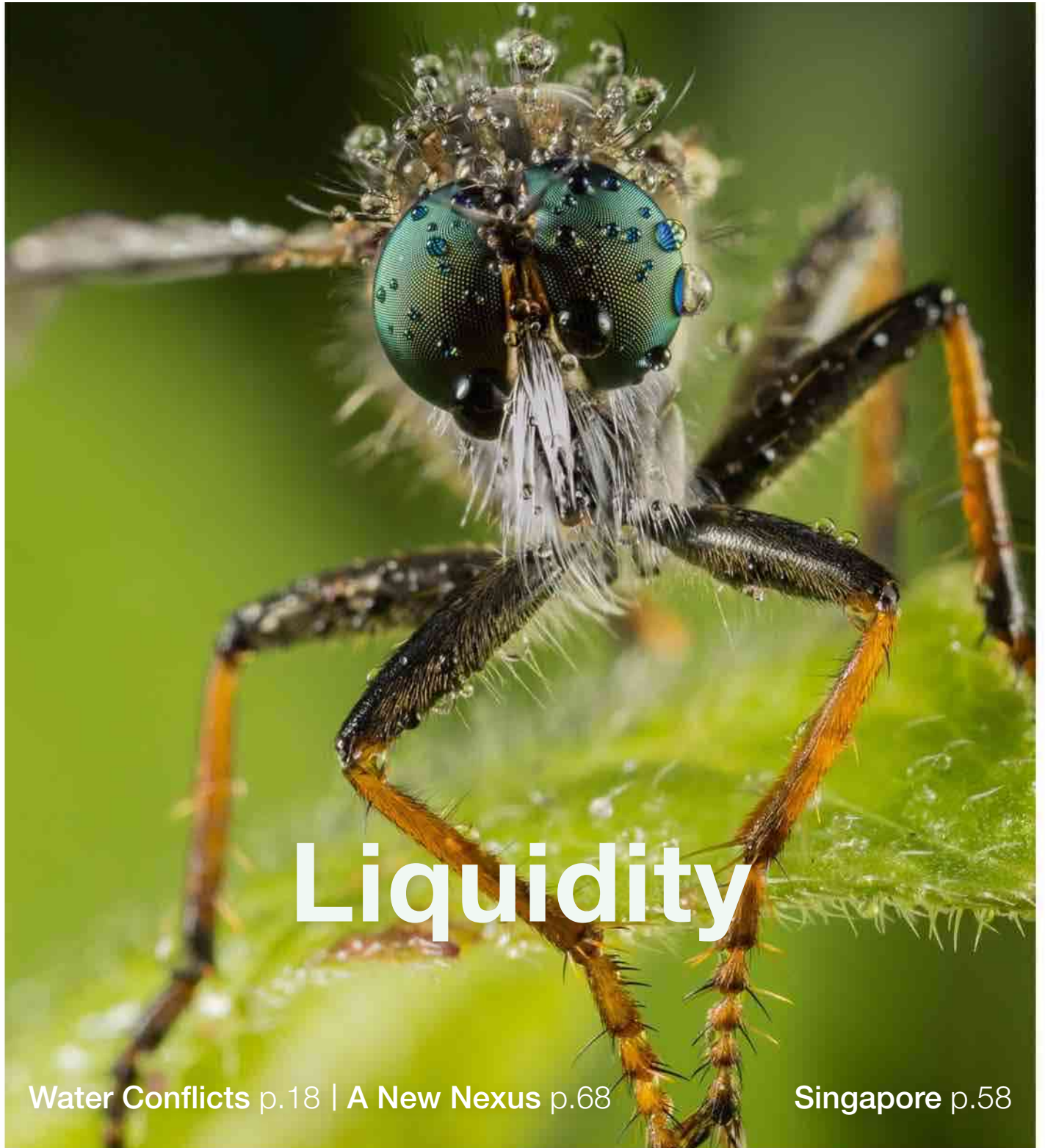


REVOLVE



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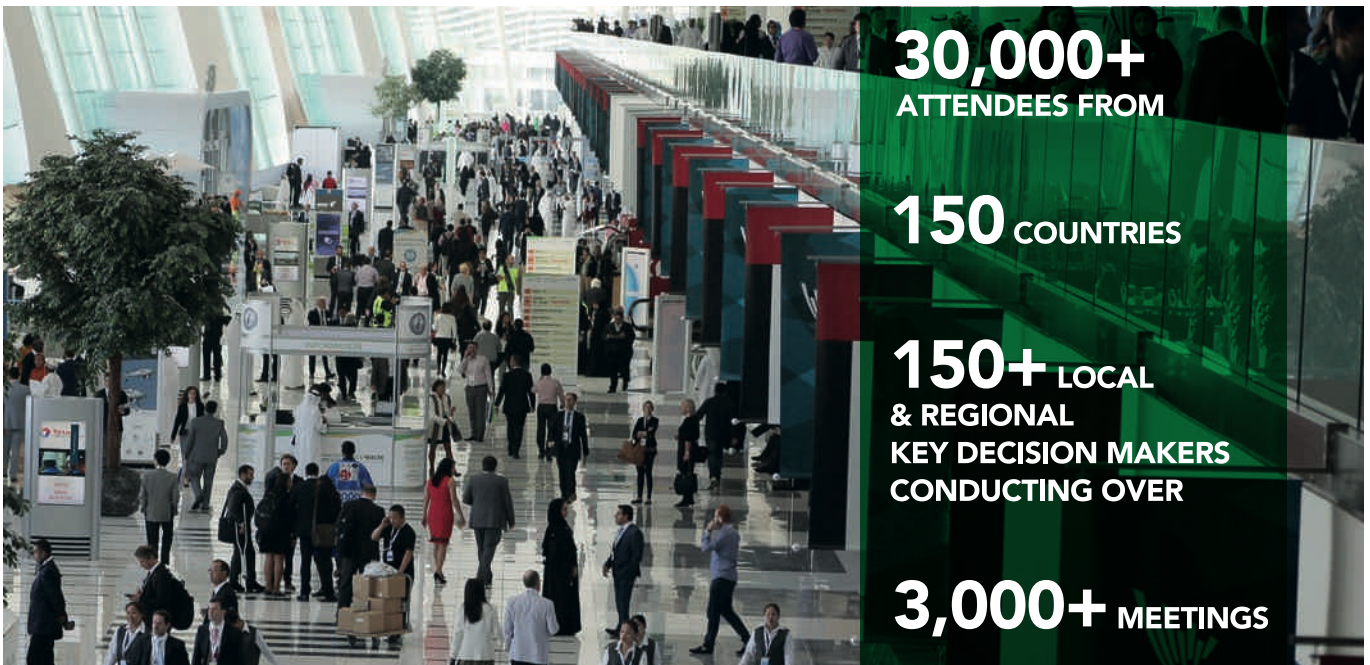
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Cover image: Robber Fly, *Promachus yesonicus*,
Mitsuike Park, Yokohama, Japan.
Source: Mark Thorpe



Investing in Water around the MENA

Writer: Stuart Reigeluth is founder of Revolve Media and Vice-President of Revolve Water.

There is a looming water crisis that is beginning to manifest itself in very serious ways across North Africa and the Middle East (MENA) regions. The general public seems oblivious to the threat and national ministries often seem to be looking the other way, but the data is there now:

According to NASA, we are experiencing the worst drought in 900 years as mentioned by HRH Princess Sumaya of Jordan at the opening of the first AMWAJ ("waves" in Arabic) forum in Amman on 28-29 November about advancing sustainability and entrepreneurship around MENA.

MENA is the most water-scarce region in the world. Water availability per person per year has declined sharply over the last 50 years and is today a tenth of the average global water availability. In Jordan, water availability declined from 3,600 cubic meters per person/year in 1946 to 128 cubic meters today.

This is a drastic and worrying decline and yet many people in the MENA remain unaware of the water crisis – of its causes, its long-term impacts and why certain viable solutions are not being implemented. What are some of the solutions?

Public-Private Partnerships (PPPs)

On a big scale (starting with at least \$100 million), "PPPs are on the rise and come in many forms", stated Koussai Quteishat, former Jordanian Minister of Water, at the 2nd UfM Regional Conference on Governance & Financing for the Mediterranean Water Sector in Tunis on 5-6 December.

"PPPs are complex structures that only work in specific circumstances", claimed Marcos Martinez from the European Bank for Reconstruction and Development (EBRD) who gave two PPP success stories: As-Samra Wastewater Treatment Plant in Jordan and the New Cairo Project in Egypt.

Incidentally, at the AMWAJ forum in Amman, Revolve led a field trip to As-Samra WWTP in partnership with the Millennium Challenge Corporation (MCC) to show young professional journalists, researchers and policy-makers how the 'complex structure' works.

As-Samra channels the 'grey' (sewage) water from Amman towards Zarqa. The

natural gradient gravity flow turns a turbine that generates electricity to power the Jordanian capital. The waste water is then treated and sent on for irrigation purposes in the agricultural fields around Zarqa.

The complexity arises in the financial meanders of the PPP: As-Samra consists of a grant from the U.S. government, a loan from a consortium of banks via the Arab Bank, and the As-Samra Project Company that is paid for its services by the Jordan Ministry of Water for the provision of 'clean' water.

"PPPs are complex structures that only work in specific circumstances"



Tartous, Syria, on the eastern Mediterranean. Source: Adel Samara

The Water-Migration-Employment Nexus

It's all about clean water; about how to provide it to more and more people; and who provides it at what cost and price. Just as the “final objective of PPPs is creating positive social impact”, as mentioned by Mr. Quteishat, so the reform of the water sector is meant to benefit society at large.

According to Bruno Denis from the European Investment Bank (EIB), 1.5 billion euros was invested in southern Mediterranean countries in 2015, 10% of which went to water and sanitation projects. And there remains a colossal need to revamp aging infrastructure that suffer from disrepair and leakages.

Irrevocably, this will mean involving the private sector more. “This does not mean the privatization of water services,” stated Marie-Alexandra Veilleux-Laborie of EBRD Tunisia. It means helping authorities provide better basic

water services, such as potable water to its citizens at an affordable price.

Investing in water is a massive long-term endeavor. It involves upgrading thousands of kilometers of tubes and pipes, but ultimately it means improving environmental standards, and in the process, it has the tremendous potential of creating many jobs (see the 2016 UN Water for Jobs report).

Coined by the Global Water Partnership (GWP) – Mediterranean, we are seeing the emergence of a new nexus that revolves around addressing the pressing need to provide water security to southern Mediterranean populations to slow migration flows to Europe by creating more employment.

The Mediterranean water challenge is a Malthusian trap: with rampant population growth and depleting resources,

demand is now outpacing supply; plus political instability, neighboring conflicts, general job malaise, prolonged droughts across MENA... and everyone seems to be waiting for the rain. ☀️

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This editorial first appeared in Al-Ahram Weekly (Egypt) and Gulf News (UAE) in December 2016.

Lebanon's Garbage Crisis

Overflowing garbage bins...waste piling up... burning trash in the middle of the city...some people wearing masks against the smell and the bacteria; others trying to hold their breath while passing mountains of garbage. This is what you could observe in the summer of 2015 in Beirut, when the current garbage crisis broke out in the Lebanese capital.

Writer: Julia Strobl

Road leading from Beirut to Tripoli (north of Lebanon). Desperate citizens have burnt the trash as they were afraid of diseases, rats etc. and wanted to reduce the size of the huge mountains of trash

Source: Hassan Chamoun



Waste Lebanon

Until the outbreak of the crisis, the landfill Naameh received the unseparated and untreated waste from Beirut and from the areas of Mount Lebanon, which surround the capital. The Naameh-dumpsite was created in 1997 as an emergency solution to a garbage crisis that shook the country at the time. Back then, residents close to the Bourj Hammoud dumpsite protested, effectively closed the dumpsite, and so waste piled up in the streets – until the Naameh landfill was created as a contingency solution.

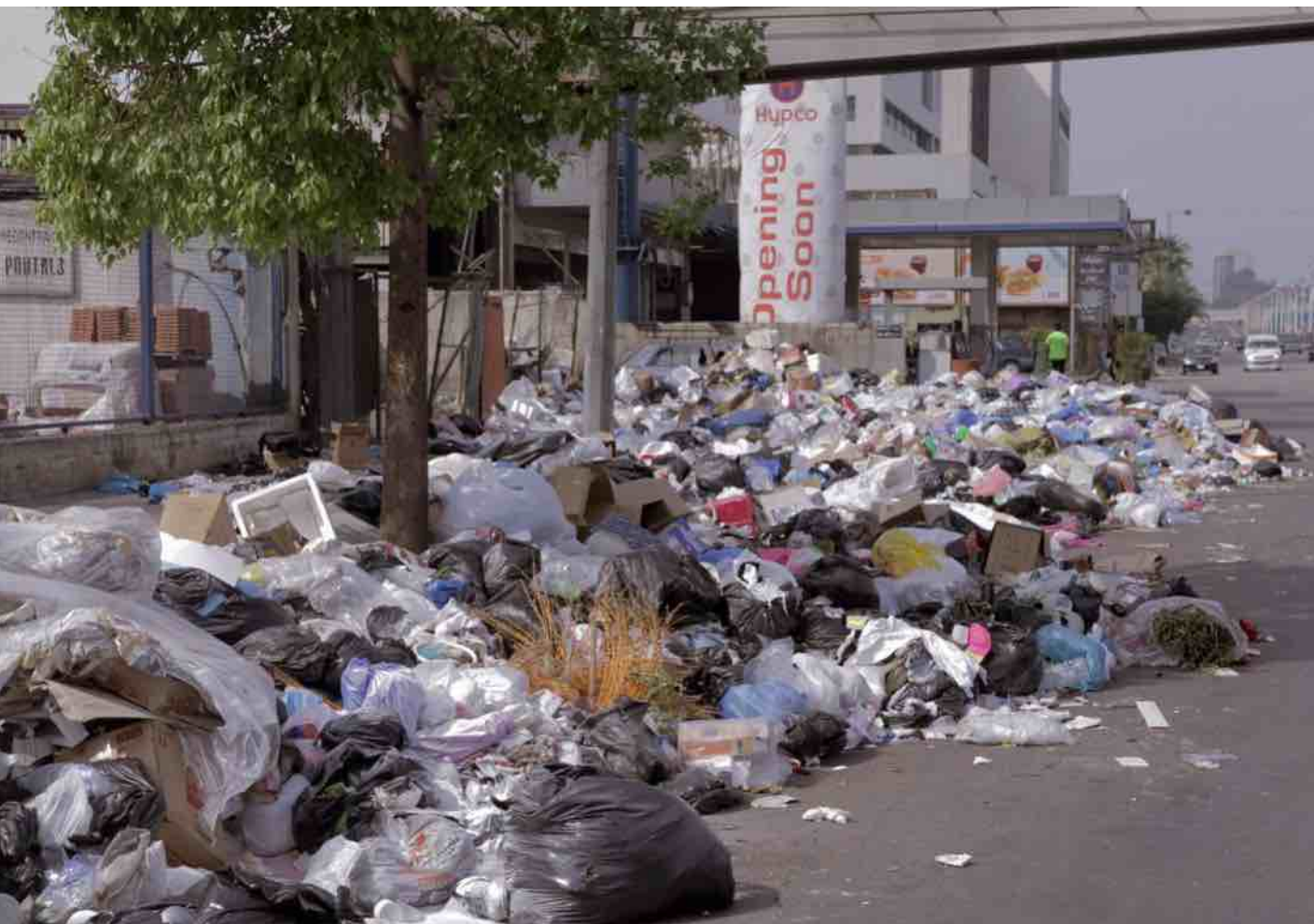
This emergency solution was supposed to be a temporary one, as the landfill would be shut down in 2003 and replaced by a proper national waste management plan. The closing date of the landfill, however, was continuously postponed by the author-

ities. This eventually led to the landfill still receiving waste almost two decades after its inauguration. The residents of Naameh protested having the landfill in their neighbourhood on different occasions and each time they were pacified with promises that the landfill would get closed. New deadlines were set, but never met. This was also the case on July 17, 2015. However, this time the residents would not give in and their protests eventually led to the closure of the landfill. As no alternative solution for the waste disposal was provided by the government, the waste remained in the streets of Beirut and Mount Lebanon, accumulating in mounds of garbage.

After this, it did not take long until the citizens of Beirut and Mount Lebanon joined the residents of Naameh and pro-

tested this unsanitary and environmental catastrophe. Soon, the residents of other Lebanese cities joined, demanding a proper treatment of their waste. At the same time, many used the opportunity of this growing social movement to demand, among others, proper electricity supply, public spaces, the end of corruption and a change of the currently sectarian system to a secular political system.

Garbage piling up in Burj Hammoud, just north of Beirut, Lebanon.
Source: Hassan Chamoun





Mounds of trash next to a seaside road east of Beirut, Lebanon.
Source: Hassan Chamoun

Solid waste (mis)management in Lebanon

Waste mismanagement has a long history in Lebanon. In the years of the Lebanese Civil War (1975-1990), all the waste, including construction waste due to houses being destructed, was dumped at the Normandy landfill. This dumpsite is located along the coast off the capital's downtown. Originally, the site was situated at a small bay, cutting 200m into the land. However, the waste dumped there accumulated and thus extended the shores for about 600m beyond the original coastline. The usage of the dumpsite was suspended in 1994; by that time, the landfill had reached a volume of 5 million m³. After its closure, the reclaimed land was transformed into an artificial coastline and became a profitable piece of land for private investors, providing possibilities for real estate investments.

Also in 1994, the Council of Ministers contracted the private company Sukleen to provide solid waste manage-

ment services for Beirut. However, the contract between the government and Sukleen is illegal: the right and duty to organize solid waste collection and disposal lies by law in the hands of the municipalities.

The decision was made nonetheless, even though there was another striking argument for not contracting the company: The Municipality of Beirut had developed a waste management

The usage of the
dumpsite was
suspended in 1994;
by that time, the
landfill had reached
a volume of
5 million m³

plan in the same years as Sukleen. The municipality's plan would have cost half of the amount requested by the company. Strangely, the plan elaborated by the municipality was not considered, and Sukleen was awarded instead. *The Daily Star*, a Lebanese newspaper, published an interview with the head of Sukleen, which might provide an explanation for the decision made by the Council of Ministers: Maysara Sukkar acknowledged in this interview the need for ties with politicians in order to do business in Lebanon and to flourish: The company's service area got continuously expanded until including the areas of Mount Lebanon. Between 1994 and 2015, the contracts with the company have been constantly extended, while Sukleen's costs increased exponentially throughout these years.

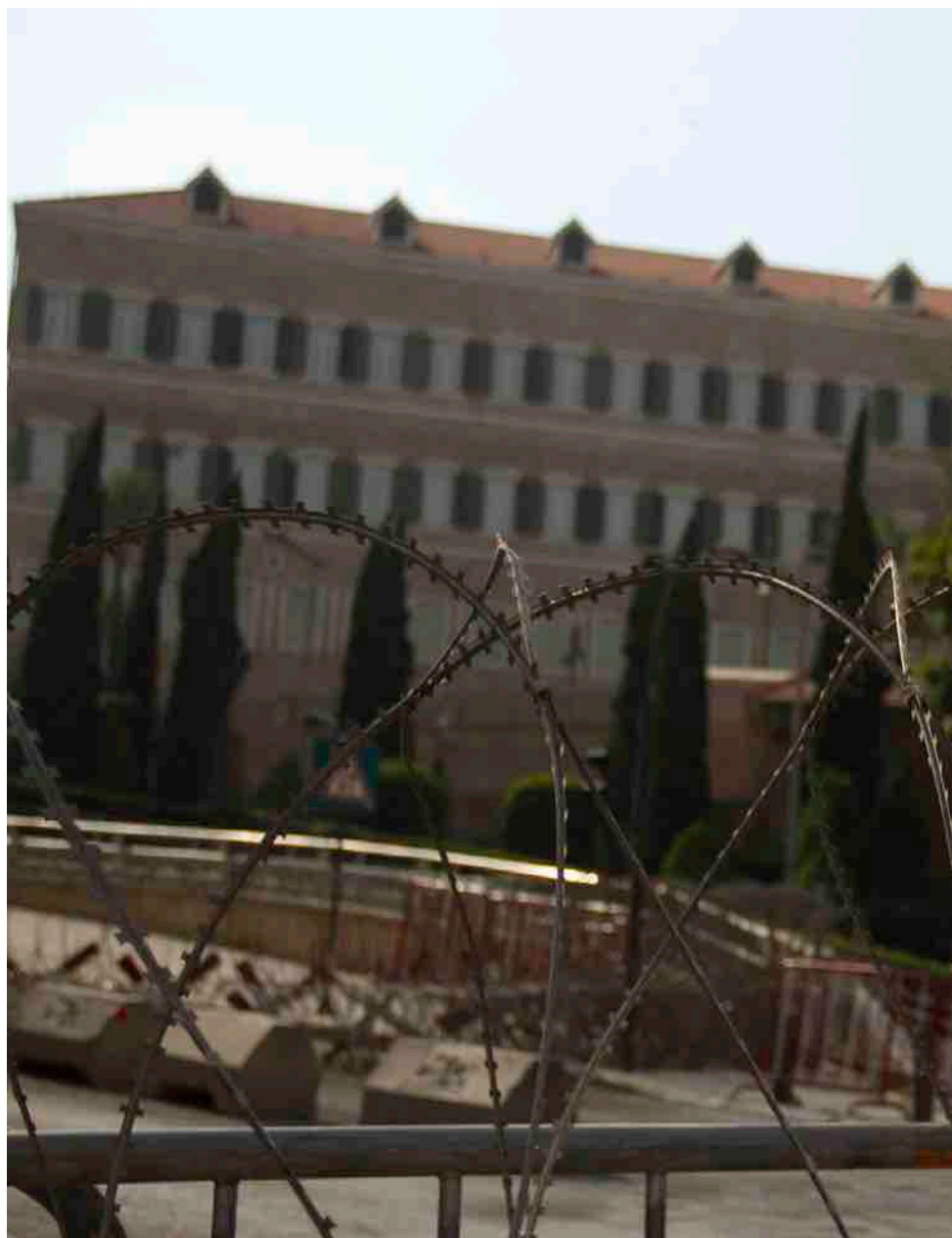
The rates the government pays for waste collection and disposal services eventually reached \$147 per ton in

Waste Lebanon

2015, which is nearly double the global rate of \$75 per ton, and almost four times the regional average of \$40 per ton. The company is still being paid through mechanisms that are pending regularization. It is supposed to get paid through the so called “independent monetary fund” that was created in the post-war years to support the financially weak municipalities. However, this fund would have to get paid to the municipalities first, who then would pay for waste management services. Yet, the government centralized waste management and instead of handing the money over to municipalities, Sukleen is currently paid directly from the treasury.

The garbage crisis proved to be a good excuse to extend Sukleen’s contracts, as there was no alternative to a dumpsite

The Lebanese government had set July 17, 2015 for the closure of the Naameh landfill. The same day marked yet another expiration date of the contracts between the Lebanese government and Sukleen. However, the government asked Sukleen to continue to provide its services, even though there was a huge public outcry against the mistrusted company Sukleen. The garbage crisis proved to be a good excuse to extend Sukleen’s contracts, as there was no alternative to a dumpsite, nor for the services. That is, as no other company had the means, expertise nor equipment to substitute Sukleen. This,



combined with the urgent character of the crisis, made other companies ineligible candidates for service provision.

However, closer scrutiny suggests other solutions that did not include the Naameh landfill, or Sukleen’s services, has never been the governments’ intention.

The government launched a call for bids for the waste collection and disposal

services in 2015. However, the tendering companies had to provide vehicles and a dumpsite. Yet, only short-term contracts were promised by the government, not providing companies with the possibility to recover their investments. Sukleen was provided with both vehicles and a dumpsite when it started its services in the 1990s. In the end, the bidding got cancelled due to the outbreak of the garbage crisis.

Out of Sight, Out of Mind?

The protests grew to a vast social movement, which peaked at an estimated 100 thousand people descending to the streets.

It was and still is very difficult, however, to protest one specific government authority, or against a specific political figure responsible for waste management, because the division of waste management is fragmented within the government. By law, the municipalities have the right and duty to deal with their waste. The Ministry of Interior and Municipalities represents the municipalities on a national level and has therefore jurisdiction over the waste sector. The Ministry of Environment has also jurisdiction over the sector. Supported by the United Nations Development Programme (UNDP), the Ministry of Environment has been elaborating waste management plans in the past years. None of these plans, however, has been put into practice: in July 2006 a war broke out with Israel, which itself had horrendous implications on the environment of the country: Israel had attacked a coastal power plant and during this attack, oil tanks were bombed. Thus, 15,000 tons of oil were released into the Mediterranean, causing a damage that the UN estimated to reach \$856.4 million. Due to these dramatic months of 2006, the waste problematic yielded to reconstruction plans and clean-up efforts. Another waste plan, proposed in 2010, included incinerators and the burning of trash, which was opposed by the public.

The Office of the Minister of State for Administrative Reform (OMSAR) has also played a role in the solid waste sector. It has executed and financed (through the European Union – EU) several solid waste projects and awareness campaigns. Finally, the Lebanese government created



A polite “fuck you” to the “Zaim”, Downtown Beirut, facing the Grand Serail, government headquarters.
Hassan Chamoun

Although there are many parties involved, their responsibilities are not clearly defined, making the elaboration of a proper waste management plan difficult

Waste Lebanon

the Council for Development and Reconstruction in the 1990s and put it in charge for solid waste services. It is this entity that elaborated the contracts with Sukleen, and together with the Ministry of Interior it manages the payment of the company.

Although there are many parties involved, their responsibilities are not clearly defined, making the elaboration of a proper waste management plan difficult. This lack of clearly assigned responsibilities makes it also difficult to elaborate a properly defined law for waste management. In addition, none of these many parties involved can be held fully accountable for crises like the one the country is facing. Each authority points fingers at the others and obviously, none of the government agencies takes responsibility for the ongoing garbage crisis.

Even though it was in the summer of 2015 that garbage severely accumulated in the streets, all the above shows that the country has been reigned by a garbage crisis for the past two decades and even longer. And although the cities have been largely liberated by the waste, the garbage crisis is still continuing: there are still some

areas where waste keeps on accumulating. When the trash gets collected, however, it is still not treated and all sorts of waste, whether it consists of medical, industrial, household, or other types of waste, are dumped together without treatment. Today, the waste of Beirut and Mount Lebanon is dumped in two coastal areas close to the capital (Bourj Hammoud and Costa Brava) and dumped right at the coast. This seems to be a repetition of the situation during the Civil War, when waste was dumped into the sea, enlarging the capital. The end of the garbage crisis was the major demand of the protesters and

The social movement and the parties arising from it provide hope for the people who are still facing the Lebanese garbage crisis.

yet, it was not met. The fulcrum of the protests, with the highest number of followers, was the “You Stink” campaign.

The citizens of Lebanon kept on protesting against the garbage crisis, the corrupt government, or the poor services, but on a much smaller scale. This social movement resulted in the rise of new parties that challenged the political figures in the municipal elections that took place in May 2016. Even though the new parties did not win the election, their support was very large, especially considering that they formed only a couple of months before the election. Thus, the elections showed that the population was not content with the political leaders and the political system of the country. The social movement and the parties arising from it provide hope for the people who are still facing the Lebanese garbage crisis. 🌀

¹ Leenders, R., Politics (2004), p.85.

Leenders, R., The Politics of Corruption in Post-War Lebanon (Doctoral dissertation, London University, 2004).

Activist from the Youstink campaign remove garbage in Bourj Hamoud to later recycle it.
Source: Hassan Chamoun



“You Stink” Campaign

This movement had four major demands: the end of the garbage crisis, the resignation of the minister of environment, accountability of the authorities who are responsible for the violence against the protesters, and a new law, which would give revive currently powerless institutions. Up to now, none of these demands have been met.



Protesters in Tripoli walk near a pile of garbage
Source: Hassan Chamoun



Protest near the old Burj Hammud landfill, when talks of opening a new landfill there emerged. Banner: “From Akkar to Naameh, to Barja to Bourj Hammoud, the pain is the same”
Source: Hassan Chamoun



Protest facing the great Serail. Banner says: “Today we will wipe you [away]”
Source: Hassan Chamoun



Protesters stand side by side and are targeted by water cannons, Downtown Beirut.
Source: Hassan Chamoun

From conflict to context-based metrics

The stories of the Cauvery
and California's Central Valley

Writers: Rylan Dobson & Alexis Morgan

Banks of River Cauvery, India
Source: Ashwin Kumar





Water Conflicts

Few things convey conflict like an image of a truck on fire. This photo, taken in India from September 2016 does just that, serving to remind us that the 125-year conflict between the states of Tamil Nadu and Karnataka over water allocations in India's Cauvery River basin is still alive today. The Cauvery River is relied on by both states to support their agricultural sectors, and despite a "normal" monsoon season in the region this year, shifts in average monthly rainfalls left reservoirs abnormally low, igniting tensions once again and setting the stage the world's latest tragedy of the commons. The international obsession with disturbing images and political turmoil often overshadows the desperate stories of farmers, who are forced to make agonizing gambles with their crops, lest the water run dry and their meager means of support collapse. To make matters worse, politicians are just as quick to re-assert these provincial water claims as they are to condemn the violence caused by them.

Tensions surrounding water allocation between the Indian states of the Cauvery River basin stretch back to mid-1870s when the British relinquished control of the Karnatakan city of Mysore, while retaining their colonial control through the Madras Presidency. The first formal agreement for a regular supply of water between the two states was reached in 1892, and reworked again in 1924. Since then, numerous attempts have been made throughout the years to renegotiate the original agreements, but with little success. In 1990, the Supreme Court of India ordered the establishment of a tribunal to resolve these issues, mandating the reallocation of water between the two states. The tribunal's first decision in 1991 was met with riots in both provinces, refusing to comply with the award. Both sides revealed stark differences in the philosophical foundations underpinning their allocational demands:



Truck with TN number plate burns as the Cauvery protest continues in Bangalore.
Source: Abilash Mariswamy

Karnataka's core argument is that they have a growing need for drinking water and that there are other hydrological imbalances that favour Tamil Nadu that need to be rectified. An example that is often cited is Tamil Nadu's longer monsoon season, which allows for an extended growing season that is less reliant on water from the Cauvery River. Other perceived imbalances are Tamil Nadu's underutilization of their ground-water reserves, and wasteful use of river water by farmers of the state. These arguments tend to follow the Harmon Doctrine of allocation, which aims to "uphold absolute territorial integrity" of water interests, placing disproportionate control of resources to upstream states as Karnataka is to Tamil Nadu.

Tamil Nadu argues that as their water allocations are primarily used for agricul-

ture per the agreements from 1892 and 1924 originally state, Karnataka's shift in usage for agricultural purposes is not a valid reason to alter their allocations. Since the original agreement, Tamil Nadu has developed its agriculture according to these allocations, so they believe that reductions now would result in widespread economic downturns. As such, the Tamil Nadu arguments tend to follow the doctrine of prior appropriation.

Beyond the issues of appropriation and the widespread disavowal of the tribunal award volumes lies a threat of greater conflict. The lack of reliable data, reliable institutional mechanisms, and a credible governing body to provide guidance in water shortage crises has stoked the embers of discontent, leading to what the media has sometimes dubbed a water war.

"I really don't know what I'm going to do," remarks Lax Iyer, a farmer who migrated from India to the United States many years ago. Iyer faces similar challenges on his farm in the California Central Valley, where he contemplates this issue, 9000 miles from Tamil Nadu and Karnataka. On one side of the road is an orchard in bloom, on the other, an orchard in danger of being engulfed by dust.

Last summer, authorities failed to deliver a sufficient amount of water to the 15,000 farmers of the San Joaquin Valley with junior water rights — those who get their water allocation only after senior water rights holders have filled their needs. Frustrations are mounting as workers are laid off, farm land is fallowed, and water allocations sold off far above market rates. Thirsty, high-profit almond orchards being ripped out as water scarcity threatens the investments of farmers in the region. This is a reality which Iyer must face as his almond farm, as well as his American dream, dries up before his eyes.

In the Central Valley, the water supply is significantly imbalanced, with northern and western portions of the region who receiving high precipitation in contrast with the naturally arid south and east. This imbalance has been amplified over the years by diverting groundwater through pumping, so much so that the area is often described as one of the most hydrologically engineered areas on earth. This has impacted the region so severely that the land level over these groundwater reserves has dropped over 20 meters in the last century. To make matters worse, a recent study indicated that of the 27 major rivers in the California Central Valley, 16 were being drawn on at over 100% of their natural supply. Simply put, the demand has surpassed the threshold for renewable freshwater.

As the region enters another year of drought, authorities of the Central Valley Project announced that with high probability, surface water would not be delivered to farmers lacking senior water

rights. While this may appear unfair to many farms, the problem truly lies within the broken, antiquated system of water allocation which has operated in an unrealistic, overly-generous way. Critics have argued that water allocation policies in the state have never been evaluated according to science, rationale, or democratic process, ever since the state was founded back in 1850. California's legal frameworks are compatible with reform in principle, but the process of overhauling the system from a governmental standpoint is burdensome and expensive, in addition to the major threat re-allocation and modification would present to current water rights holders, not to mention. As it stands, California is left with a broken allocation system stuck in a political quagmire; between the status quo and its downward spiral.

Wildflower bloom in California's
Central Valley near the town of Arvin
Source: Marc Cooper





California Aqueduct Crossing the San Andreas Fault, USA
Source: Michael R. Perry

Compounding this challenge is the fact that California's water rights system has not adapted to consider the population and economic growth of the state, nor considered the projected effects of climate change and its implicated effects on energy, food, water and biodiversity – the so called “nexus”. The California Central Valley is relied on to produce 25% of America's food on less than 1% of the nation's farmland. The net impact of subsidized, water-thirsty crops consuming 70-80% of the available water in the area is that energy brown-outs, loss of freshwater species, and community water rationing have become regular occurrences in California. Water rights for groundwater remain separate from those for surface water, and until late 2014 were subject to no legislation at all. Even with new groundwater legislation now in place, implementation of the changes will only begin to be phased in by 2020, setting the stage for yet another tragedy of the commons.

Formal allocation failures

Despite their geographic and economic separation, both the Cauvery River Basin and the California Central Valley draw many similar stories to the surface – stories of wells running low and social tensions rising. Unrealistic allocation laws, poor water governance, patchy data, lack of accountability on environmental issues and a failure to establish sustainable thresholds for hydrological systems have resulted in an urgent need to address oversubscribed water resources.

Both basins have placed their hopes in the formal public institutions of their regions to establish and enforce water allocation, and it is important to recognize the stark realities that have driven these success stories. These successes occurred in situations where public sector agencies collabo-

rated with local, often informal networks to improve the situation. Despite these efforts, the negative impacts of mismanaged resources continue to grow, while businesses, communities and above all, the natural environment continues to pay the cost.

The time has come to be realistic about basin thresholds. We must set aside water allocations (i.e., junior & senior water rights) and consider how much renewable water is available each year (i.e., precipitation). We must honestly ask ourselves, “How much does nature need, and therefore how must society act to ensure that we have enough water for energy, food, drink, and its other essential uses for our wellbeing?” Answering this question is the basic foundation for setting context-based

targets (Figure 1). To say it another way: What is a given user's share of water use that is fair, sustainable, and optimizes societal wellbeing?

Despite their
geographic
and economic
separation, both the
Cauvery River Basin
and the California
Central Valley draw
many similar stories
to the surface

Illustrative concept of a volumetric context-based water metric

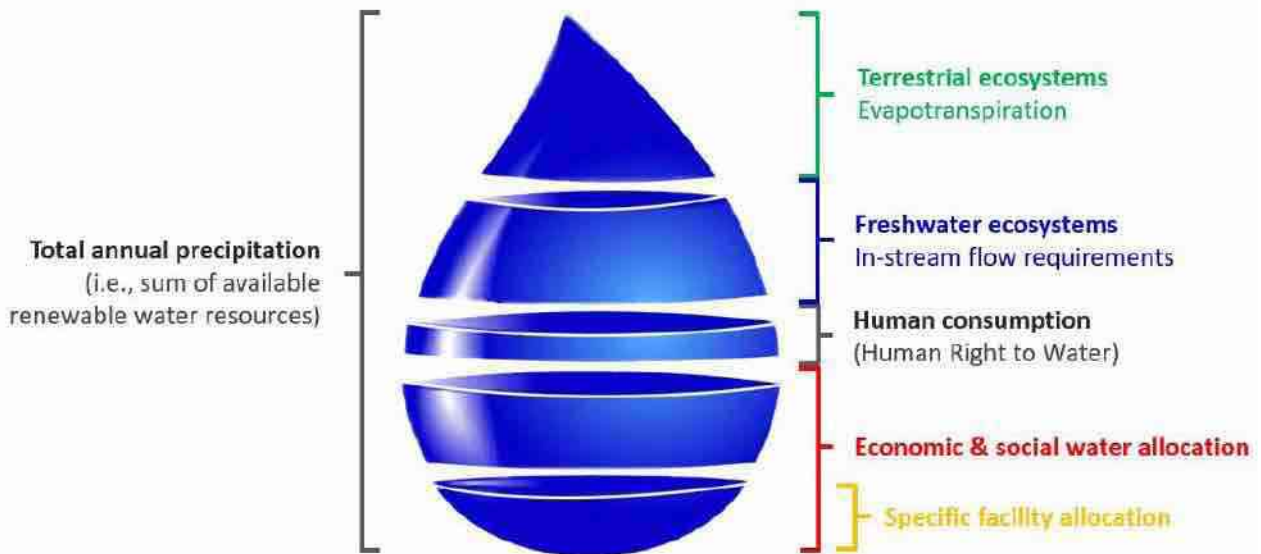


Figure 1: The basic idea behind a (volumetric) context-based water metric

Allocations that effectively accommodate these various economic and social needs of a basin require many things:

1. Clear system boundaries
2. Careful consideration of the trade-offs between food, water, energy, and nature;
3. Access to water data, in-depth knowledge of seasonality, geography and other local water management plans
4. Support by clear institutional mandates that have the capacity to proactively engage and communicate with stakeholders
5. Allocation mechanisms that bring together the above aspects and optimize wellbeing for basin water users.

The degree to which each of the above elements are present in the Cauvery River Basin and the California Central Valley varies, but despite their differences, the similarities in the needs of the regions are striking.

Looking forward, there is no question that the public sector will remain the leading party in finding solutions to water allocation issues. However, with the present threats of water scarcity and growing interest to address these shared challenges in the private sector, there are many new opportunities to design functional, rather than regulatory strategies. Indeed, one could argue that consensus-

driven allocation processes that respect system boundaries are indeed the only way to ultimately address water crises, but when it comes to water, success is driven by active, collaborative problem solving, more so than by rules and regulations alone.

Harnessing business to drive context-based targets

The development of context-based metrics uses an objective, scientific approach to establish sustainable basin thresholds, while embracing subjective socio-politically oriented stakeholder-driven processes to determine fair allocations. To explore various allocation options, data must be made readily accessible to the public, and scenarios that assess the trade-offs between

food, energy, water and nature must be explored, even if they present solutions that are hard for the public to stomach. In short, it drives collaboration towards sustainable water use. By respecting the limits of our water systems and engaging in fair-share allocation processes, we can help to reduce shortages and maintain the social license of business to operate or grow.



Benefits and challenges of context-based targets

Context-based target setting is not without its challenges:

1) The process of equitable allocation between users is fraught with ethical questions. Methodologies will need to handle nebulous variables such as the human right to water, and cultural/religious approaches to water.

2) The availability of reputable and consistent water data varies across locations.

Finding a source of objective data can be complicated when setting context-based water targets.

3) The reporting of context-based targets involves complex metrics that may require teaching for audiences accustomed to simpler water metrics. Context-based targets are more nuanced than common metrics such as total water use, etc. To clearly communicate the benefits of such an approach, the community must educate its constituents.

4) Finally, the business community will need to broaden its perspective on the basin when developing context-based targets to consider the social, economic, and political context in which food, energy, water and ecosystem security could be impacted through their decisions.

With accessible data and scenario modelling, encouraging companies to engage in such a process may still be difficult, but the true challenge lies in



Banks of River Cauvery
Source: Ashwin Kumar

merging this system into a politically-gridlocked public water governance. Unlocking this system will require multiple actors to apply pressure in the right spots. For example, aligning corporate water metrics with those set by the public sector forms an important foundation for a collective response to shared water challenges. The benefit to the business community through this alignment is a more stable business environment, a reduction in business risks and potential reductions in operational costs.

The shared water challenges present in both the Cauvery river basin and

the California Central Valley are long standing, complex and won't be solved through the individual actions from any one group. Effectively addressing these shared challenges will require innovative, new approaches that go beyond traditional public sector solutions to good water governance. We, at WWF along with other leading NGOs such as World Resources Institute, believe that establishing context-based water stewardship targets within a basin will greatly support the current public sector efforts and the Sustainable Development Goals. Solving the water challenges in places like the Cauvery and

the Central Valley that have not been unlocked for over a century will require patience, innovation, a willingness to listen and a passion to work collectively. But when everyone's shared future is on the line, what other options do we have? 



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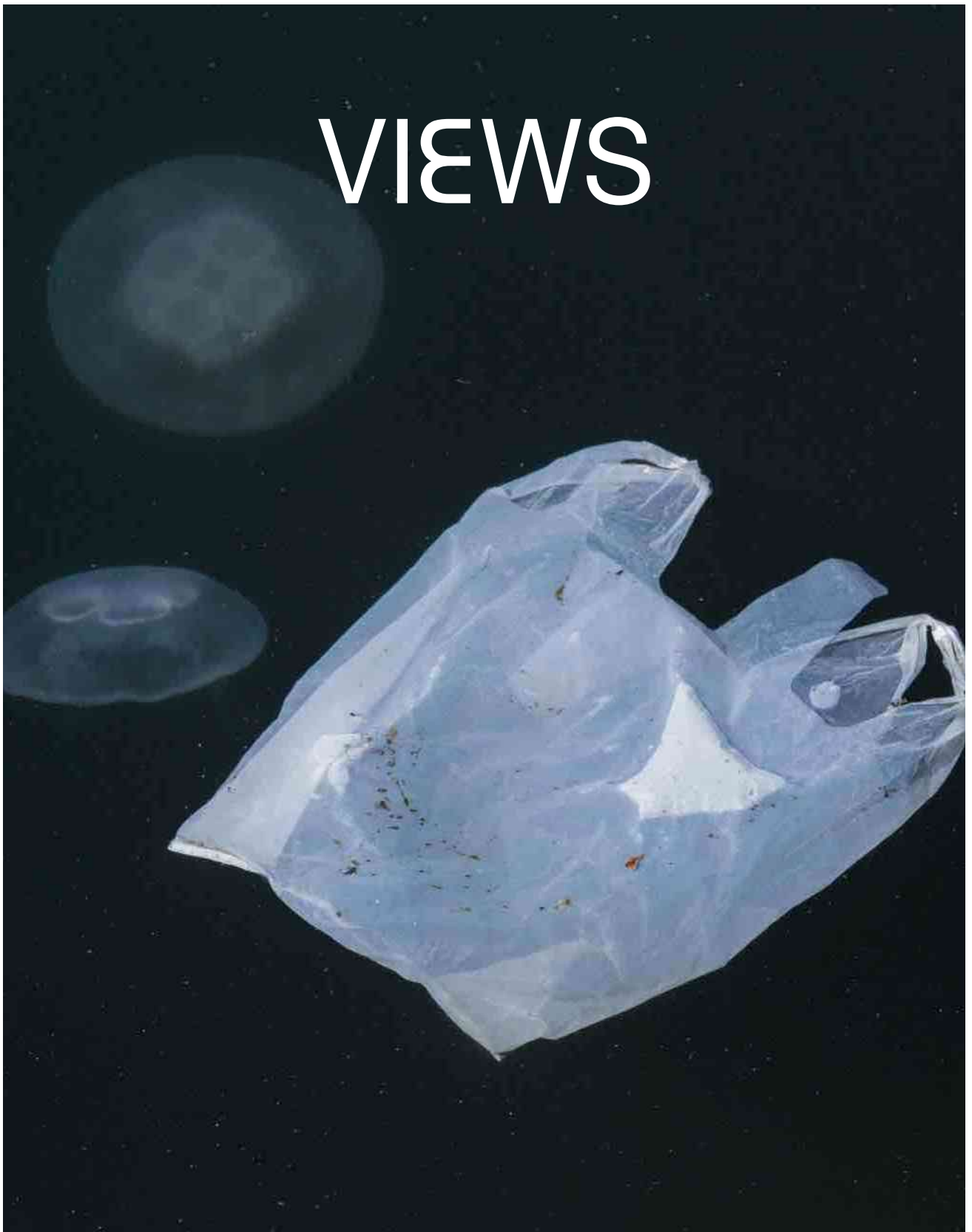


Strategic Partners

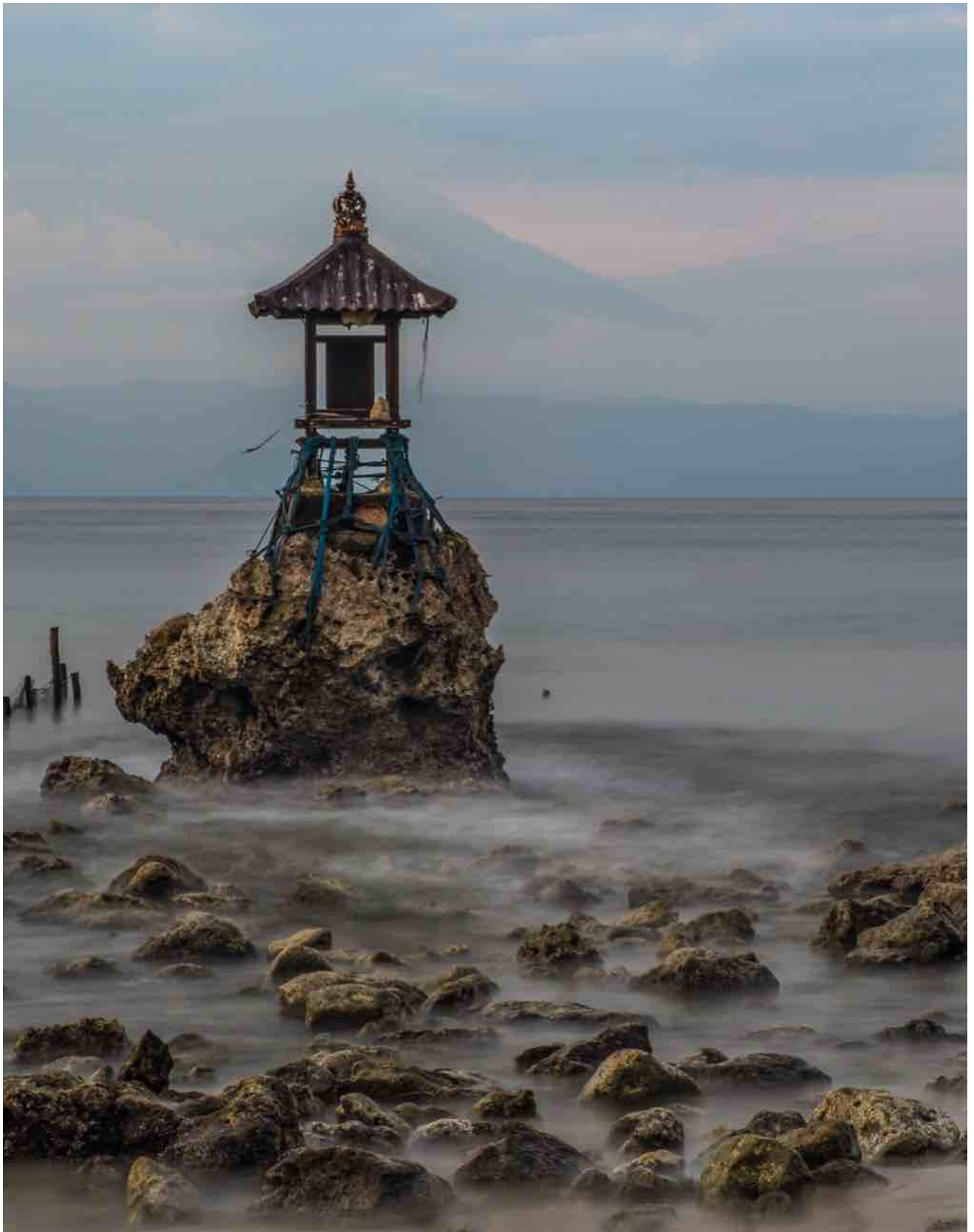
Forest-based Sector
Technology Platform



VIEWS



Short sighted Sea Turtles cannot differentiate. One nourishes, the other kills.
A sad reflection on the way our Oceans are increasingly polluted. Yokohama Bay, Japan.



A Hindu Temple set in the warm shallows of the Indian Ocean, Bali's holy mountain, Gunung Agung can be seen in the distance. Hindu Temple, Nesa Penida Island, Bali in the background.

Water is the very foundation of life on Earth; the life source for all that exists and thrives on Planet Earth and yet we treat Her with such disdain: our oceans and waterways are polluted to almost toxic levels. Whether intentionally or accidentally, these life-sustaining veins of our natural environment are becoming progressively contaminated and clogged by pollutants. We are killing our home, and we continue to do so knowingly.

I am on my hands and knees inching closer. My hands are chilled in the early hours of a Japanese winter morning. Dew drops glisten in the first rays of light. Numb by the cold, insects wait for the onset of evaporation. A robber fly. A blade of grass. A flower. If I can just get close enough... and with adequate magnification I can look through their adorned droplets as lenses onto another world, our re-

fracted world. Refraction offers a unique view of a world so very few people ever witness, or even know exists.

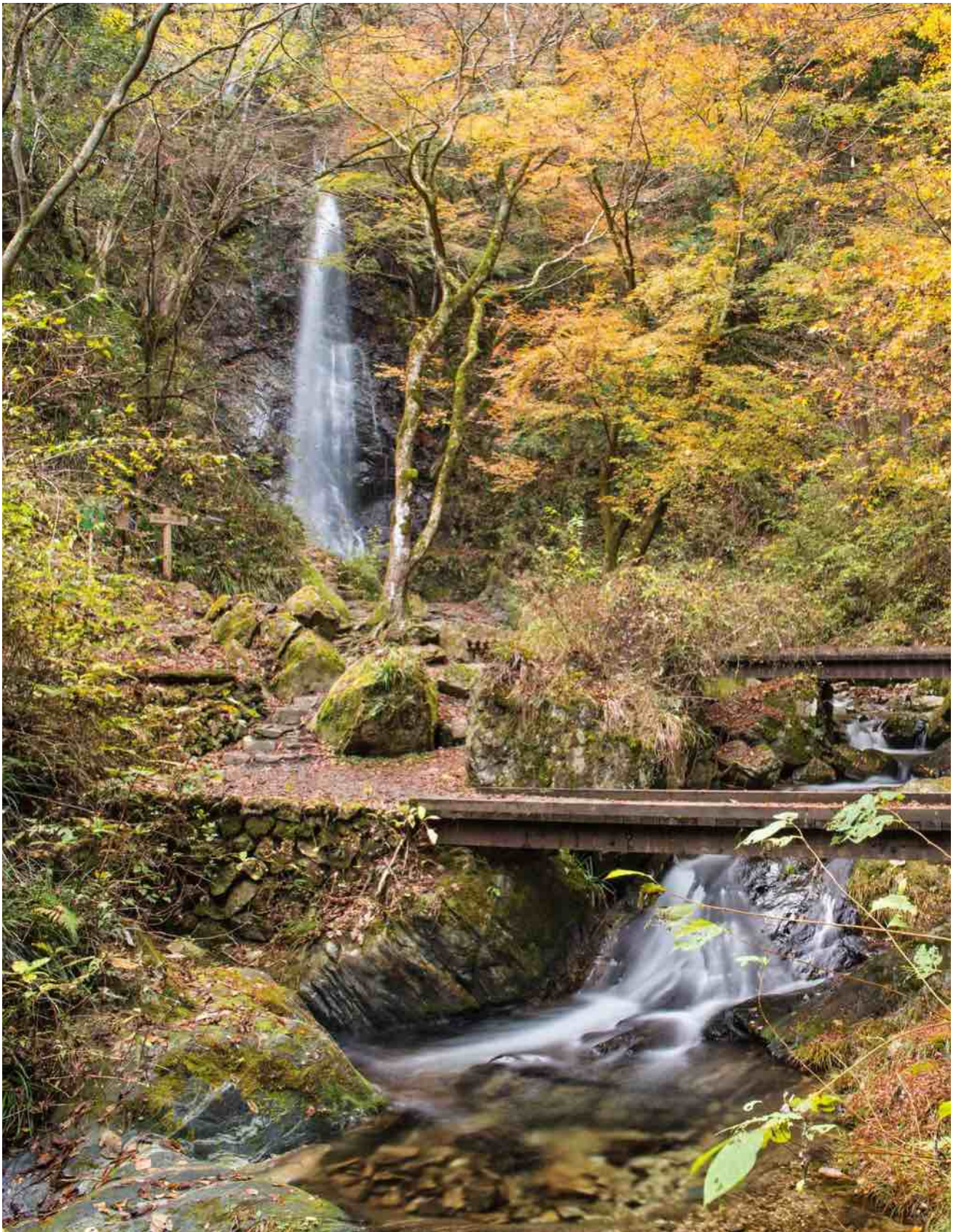
Imbibed in liquidity, we are free. We can challenge the power it yields but never do battle with it; so futile are we in it's midst to even consider the challenge would be comical. In vain, with machines and explosives, we try to stamp our authority on it, to channel and control the forces. We change the course of its rivers, create islands, alter coastlines... is anything we do to it ever really of any consequence?

At the end of the day, Nature will be around long after we are gone. In what state we will leave it in is anyone's guess. One consolation is that our oceans once again will then become clean.

Mark Thorpe



Reflected in the calm of Lake Shoji, Japan's famous Mount Fuji is bathed on the hues of a Summer sunset. Sunset over Mount Fuji seen from Lake Shoji, Japan.



Silken liquid flows through the golden foliage of a Japanese forest. Hossawa Falls, Hinohara Village, just outside of Tokyo, Japan.



The Morning Toll: The wooden canoe of a seaweed farmer on the island of Nusa Lembongan half filled with his crop. Traditional Canoe with Seaweed Load, Nusa Lembongan Island, Bali, Indonesia.



Fishing boats jostling in the early morning hours on the island of Lombok. Tanjung Luar fishing village, Indonesia.



Seaweed farmers w



wait for low tide on the island of Bali before they can access the water to tend their crops. Seaweed Farmers, Serangan Island, Bali, Indonesia



Dark weather, vibrant memories... Serangan Reef Break, Bali, Indonesia. Sho

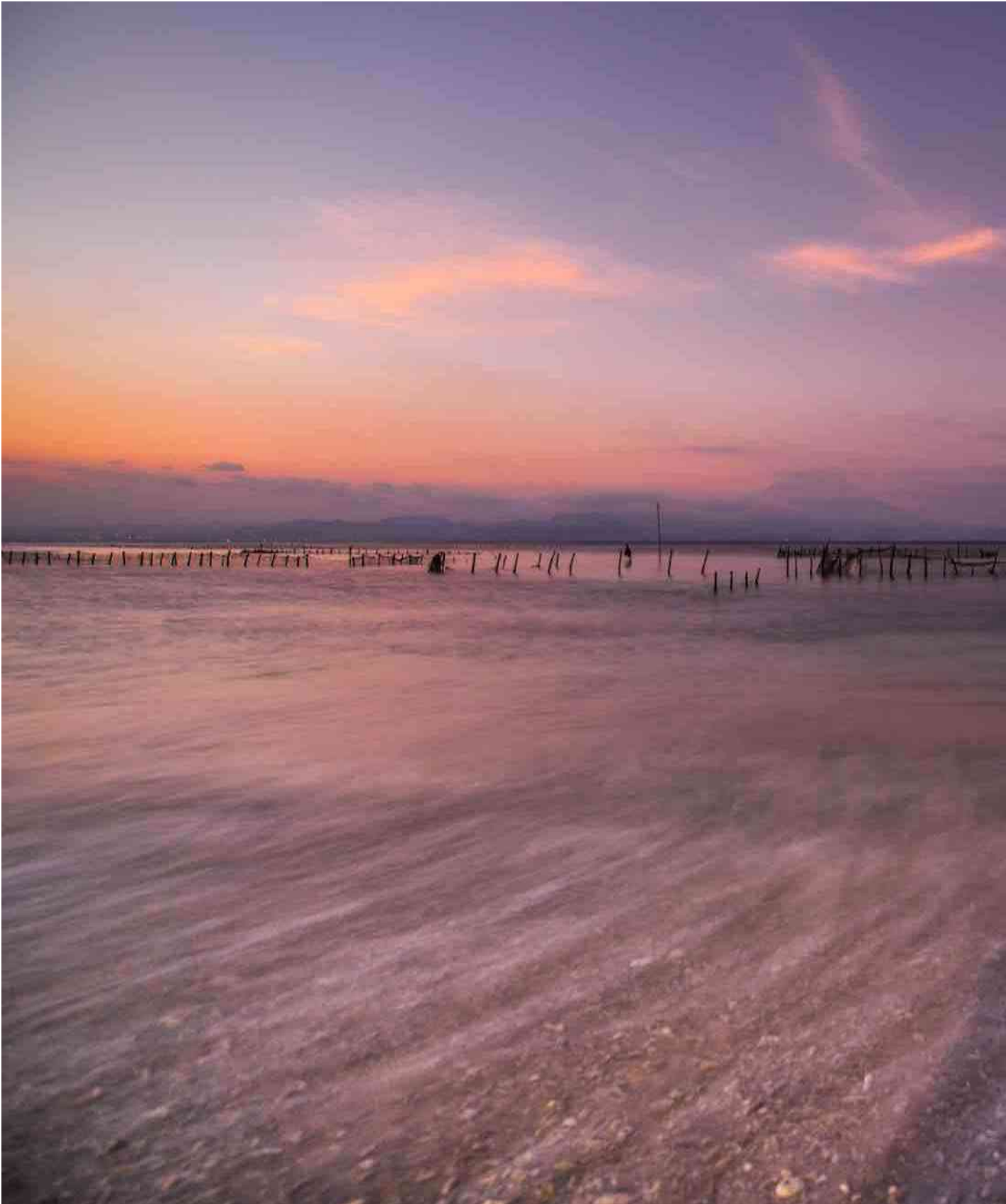


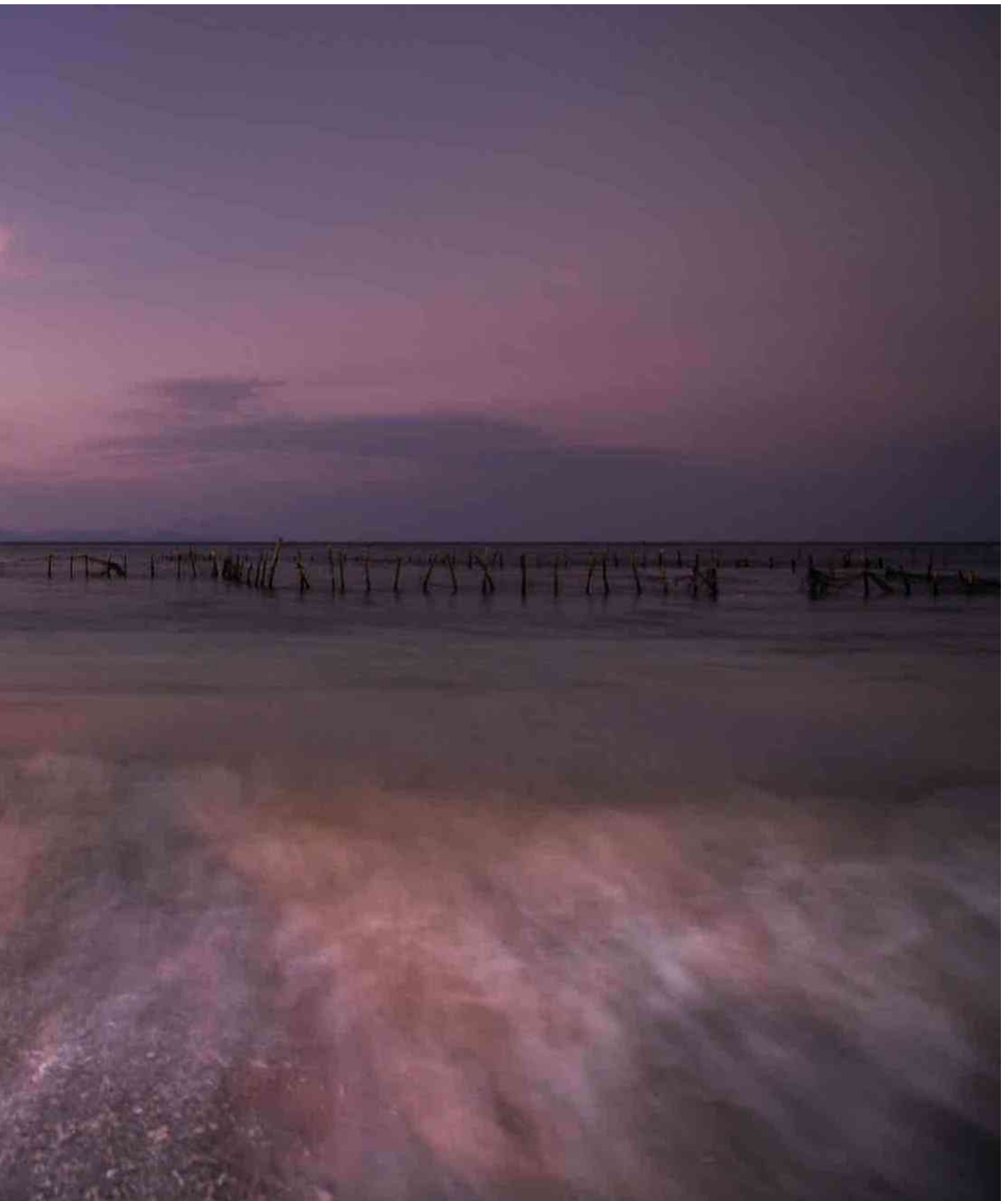
ot at sea level at a time when I used to swim out into the waves to photograph the waves themselves and also the surfers who rode them.





Maelstrom, Balangan Beach, Nusa Dua, Bali, Japan.





A Seaweed farm on the island of Nusa Penida, Bali in the distance, Indonesia



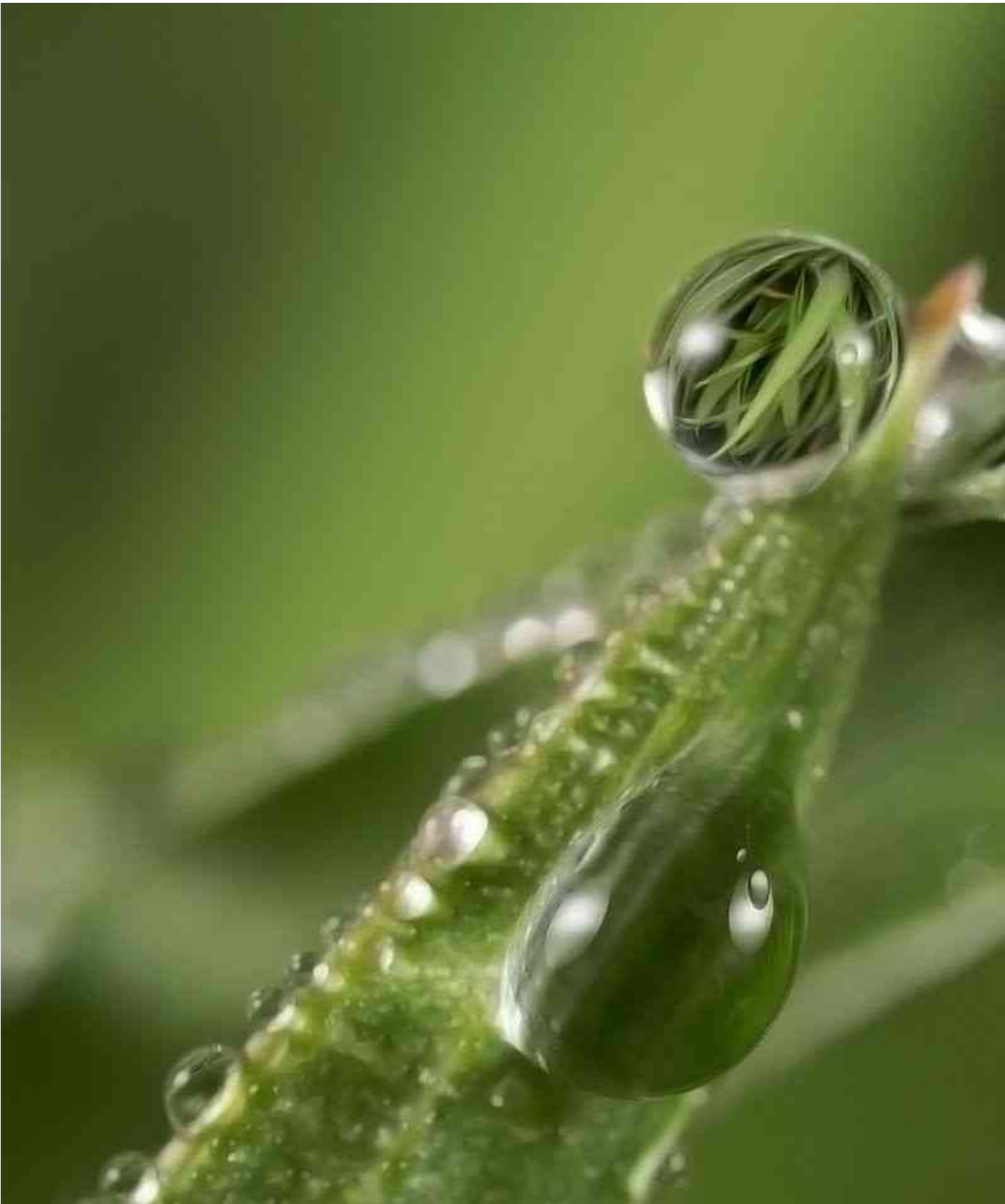


Like a painter, this tree attracts greater attention after its demise...Gili Trawangan Island, Lombok Island, Indonesia





Mitsuike Park, Yokohama, Japan



Refraction of dewdrops on a blade of grass. This can only be photographed



d at magnification ratios of 2:1 and greater. Focus stacked from 6 images each with differing focal point. Mitsuike Park, Yokohama, Japan



Hammer(head) House of Horror. Supposedly protected Great Hammerhead Sharks await processing at a fish market in Eastern Indonesia. We take, and we take some more... Tanjung Luar Fish Market in NE Lombok, Indonesia.



Once majestic apex hunters, shark numbers are in free fall on a global scale. Hunted for their fins for Asian Soups, will they ever recover? Tanjung Luar Fishing Village, Lombok, Indonesia.

Water Governance in Cities

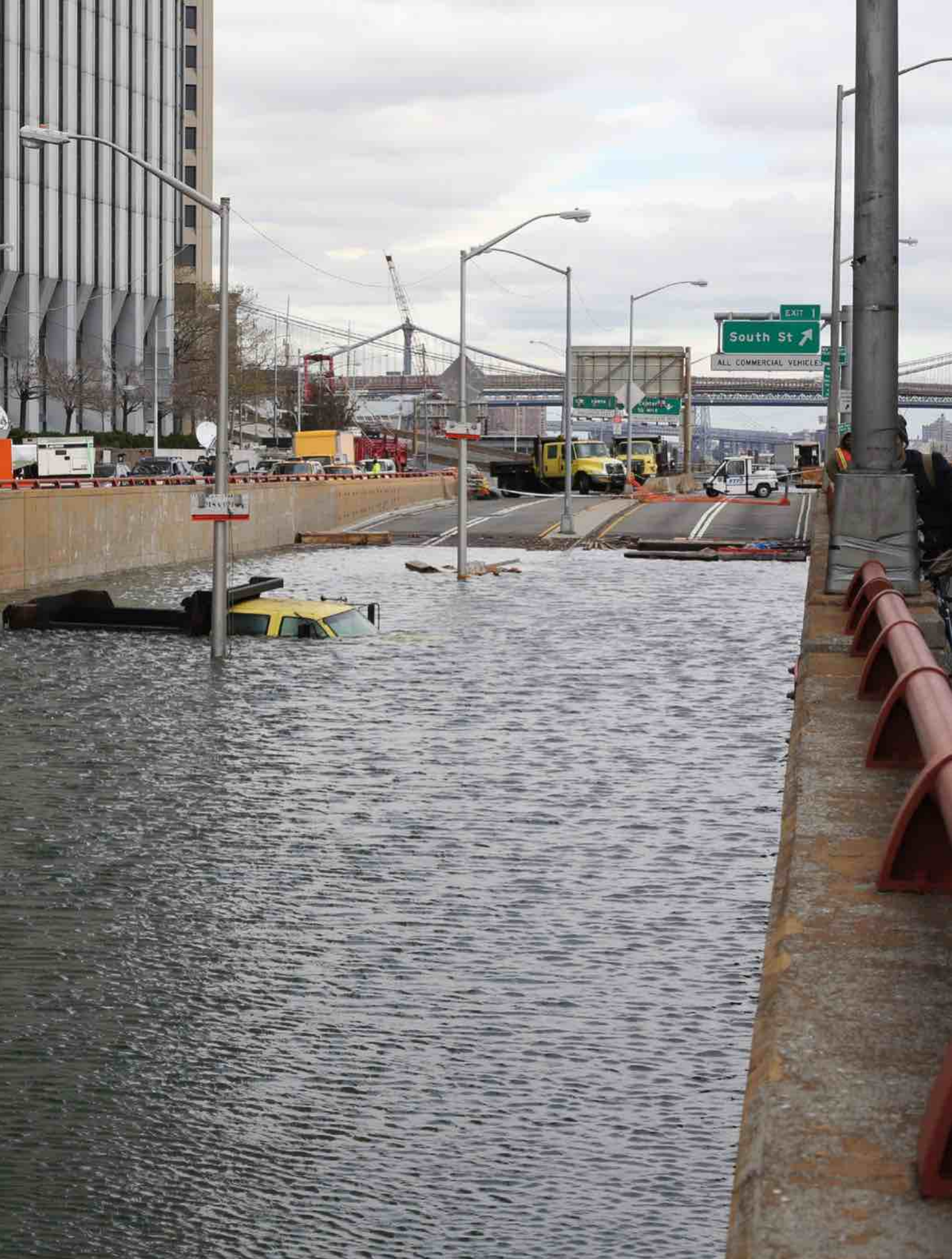
What Challenges for the Future?

At a time when most of the world's population is living in urban areas or is likely to do so in the future, the relationship between water and cities has become increasingly stressed. Water is both an opportunity for cities to discharge economic and social functions, and a threat when natural disasters affect the local economy, well-being of the people, and ecosystems.

Writer: Oriana Romano

Flooded Battery Park Tunnel after Hurricane Sandy,
Manhattan, USA.
Source: Timothy Krause





Population growth, urbanisation and climate change will inevitably affect water supplies and demand in the near future, painting a dire picture for what lies ahead. By 2050, water demand is projected to increase by 55%. 4 billion people will be living in water-stressed areas and about 240 million people will lack access to a quality water source, most living in rural areas. To make matters worse, nearly 1.4 billion people are projected to lack access to basic sanitation as the at-risk population from floods rises from 1.2 billion today to 1.6 billion in 2050.¹

Global agreements and frameworks such as the UN Sustainable Development Goals, the Sendai Framework, and more recently the New Urban Agenda, each call upon cities to better prepare themselves for water-related disasters and to be more resilient and inclu-

sive in their providing of water services. Business as usual is no longer an option. The urgency of these challenges call for the development of innovative practices, and to shift from linear to circular economies for a long-term vision that optimizes the use (and re-use) of available resources.

The key question now is: How to make this happen? While there is no doubt that technological solutions play a fundamental role in this process, they represent only part of the solution. Achieving greater resilience in water management means cities need to adapt in a sustainable, integrated and inclusive way, taking time and cost into account.

Beyond what do we do? it is crucial to define who does what, at which level? and how?² This calls into question the governance

frameworks that can help cities to adapt to changing circumstances while maintaining their central role in local, national and global contexts. The Organisation for Economic Co-operation and Development (OECD) has argued that current levels of service delivery and water security should not be taken for granted in cities from OECD countries and emerging economies.³ Cities must ensure that institutional frameworks in place to fit and fix the pipes, and that information on the systems is readily accessible. Transparency and integrity are key for ensuring meaningful stakeholder engagement and coherence across sectorial policies.

Ipanema beach after a flood,
Rio, Brazil.
Source: Andreia C. de Andrade





Copenhagen experienced the worst thunderstorm in 30 years, early July 2011. Tivoli, Copenhagen, Denmark.
Source: Rene Passet

What are the challenges?

The challenges surrounding water management differ from city to city, although a common problem for several cities is ageing water infrastructure. This puts the ability to maintain levels of universal access into jeopardy and the prospect of dealing with risky situations much more concerning.⁴ Ageing water infrastructure increases the risk of social and commercial disruption, as well as broader environmental impacts.⁵

The OECD estimates that by 2050, \$6.7 trillion will be required to renew and upgrade infrastructure for water supply and sanitation to keep up with current growth. This amount could triple if a wider range of water-related infrastructure is considered.⁶ In a context of economic recovery and fiscal consolidation, cities need to look for alternative sources of finance since public spending and transfers from

central governments is no longer sustainable. Efforts are needed to foster efficiency and value for money to minimize investment needs considering low cost options and green infrastructure.

Cities must find ways to adapt long-term investments, planning, and commitments with evolving needs and

Cities have increasingly had to deal with the risk of "too much", "too little" or "too polluted" water

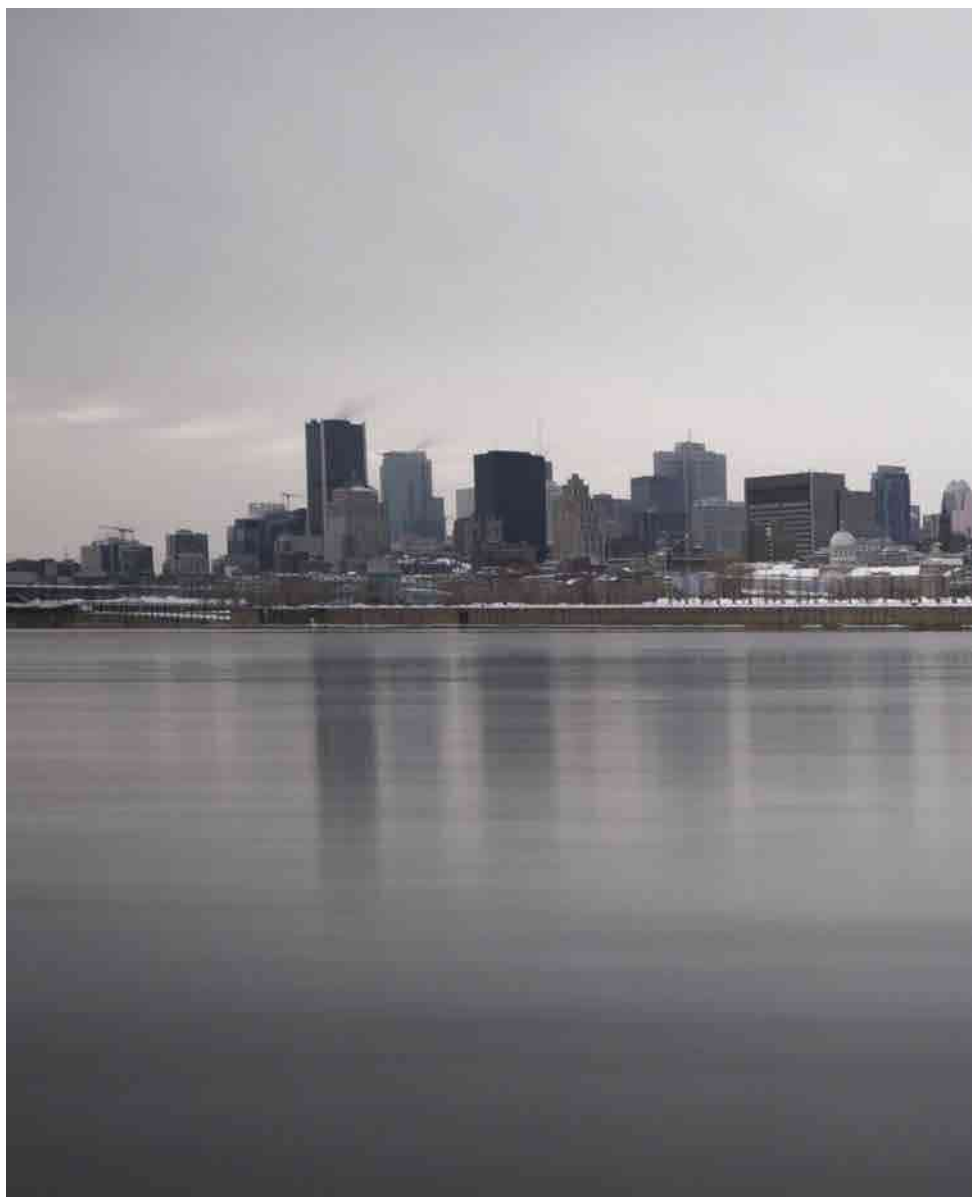
circumstances due to unforeseeable water-related events and institutional changes. Cities have increasingly had to deal with the risk of "too much", "too little" or "too polluted" water.

Some cities face all these risks at the same time. For example in Brazil, a country which controls 12% of the world's freshwater resources, Rio de Janeiro and São Paulo were hit by the worst drought in 84 years while other areas in the country were dealing with floods.⁷ Moreover, these extreme events are incredibly costly, such as the 2011 flooding in Copenhagen that caused about EUR 700 million of damages, or the \$19 billion of economic losses that were attributed to Hurricane Sandy in 2012. Overall, the assets at risk of flood is projected to grow over 340% from 2010, reaching a combined value of over \$45 trillion.⁸

Are cities equipped to handle these challenges?

From an institutional point of view, roles and responsibilities in urban water management are highly fragmented between central governments that concentrate policy making prerogatives, and local governments that play more of an operative role. In this setting, coordination is crucial to minimize overlaps, duplications and to identify grey areas. Cities cannot deal with the complexity of water issues on their own, but instead need to work with other levels of governments.

Opportunities can arise from territorial reforms such as municipal mergers and inter-municipal co-operation, which can result in the re-organization of water services delivery, a reallocation of roles and responsibilities, and the creation of new platforms to share information and engage stakeholders.



What are the solutions?

Solutions can be found in three dimensions: policy, people and places.

Cities should consider policies by thinking outside the 'water box'. Water managers often have little to no say in final policy decisions, frequently leading to unintended negative outcomes. Therefore, cities need to make a more strategic decisions regarding water

in their broader economic, social and environmental portfolios. It is important to foster synergistic relationships with the energy, agriculture, waste and spatial planning departments of government in order to efficiently allocate resources and build capacities.

One example of this synergy is Dutch municipalities, who carry out water

assessments to factor in potential conflicts and costs in spatial planning decisions. In Cologne, the government coordinates water and spatial planning for new building areas to prevent flood damages from heavy rainfalls. Paris offers economic incentives as well for farmers to reduce their use of pesticides as a safeguard for water and natural resources.



Montreal skyline.
Source: Maëlick

Many actors are involved in the water sector of major cities such as urban planners, water service providers, regulators, advisors, and civil society. They all contribute to the dynamic and integrated approach to water management. These are the people which must be engaged in urban water governance, not only to raise awareness about current and future water issues, but also

for building social and political cohesion for water projects and reform.

Stakeholder engagement can help build trust and ownership, which secure payment for water services and ensure the accountability of city managers and service providers to end-users and citizens. Preventing and managing conflicts on water allocation, as

well as addressing convergent objectives across policy areas are key to the functioning of these systems. Cities engage with stakeholders to improve water services (Nantes), discuss tariffs (Grenoble), and prepare for the risks of drought (Bologna).

Finally, cities must take places into account for urban water governance.

Water Governance

Water cuts across boundaries. Whether it concerns floods, drought protection, water supply, sanitation, or drainage, synergies between urban areas (where most people live) and their surrounding environments (rural and watersheds) must be strengthened. Different governance tools can be used to achieve this.

For instance, rural-urban partnerships are win-win solutions that benefit cities, as well as upstream and downstream communities and ecosystems. Other good practices include multi-stakeholder committees such as the ones that helped to improve the quality of discharged water in catchment areas around Montreal. 



When asked to associate the top 5 words with water management in cities, from a choice of 65, respondents from 48 cities gave a high relevance to “infrastructure” and “efficiency”.

Source: OECD (2016) Water Governance in Cities, OECD Publishing, Paris

Bologna, Italy.
Source: Roberto Taddeo



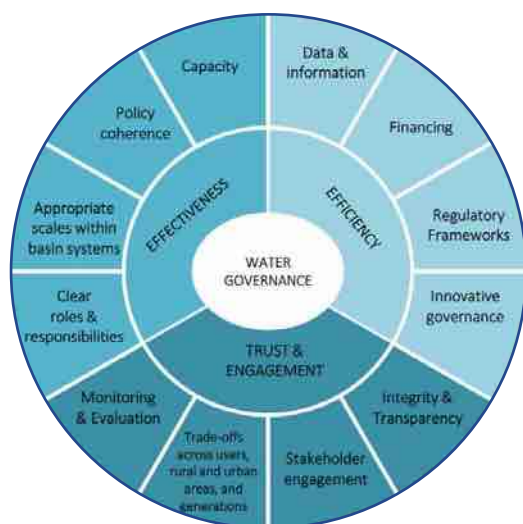
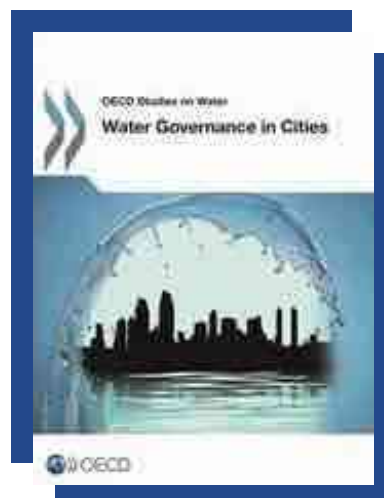
Notes:

1. OECD 2012, Environmental Outlook, the consequences of inaction, OECD Publishing, Paris
2. OECD 2015, OECD Principles on Water Governance, available at: <https://www.oecd.org/gov/regional-policy/OECD-Principles-on-Water-Governance-brochure.pdf>
3. OECD 2016, Water Governance in Cities, OECD Publishing, Paris
4. Ibidem
5. TOECD 2015, Water and Cities. Ensuring sustainable futures, OECD Publishing, Paris
6. OECD 2007, Infrastructure to 2030 (Vol.2): Mapping Policy for Electricity, Water and Transport, OECD Publishing, Paris
7. OECD 2015, Water Resources Governance in Brazil. OECD Publishing, Paris
8. *OECD 2012, Environmental Outlook. The consequences of inaction. OECD Publishing, Paris

OECD Water Governance in Cities & OECD Principles on Water Governance

The OECD Water Governance in Cities report builds on a survey of 48 cities in OECD countries and emerging economies. It analyses key factors affecting urban water governance, discusses trends in allocating roles and responsibilities across levels of government, and assesses multi-level governance gaps in urban water management. It showcases best practices to promote a strategic vision across sectors, to engage with stakeholders and to foster integrated urban water management in cities and their hinterlands.

<http://www.oecd.org/fr/publications/water-governance-in-cities-9789264251090-en.htm>



Solutions suggested in the report are based on the OECD Principles on Water Governance, a framework of 12 must-haves for governments at different levels that can strengthen water governance' efficiency, effectiveness and inclusiveness.

Interested international, national, basin and local stakeholders can join the Global Coalition for Good Water Governance to showcase success stories and learn from international experiences.

<https://www.oecd.org/gov/regional-policy/OECD-Principles-on-Water-Governance-brochure.pdf>

More information at:
<https://www.oecd.org>



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Singapore's water story

A streamflow towards self-sufficiency and sustainable development

From water scarcity and rationing, Singapore has come a long way in coping with its water security and water management issues and has now become an International Water Hub. Singapore's water story points at the importance of constant innovation and investment in new technologies that use and reuse all available resources as many times as possible.

Writers: Katarina Uherova Hasbani & Elisa Asmelash

Singapore River and skyline.



Water security is identified as one of the threats emanating from failing global efforts to stop climate change. As of 2015, two-thirds of the world's population will be affected by water scarcity in the coming decade if no impactful action is taken.¹ Ambitious action requires role-models, and Singapore's water story is an example of a successful development policy. Singapore dramatically reduced its external water supply dependency while

employing regulatory instruments, proactive industrial support policies and direct engagement with water consumers. This a story which should serve as an example for Singapore's neighbours to follow, as well as the increasing number of countries facing water challenges in years to come.

Singapore's historical water challenges

Singapore is a tiny-city state nested within the strategic crossroads of Asia. While lacking in natural resources, Singapore succeeded in becoming a regional power house by using a smart mix of efficient governance and an open attitude to foreign investors. The Republic of Singapore is a small and densely populated tropical urban island in South East Asia² with only 718 km² in territory and a population of 5.4 million. While receiving plentiful rain-water, reaching up to 2,400 millimeters annually, the city-state has been facing historically severe water shortages. These are due to three key aspects; i) the limited land available for water collection and storage; ii) the complete lack of groundwater resources and natural endowments; and iii) land constraints caused by competing uses: housing, industry and business.

However, in order to understand Singapore's water challenges, we need to look back to its foundation in the 19th century. Singapore was founded in 1819 by Sir Stamford Raffles of the British East India Company. When he landed in Singapore, water from inland streams and self-dug wells was enough to maintain the island's limited population, but as population and

trade-related activities increased, more water was needed to sustain the city's growth. This led to the construction of a number of reservoirs,³ as well as the signing of agreements with the Government of the State of Johor (Malaysia) to transport water to ensure consistent supply over the long term. Yet, these agreements did not succeed in guaranteeing water security, as Singapore faced water rationing in 1961 and 1963 due to inadequate infrastructure and water management. As a response to these crises, the Singaporean Government established the Public Utilities Board (PUB) as the national water authority, which became responsible for the country's water management activities and the management of these water agreements.

When Singapore separated from Malaysia in 1965, these agreements remained, but held Singapore in a precarious position. The country only had three reservoirs, covering 20% of its needs and therefore still relied heavily on Malaysia as the country's single supplier of water. This being so, the agreements have always been the source of political tension and geopolitical stress between the two countries. Thus, water supply and the push for



water independence became a strategic priority for the Singaporean government.

In the 1970s, water management entered a new area of transformation. Institutions were restructured, legislation was revised, and the public was finally educated about water management and encouraged to



Jellyfish, Singapore aquarium.

A world leader and international water hub

Singapore currently consumes about 1.36 billion liters of water per day.⁵ The long-term agreements signed in 1961 and 1962 with Malaysia gave Singapore the drawing rights up to 391 million liters per day until 2011 and up to 1,136 million liters per day until 2060.⁶ Negotiations on the possible extension of the water agreement are now stalled as Singapore has asked for an extension beyond 2061. Malaysia has agreed, but at a much higher price: 15 to 20 times greater than their present price of water.

As a result, Singapore has developed a new strategy for increasing water security and self-sufficiency, which includes a wide range of elements such as: an efficient water management system, the formulation and implementation of new water-related policies, heavy investments in desalination and extensive reuse of wastewater. In its management of the entire water system, the PUB has developed and implemented a holistic policy approach, covering the whole water cycle, from storm water management, to desalination technologies, as well as demand management through public education and awareness programs.

directly engage in water conservation activities. The government began to move on a route to diversify the country's water supplies to decrease dependence on Malaysia. This included the expansion of existing catchment areas and reservoirs, as well as the adoption of control strategies and measures to monitor and regulate

water pollution problems. In 2001, the PUB was given full control over the entire water apparatus, and in 2003, the country began a program of water recycling. In 2005, the first desalination plant was built, and in 2008, the country began urban storm water collection.⁴¹

The Government has identified the water industry as a key growth industry for the country.



Marina bay of Singapore.

Building water resilience for the future

Writers: Maria-R. Cacenschi

Tough challenges often lead to inspiring opportunities. While many developed nations around the world take water for granted, the example of Singapore forces a change in perspective, especially in times of urbanization and climate change. With a history of water stress, the country grasped the necessity for a diverse, secure and reliable water supply and turned it into a world-class innovation-driven water industry. Strategically set to address water challenges at home and worldwide, Singapore has become a Global Hydrohub, fostering a favourable climate for public and private sectors to engage in R&D collaborations.

Growing an Ecosystem That Drives Breakthrough Water Innovation

Ambitious goals and effective policy instruments have been essential drivers for transforming Singapore into today's vibrant global cluster of innovation across the entire water value chain.

With an allocated total of 470 million SGD to fund innovation and capability development in the water sector over the last ten years, the Singapore government has demonstrated a strong commitment

in nurturing the development of the local water industry (PUB, 2016).

Not surprisingly, within the same period, the number of Singapore-based local and international water companies more than tripled from 50 to about 180, generating around 2.2 billion SGD in value added for the national economy. In addition, the number of public and private R&D centers has increased from three to 28 (PUB,



By combining and adopting the expertise in membrane development and water reuse, Singapore was able to close its water loop in 2003.

ized ideas into technological innovations for the future. Self-proclaimed a “Living Laboratory”,³ Singapore has enabled the conceptualisation of new technologies, and has been an early adopter of these technologies, validating their efficiency. More precisely, the Public Utilities Board (PUB), country’s national water agency, opened the doors of its venues and facilities to provide industrial test-bedding and implementation sites for innovative products, processes, systems and services. As a result, Singapore built up expertise and excelled in membrane development, water reuse and desalination.

By combining and adopting the expertise in membrane development and water reuse, Singapore was able to close its water loop in 2003. The production of NEWater – high-grade reclaimed water, which became a hallmark of PUB’s efforts, meets up to 30% of country’s water needs. The source of NEWater is treated used water, which is put through a process of microfiltration, reverse osmosis and ultraviolet disinfection, to produce ultra-clean reclaimed water.

Following the success of NEWater, PUB introduced desalinated water in 2005. Despite the desalination process being different than water treatment and purification processes, membrane technologies played a vital role.

Home-grown companies such as Memstar, NanoSun and global player Hyflux have enjoyed public financial and technical support to develop and sharpen their mem-

brane-based solutions and take them onto the world stage. As a result, Hyflux, having built two desalination plants in Singapore, has gone on to build one of the world’s largest seawater reverse osmosis desalination plants in Algeria.⁴

By challenging the boundaries of traditional water management across the world, the average annual value of projects overseas secured by Singapore companies has increased from 340 million SGD (2004-2005) to 1.4 billion SGD (2006-2012). Last year alone, Singapore companies exported their capabilities at an overall value of more than 1 billion SGD.⁵

The Future is Now

One of the lessons from Singapore’s water success story is that pushing for greater R&D and innovation in sustainable technologies certainly pays off. Particularly in times of climate change and resources depletion, thoughtful policies and incentives can be strategically implemented to balance the needs of the industry versus overall economic results, social benefits and the environment.

A model for sustainable urban water management for cities around the world, Singapore brought promising outcomes and knowledge resources that few utilities in the world can **pride on**. But most importantly, by recognizing early enough the true value of available and reliable clean water, it equipped itself to tackle one of the greatest challenges of our times: building water resilience for the future.

Notes:

1. <https://www.edb.gov.sg/content/edb/en/industries/industries/environment-and-water.html>

2. <https://rita.nrf.gov.sg/ewi/default.aspx>

3. <https://www.edb.gov.sg/content/edb/en/why-singapore/about-singapore/strategy/home-for-innovation.html>

4. <https://www.hyflux.com/highlights/magtaa-desalination-plant-algeria/>

5. <http://www.straitstimes.com/singapore/environment/made-in-singapore-going-places>

2016), with Singapore’s top universities NUS and NTU being recognized respectively as #1 and #2 universities in water research globally.¹

A recent additional 220 million SGD boost to fund R&D activities over the next five years is expected to further consolidate Singapore’s global leadership position.² The updated national water policy that serves now a dual purpose of addressing the country’s water shortage and the export of cutting-edge water technologies under a made-in-Singapore label c.

Water Technologies Made In Singapore

Beyond numbers, Singapore’s supportive policy approach has created a dynamic private water sector comprising of global international and local players, as well as home-grown start-ups that have material-

In 2006, \$330 million was committed to fund innovation and capacity development, which were topped up in 2011 with an additional \$140 million.⁷ More recently, the Singaporean water industry has received an extra 200 million SGD (148 million USD) in research and development funding to be used over the next five years. The funding will come from the National Research Foundation (NRF) under Singapore's Research, Innovation and Enterprises (RIE).⁸ Besides making sure that country meets its national water needs, these funds will also contribute to the flourishing and growth of the overall national water industry, making Singapore a world class and international water hub.

In more recent years, the drive of opening markets through the creation of competitive local environmental and water industries has led the Ministry of Environment and Water Resources (MEWR) to establish the Environment & Water Industry Development Council (EWI). The EWI works with stakeholders, such as public sector entities and academia to support R&D for new water technologies, encouraging them to engage in basic and applied research to develop and create new, innovative practices in water management. In addition, the EWI is also tasked to facilitate cross-sector coordination among government agencies involved in water management in order to prevent any potential conflicts of interest across sectors.

Singapore is increasingly recognized as the preferred hub for regional water management and water scarcity issues in Asia. The Asia Pacific Private-Public Partnerships (P3) Incubation Hub ([AsiaP3Hub](#)) was created with the support of World Vision International and the Singaporean government to develop and incubate new business models for deployment in developing countries in the region.

Today, Singapore's water industry is thriving. The country is home to about 180

Asia P3 Hub

Launched in July 2016, Asia P3 Hub (public-private-people partnerships) brings together public and private sectors to facilitate market-driven solutions for development and humanitarian opportunities. Based in Singapore and hosted by World Vision International, the Hub's initial focus is on water challenges in Asia Pacific. Visualized as a shared platform for co-creation, this collaborative space is designed to share resources and strengths across public, private and civil society sectors to encourage creative dialogue, and spark new partnerships and alliances for shared value creation and project implementation. Alongside brokering and managing new partnerships to drive these innovative market-based solutions, Asia P3 Hub will provide a platform for tri-sector learning and collaboration.

The initial theme of AsiaP3Hub is: water, sanitation and hygiene. The Hub will harness the competitive advantage, depth, breadth, energy and resources of not only World Vision, but also of the many stakeholders across the public and private sector, and civil society focused on achieving the Sustainable Development Goals (SDGs). The Hub will also leverage on Singapore's strategic geographical location and its position as a leading hydro-hub in Asia Pacific to achieve shared value creation across different sectors.

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Contact

Christy Davis, Executive Director
christy@asiap3hub.org

water companies, representing the entire value chain of the water industry ranging from upstream manufacturers to system integrators, downstream players and project developers. The water industry currently contributes more than 2.2 billion SGD to Singapore's gross domestic product and has created over 14,000 jobs, which the Government aims to increase to 15,000 by 2020.⁹

The water industry currently contributes more than 2.2 billion SGD to Singapore's gross domestic product and has created over 14,000 jobs

The Merlion is the national personification of Singapore.





Source: Nadim Hasbani

What is the secret to Singapore's success?

What makes the case of Singapore unique is that its approach to water independence does not rely solely on the construction of physical infrastructure. Singapore's strategy focuses on the creation and enforcement of a proper legislative framework, which includes correct water pricing, public education and a national research and development expertise. This challenge has motivated the city-state to transform the potential water crisis into an opportunity, establishing Singapore as a world leader in innovative, sustainable water technologies and management practices.

The key ingredients to Singapore's success:

First, an emphasis on supply and demand management. Singapore has always used a holistic approach when managing and dealing with its supply sources. Even when importing water from neighbouring Malaysia, Singapore has always looked at its own available resources and namely at ways of protecting them both in terms of quality and quantity, while also at expanding them through innovative water management techniques such as desalination, re-use of waste water, etc. Similarly, the demand side of water management plays an important role through the promotion of water conservation. This has been done through economic mechanisms, such as pricing adjustments and tariffs settings, as

well as through widespread engagement, education and mobilization of the community. National businesses and industries are encouraged to certify their buildings, and a water efficiency labelling scheme helps consumers choose efficient water appliances. The result is that citizens are generally educated on good water saving habits.

Second, the exemplary performance, transparency and accountability of the Singapore case is an emblematic example of how water management in a country can only be as effective and as efficient as its management of other related and connected sectors, such as energy, agriculture and indus-

try. The PUB has a high level of autonomy and has always been run by highly professional and proactive political leadership that take the water issue seriously. Compared to other Asian states, Singapore's ruling class can be proud of having a strong anti-corruption mentality, as well as competent and prepared professionals and experts at all levels of the water industry. The PUB trains its staff for their professional and personal development, and rewards good performers to ensure overall organizational performance and growth.

Finally, the thriving national water industry is an emblematic example of the impor-

tance of investing in new and innovative technologies that can reuse all resources as many times as possible. Singapore made a key policy decision to invest heavily in R&D, with the view of building a robust, diversified water supply with a sustainable cost base, without exposure to geopolitical stress. This R&D transformation has encompassed the entire water value-chain, from the first level of idea conceptualization and basic research, to more advanced levels of applied research, demonstration and commercialization. The country's PUB closely collaborates with both local and international partners from the private and public sectors alike

and supports cross-disciplinary research in sectors like energy, which are believed to have a close relation and direct impact on the water industry. The PUB has also found ways to consistently inspire and encourage community stewardship of the island's water resources. This includes, for instance, an award-system for granting recognition and special prizes for individuals and organizations who make an outstanding contribution to water use. Some examples include the Watermark Award, Gold Certificates for Water Efficient Buildings, the Friends of Water.

What can other countries learn?

Singapore's water story is inspiring at a crucial time for policy-makers facing water issues in many countries across the world. Water security is one of the global consequences of climate change, which we must urgently address. The Middle East and parts of South Asia will face serious water scarcity because of changing weather patterns, compounding the challenges that these developing countries and emerging economies already face surrounding water management as well as other issues of public works. Lack of indigenous water resources, coupled with

growing demand as a result of economic and demographic growth are some of the mounting pressures facing these nations.

Singapore's example confirms that simple measures combined with diligent implementation can transform the national water landscape of a country in the space of only a few decades. Targeted policies and regulations, working closely with consumers, and the construction of national industry is what made Singapore succeed, despite its considerable challenges and limited resources. However, what makes

this case truly exceptional, is the efficient and transparent governance which was able to bring the idea to reality. This is the most important lesson of Singapore's water story. ☺

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Revelle Group is a development consultancy working in developing countries and emerging economies in three key sectors: energy, environment & climate change and sustainable economic & social development. Revelle works with governments and international organizations to help create visions, develop roadmaps and implement strategies that tackle today's main global challenges for a more sustainable world.

The New “Water – Employment – Migration” Nexus

Water, employment and migration crises are posing rising risks globally. In parts of the Mediterranean, the situation on all three crises is alarming. Their link may not be obvious at a first glance, but it is becoming increasingly evident based on the hard evidence of realities on the ground. Exploring their causal relationships will provide a better understanding on how to tackle some of the greatest global challenges and help to effectively work towards the fulfilment of the UN Sustainable Development Goals (SDG).

Writer: Konstantina Toli

Old stone bridge on a dry lake, Lebanon.
Source: Amal Charif





In line with UN SDG #6 on Clean Water and Sanitation and linking with a range of other SDGs, the Global Water Partnership-Mediterranean (GWP-Med) is developing a new program on “Water Security, Migration and Youth Employment” with a focus on the Middle East and North Africa (MENA) region. The goal of this nexus is to turn water insecurity into security; unemployment and under-employment into employability and job creation; and displacements into emigration prevention in countries of origin and integration of migrants in transit and destination countries.

Water is directly linked with the region's economic development as it threatens to lower MENA's GDP by 6-14% until 2050, if no water-smart policies and technologies are employed in the immediate future.

Source: Shutterstock



The situation in the MENA region

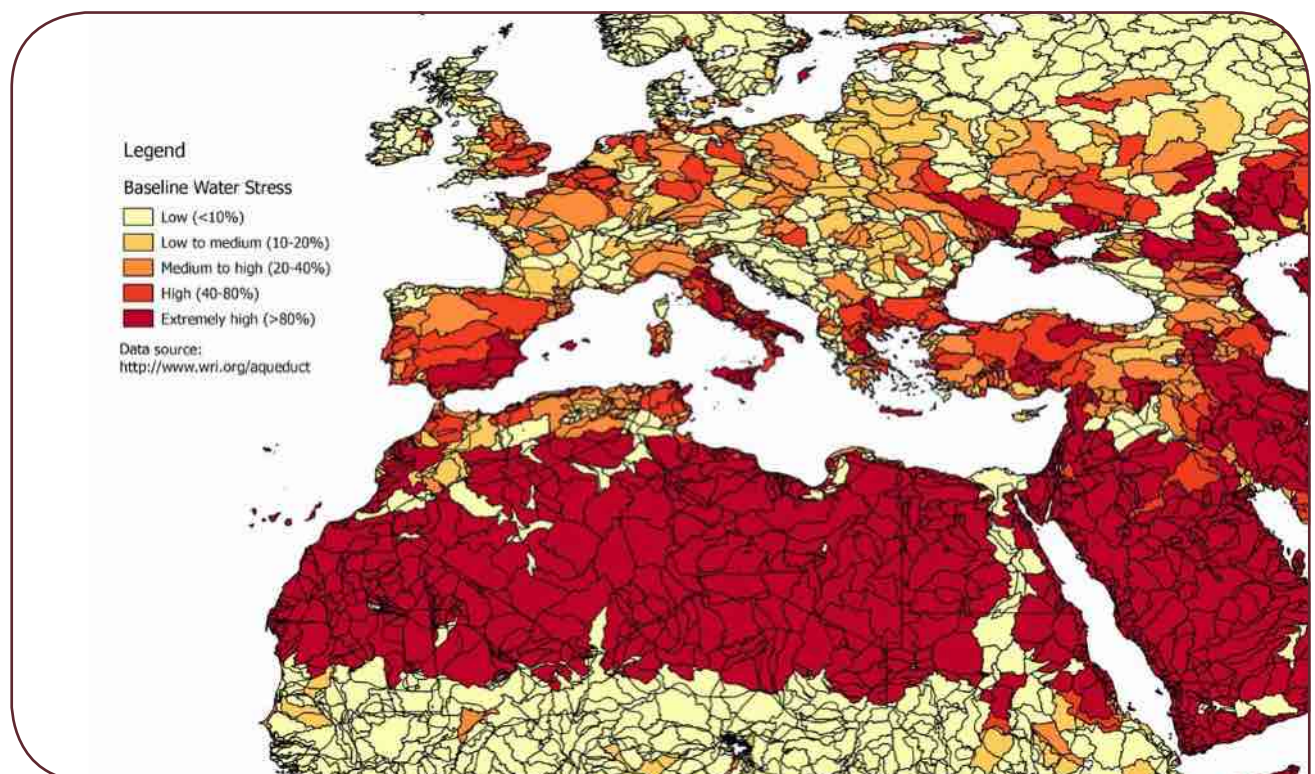


Figure 1. Water Insecurity portrayed as a threat multiplier for the MENA region. Source: World Resources Institute

Water scarcity in the MENA is acute, hindering development and triggering migration. It threatens human security, and can jeopardize the socio-economic stability across the Mediterranean. Looking back at the lifestyle of nomads who moved across the MENA and beyond to find areas with sufficient water for their tribe, the relation between water and migration is not a new trend for the region.

The youth employment crisis is also a long-standing issue for the MENA countries. Recording the highest youth unemployment and under-employment worldwide, with rates ranging between

28-30% per the International Labour Organization (ILO) 2015 report, this crisis can be identified on two levels.

Firstly, agricultural areas are challenged due to water pollution, depletion of ground water resources and higher variability in water supply. Farmers, including rural youth, are abandoning their land, driven to the cities by drought, dying livestock and loss of market to find work. But they often face a decrease of their living standards. Approximately 60% of the population in the MENA live in cities, while the urban population is expected to double by 2040. The negative impacts of urbanization on the diversity of the job

market and on the dynamism of economic activities in general can undermine the social equilibrium. This situation causes profound dissatisfaction on the grounds of unemployment, and may result in violent outbreaks and eventually to migrant outflow.

Secondly, ineffective education programs that are detached from the market needs result in a mismatch of skills and impede school-to-job transitions: the region presents exceptionally high rates of unemployed youth and a broadly ascribed low employability. This applies especially to many university graduates who find themselves amidst fierce com-

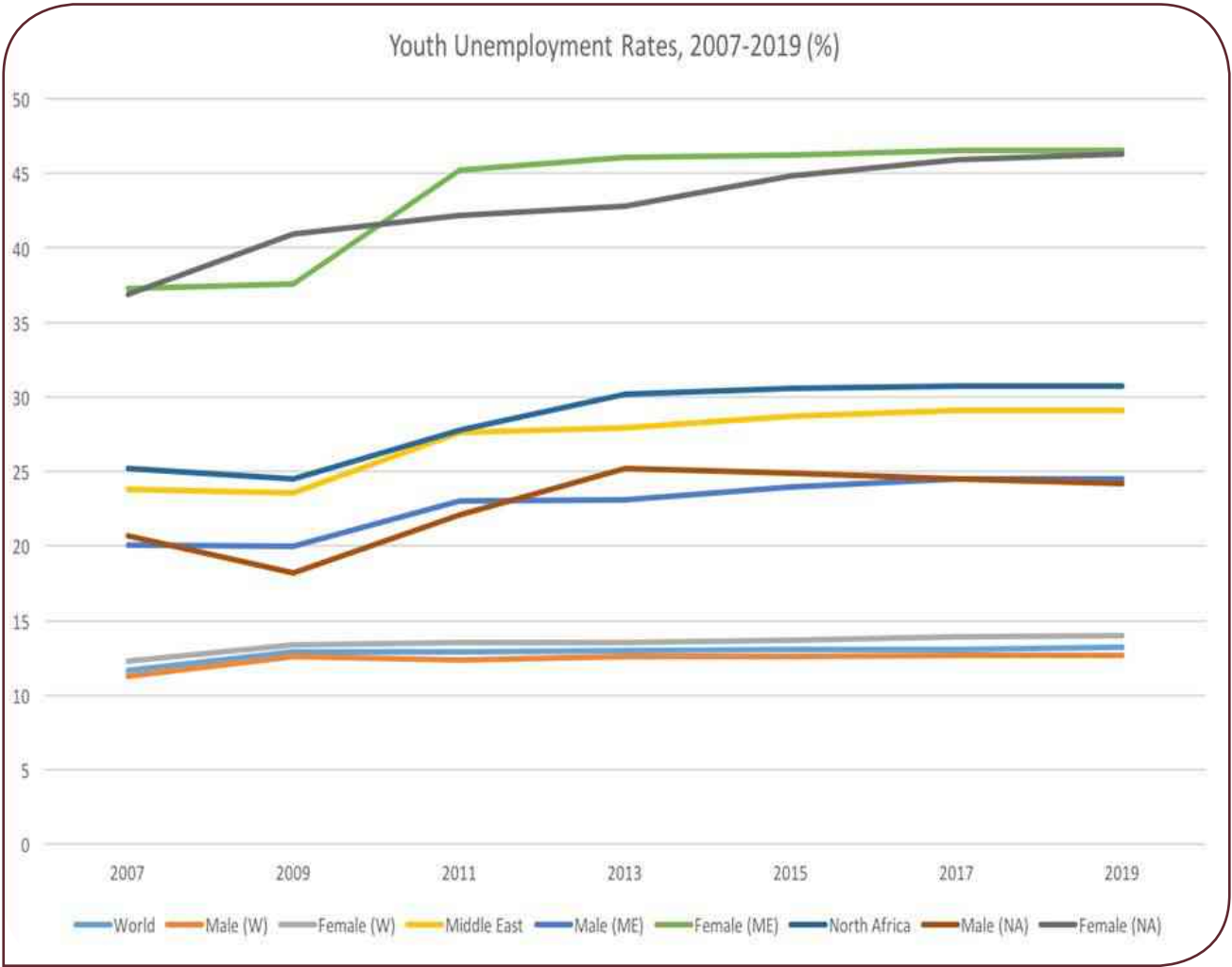


Figure 2. Global youth unemployment compared to male and female youth in the MENA
Source: ILO, Global Employment Trends for Youth 2015



The intensifying water-related risks due to climate variability and change, combined with the rapid population growth, and increase in unemployment, constitute daunting socio-economic perspectives for young people between the ages of 15-29 across the MENA.

Source: Shutterstock

petition over very few jobs. At the same time, qualified workers are missing from the lower-standards labour market.

Young women of all skill levels are in a more disadvantaged position compared to their male counterparts. A triple burden of gender, age and skills mismatches affects the female employment quota, which is significantly lower than the one of their male counterparts.

With less than 3% GDP increase since 2013, according to the World Bank, small economic growth in the MENA countries prevents the absorption of the additional labour supply flooding the market every year, impacting youth and affecting their decision to migrate. Consequently, more than ¼ of the MENA youth intends to either relocate within its own country or emigrate in Europe in hope of a better future.

While water insecurity can trigger an economic downturn, water security could fuel economic growth.

The link between Water, Employment and Migration

The intensifying water-related risks due to climate variability and change, combined with the rapid population growth, and increase in unemployment, constitute daunting socio-economic perspectives for young people between the ages of 15-29 across the MENA. The lack

of resources forms pressing conditions that affect different groups, depending on whether the country is an origin, transit or destination hub for migratory flows. As a result, the Mediterranean has become an international migration hotspot where movements originate

from, cross and circulate within, making the sea a veritable hub.

Tunisia, for example, is primarily an origin country of migrants. This is because rural livelihoods are reducing due to the increased inter-annual water sup-

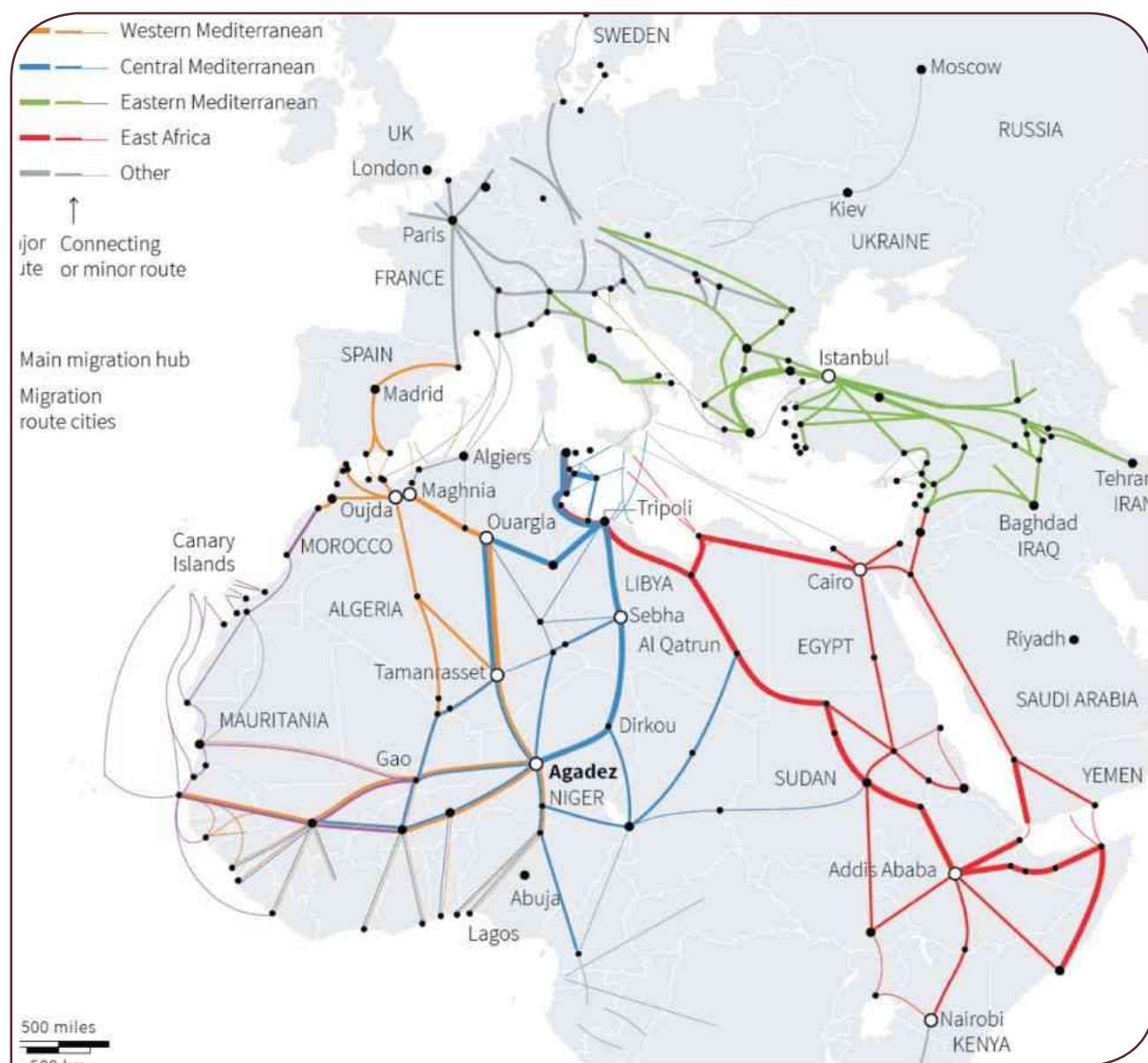


Figure 3. Main migration routes into and through the Mediterranean
Source: Reuters Graphics, 2016

Interview of Vangelis Constantianos, Executive Secretary of GWP-Med



What is the link between Water Security, Youth Employment and Migration? How did you conclude on this nexus and how does it fit under the agenda of GWP-Med?

There is a fundamental thread: less water - less jobs - more migration. In a water scarce region, with high unemployment rates, and under great migration challenges, the mix is explosive. Youth is a victim and a trigger of that explosion that we shall avoid. Immediate action, governed by a long-term vision, is a must. GWP-Med is a promoter of the much-needed positive change towards water security and sustainable development in the Mediterranean. Developing with partners the Water Security, Youth Employment and Migration Program is a key contribution to that.

What are the objectives of the Water Security, Youth Employment and Migration program? In what way do you hope to impact the youth employment situation in the MENA?

We will work to address the low employability of youth in the MENA, including skills mismatch and gender imbalances. We will design and apply interdisciplinary curricula and training programs to advance employability, and we will enable entrepreneurship opportunities in water related jobs through mentoring and start-up funding. Contributing to the respective governance processes at regional and national level, we will assist introducing actionable strategies to tackle these pressing challenges. Awareness raising, dialogue across and engagement of stakeholders will be a key enabling component of the program.

What is your strategy to address this multifaceted challenge? Has it been easy to identify and engage partners to implement the project?

Like with all burning developmental issues, solutions can come real only with wise leadership, wide partnership, integrated planning and sustained investment. A range of state and non-state entities across and beyond the MENA share similar comprehension of the issues and their solutions, and wish to engage in concert. The volume and complexity of the challenges demand a wide partnership. At this stage, we have introduced the concept to targeted regional and national potential partners and we are starting to build momentum. Our plan is to reach out in the coming months to international, regional and national institutions, migration and employment organisations, civil society academia, and of course interested financing partners, including the private sector. The program is built with support by the Swedish International Development Cooperation Agency (Sida) and GWP, and we would aim for labeling it under the Union for the Mediterranean (UfM). A multifaceted program like this can only succeed through collaboration and joint efforts.

What are the greatest challenges you expect to face in the coming months?

Focus of contents and envisaged solutions for the employment and migration challenges differ in the countries of the region. To be relevant and helpful, our national actions should be tailored accordingly. Furthermore, linking these with the water security agenda is not necessarily high in national priorities, since the tangibility and volume of benefits is not always evident. However, we see both the volume potential including through promoting new markets in Water-Energy-Food-Environment Nexus fields, and the quality element promoting a new water culture amongst youth and mainstreaming gender issues. Another important challenge is to quantify the expected tangible outcomes in a process that involves several intangibles which can only present impacts in the longer term. To ensure the effective investment of our own start-up resources, we will first launch a couple of pilot activities in targeted MENA countries to enhance our understanding and identify how our work can be of most help. At the same time, we will be working at assisting policy making and action planning at both regional and national levels.

ply variability, leading to plummeting agricultural income. In response, many young rural residents are drawn to the often deceptively promising city life. This increases the pressures on urban areas, which often struggle already with inadequate infrastructure. Those with the necessary financial means, usually higher skilled individuals, then turn their attention towards Europe and leave the country, leading to the infamous “brain drain”.

Lebanon, as a transit and – for some – a destination country for regional migrants, is recording a new high in unemployment while facing a range of water security challenges. With limited rainfall over the past three years and

the demographic changes since 2011 due to the influx of Syrian refugees, Lebanon is now suffering from additional water supply and wastewater treatment demands.

The 2016 World Water Development Report on “Water and Jobs” suggests that three out of four jobs are either heavily or moderately dependent on water. Investments into water can secure existing jobs and generate new ones through economic trickle-down effects.

For example, if the MENA countries could invest into more sustainable agriculture, through irrigation efficiency or rainwater harvesting, they could generate a multitude of direct on-farm employment

and indirect jobs. According to the Arab Forum for Environment and Development (AFED), such approach in the Arab countries could save up to 5% of the region’s GDP and add 10 million new jobs in the years to come. Investing into wastewater and greywater treatment, flood protection, and other non-conventional water resources, could create additional job opportunities and contribute towards the 50 million jobs needed until 2020 to employ the additional labour supply in the region.

What GWP-Med is doing

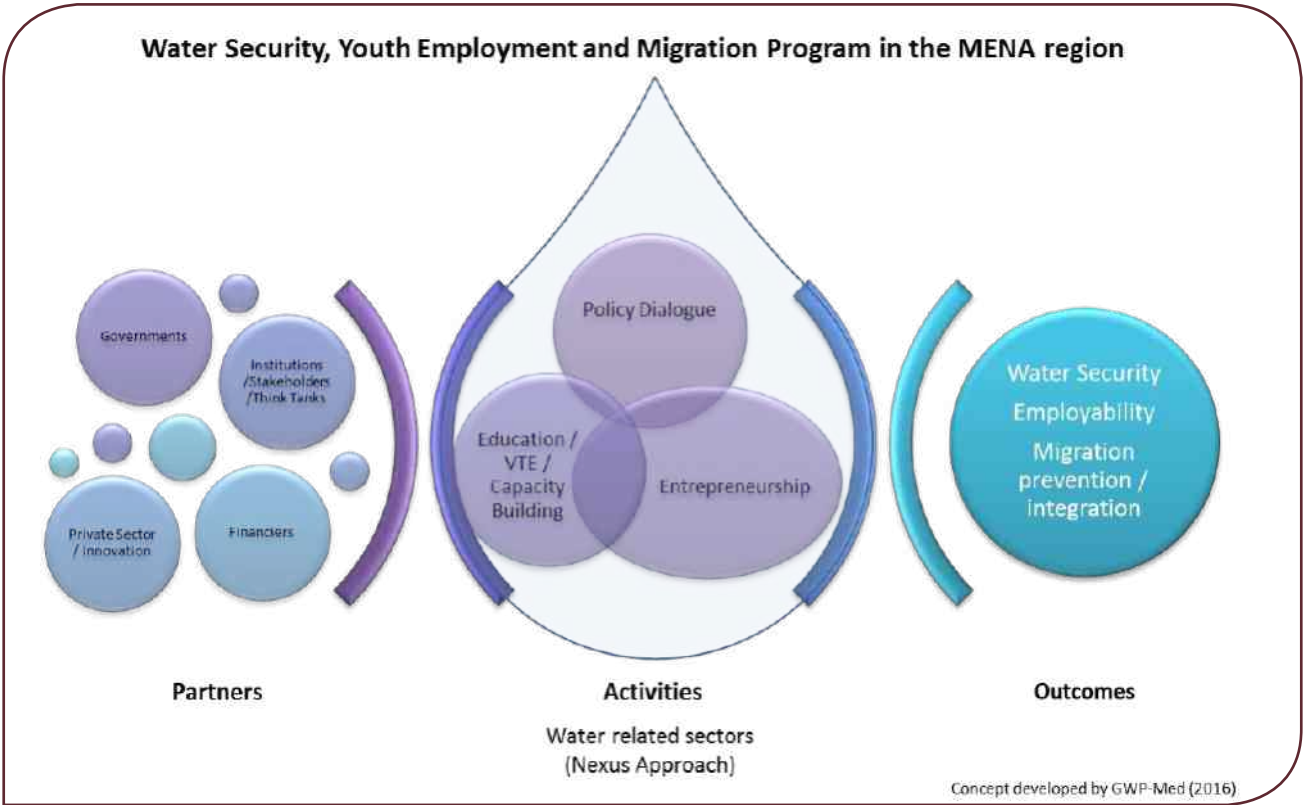
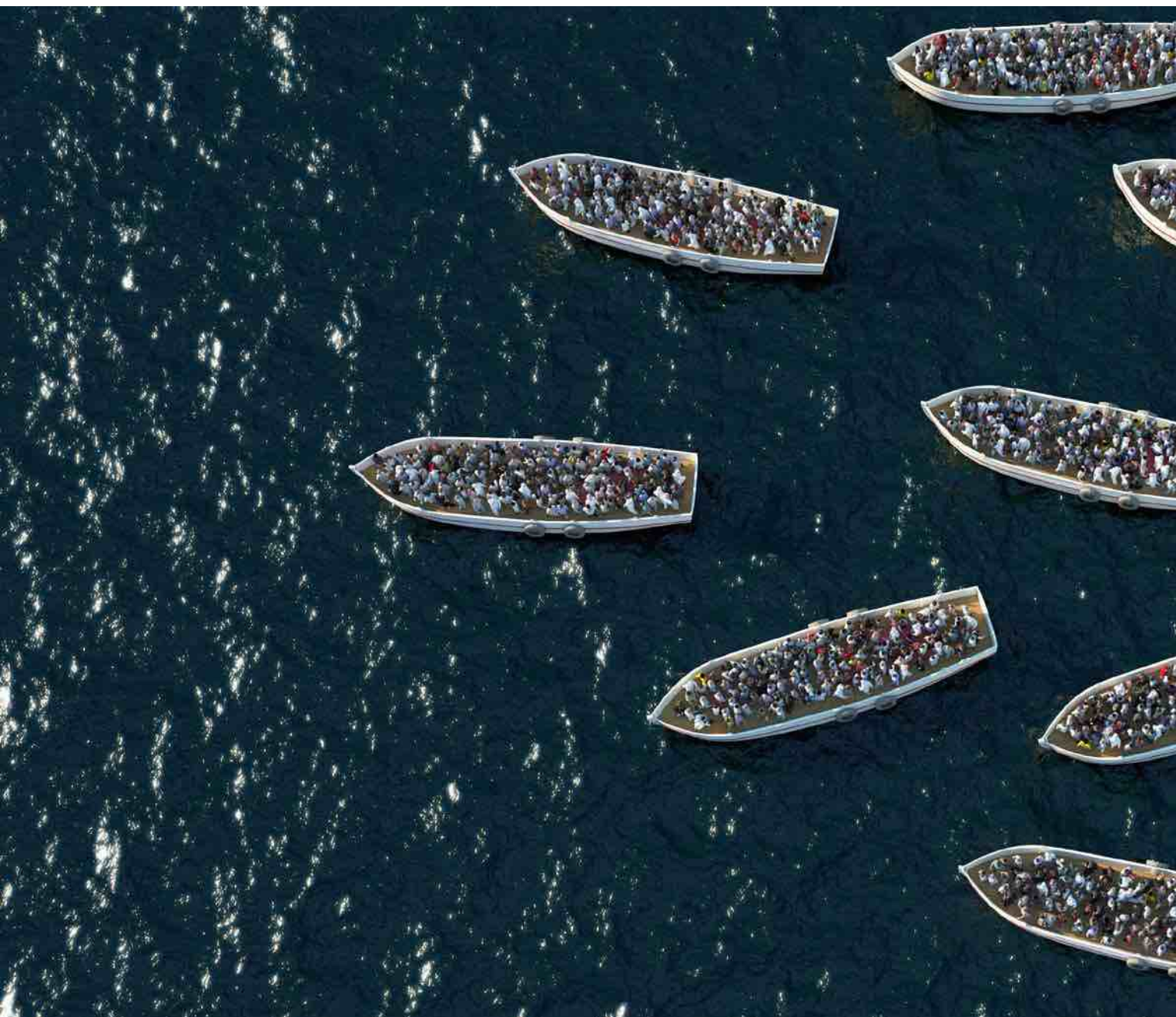


Figure 4. Water Security, Youth Employment and Migration Program
Source: GWP-MED, 2016



More than one fourth of the MENA youth intends to either relocate within its own country or emigrate in Europe in hope for a better future. Source: Shutterstock

Water is directly linked with the region's economic development as it threatens to lower MENA's GDP by 6-14% until 2050, if no water-smart policies and technologies are employed in the immediate future. While water insecurity can trigger an economic downturn, water security could fuel economic growth.

GWP-Med started exploring the new nexus of Water Security, Youth Employment and Migration, and conducted preliminary case studies in Tunisia and Lebanon as potential pilot countries. The goal is to select the water-related sectors that present the most opportunities for employability, identify the priority groups

in need of employment, and pin-point the kind of water-related training, skills and start-up support needed to match these.

In cooperation with governments, international institutions, stakeholder organizations (including youth associations), and financiers (the private sector), GWP-Med



and its partners will design vocational and entrepreneurship training programs for youth on Water-Energy-Food-Environment Nexus fields, including with a focus on non-conventional water resources promotion. Special attention will be on addressing low female employment opportunities in the MENA.

A central contribution in the development of curricula will be aimed at private sector companies to respond to their needs and requirements. Start-up support structures and mentoring networks in the incubation phase of nascent enterprises, will impart a 'green-blue mindset' and 'green-blue skills' to the program's participants, creating new jobs while nurturing a new water culture.

To support setting the regional and national institutional and regulatory ground for successful measures, GWP-Med will assist national and regional authorities, to develop strategies to address the root causes of unemployment and migration and effectively contribute to water security in the region. Needs are adamant. Challenges are high. But, solutions are feasible – if vision, partnership and investment come together. 🌐

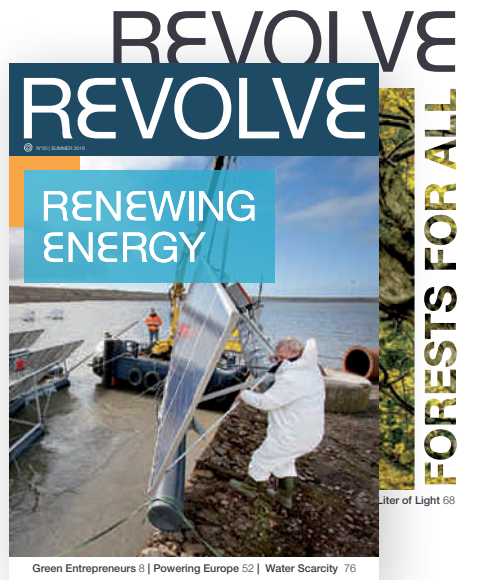


Global Water Partnership – Mediterranean (GWP-Med) aims at a water-secure Mediterranean, through application of Integrated Water Resources Management (IWRM) approaches. It brings together more than 100 stakeholders of different water disciplines, including 10 regional stakeholders networks. It was established in 2002, and is one of the 13 Regions of the intergovernmental organization Global Water Partnership (GWP)

Global Water Partnership – Mediterranean (GWP-Med) aims at a water-secure Mediterranean, through application of Integrated Water Resources Management (IWRM) approaches. It brings

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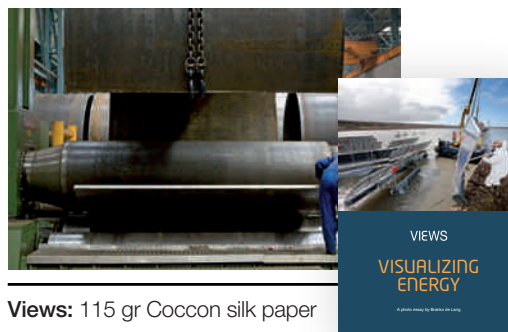
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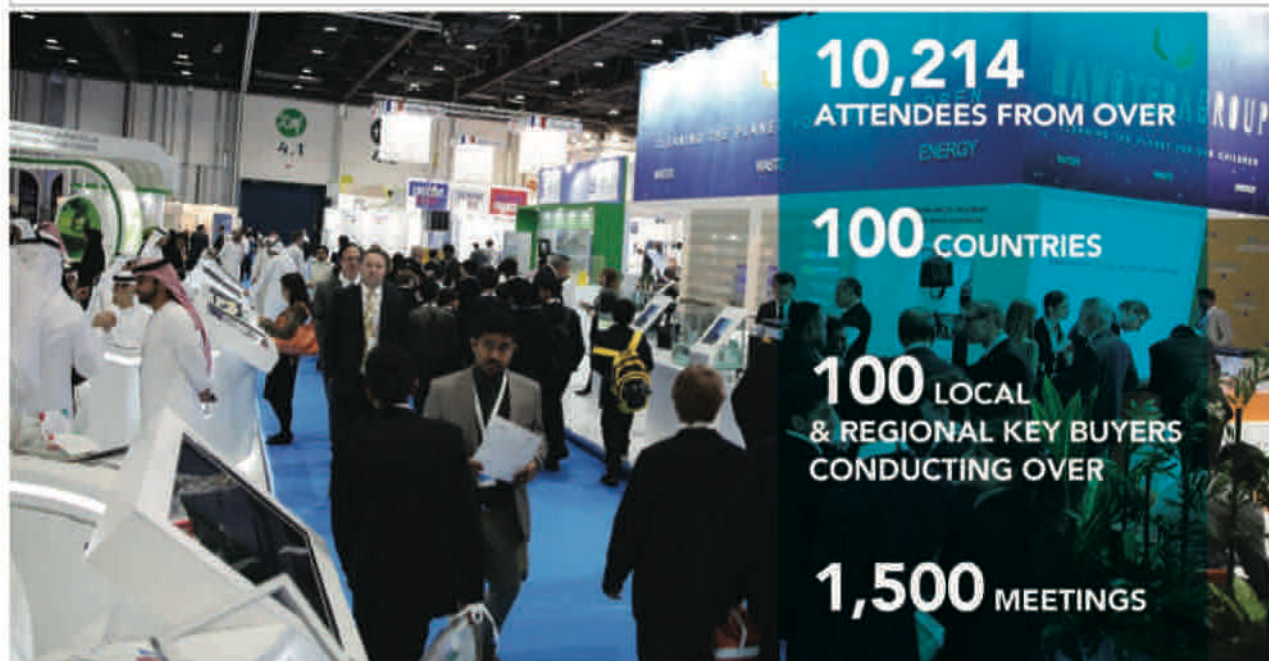


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