REVOLVE

QUARTERLY INSIGHTS INTO A CHANGING WORLD

N° 38 | Winter 2020/21



Coastal Cities

Get ready for a world with a lot more water!

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Are Water Footprints Reliable? p.24 #Sweat4Soap with Mina Guli p.31
Marine Protected Areas p.62 India's Urban Water Challenge p.70 Circularity in Africa p.74

We asked – you answered!

Throughout the month of November, we invited you to vote on the cover that is most evocative of rising sea levels.

The three options depicted (1) the next generation that would be impacted, (2) the movement of people due to flooding, and (3) co-existence with water:







The voting took place on 4 of our social media channels:

Thank you for choosing!

Watch this space for more on sustainability:

revolve.media


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Water

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Mina Guli

Water advocate and ultra runner, #Sweat4Soap.

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Sören Bauer

President, REVOLVE Circular, interviews the 8 Executive Team members of the African Circular Economy Network (ACEN).

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Cover image: Children play in flood waters after torrential rains in Kampung Melayu, Jakarta, Indonesia, 2013. Photo: Kate Lamb

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The REVOLVE communication group is about fostering cultures of sustainability. With offices and staff in Barcelona, Beirut, Brussels, Lisbon, and Vienna, we publish an international magazine (ISSN 2033-2912) that compiles the 'best of' from our online content in quarterly issues focusing on water (winter), nature (spring), energy (summer), and transport (autumn) with the circular economy as a recurrent theme. To subscribe, order back issues, or discover all our publications, including our country and industry reports, visit: **www.revolve.media/shop**

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Water Challenges for the 21st Century

The amount of water on Earth is constant and should be sufficient to keep us going for centuries to come. However, our world is increasingly exposed to natural disasters, pollution, a volatile climate and socio-economic changes that threaten, among others, our water supply and sanitation.

It will take all of us to overcome what could prove to be our greatest challenge of the 21st century.

DRAGAN SAVIĆ
CEO OF KWR WATER RESEARCH INSTITUTE AND PROFESSOR OF HYDROINFORMATICS AT THE UNIVERSITY OF EXETER

Water is the key to life as we know it. From a purely biological role to being crucial for sustaining societies, economies and the environment, its importance is undeniable. After all, readers of the British Medical Journal selected water-based sanitation as the greatest medical milestone of the last century and a half. That is even more remarkable when it is compared with inventions such as vaccines, which are quite clearly on the minds of the world's population due to the COVID-19 pandemic.

Living with uncertainty

The water cycle, on which supply and sanitation services rely, shows signs of significant change. As a result, scientists are questioning the notion of stationarity that suggest that the statistical properties of the water cycle in the future will be similar to what happened in the past.

Irrigation for crop production now claims close to 70% of all freshwater appropriated for human use. With the world's population expected to increase to 9 billion, this could become unsustainable in the long term. Therefore, humanity will have to learn to live with the rise in demand and increased uncertainty associated with natural resources, including water.

Water is also closely related to meeting other challenges, most notably the provision of food and energy for the increasing, urbanized and affluent population. Furthermore, managing this 'nexus' of challenges will become increasingly difficult in the 21st century, and the world will have to get smarter about water consumption. So, how are we prepared for those challenges?

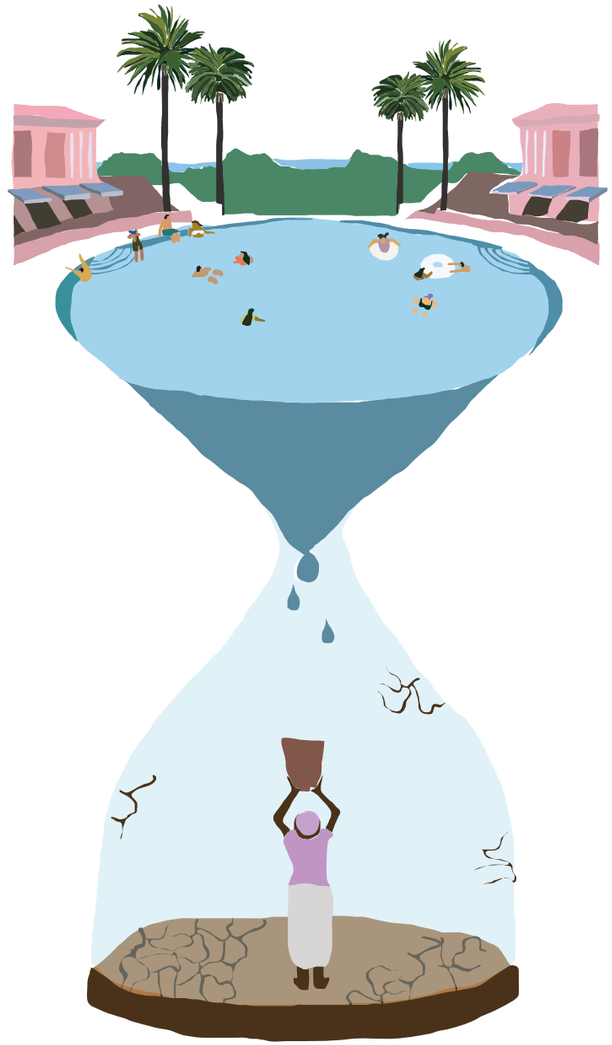


Illustration by Cristina Sanuy

Embracing digital transformation

The key developments that the global water sector is beginning to embrace are the digital transformation and the engagement of the public (users or beneficiaries of the services).

Digital transformation has already made a significant impact on how many water utilities use tools to support planning and operational decisions related to water and sanitation services they provide. In urban areas, simulation and optimization tools, combined with the proliferation of the technologies, have shown a great potential for improving utility decisions and customer service.

However, due to changes brought by the digitalization of our world, these utilities will likely have to deal with large volumes of data, often referred to as "big data". A similar trend can be seen in food production with smart farming and precision agriculture being tested. Decisions can be made for a particular local plant and hydrology conditions, which should improve agricultural efficiency and reduce water usage in this sector.

Making the invisible, visible

Water is sometimes considered as an "invisible utility" due to its infrastructure being largely out of sight and thus often taken for granted. However, customer expectations are increasing across sectors, as in the retail and financial services industries.

Due to the expected global trends, water utilities will have to make some difficult decisions about the use of resources, for example with freshwater, energy, chemicals, and the levels of investment in ageing infrastructure to meet customer service expectations. Such expectations will drive utilities to better understand and engage with those customers.

These challenges have already resulted in the emergence of new water leaders trained in hydroinformatics – where mixing big data with smart technologies will deliver more sustainable water solutions. This relatively new discipline aims to improve development, uptake and use of digital tools in the water sector and empower citizens to engage with water service provision on an individual level.

Coastal Cities: the Frontline Against Rising Seas

WRITER: **ROBERT MUGGAH**

The warning signs are getting harder to ignore. Rising seas are already displacing tens of thousands of people, destroying millions of homes, and generating billions of dollars in losses. Due to competing predictions of future global temperatures, scientists are unsure exactly how fast or high sea levels will rise. But they all agree on its impacts: submergence and flooding of coastal land, saltwater intrusion into surface waters and groundwater, increased erosion and overwhelmingly negative social and economic repercussions. They are also clear that these effects will be widespread and will accelerate with time.

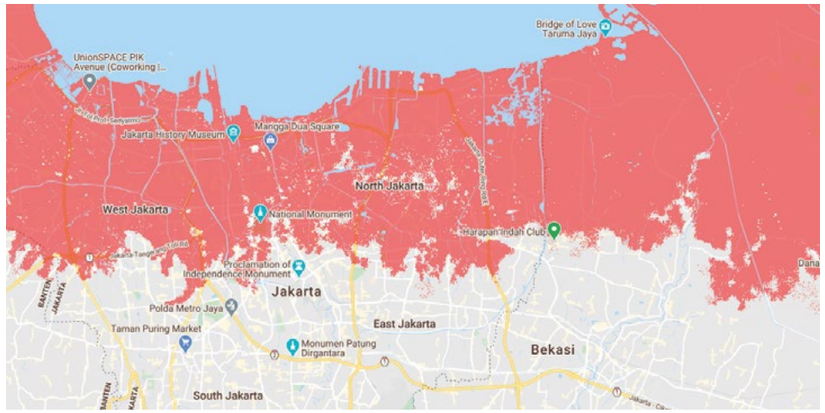
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Even in the unlikely event that global temperatures are kept from exceeding two degrees Celsius by 2050, close to 600 coastal cities with over 800 million residents will be ravaged by rising seas and storm surges, water salinization and an unfathomable financial burden. Yet most of the world's fastest growing sea-side cities are not even remotely prepared to deal with rising water levels. Most coastal cities across North America and Western Europe have yet to put in place mitigation and adaptation strategies. Few cities in Africa, Asia or Latina America have published climate action plans, much less installed concrete strategies to protect and educate their populations.

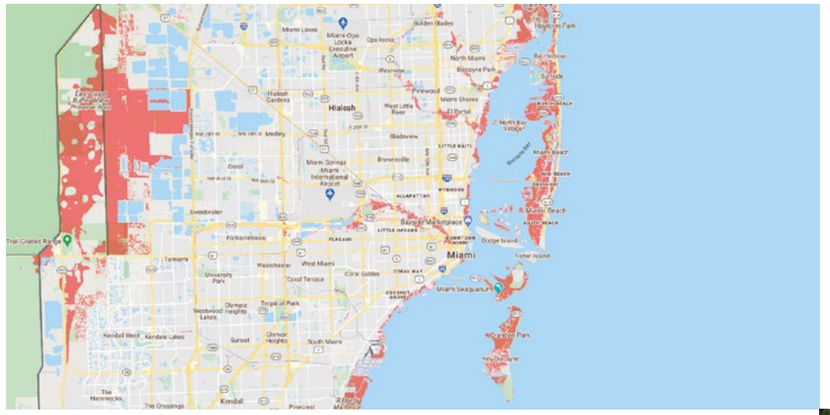
Sinking Cities

Some cities are more at risk than others. Sprawling megacities like Lagos, Shanghai and Mumbai are facing sea-level rises well above the global average. Since many of them are built on mangroves and swamps, some of the world´s biggest cities are sinking at the same time as seawater is seeping in. This is not just because they are heavy, but because their residents are extracting vast quantities of groundwater. Consider Jakarta, a sprawling metropolis of over 9.6 million people, which has sunk by 2.5 meters (over eight feet) over the past decade. As can be seen on the map, parts of the city have disappeared under up to 3 meters (ten feet) of sea level rise since the 1980s. And if global temperatures rise by one and a half degrees Celsius or more, entire neighborhoods are likely to be swallowed up.

Jakarta is a victim of geography. It is hemmed in by the Java sea to the north, built on swampy land and is crisscrossed with over a dozen rivers, many of them intensely polluted. Despite an abundance of water, local authorities can only meet about 40 percent of the city´s demand. Local authorities´ inability to enforce regulations preventing groundwater extraction means that illegal tapping is out of control. The northern neighborhoods, home to one of Southeast Asia's busiest seaports, are sinking fastest. Yet despite routine flooding, luxury apartments are filling-in the coastal skyline. The building bonanza will soon go bust: 95 percent of the city is expected to be underwater by 2050. Local authorities have taken notice and are building a $40 billion sea wall with Dutch and South Korean support. The city has already relocated more than 400,000 people from threatened riverbanks and reservoirs. But the truth is that the city is unable to face-up to the factors that are causing the city to sink beneath the waves.



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1. Flood in Jakarta, Indonesia, January 2013. Photo: Dani Daniar.

2. Jakarta area, land projected to be below annual flood level in 2050 (shown in red). Image: Climate Central.

3. Miami area, land projected to be below annual flood level in 2100 (shown in red). Image: Climate Central.

4. Flood in Manila, Philippines, 2012. Photo: AusAID.

Asian urbanites face rough seas ahead. Part of the reason for this is that there are simply more of them: about four out of every five people impacted by sea level rise by 2050 will live in Asia. So-called "delta cities" will be the first to be submerged. Today, hundreds of millions of people live in roughly 50 delta cities such as Dhaka, Guangzhou, Ho Chi Minh, Hong Kong, Manila and Tokyo. These cities were once ideal places to settle because of their access to the sea and fertile farmland. These characteristics help explain why the Brahmaputra, Ganges, Indus, Nile and Yangtze served as cradles of many of the world´s great civilizations. But these ancient virtues are modern liabilities. Coastal living is becoming dangerous: the costs of sea level rise will rise to the tens of trillions of dollars by 2100. Not surprisingly, insurers are pondering a world of ex-cities. They are already pricing in a "new normal" of higher-frequency and more extreme events. We can expect to see rising seas factored into rising insurance premiums.

Cities across the Americas, especially those on the North American eastern seaboard and Gulf coasts, are on the front line of sea level rise. Their vulnerability is due in large part to melting ice in Greenland and the weakening of Atlantic Ocean currents. In the U.S., over 90 coastal cities are experiencing chronic flooding – a number that will likely double by 2030. New York is one the most at-risk due to its location, but also its population size. Over the coming decades, 22 of the 25 more threatened cities will be in Florida. Faced with between three and 9 meters (10-30 feet) of sea level rise by the end of the century, Miami is the poster child for cities on the edge. This partly explains why so many people are closely watching how Miami´s metropolitan authorities handle the situation. They have their work cut out for them. For one, Miami was never planned with sea level rise in mind, which means its real estate and road infrastructure are highly exposed. Making matters worse, southern Florida's underlying geology is like Swiss cheese – made-up of compressed reef – and is predisposed to heavy flooding regardless of whatever local officials decide to do. As if that were not enough, hurricanes and extreme weather events are growing in frequency and ferocity, which means more rainfall and storm surges.

The costs of sea level rise will increase to tens of trillions of dollars by 2100.



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Our floating future

Whether they like it or not, Miamians face a floating future. City officials are busily installing engineering fixes like sea walls, water treatment plants, and pumps to force water back into the bay. They are also investing in climate resilience by revamping building codes, raising roads, restoring wetland areas and issuing municipal green bonds to fund mitigation efforts. As in Jakarta, some neighborhoods are being surrendered to rising seas. A rash of properties are being converted into parks and water retention areas to absorb overflow. Governments, businesses and civic groups everywhere have good reason to plot cities with the future in mind. Roughly three quarters of all European cities will be hit badly by rising seas, with Dutch, Spanish and Italian cities especially exposed. Rapidly urbanized and crowded African and Asian cities are also in trouble, especially the poorest segments of the population that are often densely crowded into informal and low-income housing at the water's edge.

The fight-back has begun

Faced with prospects of extinction, a growing number of cities are making themselves climate-proof. Some of the most forward-looking cities are actively mitigating greenhouse gas emissions and designing-in adaptation at precisely the moment when nation states are moving in the opposite direction. A prime example of this occurred immediately after the U.S. announced its withdrawal from the 2015 Paris Climate Agreement. Within days, over 1,000 cities signed a Mayor's Climate Protection Agreement to meet – and exceed –global targets. Even cities like Austin, Dallas and Fort Worth in the oil-state Texas expect to be carbon neutral in the next few years. Already far-ahead of their U.S. counterparts, European cities are also actively adopting mitigation and adaptation strategies, for example Copenhagen, in Denmark, which expects to be carbon neutral by 2025. Powerful global city coalitions like the C40 and Carbon Neutral Cities Alliance are helping cities kick their addiction to fossil fuels before 2050. A Global Covenant of Mayors for Climate and Energy has already rallied at least 10,000 cities – more than 806 million people – to the cause.

At the vanguard are Dutch coastal cities that are rolling-out an array of solutions to manage sea level rises. They have good reason to be proactive since over a quarter of the country is already below sea level. To accelerate municipal efforts, the national government has decentralized many aspects of water management, delegating cities to take charge. For example, flood protection is the responsibility of regional water management boards and not the central authorities. This is not to suggest that the national government is passing the buck: to the contrary, they have funded hard defenses such as a 3,700-kilometer network of dikes, dams and seawalls, as well as the massive Maesland Barrier. Built to protect Rotterdam (which is 90 percent below sea level) from water surges and floods, the barrier is the size of two Eiffel Towers flat on their sides.

Changing our attitude is the key

Cities like Rotterdam offer an inspiring model for how to manage sea level rise. Rotterdam is one of the safest delta cities in the world precisely because it has learned to live with water. This attitude isn't new. It can be traced back as far as the thirteenth century when local merchants and city administrators erected a 400-meter long dike to keep high waters from seeping in, but also to facilitate drainage. New canals were built in the 1850s to improve water quality and reduce routine outbreaks of cholera. The Maesland Barrier was constructed in 1997, several decades after catastrophic floods killed over 1,800 people in the early 1950s. As the maps show, today these titanic gates protect the city´s 1.5 million people from floods with no impediments to sea traffic.

But the critical ingredient of Rotterdam´s success isn´t engineering – it is attitude. The city´s current mayor, Ahmed Aboutaleb, claims that local residents "do not view climate change as a threat, but rather as an opportunity to make the city more resilient, more attractive and economically stronger." In his view, climate adaptation is a window of opportunity to upgrade infrastructure, increase biodiversity, and more meaningfully engage citizens in city life. A few years ago, the city adopted a Climate Change Adaptation Strategy to climate-proof the city by 2025. Since then it has started converting ponds, garages, parks and plazas into part-time reservoirs. Local authorities are also working with community groups to revitalize neighborhoods, reduce inequality and build resilience to future shocks.

Sponge cities

Chinese cities are also taking action to mitigate and adapt to sea-level rise. As in the case of the Netherlands, the Chinese were motivated in part by disaster. In 1998, floods killed roughly 4,000 people when the Yangtze River basin overflowed. A growing number of big cities such as Beijing – which more than doubled its total land coverage in the last decade – are also suffering a rise in floods. Today, roughly 641 of China's 654 largest cities are affected by regular flooding, especially those on the coast. The Chinese government has responded with a combination of hard engineering, environmental and people-based strategies, together with the relocation of millions of citizens.

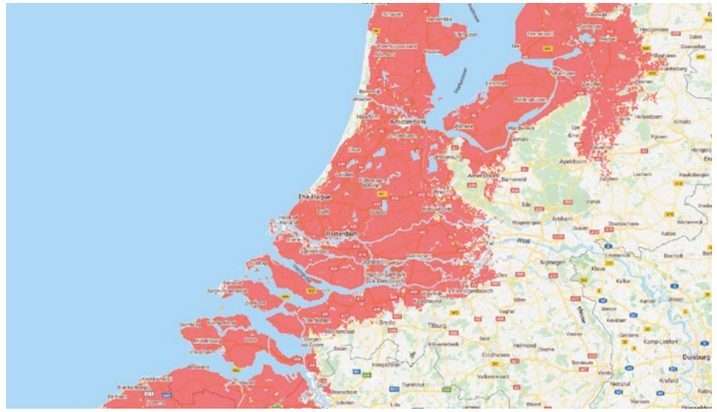
5. Part of the Delta Works, the Maeslant barrier is controlled by a supercomputer, and automatically closes when Rotterdam (especially the Port of Rotterdam) is threatened by floods. Maeslantkering has two 210 meter long barrier gates, with two 237 meters long steel trusses holding them. When closed, the barrier will protect the entire width (360 meters) of the Nieuwe Waterweg, the main waterway of the Port of Rotterdam. It is one of the largest moving structures on Earth, rivalling the Green Bank Telescope in the United States and the Bagger 288 excavator in Germany.
Photo: Frans Berkelaar.

6. The Thames Barrier is a movable barrier system that is designed to prevent the floodplain of most of Greater London from being flooded by exceptionally high tides and storm surges moving up from the North Sea. It has been operational since 1982. When needed, it is closed (raised) during high tide; at low tide, it can be opened to restore the river's flow towards the sea.
Photo: Phil Dolby.

In 2014, China launched the so-called sponge city initiative. The term actually originated in Hyderabad when the city authorities started collecting storm-water to offset water demand during planting season. Likewise, Vinh in Vietnam also adopted a 'city as sponge' strategy to lessen the impacts of seasonal floods on vulnerable urban areas. In the case of China, the sponge strategy requires that 80% of all urban land is able to absorb or reuse 70% of storm-water. More than 30 cities are currently part of the initiative including Shanghai – one of the most flood-prone cities in the world. The Chinese expect that at least another 600 cities will join in the coming decade.

Shanghai's authorities are putting enormous stock in adaptation strategies. And not without good reason – by 2050, the city is expected to experience flooding and rainfall that is 20% higher than the global average. The city is already rocked by two to three typhoons every year. Shanghai is also sinking, albeit less slowly than Jakarta. To reduce its exposure to rising seas, Shanghai has constructed 520km of protective seawalls that stretch across the Hangzhou Bay and encircle the islands of Chongming, Hengsha and Changxing. As in the case of Rotterdam, Shanghai has also installed massive mechanical gates to regulate overflowing rivers.

For their part, US cities are busily investing billions of dollars to bolster their resistance to rising sea levels. New Orleans established the Hurricane and Storm Damage Risk Reduction System shortly after Hurricane Katrina killed more than 1,600 people in 2005, leaving 80% of the city underwater. The system includes a series of massive dam barriers, reinforced levees and flood-walls stretching some 560km around the city. The city also built a living water system of parks, wetlands and other existing features to reduce reliance on pumping and canals. It is one of the largest public works projects in US history and the most expensive flood-control system in the world. Boston, Houston, Miami, New York City and dozens of other places are following suit, albeit on different scales.



7

Entire nations under threat

The people who are most nervous about sea level rise are already living at, or below, sea level. Few places are more at risk than small island nations like Kiribati, the Marshall Islands, the Solomon Islands, Tuvalu or the Maldives. Climate change will literally wipe these countries from the face of the earth. Besieged by rising waters, Kiribati is negotiating to buy 5,000 acres (20 square kilometers) of land in neighboring Fiji on which to move its 113,000 citizens when necessary. A government website concedes that national survival is unlikely, making it the first nation state likely to cease to exist as a result of climate change. Residents of the Marshall Islands face a similarly stark choice: leave the country or climb higher. Public authorities there are desperately looking for ways to reclaim land and build islands that are high enough to withstand rising seas. The Maldives is also attempting to reclaim, fortify and build new islands, and relocate when necessary. These countries are not rare exceptional birds: they are the canaries in the mine.

From Asia and Africa to Europe and the Americas, sea-level rise is inevitable. Mitigation efforts must be scaled up. However, precisely because it already poses an existential threat to coastal communities everywhere, adaption is essential. At a minimum, governments, businesses and citizens need to avoid making a bad situation worse. Adjusting zoning laws and reducing building in at-risk coastal areas and flood plains is a start. Proactively developing strategies to relocate populations who are vulnerable to sea-level rise is no less important. Innovative financing models and multi-stakeholder partnerships are also critical. But perhaps most importantly we need a new mindset. The fates of millions depend on it. ●

This feature first appeared as "The world's coastal cities are going under. Here's how some are fighting back" on 16 January 2020 on **www.weforum.org**.

7. The Netherlands, land projected to be below annual flood level in 2050 (shown in red).
Image: Climate Central.

Cities4Forests

WE CONNECT CITIES WITH FORESTS FOR A HEALTHIER WORLD

Every city, and our collective future, depends on healthy forests around the world. It is time for cities and their residents to join the global effort to conserve and restore forests — inside and outside city boundaries.

Jakarta x **Cities4Forests**

In 2018, the loss of Indonesia's primary forest was 40% lower than the annual rate of loss from 2002-2016, but it still ranks third in the top ten countries losing the most tropical primary rainforest.* There's more work to be done.

Jakarta is a member of the global network Cities4Forests.

Learn more about its reforestation efforts and tree mapping on Cities4Forests.

www.cities4forests.com | #Cities4Forests

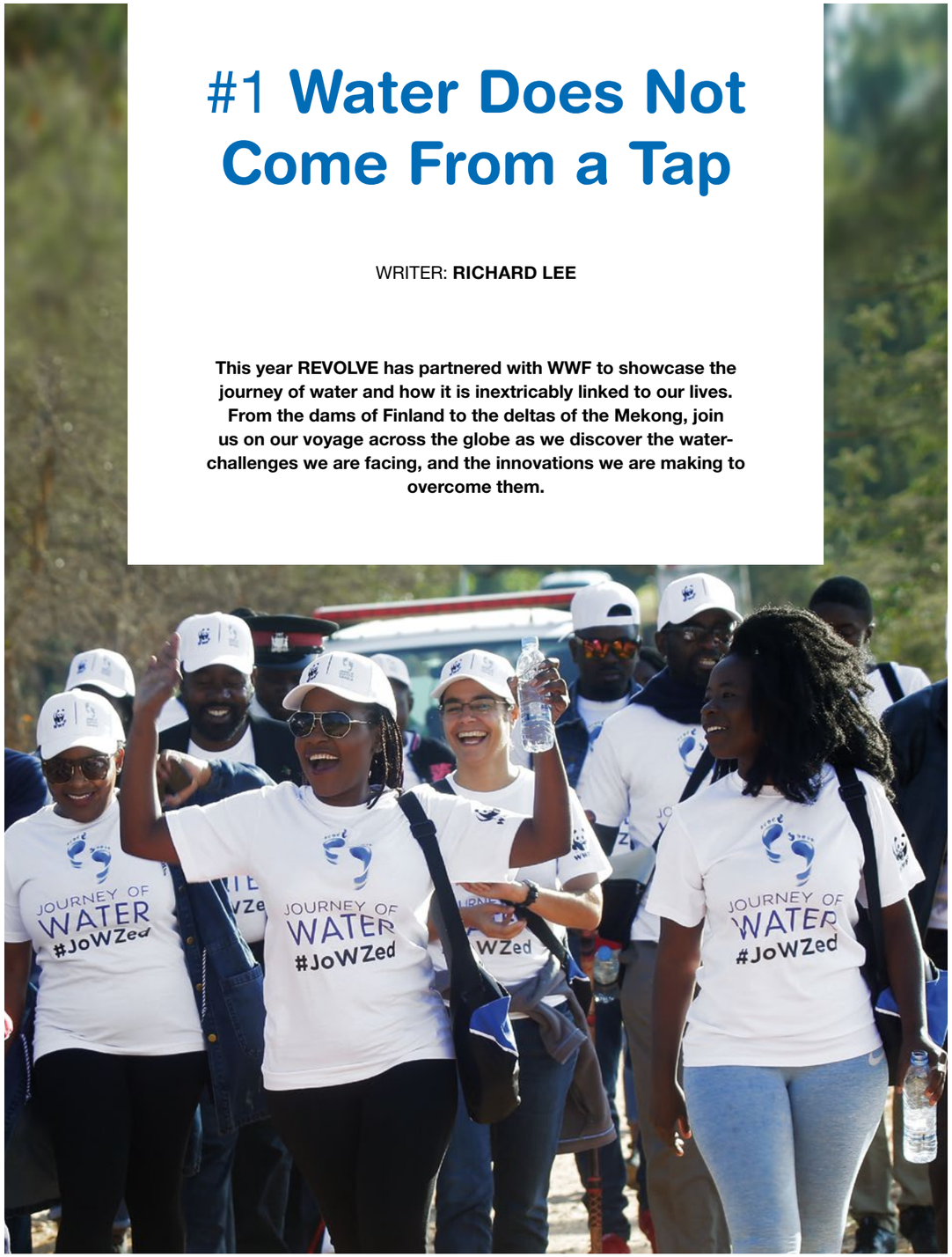
*Ranking includes countries with over 100,000 ha of primary forest.
Source: Global Forest Watch & World Resources Institute



#1 Water Does Not Come From a Tap

WRITER: **RICHARD LEE**

This year REVOLVE has partnered with WWF to showcase the journey of water and how it is inextricably linked to our lives. From the dams of Finland to the deltas of the Mekong, join us on our voyage across the globe as we discover the water-challenges we are facing, and the innovations we are making to overcome them.



1

When it comes to SDG6 of the UN development goals, the world is way off track: over 2 billion people still lack access to safe water. Meanwhile, many of our rivers – the direct source of much of our drinking water – are dying as they are drained, dammed, dredged, and polluted. But few people connect the two. The WASH sector sticks to taps and toilets, while the freshwater conservation community focuses on riverine health – as if the two worlds are somehow unconnected with each other.

WWF's flagship Journey of Water campaign was launched to bridge this gaping communications gap – to remind people that water does not come from a tap and that you cannot have water for all without healthy rivers.

A self-fulfilling prophecy

Prophetically, the very first Journey of Water in 2013 followed the course of a key river near Cape Town – five years before the city came perilously close to #DayZero and running out of water. Suffice to say, Capetonians are all too aware these days about the need to protect and restore their water sources if they want their tap water to keep flowing.

Since that successful start, there have been three more journeys in South Africa, while the campaign has also gathered steam across the world with journeys in Asia, Africa, Europe, and South America.

Key to the reach and impact of the journeys are the participants – celebrities, social media influencers and journalists – who not only tackle the physical challenge but also learn first-hand from guest speakers along the route about issues affecting water security and river health, ranging from mining impacts to irrigation for agriculture, pollution and climate change. Critically, they then tell their assorted followers about the threats and solutions in their own words and their own way – a far more effective means of influencing mass audiences.

Journeys across the world

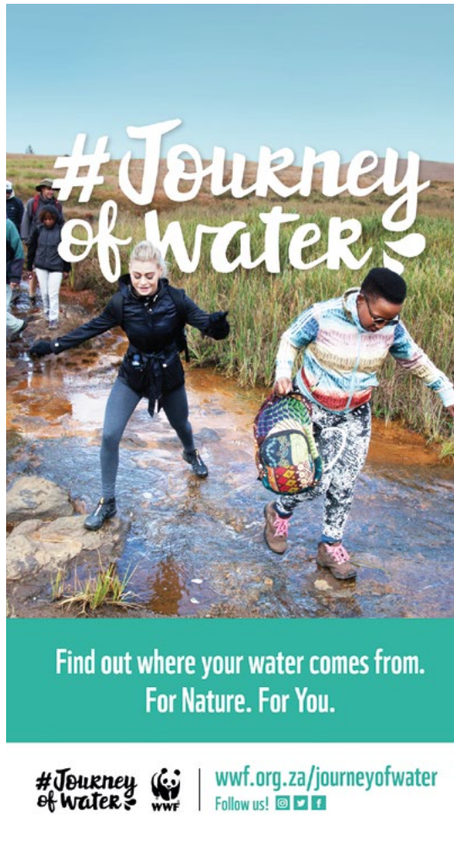
The journeys all involve a variety of activities that give the participants a close up view of the river, such as hiking, canoeing, horse-riding and even zip-lining. Underpinning this physical journey is the message that the best way to ensure there is water for human needs is by looking after the natural environment and the rivers we depend on – a message that is echoed by everyone they speak to, from community members to river managers and government ministers.

The first country to follow South Africa's lead was Zambia, which focused its celebrity-laden journey on an increasingly water stressed stretch of the Kafue River, which provides most of the capital's water and much of the country's electricity. With backing from corporate partners, Malaysia has run three journeys, capturing significant media and social media attention. In Brazil, participants journeyed by foot, horse, bike, and boat along the Paraguay River to highlight threats to the Pantanal, the world's largest tropical wetland. One of the celebrity participants was so inspired that he subsequently moderated a major event at the World Water Forum when Bolivia, Brazil and Paraguay signed a landmark agreement to sustainably manage the Pantanal. Finally, China – unsurprisingly – hosted the longest and biggest journey of them all so far on the Yangtze, directly reaching tens of thousands during the voyage and vast numbers on social media.

While COVID-19 has left several planned journeys in limbo – it is expected that these will resume in 2021 once the pandemic is brought under control. There is no time to rest in our fight to save our rivers and ensuring water can continue its journey. ●

1. Participants enthusiastically partaking in the #JourneyofWater in Zambia. Photo: WWF Zambia

2. Campaign ad from WWF's #JourneyofWater in South Africa. WWF has been working in catchments in South Africa for nearly two decades. Photo: WWF South Africa



2

#2 Halting Harmful Hydropower

When the Zambian government axed plans to build a mega-hydropower dam on the Luangwa river, Senior Chief Luembe could finally relax, knowing that the lifeblood of his Nsemba people would continue to flow freely. “It gives them water. It gives them fish. It supports the wildlife around which the tourism economy is centered.”

It was the best possible end to a campaign that had specifically focused on the need for long term protection for the river – and the benefits it provides to people and nature – rather than just stopping the dam. It was also a campaign that offered the authorities an alternative energy solution: a system-wide approach that could power Zambia’s sustainable development without damming its remaining free-flowing rivers and speeding up the collapse of its freshwater biodiversity.



3

Advocacy action on the Mekong

Far away on the Mekong river, another campaign was simultaneously gathering steam – to convince the Cambodian government to halt plans for two large hydropower dams on the mainstem at Sambor and Stung Treng, which would have had a massive impact on the river and the world’s largest freshwater fishery. At the heart of the advocacy action was a focus how the dams would undermine the food security of millions of Cambodians and expose communities in the delta in Viet Nam to worse floods, along with concerted efforts to promote the benefits of solar power. While no one knows for sure why the government changed course, the result was a landmark decision to impose a 10-year moratorium on all dams on the mainstem of the Mekong in Cambodia.

But there are still new hydropower dams on the drawing board just upstream in Laos. And thousands more across the world from the Amazon to the Zambezi. The renewable revolution – powered by the plunging price of solar and wind generation and new storage technologies – offers viable alternatives to many hydropower projects that are low-carbon, low-cost, and low-conflict with communities and rivers. As the flagship WWF/TNC report, Connected and Flowing, makes clear: we can now meet our global climate and energy goals without sacrificing our remaining free flowing rivers. But it also makes clear that hydropower still has a significant role to play in powering this brighter future, including by modernizing current plants, retrofitting existing dams and developing low impact pumped storage.



4

Governments stuck in the past

Unfortunately, many governments and developers are still stuck in a 20th century mindset that only sees free flowing rivers as sources of water and power and the site of future dams – failing to factor in the other diverse benefits of healthy rivers and the advantages of solar and wind, especially in as the world seeks to build back better from the COVID-19 pandemic.

More campaigns will be needed. Some will be focused on individual iconic dams, while others will cover a whole region or look to transform the financial structure of the industry – whatever is likely to work best. Such as current campaigns driven by communities and conservationists to scrap plans (and subsidies) for thousands of small hydropower dams across the Balkans, which would wreck the last wild rivers in Europe.

Using a variety of tools and tactics, these campaigns and growing community opposition in many places will increase the risks and potential delays. Combined with the accelerating renewable revolution, growing concerns about the global collapse of biodiversity and the hydropower industry committing itself to a more sustainable pathway, it’s clear that it will become harder to convince increasingly skeptical investors to put their money into harmful hydropower – potentially safeguarding many of the world’s remaining free flowing rivers. ●



5

3. Fisherman in the Luangwa river Zambia. Photo: James Suter / Black Bean Productions / WWF-US.

4. Fishermen unloading their catch to the local fish market, My Tho City, Mekong Delta, Vietnam. Photo: Esin Üstün.

5. Upper Neretva river in Bosnia and Herzegovina threatened by hydropower dam. Photo: Michel Gunther / WWF.



6

One of the most extraordinary things about rivers is how little people value them, despite the fact that healthy rivers underpin our societies and economies – and were the very foundation of our earliest civilizations.

Today, rivers still flow through our cities and our cultures. They still provide drinking water for billions, irrigate a quarter of our crops, sustain freshwater fisheries that feed hundreds of millions, supply sediment that keeps deltas above the rising seas, and support astonishing biodiversity.

Our rivers are dying

But they are still overlooked and undervalued – with decision-makers failing to factor in all the diverse benefits healthy rivers provide to people and nature…until they are lost. And we are losing them because our rivers are dying – choked by dams, pumped dry for agriculture, poisoned by pollution.

River lovers and freshwater conservationists have pondered this predicament for years, wondering how to wake people up to the value of rivers (and indeed the value of water). The conclusion: we need to try new approaches to reach mass audiences, come up with innovative ideas to inspire enough people to tip the balance. Courtesy of Thirst, Mina Guli and WWF – that's where #Run4Rivers comes in.

Running for rivers

Piloted on World Running Day in 2020, the first #Run4Rivers was never likely to see millions jog for their favorite rivers considering all the COVID-19 restrictions across the world. But the enthusiastic reception showed three things:



7

- Runners from Australia to Zambia will happily rack up kilometers on behalf of rivers;

- There is a large untapped market for campaigns that reconnect people to rivers;

- Next year, with a longer lead time and more (vaccine-created) freedom to run, it could grow into something huge.

It could do more than just remind people to value rivers. It could also help to bridge the gap between the world of freshwater conservation and water and sanitation (as the Journey of Water also seeks to do). Following the success of #Sweat4Soap, discussions are now underway to make every kilometer really count in the next #Run4Rivers, with participants potentially donating a tap for every kilometer - maybe even a toilet for every 10 kilometers.

So, keep your jogging shoes at the ready. The next #Run4Rivers is coming in 2021. It is going to be bigger and better and play a part in mobilizing people to change the path of river conservation. ●

6. Running along the Canal du Midi, France.
Photo: Maeva Vigier.

7. Mina Guli runs along the Nile River near Egypt during the 6 River Run expedition on 20 April 2017.
Photo: Mina Guli, Kelvin Trautman.

#4 How Finland Fell in Love with Migratory Fish – and Dam Removals

They say 'sex sells' – and if you want proof, look no further than the transformational dam removal campaign in Finland. In the past five years, the country has moved from planning and funding new hydropower dams on its remaining free flowing rivers to removing hydropower dams and freeing rivers for the first time in centuries. One key driver of this paradigm shift was a hugely successful TV and social media campaign entitled 'mating belongs to all', highlighting the fact that dams stop migratory fish from reaching their spawning grounds – and having sex!

This innovative approach built on the momentum that had arisen during parliamentary elections in 2015. Back then, political parties were openly planning to infringe key 1987 legislation, which covers the protection of the country's last free-flowing rivers and wild rapids, by investing in hydropower to phase out coal plants and switch to cleaner energy. While it would have helped Finland to meet its targets under the Paris Climate Agreement, it would also have choked more rivers, threatening fish populations and freshwater biodiversity.

Free-flowing rivers

This served as the impetus for the public to stand up for rivers. Just prior to the elections, WWF and partner NGOs conducted a social media campaign, which pitted hydropower against free-flowing rivers and used citizen polls and meetings with politicians to amplify citizens' voices. Momentum has only grown since then, pressurizing politicians to not only drop the idea of harnessing the rest of the country's free-flowing rivers for hydropower, but also to include language on restoring rivers, dam removals and bringing back migratory fish stocks in the government's new four-year plan.

"Rivers became a big national topic! From destroying to restoring, politicians saw the value of nature – or perhaps they were forced to do so," said Sampsa Vilhunen, WWF-Finland's Head of Program for Marine and Freshwater, an avid fly-fisherman and a driving force behind the sea-change in Finnish attitudes to rivers and migratory fish.

A landmark deal

Along with the policy changes, including the government identifying dam removals as an official goal, and large-scale new government funding for restoring rivers, WWF's campaign has also brought communities, landowners, donors and companies together to remove dams. So far, 32 dams and barriers have been removed, freeing up 650km of river, enabling trout to migrate upstream once again and enhancing river health. Funding has also been secured for many more dam removals.

In a landmark deal, three hydropower dams will be removed over the next few years on the Hiitolanjoki river thanks to WWF and government funding, restoring a series of big rapids and allowing salmon to return to ancient spawning grounds for the first time in 200 years! This big win has generated even more public and media interest and sparked additional dam removal momentum – creating a virtuous circle for Finland's fish, rivers, and people.

Today, Finland is working to mitigate climate change, but hydropower is no longer a major part of the equation. The country is removing dams and restoring rivers, bringing migratory fish and other species back – while also helping to build resilience to climate change and to tackle the other great global crisis of our time – the destruction of nature. ●

8. River Kemijoki at Vanttauskoski, Rovaniemi, Finland. Photo: Fanny Schertzer



Are Water Footprints Reliable for Food Purchase Choices?

WRITER: **PETER EASTON**

The water footprint was first developed in 2002, offering a measure of the total water used to produce a given product, from supply chains to the point of purchase. Some consumers may wish to use it to guide purchase choices, but while useful for raising awareness, it is important to be aware of its limitations, with the potential to promote choices which may not be in the best interests of the farms and countries of origin.

Since 2010, 'water footprint' as a concept has become widely used throughout industry, in particular towards consumers. The concept derives from 'virtual water' developed by Tony Allan, 2003 – the principle of which is that while a product may itself contain little or no water, very often its growth or production requires large amounts of water in another country from where it is purchased and consumed.

Professor Arjun Hoekstra and his colleagues at the University of Twente, Netherlands, progressed this work into developing a water footprint calculation method, which has proved highly successful in further raising awareness of the international impacts of our consumer choices.

1 cup of coffee
=
140 liters of water
Really?

The impacts are most significant for agricultural produce for food or textiles. A commonly quoted example is that 1 cup of coffee (about 125 ml) has a water footprint of 140 liters (Chapagain and Hoekstra, 2003). Most of this represents the water used in growing the coffee plant and beans, but also includes water used in processing the beans, and filtering the coffee. How is this water volume calculated?

A growing plant takes up water from the soil via its roots bringing with it essential minerals and nutrients. Most of this water eventually departs from the plant as transpiration from its leaves, at varying rates depending on the time of day, weather conditions, season and plant maturity. The idea is that when you drink your 125ml of coffee, you should be aware that you have also 'used up' 140 liters of water somewhere else in the world, and perhaps in a region of water scarcity.

1. Coffee plant. Photo: Max Letek.



1

Thus, your 'guilty' coffee fix may be depriving communities of essential water supplies. Other commonly quoted water footprint examples are: 200 liters for a glass of milk, 2,400 liters for a hamburger, 70 liters for an apple, and 2500 liters to make a cotton T-shirt. Where the item contains animal products (meat, dairy), it includes the water for growing animal feed. We will focus on coffee as an example, but similar principles and issues apply to other products as well.

*
**

Consumers have been advised to use water footprint numbers to help them make purchasing and dietary choices. The 'bible' of the method, The Water Footprint Assessment Manual Hoekstra et al 2011 states:

"One option [for a consumer to change his or her indirect water footprint] is to change the consumption pattern by substituting a specific consumer product that has a large water footprint by another type of product that has a smaller water footprint. Examples include: eating less meat or becoming vegetarian, drinking plain water instead of coffee, or wearing less cotton and more artificial fibre clothes."

Warning: *a consumer should do further research before making a choice based on a single published number, which can be misleading and could potentially promote unintended consequences.*

The role of water in so many aspects of our lives and for the things we buy is complex, and therefore there needs to be some simplification to ensure the message is easily shared and understood. Anyone interested in raising awareness about environmental and social issues faces a constant challenge of getting their message across: (1) to be noticed, and (2) to be understood.

This is a key driver of message simplification. However, there is a risk from oversimplification. The danger is that consumers (and company procurement teams), may end-up making choices with more negative than positive impacts, either environmental or social.



2

This is also relevant to EU and national policies which must make sure they take into account the more nuanced and complex aspects, including impacts at the supplying farm level.

Understanding blue-green-grey waters

First, it is important to understand the basic concepts of the method. For water used in a factory, it is relatively easy to directly measure the volumes of water used with flow meters. For agriculture, however, measurement is much more difficult requiring complex data collection and academic studies. Therefore, most assessments are based on established databases, modelling and simplifying assumptions.

The total agricultural water footprint of an item has 3 main components: green, blue and grey. These are calculated separately and then added to give the total:

- **Blue water** is irrigation water directed at the plant, originating from surface or groundwater.

- **Green water** is the water that derives from direct rainfall onto the soil and then taken up by the plant's roots.

- **Grey water** is representative of the water polluted, mostly due to fertilizers and/or pesticides applied to the crop or irrigation water. The water footprint is a measure of the volume of clean water which would be theoretically required to dilute a contaminant to below its quality limit.

This may already raise some questions for some readers. Clearly, water extracted for irrigation (blue water) represents an active removal of water from the environment and its use by humans.

However, rainfall (green water) will fall regardless of which plant or crop is present. Different plants use different amounts of water. Some have argued that the green water footprint is better represented by the relative green water footprint. Then the green water footprint is the *additional* volume of rainfed water used by a crop compared to the original natural vegetation at that location. If the crop uses no additional water, the green water footprint would be zero. In fact, there are examples where a crop uses less water than natural vegetation. A study has shown that kiwi fruit in New Zealand have a negative relative green water footprint. That means groundwater recharge has increased as a result of kiwi fruit cultivation.



3

The grey water footprint does not represent any 'used' volume of water. We generally do not treat polluted water by diluting it. For industrial wastewater, we treat it with a range of methods to remove contaminants from the water. In agricultural settings, the contamination is more often dispersed in surface and groundwater so focused mechanical treatment is not an option.

The best solution is to better manage how chemicals are used so as to reduce pollution in the first place. Then, if nature does not have the capacity to filter out the contaminants then we can use 'green infrastructure' such as treatment wetlands and silt traps to capture contaminants and to absorb and transform the chemicals.

2. A coffee farmer inspects his crop in Colombia's southwestern Cauca department. Photo: Neil Palmer (CIAT)

3. Drip irrigation of a coffee field in Honduras. Irrigation (blue water) represent only 1% of the water footprint of coffee. Photo: USAID-ACCESO.

Crop	Water footprint proportions %			Total water footprint	Blue (irrrigation)
	Blue	Green	Grey	Liters/kg	Liters/kg
Wheat	19	70	11	1,800	337
Maize	7	77	16	1,200	80
Rice	20	68	11	1,700	346
Apples	16	68	15	800	130
Sugar (cane)	27	67	6	200	55
Coffee	1	96	3	16,000	117

Based on global average. Proportions will vary depending on location and local climate. Coffee has the largest total footprint per kg by far, but does not use the most irrigation water. Source: Mekonnen & Hoekstra, 2011.



Figure 1. Coffee growing regions map.

- Coffee Arabica
- Coffee Robusta



Figure 2. Water stress map

Water Stress

Low (<10%)	Low-Medium (10-20%)	Medium-High (20-40%)	High (40-80%)	Extremely high (>80%)

So, while a large grey water footprint is an indication of a problem, the solution is not – as the water footprint approach suggests – to avoid buying that product. There are other more established and meaningful ways to address water pollution.

Back to coffee consumption

Water foot-printing for coffee is, on average, separated as follows: 1% blue water, 96% green water and 3% grey water (Mekonnen and Hoekstra, 2011). If we focus on just the water actually used (blue + green), it is 1% blue and 99% green. Then, the volume of water actively applied as irrigation (blue) is just 1.4 liters. While we do not have here the relative green water footprint, which may or may not be net positive, clearly the true water-use impact of your cup of coffee is considerably less than 140 liters. If you chose not to buy that coffee, it does not mean that 140 liters of water will remain in the ground or rivers. Most of it will still be 'used' by other crops or natural vegetation in its place. The blue-green-grey distribution for some other crops is shown in Table 1. This shows that although coffee has by far the largest total water footprint per liter, it does not require the largest amount of irrigation per kilogram.

In addition to understanding how the total water footprint is derived, it is important to understand the real local impacts. The study that derived the 140 liters is based on coffee drunk in the Netherlands, but claiming it is quite representative as a global average (Chapagain and Hoekstra, 2003). It states that the majority of its coffee is grown in Colombia and Brazil. The maps in Figure 1 and 2 compare the main coffee growing regions of those countries with the WRI Aqueduct baseline water stress map. Colombia is all classed as Low stress. Therefore, will sourcing coffee from Colombia contribute to water scarcity there? It does not look like it.

An over simplistic assumption of the WF approach is that the water used in growing a crop is used up and 'lost'. On the contrary, evapotranspiration (the combination of evaporation and leaf transpiration) is a critical component of the perpetual water cycle. In fact, in many parts of the world, evapotranspiration is an essential ecosystem service (Keys et al 2016). We know we depend on evaporation from the oceans for much of the rainfall that falls on our land. But, with prevailing winds travelling west to east, for land more than about 200 km from the coast, rainfall is dominated by water that has already evaporated or transpired from land. Figure 3 shows that for large parts of the world between 40 and 80% of rainfall originates from land evapotranspiration.

Figure 1. Coffee growing regions map. Source: Bunn, C., Läderach, P., Ovalle Rivera, O. et al. A bitter cup: climate change profile of global production of Arabica and Robusta coffee. Climatic Change 129, 89–101 (2015).

Figure 2. Water stress map. Source: Aqueduct Water Risk Atlas, World Resources Institute.

Figure 3. Percent of precipitation coming from evaporation on land. Source: Keys & Al 2016.

The reported water footprint of a cup of coffee is 140 liters, only 1.4 liters of which is from irrigation.

As already mentioned, the WFN advocates making consumer choices on the basis of the simple water footprint of a product without stressing the need to take other factors into account. While recognizing that the water footprint raises a flag that there may be some water-related concerns in a region, it is arguably inappropriate to make a key decision on such limited information.

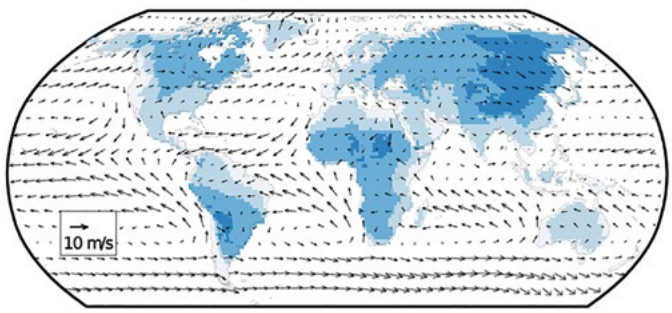


Figure 3. Percent of precipitation coming from evaporation on land.

Precipitation recycling (%)

0 10 20 30 40 50 60 70 80 90 100

There are many other factors that should be taken into account. The '140 litres' for one cup of coffee is a global average figure which does not take into account local conditions. Any purchase choices should at least be based on a local-specific assessment and ideally farm-specific. This can be done, as described in The Water Footprint Assessment Manual (Hoekstra et al, 2011), but more often than not, the most commonly quoted numbers are the global averages. But even with a more accurate 'local' assessment, this may still include question marks around the true impact of the green and grey water components.

Distributing wealth and protecting resources

The world remains imbalanced regarding the share of wealth and standards of living.

It is perfectly legitimate for poorer regions to sell raw materials and products to richer ones as a form of wealth generation. Their natural resources may include such things as plentiful sunshine (providing the energy for rapid crop growth), water, minerals, good quality soils and an optimal climate. These resources combine to support economic growth as export to richer countries.

Will a coffee farmer in Colombia be grateful to the European who chooses not to buy his coffee beans in order to protect Colombia's water resources? It is unlikely if Colombia is not water stressed. Colombia is also a country that is trying to reduce its dependence on the cultivation of narcotic drugs. That will not be helped by a reduced demand for coffee or other legitimate agricultural products. While no region should over exploit its natural resources at the expense of the environment or stable and healthy communities, these are matters for those regions to manage. It should not be for consumers in richer countries to make arbitrary 'feel good' choices based on over simplistic models. There are certainly regions in the world suffering from over-exploitation of scarce water resources, but actions and decisions should be undertaken with a full spectrum of the facts and in clear consultation with local stakeholders at national and local level, and especially the farmers whose livelihoods may be impacted by our choices. There can be better ways to address local water challenges through improved governance and efficiencies that will better serve local farmers and communities. In some cases, this will mean choosing not to grow thirsty crops in water scarce regions.

In summary, the water footprint method has proven to be an informative and 'fun' way of raising awareness about global water issues and on how our consumer choices can have negative impacts in distant parts of the world. On the other hand, the scale of impact indicated by crude water footprint numbers can be misleading. No final choice or action – by consumers, purchasing businesses or EU and national policymakers – should be made without taking into account a much wider range of issues and especially the position and views of those we ultimately buy from and by not assuming we know what is in their best interests. ●

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#Sweat4Soap Running for Change

INTERVIEW WITH **MINA GULI**

Mina Guli is a global leader, entrepreneur and adventurer committed to making a difference in the world. Following a 15-year career in climate action, Mina established Thirst – a non-profit changing the way we think about water.

Harnessing her passion for running to provide bars of soap to those who need it the most, in 2020 she launched the #Sweat4Soap campaign. REVOLVE connected with Mina to talk about her latest project, her aspirations and plans for the future.

1



2

What was the driving motivation for the #Sweat4Soap campaign?

Right now we're washing our hands, our clothes and the surfaces around our home more than ever. For most of us, the process is relatively straightforward, we do it without a second thought.

People sent out challenges to their communities to join their campaign.

Tap on, hands underneath, apply soap and sing happy birthday while we scrub. But for the 3 billion people on our planet that don't have access to adequate handwashing facilities, it's a very different story. For these people – women and girls, men and boys, parents, workers and farmers - hand hygiene in normal circumstances is challenging. In the midst of a pandemic it can be the difference between life… and death.

As we've been told so many times this year, hands are the major carrier of disease-causing germs. Even before COVID-19, they were carrying bacteria that can cause illnesses such as diarrhea – the cause of death of more than 297,000 children under 5 each year. We were also being encouraged to wash our hands more often. But here's the problem, even though we've known for years that handwashing with soap reduces the risk of diarrheal diseases by 42-47%, 1 in 3 primary schools still don't have handwashing facilities. And even though we know how important it is to clean our hands, only 1 in 5 people globally wash their hands with soap after going to the toilet. We know it, but we don't do it. For many of us, we don't do it because we forget. Because we're lazy. Because well whatever. For us, its behavior, and behavior we can change.

But for the many others who don't have access to the soap, or the water, or both – it's not a choice issue, or a behavior problem. It's something much deeper. It's about access. When we read these statistics, or see images of people struggling often halfway around the world, it's easy to feel disconnected from the problem. To wonder what we can do to help.

1. Ultra runner and water campaigner, Mina Guli, dunks her head in a water trough to try cool down during the #RunningDry Expedition, on 1 January 2019.
Photo: Kelvin Trautman / Mina Guli

2. Mina Guli running through Shanghai, China during the #RunningDry Expedition, on 15 December 2018.
Photo: Kelvin Trautman / Mina Guli

To think "I'm just one person, how much impact can I really have"? This global handwashing day I wanted to give everyone everywhere an opportunity to do something to make a difference in people's lives - whether they live around the corner or on the other side of the world.

Did you achieve the outreach and impact that you were striving for? What were some of the main results?

Yes! We were blown away by the success of the project. We started this as a little idea to do something for global handwashing day. It was my birthday on 10 October and I wanted to find a way to celebrate by giving back on water. Since global handwashing day was 15 October, we realized that leveraging our running community to give a gift of something meaningful to people in need was a great idea! When we threw it out to our community, the response was incredible. Thousands of people ran in over 62 different countries and territories across the world. Together we managed to donate over 80,000 bars of soap and 450 handwashing stations!

Totally amazing, humbling and inspiring to watch this campaign grow and to know that every step each one of us was taking was delivering something lifechanging to others.

We are all immensely grateful to every single person that ran - from the 3 year olds running beside their parents, to the 84 year olds walking a couple of kilometers each day. People recruited their friends and families, and sent out challenges to their communities to join the campaign.

Words are insufficient for the debt of gratitude we owe to all of you, and to our supporters and partners who helped spread the word and make this happen.

What is next for #Sweat4Soap?

Over the last few weeks we've been so excited to watch closely as our soap partners make the soap and distribute it to thousands of people and communities in need across the world. The stories of how the soap is produced or harvested is amazing, and the gratitude of the people receiving the soap makes all of us want to cry with happiness that we were able to do something to make their lives a little better and safer.

Project Maji (who are our fabulous partners in producing and delivering the handwashing stations) are also hard at work producing the equipment. By the time you read this, they will be starting their hand hygiene education programs and rollout of the handwashing stations in rural communities across Ghana. You can follow the progress with us (the stories really are amazing!) on my Twitter and Instagram (@minaguli), and on my Facebook (@minaguliwater).

If you have time, please also check out the work of Ecosoapbank who make their soap from the waste from commercial soap production, Cleantheworld who recycle and reuse soap from hotel chains, and Water4 who work with local teams in the Democratic Republic of Congo to produce and distribute their soap. Incredible, inspiring stories of innovation and impact.

Finally, on a broader note, the need for soap and handwashing facilities far exceeds the capacity of campaigns like #Sweat4Soap. If we are to truly solve the handwashing problem, we're going to need a combination of innovative financing solutions, and massive expansion of public mobilization campaigns like ours. If there's one thing #Sweat4Soap showed all of us, it's that there is an appetite to make that happen. ●

For more images of Mina's #RunningDry expedition in 2019, visit:
revolve.media/views.



3

3. Mina Guli runs through the Amazon forest during the 6 River Run expedition, Manaus, Brazil on the 29 March 2017.
Photo: Kelvin Trautman / Mina Guli

AMWAJ أمـــواج

Sustaining the Future of the Mediterranean



Beirut Live 2020

13 water and energy experts from across the Mediterranean participated in 2 panel discussions last October at AMWAJ Live

Water and Energy Mediathon

During 3 immersive days, it brought together 30 change-makers — communication professionals and entrepreneurs — to develop media campaigns on water and energy solutions. The two most prominent campaigns were awarded with a monetary prize to implement their projects.



Beirut River Forest

Join our campaign with theOtherDada and SUGi Project.

Plant trees in Beirut next spring!

Strategic Partners

Union for the Mediterranean · 25 Years Barcelona Process · cewas Middle East · blue peace · Konrad Adenauer Stiftung · Rotary

an initiave by REVOLVE

VIEWS

Coastal Cities

By 2100, global temperatures will likely surpass the 2°C limit set by the 2015 Paris Agreement, potentially reaching 3-4°C.

Such an increase would see water levels rise by 5-10 meters and displace around 300 million people – roughly the population of the United States. But the people that will be most affected by coastal flooding are those living in the southern hemisphere.

▲ **Hanoi, Vietnam**

If sea temperatures increase by 3°C, an estimated 5.6 million residents could be at risk from rising seas.

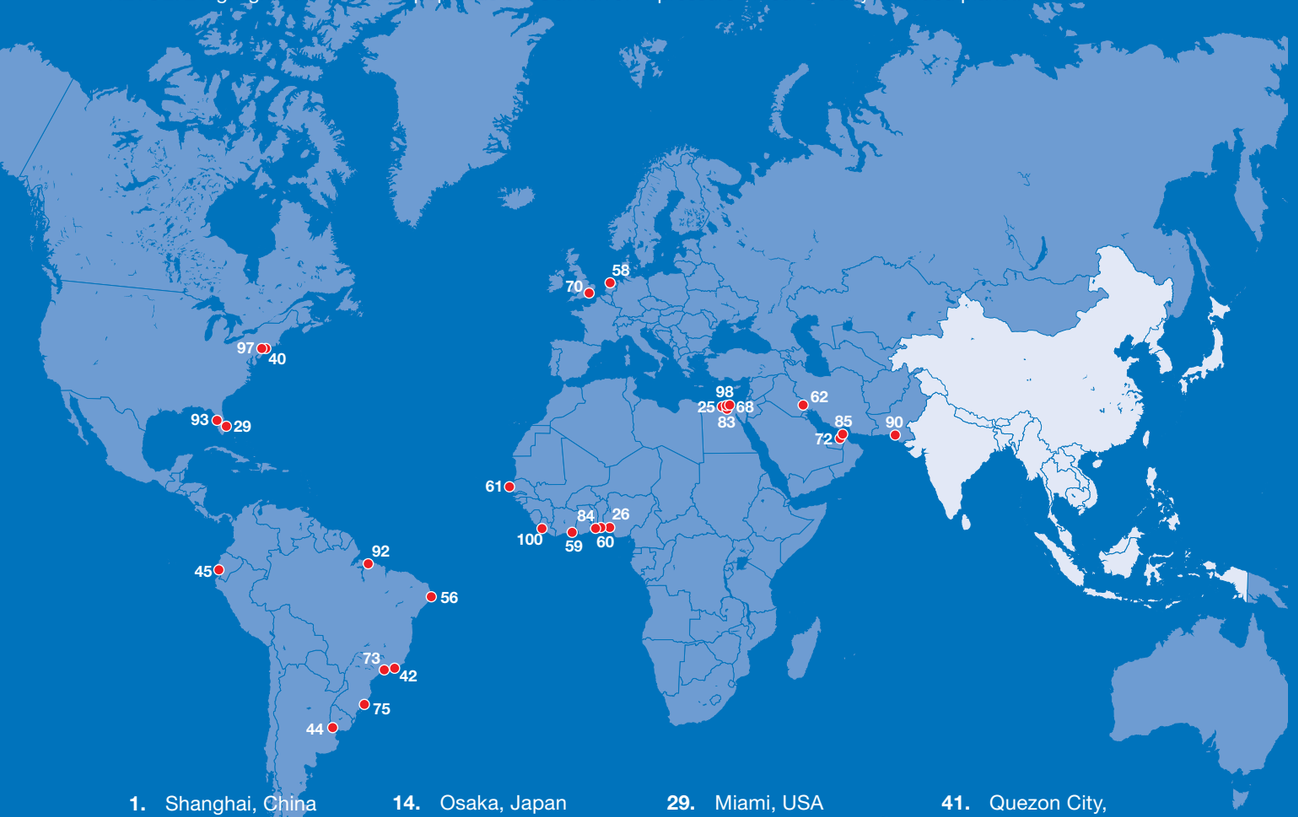
Photo: Karl JK Hedin

The world's oceans and seas are getting warmer, with projections showing global sea temperatures rising by 2-4°C by 2100.

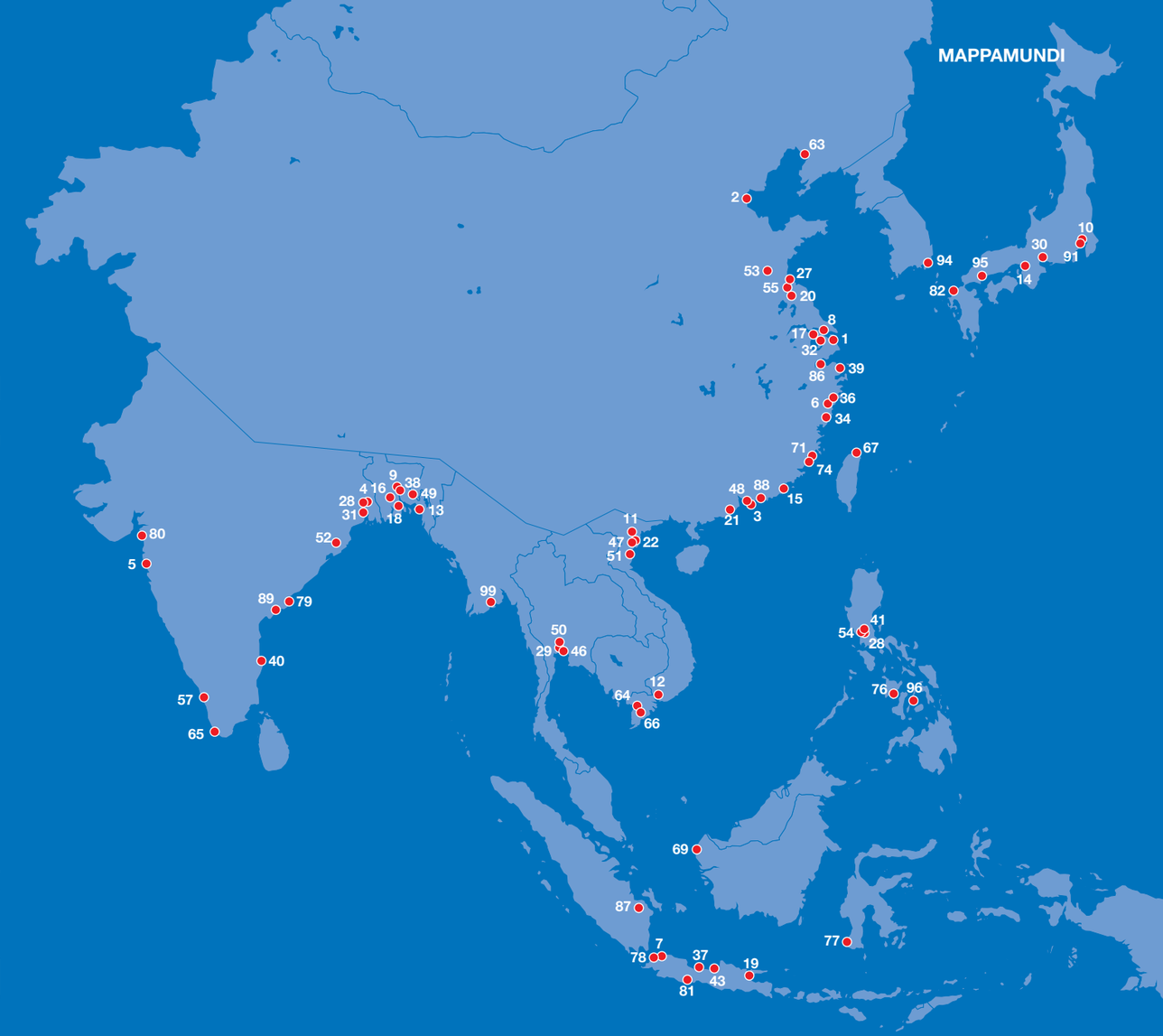
What does this mean for our coastal cities?

In 2015, Climate Central mapped over 200 cities that will be impacted by rising sea levels. Based on these projections, REVOLVE highlights the 100 most populous cities at risk of a 3°C rise in sea temperatures. While some cities, such as Amsterdam, are well prepared, many of the most populous cities, predominantly in East and South East Asia, are not.

Over the next 150 years, we will witness the next great human migration. While some coastlines begin to go under and climates become increasingly volatile, it is projected that over 300 million people will be displaced, putting increased pressure on our already crowded planet.



1. Shanghai, China
2. Tianjin, China
3. Hong Kong, China
4. Kolkata, India
5. Mumbai, India
6. Taizhou, China
7. Jakarta, Indonesia
8. Nantong, China
9. Dhaka, Bangladesh
10. Tokyo, Japan
11. Hanoi, Vietnam
12. Ho Chi Minh City, Vietnam
13. Chittagong, Bangladesh
14. Osaka, Japan
15. Shantou, China
16. Khulna, Bangladesh
17. Wuxi, China
18. Barisal, Bangladesh
19. Surabaya, Indonesia
20. Huaiyin, China
21. Jiangmen, China
22. Nam Dinh, Vietnam
23. Haora, India
24. Bangkok, Thailand
25. Alexandria, Egypt
26. Lagos, Nigeria
27. Lianyungang, China
28. Manila, Philippines
29. Miami, USA
30. Nagoya, Japan
31. Haldia, India
32. Suzhou, China
33. The Hague, The Netherlands
34. Wenzhou, China
35. New York, USA
36. Jiaojing, China
37. Tegal, Indonesia
38. Narayanganj, Bangladesh
39. Ningbo, China
40. Chennai, China
41. Quezon City, Philippines
42. Rio de Janeiro, Brazil
43. Semarang, Indonesia
44. Buenos Aires, Argentina
45. Guayaquil, Ecuador
46. Samut Prakan, Thailand
47. Ninh Binh, Vietnam
48. Shenzhen, China
49. Comilla, Bangladesh



50. Nonthaburi, Thailand
51. Thanh Hoa, Vietnam
52. Cuttack, India
53. Linyi, China
54. Pasay City, Philippines
55. Shuyang, China
56. Recife, Brazil
57. Cochin, India
58. Amsterdam, The Netherlands
59. Abidjan, Côte d'Ivoire
60. Cotonou, Benin
61. Dakar, Senegal
62. Basra, Iraq
63. Yingkow, China
64. Rach Gia, Vietnam
65. Trivandrum, India
66. Can Tho, Vietnam
67. Taipei, Taiwan
68. Dumyat, Egypt
69. Pontianak, Indonesia
70. London, UK
71. Putian, China
72. Dubai, UAE
73. Santos, Brazil
74. Quanzhou, China
75. Porto Alegre, Brazil
76. Iloilo, Philippines
77. Ujungpandang, Indonesia
78. Serang, Indonesia
79. Kakinada, India
80. Surat, India
81. Cilacap, Indonesia
82. Fukuoka, Japan
83. Tanta, Egypt
84. Lome, Togo
85. Sharjah, UAE
86. Shaoxing, China
87. Palembang, Indonesia
88. Huizhou, China
89. Machilipatnam, India
90. Karachi, Pakistan
91. Yokohama, Japan
92. Belem, Brazil
93. Tampa, USA
94. Busan, South Korea
95. Hiroshima, Japan
96. Cebu, Philippines
97. Newark, USA
98. El Mansura, Egypt
99. Rangoon, Myanmar
100. Monrovia, Liberia



▲ Can Tho, Vietnam Located in the Mekong delta, Can Tho is one of the most vulnerable cities in Vietnam to a future rise in sea levels. Photo: Vince GX.

▼ Alexandria, Egypt In November 2020, Alexandria suffered from widespread flooding, closing schools and universities. Photo: Mohammed Hassan.



▲ Amsterdam, The Netherlands The Dutch have been fighting the sea for over 700 years. In Amsterdam, floodwaters are kept at bay despite parts of the city being 4 meters below sea level. Photo: Ethan Hu.

▼ Guayaquil, Ecuador According to the UN Intergovernmental Panel on Climate Change, Guayaquil ranks 4th among coastal cities most at risk from rising sea levels. Photo: Maarten van den Heuvel.





Hong Kong, China

Made up of over 250 islands, Hong Kong has seen steady sea level rise of 2.9mm per year since the 1950s.

Photo: Samuel Wong.

Miami, USA

Scientists say 2m of sea level rise by 2100 is likely. This will make large parts of the city uninhabitable, displacing 300,000 people.

Photo: Jing Xi Lau.

Can Tho, Vietnam

In 2020 Vietnam has seen flooding across the country, causing over $1.5 billion in damages.

Photo: Falco Negenman.

New York, USA

A coastal resilience survey projects 37% of lower Manhattan to be at risk of storm surges by 2050.

Photo: Kevin Chinchilla.

Surabaya, Indonisia

Large parts of Indonesia's second largest city sit just 0-3m above sea level, increasing the risk of coastal flooding.

Photo: Kevin Yudhistira.



▲ Kolkata, India Built on the Ganges Delta, observers say Kolkata is unprepared for 'inevitable' sea level rise. Photo: Subhankar Gupta.



▼ Dakar, Senegal The city was hit by flooding in 2020 with at least 4 people dead, and large parts of the country suffering from heavy rain. Photo: Demba Joob.



▲ Narayanganj, Bangladesh Nearly a quarter of Bangladesh has been affected by flooding in 2020, with Narayanganj among the worst-hit areas. Photo: Hasib Matiur.



▼ Tokyo, Japan Typhoons and heavy rains are posing an ever-increasing risk to Japan's capital and its 9 million residents. Photo: Finan Akbar.

Chennai, India

It is estimated 31 million people across India are at risk of annual flooding. With rising seas, that number is expected to increase to over 50 million.

Photo: Steve Rybka.

Dakha, Bangladesh

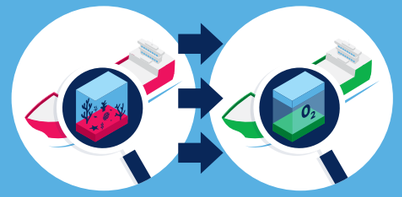
28% of Bangladeshis live on the coast - making climate migration a real and present danger.

Photo: Hasib Matiur.

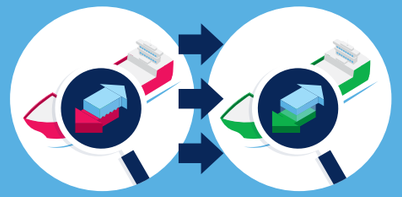
AIRCOAT

FLYING ON WATER

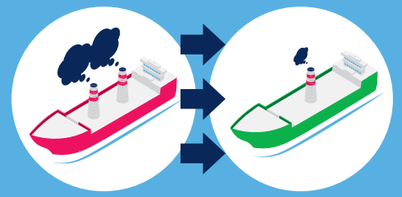
The AIRCOAT project promotes a ground-breaking passive air lubrication technology with a high potential to revolutionise the ship-coating sector by reducing energy consumption and ship emissions.



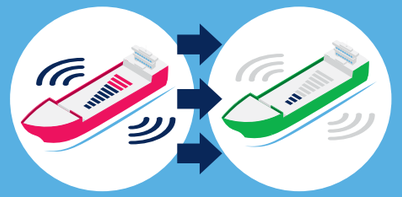
REDUCING BIOFOULING



REDUCING FRICTIONAL RESISTANCE



REDUCING EMISSIONS



REDUCING NOISE POLLUTION

The AIRCOAT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 764553.

info@aircoat.eu

AIRCOAT – Helping Ships Fly

INTERVIEW WITH **MARINA BELTRI MUNOZ**

Marina Beltri Munoz is a Marine Consultant at AquaBioTech Group. She has participated in the AIRCOAT project since 2017. REVOLVE caught up with Marina to discuss how the project is contributing to marine research and to achieving the common goal defined by the European Green Deal – transitioning to a zero-carbon society.

What makes the AIRCOAT project special?

What makes the AIRCOAT project particularly interesting is how it learns from nature, utilizing the biomimetic Salvinia effect, to potentially change the maritime industry towards a more sustainable approach. The Salvinia floating fern keeps a permanent air layer in its leaves, allowing it to breath underwater. This effect enables air to be trapped through a combination of a hydrophobic micro-structured surface with hydrophilic pins. The AIRCOAT project will technologically implement this effect on a self-adhesive foil system, which when applied to a ship will produce a thin permanent air layer, reducing the overall frictional resistance while acting as a physical barrier between water and the hull surface.

How is AIRCOAT contributing to marine research?

The AIRCOAT project addresses diverse crucial sources of marine environment degradation. Besides substantially reducing main engine fuel oil consumption and hence exhaust gas emission, the air barrier created by the AIRCOAT foil further inhibits the attachment of fouling and consequent invasive species translocation; the release of biocide substances (of underlying coatings) to the water; and mitigates the radiation of ship noise which has detrimental effects on marine life such as cetaceans.

The project will help understand and validate environmentally friendly initiatives within the maritime industry, hopefully paving the way for further marine research initiatives that look at reducing our footprint in the oceans.

Why is this project important for you?

At AquaBioTech Group, we are in charge of the biofouling experiments with the different AIRCOAT prototypes we receive from our partners. Biofouling is the accumulation of marine organisms in underwater surfaces, such as ship hulls. With the aim to demonstrate and validate the antifouling properties of the AIRCOAT prototypes, we conduct laboratory tests with diverse model fouling species, assessing their behavior towards the different samples and the air layer. We also conduct field tests, deploying the AIRCOAT samples in our offshore testing site in the Mediterranean Sea and monitoring their antifouling performance as well as air layer retention properties under real sea conditions.

I am very happy to be involved in this highly stimulating project, as it brings together many bright minds with different backgrounds for the common goal of developing a game changing technology, while acknowledging the current environmental threats and purposely building towards a more sustainable maritime industry.

What are some key challenges of AIRCOAT?

It has been a great satisfaction to see how far the project has come already, and seeing with my own eyes how the performance of the different AIRCOAT prototypes keeps getting better and better. I already consider where we are now within the project to be a big achievement, as we have proved to be a great team, working together with different expertise and bringing the project forward.

The biggest challenge I would say at this moment has been the logistical limitations COVID-19 has brought about. However, I believe the project team has stood up to the challenge with creative and resourceful solutions and alternatives to keep the project moving forward.

How can biomimicry make industry more sustainable?

The AIRCOAT project will demonstrate and validate that a more sustainable approach based on biomimicry to the maritime industry is possible.

Johannes Oeffner, Team Leader "Maritime Technologies and Biomimetics" at Germany's Fraunhofer Center for Maritime Logistics and Services (CML) and Project Coordinator of AIRCOAT explains: *"Biomimetics has driven developments in several industry sectors for many years and a number of technologies such as Velcro, self-cleaning paints or robots were inspired by biology. […] Inspired by the specific surface topology of a tropical water fern, Salvinia, a novel ship hull coating is being developed. In order to maintain its function under water, the floating Salvinia fern is equipped with a special micro and nanostructure. The surface is covered with egg beater shapes that are hydrophobic and hence repel water. Nature's trick is to produce hydrophilic areas on the eggbeater tips that allows air to be trapped and the formation of a stable continuous layer of air under water, the so called Salvinia effect."*

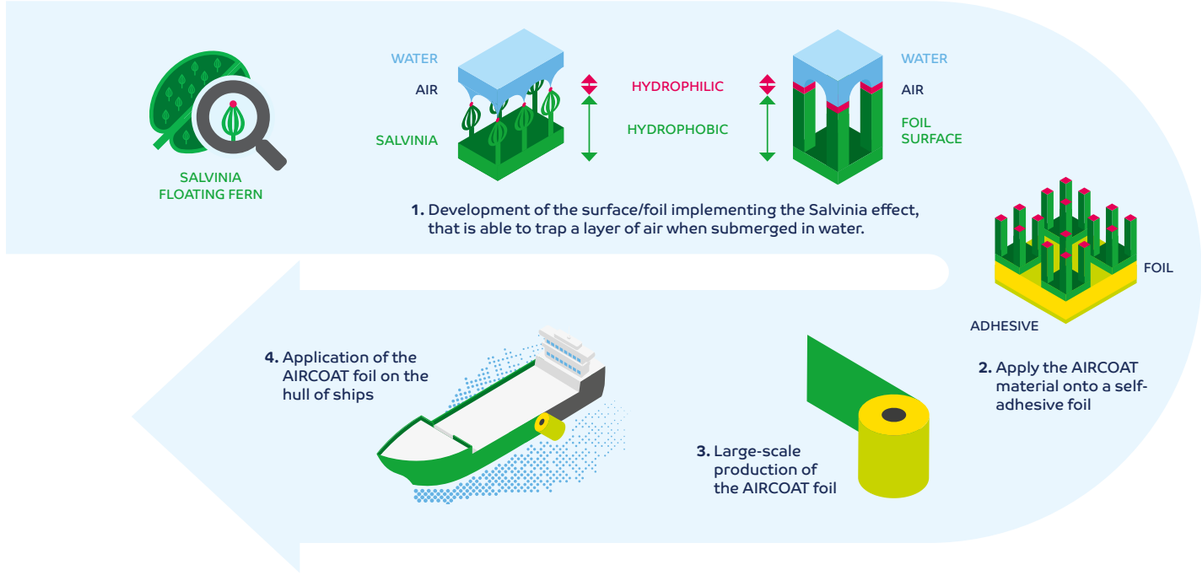
What are the next key steps for AIRCOAT?

We are about to reach one of the big milestones of the project, which is applying the AIRCOAT technology on the first ever vessel. The AIRCOAT foil will be applied to AquaBioTech´s research vessel, an 11-meter vessel based in Malta, making it the first vessel to "fly on water".

Moreover, we plan to go big with a large-scale application in a cargo vessel from one of the AIRCOAT partners, which will demonstrate the potentiality of the AIRCOAT foil to the shipping industry.

What else is AquaBioTech Group doing to foster sustainability?

This year AquaBioTech Group has launched an initiative called 360 Blue. 360 Blue is a national educational and awareness building initiative around the marine environment that will carry out activities targeted to all sectors of society. The objective is to be able to harbor environmentally conscientious citizens, and make Malta a paradigm for a thriving sustainable society and blue economy. Moreover, AquaBioTech Group has an ongoing collaboration with the ministry of education, hosting students and teachers to support building their capacity in the field of the blue economy, sustainability and marine science.





1

Re-imagining the Future of Waste

WRITER: **MARTA CASTILLO SÁNCHEZ**

Waste – when it comes to climate change and environmental degradation it is both the problem and the solution. In particular, the residues of the agro-food sector pose one of the biggest challenges. Reducing this waste but also giving it a second life is key to transition towards a circular economy with minimal or zero waste, making the sector more resilient to crises such as the COVID-19 pandemic.



2

The global consumption of raw materials is repeatedly exceeding the Earth's production. The Earth Overshoot day is a yearly reminder of that. By August 2020 – even though COVID-19 has contracted humanity ecological footprint – the global demand for ecological resources and services had already exceeded what the Earth can generate in a year.

The future is in waste

The perspective of waste as a dead road has to change. Shifting waste into a resource is at the core of the second Circular Economy Action plan presented by the European Commission this year. This plan gives the basis to a transition towards a climate-neutral, resource-efficient, and competitive economy. Giving a second life to waste is also an opportunity for companies because it can increase their profitability, while sheltering them from resource price fluctuations. Manufacturing firms spend on average about 40% on materials, according to the figures shared by the European Commission. An expenditure that would be reduced in a circular economic system. This model would give the opportunity to companies to improve their product lines and shorten the time required to bring products to the market.

However, this new perspective towards waste would not only benefit businesses but also citizens. The circular economy will offer safe and high-quality products, respecting both the consumer and the environment raising many people's quality of life. In addition, according to European Commission stats, the transition from a linear to a circular economy could increase European Union Gross Domestic Product (GDP) by an additional 0.5% by 2030, creating around 700,000 new jobs.

Livestock waste, the biggest challenge?

Livestock waste poses one of the biggest challenges in the transition towards a sustainable system. The growing global demand for meat has increased the environmental impact of the sector.

1. Cardboard baler in a recycling plant in Massachusetts Avenue, Indianapolis, United States.
Photo: Jon Moore

2. The precipitation plant of Cyprus, a pilot plant that transforms slurry and manure to struvite, a mineral that could serve as a slow-release fertilizer for crop fields.
Photo: Global Nature Fundation

In the Mediterranean, cattle and pig livestock farming has intensified over the last 40 years, resulting in large quantities of waste that require effective management.

Livestock waste was already the main source of fertilization for agricultural lands but the dramatic volume increase has broken the sustainable cycle that farmers were applying in their traditional methods, impacting directly the nitrogen load in soil and the subsequent transfer to surface and groundwater resources.

Nevertheless, the pressure to transition towards a sustainable agricultural sector is usually placed on farmers, making them responsible for changing the whole food system chain. But all stakeholders involved in the food value chain are accountable for shifting the current situation. The change to a sustainable food system will not happen unless:

1. Consumers change their food choices;

2. Policy-makers support this transition with the adequate legislation;

3. Researchers find innovative solutions to solve key problems;

4. Producers adapt to new regulations and consumer demand.

However “farmers are at the end of the line – making them particularly vulnerable”, declared Jordi Domingo Calabuig, project officer at Fundación Global Nature, one of the partners at RE-LIVE WASTE, an Interreg MED Green Growth Community (GGC) project, which is developing and testing innovative technologies to turn this livestock waste into an eco-friendly fertilizer called struvite.

The project pilot plants are located in Segorbe (Spain), Monagroulli (Cyprus), Arborea (Italy) and the suburbs of Sarajevo (Bosnia and Herzegovina), regions characterized by intensive cattle and pig farming, thus producing large amounts of livestock waste that have become a major source of environmental pollution. The results coming up from these testing will not provide a single solution for struvite production. But it is an opportunity for the farmers to adapt this technology to their own situation and needs at farm-level.

This will enable a move towards an ‘open innovation’ paradigm that reduces the need for innovation-related capital investments.

Inorganic waste threatening sustainability

It is clear that organic waste – such as livestock residues- poses a huge challenge in managing waste in the agro-food sector. Yet a big part of the waste produced at the primary level in this sector is in the management of the inorganic fractions, especially in relation to plastics used in packaging and in greenhouses such as silage film, nylon, and bailing nets. These materials are normally poorly recycled and occasionally abandoned in natural areas, damaging local ecosystems.

3. Paper waste recycling plant in Rotterdam, Netherlands. Photo: Bas Emmen





4

All stakeholders need to work together to change the current system

The REINWASTE project, also part of the Interreg MED GGC, is testing innovative solutions for zero inorganic waste in the agro-food sector.

The testing of the project, carried out in 3 agro-food value chains (horticulture, meat and dairy sectors) in the Mediterranean, has provided knowledge on Best Available Technologies (BATs) and Key Enabling Technologies (KETs) that demonstrate sustainable solutions.

These differ according to the sector, but they all show the way for a sustainable and zero waste food system.

4. Zero waste bulk shop, an example of a completely plastic-free store, with the aim to provide a zero waste environment for the customers, offering refill stations on bulk food goods. Photo: Laura Mitulla

Businesses and farmers are not the only ones responsible for agro-food waste - it's everyone's responsibility.

A Zero Waste Paradigm

The transition towards a circular economy is “irreversible” as the EU Circular Economy Action Plan states. The Interreg MED GGC works to push this change in the Mediterranean promoting innovation in the waste management field to shift to a minimal or zero waste system.

The GGC produced unified results and knowledge that are currently being capitalized on and transferred to key stakeholders, contributing to the achievement of targets in the EU Green Deal and in the strategies and legislations around it – such as Farm to Fork and the revised Common Agriculture Policy (CAP).

But, as highlighted by the GGC, there are still barriers to that transition that need to be addressed.

5. The Greenhouse Facilities of the University of Thessaly, located at Velestino (Magnesia). An example of technologies for production with low inputs in greenhouses. Photo: AgriTexSil



5

On one hand, there is a lack of knowledge about affordable alternatives to inorganic waste across the agro-food sector, which is an important limitation as underlined by the REINWASTE project. On the other hand, unrealistic regulations can pose a big barrier as well, especially regarding organic waste. The GGC project RE-LIVE WASTE is working to ensure that future regulation will be reasonable and applicable in real farms to be able to convert organic waste into a valuable resource. That is why the GGC works to raise awareness among stakeholders and transferring knowledge about the best innovative solutions.



6

However, responsibility for this must be shifted to make the transition effective. Businesses and farmers are not the only ones responsible for agro-food waste, but it is everyone´s responsibility. And we cannot forget the big role that policy-makers play in the transition to a circular economy. They are accountable for supporting industries and territories with effective policies aimed at achieving real progress towards waste prevention and management and support the transition to a sustainable system.

Therefore, all actors that make up the different value chains, beginning with the producer and ending with the consumer, must respond together to deliver an environmentally friendly waste management solution. ●

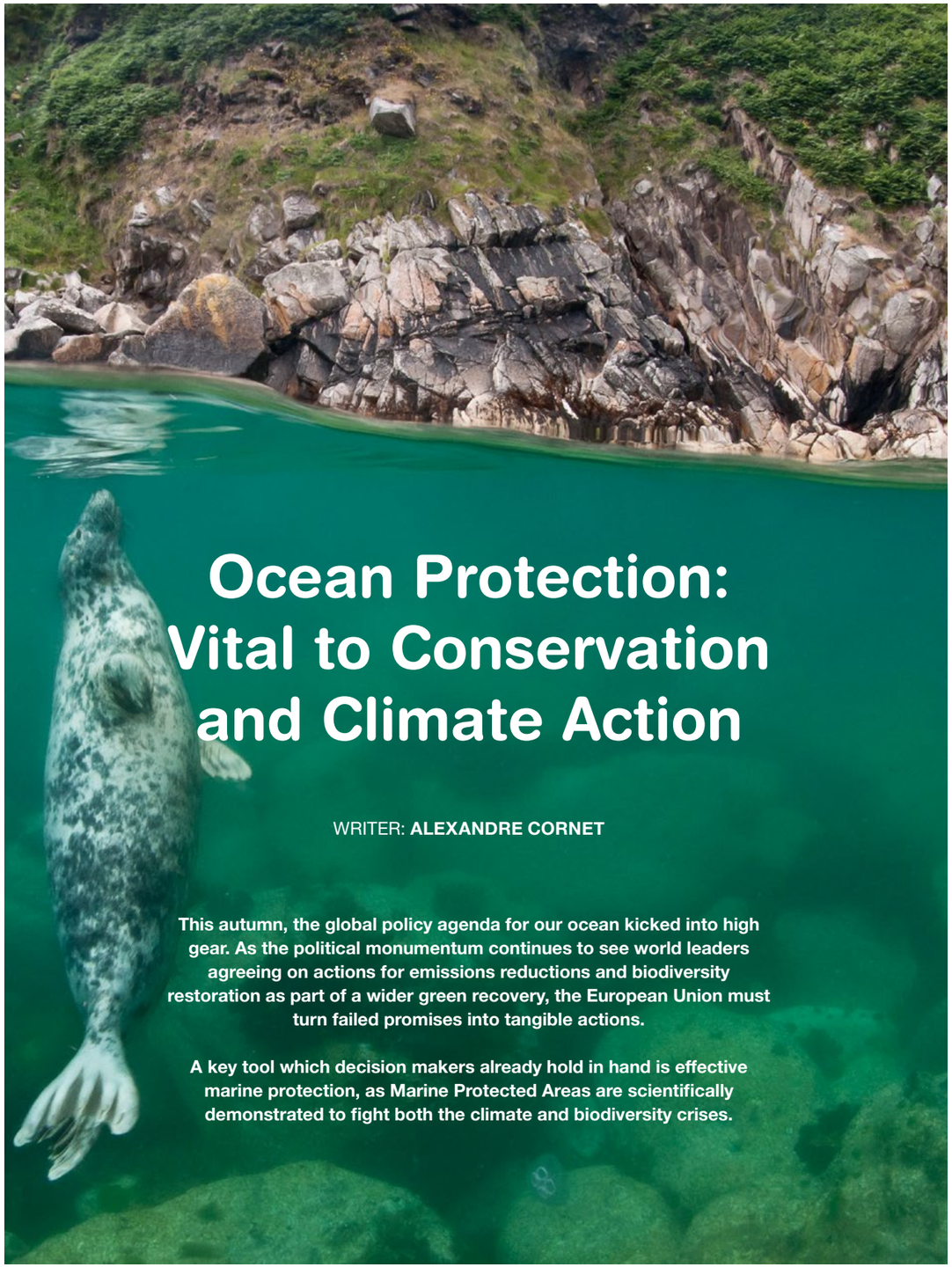
Learn more about the GGC projects outputs in the community capitalization platform:
interregmedgreengrowth.eu



7

6. REVOLVE / *Green Growth community activities in the waste focus area.*

7. Cows, bulls and calves graze placidly on a green farm in Seville, Spain. Photo: Jorge Marquez



Ocean Protection: Vital to Conservation and Climate Action

WRITER: **ALEXANDRE CORNET**

This autumn, the global policy agenda for our ocean kicked into high gear. As the political monumentum continues to see world leaders agreeing on actions for emissions reductions and biodiversity restoration as part of a wider green recovery, the European Union must turn failed promises into tangible actions.

A key tool which decision makers already hold in hand is effective marine protection, as Marine Protected Areas are scientifically demonstrated to fight both the climate and biodiversity crises.

1

Marine Protected Areas (MPAs) not only alleviate the negative effects of climate change on marine ecosystems, capture carbon, protect coastlines from erosion and reduce water acidification, they also constitute vital sanctuaries for many threatened species. In turn, they support our communities by contributing to food security and safeguarding the landscapes many of us call home.

However, poor management and lack of sound planning of our seas continue to render the vast majority of MPAs to mere lines on a map. To ensure the resilience of our ocean in the face of unprecedented changes, it is imperative for the EU to deliver on its commitment to marine protection, setting a global precedent that will ultimately benefit both people and planet.

Climate: A crisis for our seas

Last year's IPCC's report on the Ocean and Cryosphere highlighted the poor state of our ocean and alerted us to its compromised future. Since 1980, the ocean has absorbed up to 30% of human-induced carbon dioxide emissions, which acidifies our seas, making them inhospitable to life.

Having taken in up to 93% of excess heat from greenhouse gas emissions in our atmosphere since 1970, the water is also getting warmer. The results include the melting glaciers and rising sea levels which fill our headlines, but also less visible consequences like reduced oxygen which suffocates marine life.

As if this was not enough of a challenge, global overfishing combines with climate change to make things even worse for marine ecosystems, and we now face the disappearance of up to 15% of the global biomass of marine animals by 2100.

The impacts on our societies would be extensive: fishery industries, for example, could lose up to a quarter of the fish needed to ensure populations remain large enough for us to continue harvesting seafood sustainably.

Although the EU likes to think of itself as a climate and biodiversity leader on the global stage, it's easy to see that we're falling short when we look at what's happening in our own backyard.

1. Lundy, a rocky shore, was Britain's first Marine Nature Reserves, which helped marine life to thrive.
Photo: naturepl.com / Alex Mustard / WWF

2. Dogfish off the coast of Norway.
Photo: Fredrik Myhre / WWF Norway



2



3

For generations, we've been captivated by fantastic stories of mysterious creatures filling an immeasurable blue expanse, but what actually remains after decades of overexploitation are the very real dangers of polluted waters and plastic-contaminated seafood – where overfishing hasn't already left us with nothing to catch. In June 2020, the European Environmental Agency confirmed that marine biodiversity is continuing to decline in Europe's seas, with around 12% either threatened or near-threatened.

About 84% of biodiversity in assessed European marine areas and nearly 80% of marine ecosystems are in "problematic" conditions. The European Commission reached a similarly bleak diagnosis in its analysis of how the Marine Strategy Framework Directive (MSFD) - a key piece of legislation meant to deliver "clean, healthy and productive seas" - is being implemented by EU countries, admitting failure to reach the legal requirement of "Good Environmental Status" of all EU seas by 2020.

Both reports point to human activities driving overexploitation, overfishing and pollution. The socio-economic consequences are unequivocal. The EU's Blue Economy was worth around €750 billion in 2018, employing roughly five million people in sectors including fisheries and maritime tourism. The prosperity of these activities relies upon a thriving ocean, the foundation of which is resilient marine biodiversity.

Marine protection: Our not-so-secret weapon

With the marine world landing in the crux of both the biodiversity and climate crises, the good news is that solutions exist to boost our ocean's resilience – foremost among these are marine protected areas (MPAs). They are scientifically-proven, efficient and cost-effective tools for reinforcing ecosystem resilience, bolstering the capacity of marine and coastal habitats to sink and store carbon.

Storing carbon keeps it out of our atmosphere and is one of our planet's greatest natural capacities to regulate global temperatures – this vital service requires immediate restoration and reinforcement in our fight against climate change.

Nature has shown us that, with the right support, she can deliver on this front: a WWF-supported 200 hectare saltmarsh restoration project in the Baltic Sea is calculated to lock in up to 5,000 tons of carbon dioxide emissions annually.

Our underwater meadows and forests also are real climate heroes. Seagrasses, for example, not only store up to twice as much carbon as terrestrial forests, they also slow down water acidification, protect our coastlines from erosion and are the places many marine species call home.

Seagrasses store up to twice as much carbon as terrestrial forests.

All of these services directly support human activities, including putting food on our plates and inviting us to some of our favorite holiday destinations. Despite these benefits, seagrasses remain in sharp global decline due to human activities which damage the seabed and pollute our seas. In the Mediterranean, for instance, more than a third of *Posidonia* seagrass meadows have been lost over the last fifty years.

3. Diver and dusky grouper (Epinephelus marginatus) in Port-Cros National Parc, France. The dusky grouper is considered vulnerable by the International Union for Conservation of Nature and a number of Marine Protected Areas have been established to protect its habitat. Photo: Sandrine Ruitton.

Despite 12% of the EU marine area being designated for protection, less than 2% had plans for how to actually protect these sites.

HUMAN-INDUCED CLIMATE CHANGE

Annual human CO_2 emissions jumped from below 2 billion tons at the start of the 20th century to over 37 billion tons in 2018

Intensified and more frequent weather events

Integrity to man-made structures and systems along our coastlines

Living conditions of coastal communities

Critical coast… offshore as… such as offs… wind farr…

Loss of revenue for fisheries, aquaculture and tourism

ELEVATED SEA TEMPERATURES

The ocean has absorbed up to 93% of excess heat from greenhouse gas emissions in the atmosphere since 1970, which leads to:

- Melting glaciers
- Rising sea levels
- Less oxygen in the sea
- Less mixing of layers of oxygen into deeper waters

OCEAN ACIDIFICATION

Since 1980, the ocean has absorbed up to 30% of human-induced CO_2 emissions, which has made it more acidic

The ocean's capacity to regulate climate is reduced, as it no longer effectively traps heat or excess carbon

WHAT THE SCIENCE TELLS US

PRESSURES ON MARINE LIFE:

- Geographic distribution of species changes
- Species diversity and population density decrease
- Ecosystems already stressed by human activities become increasingly vulnerable
- Oxygen-deprivation reduces the health of deep-sea organisms, making them less effective carbon sinks

DEGRADATION OF OCEAN ECOSYSTEM SERVICES TO PEOPLE - INCLUDING:

- Coastal communities and assets in jeopardy
- Food security at risk
- Weaker blue economy

UNDERSTANDING THE RISKS

Coastal erosion and extreme weather events increase human vulnerability to climate change through loss of:

At global level, increasing water temperatures and acidification alter marine food webs, instigate algal blooms, and create dead zones at sea

- A more acidic ocean weakens the shells and structures of many species
- Health of marine life declines
- Deep sea mining, oil and gas exploration
- Disrupting seafloor sediments by trawling

MPAs provide … for juveni… protect spec… habitat… extract… destructive ac…

M… resilienc…

popula… individ…

HOW MP… ALLEVIA… EFFECT… CLIMATE…

…stal and … assets … ffshore … arms

People's food security is threatened

Good MPA planning fosters dialogue between diverse users and stakeholders of marine spaces in the face of increased competition and sea use

Healthy coastal habitats like seagrasses, dune systems, mud and mangroves protect against coastal erosion and extreme weather caused by climate change

Well-managed MPAs support large fish populations and diversity, bringing food and economic security to people

For marine research to effectively examine climate change, scientific reference areas which are left untouched are required — these can be within or outside of MPAs

Effective implementation of management plans

Support ecological coherence and connectivity of species, follow good ocean governance and SMART* principles (Specific, Measurable, Attainable, Relevant, Time based)

MPA management activities based on robust scientific understanding

Stakeholder involvement and collaborative approaches to foster support and compliance

…PAs CAN …ATE THE …CTS OF …E CHANGE

BLUE CARBON

Seagrasses, salt marshes, mangroves and the seafloor all provide direct capture and storage of carbon. Actions which disturb or reduce these habitats must be restricted

BENEFITS FOR PEOPLE

MPAs foster human well-being by providing thriving coastal and marine environments

Strong management plans, with proper restrictions in place and tangible restoration targets

Broader spatial and socio-economic integration of MPA planning through the ecosystem approach to Marine Spatial Planning (MSP)

SOUND PLANNING

FINANCIAL SECURITY

Guaranteed, long-term funding secures effective planning, monitoring, evaluation, enforcement and habitat restoration

LONG-TERM VIEW

- Constructing port and harbour facilities
- Extracting sand and gravel

BENEFITS FOR BIODIVERSITY

…e refugia …niles and …ecies and …tats from …ctive and … activities

MPAs support the …nce of marine life – for example, fish …ulations increase as …viduals grow larger and more fertile.

As warmer, more acidic and oxygen-deprived waters force species to move, MPA networks help marine life find refugia and recover

WHAT NEEDS TO BE DONE

INTEGRITY

- Marine protection must not be weakened by economic interests
- Nature needs to be protected for its own value, not as an alternative to the reduction of h… armful emissions
- Adopt a precise time frame for achieving MPA objectives
- Maintain flexible and iterative management to adapt to changes in the environment

MPAs are proven tools for reinforcing seagrass meadows, which in turn support resilient ecosystems in surrounding areas.

Ambitious field projects to restore them are demonstrating that effective action is far from impossible: in the UK, where about 92% of seagrasses have been lost in the last century due to pollution and human activities, Sky Ocean Rescue teamed up with WWF to plant over a million seagrass seeds in the biggest restoration project of its kind ever undertaken in the country.

In addition to the carbon these underwater plants capture, it is estimated that the mature meadows will host about 160,000 fish and 200 million invertebrates.

It's time for good ocean governance

At WWF, we're advocating for 30% of EU seas to be effectively managed MPAs by 2030, with at least 10% being highly protected. The European Commission sent a strong political signal in favor of ocean preservation when aligning the EU Biodiversity Strategy with these marine protection targets earlier this year.

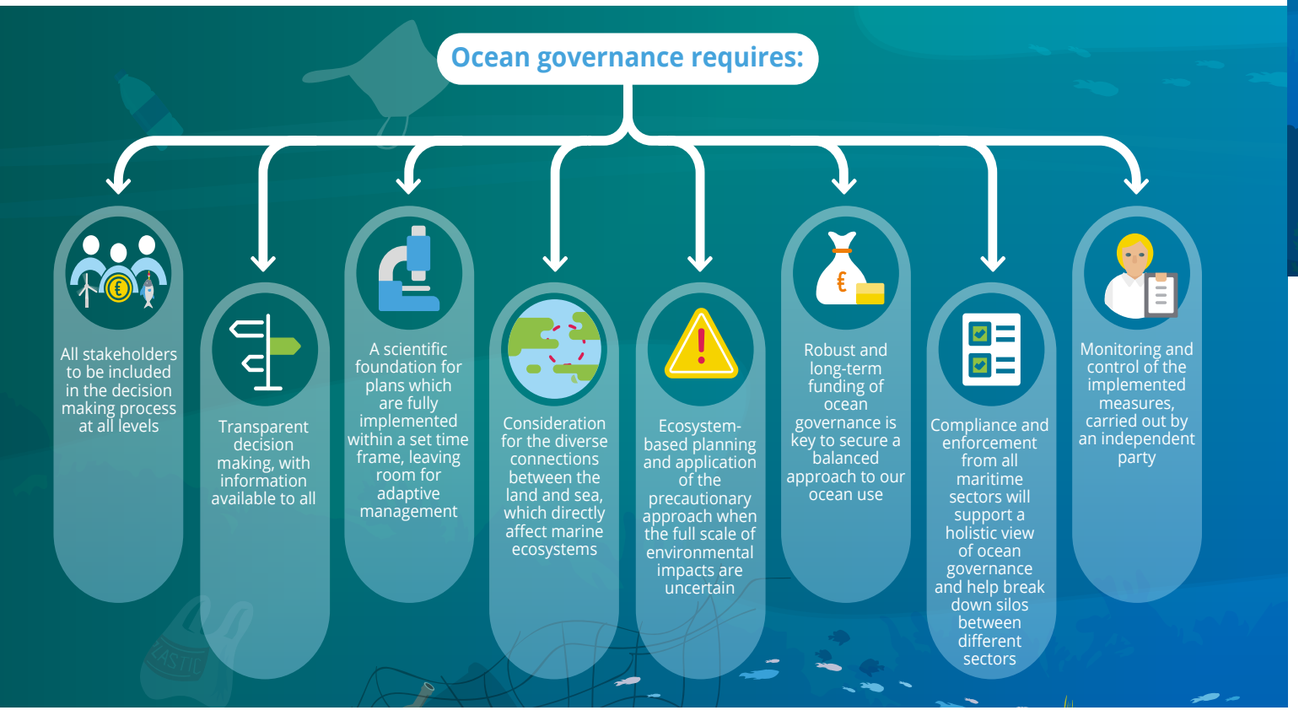
However, the European situation shows us that it's not just about identifying the right solutions, like MPAs, but living up to political commitments with effective implementation. For instance, a 2019 WWF report found that, despite 12% of the EU marine area being designated for protection, less than 2% had plans for how to actually protect these sites.

In a nutshell, the vast majority of European protected areas remain nothing more than "paper parks" – lines drawn on a map without any measurable action on the ground or in the water.

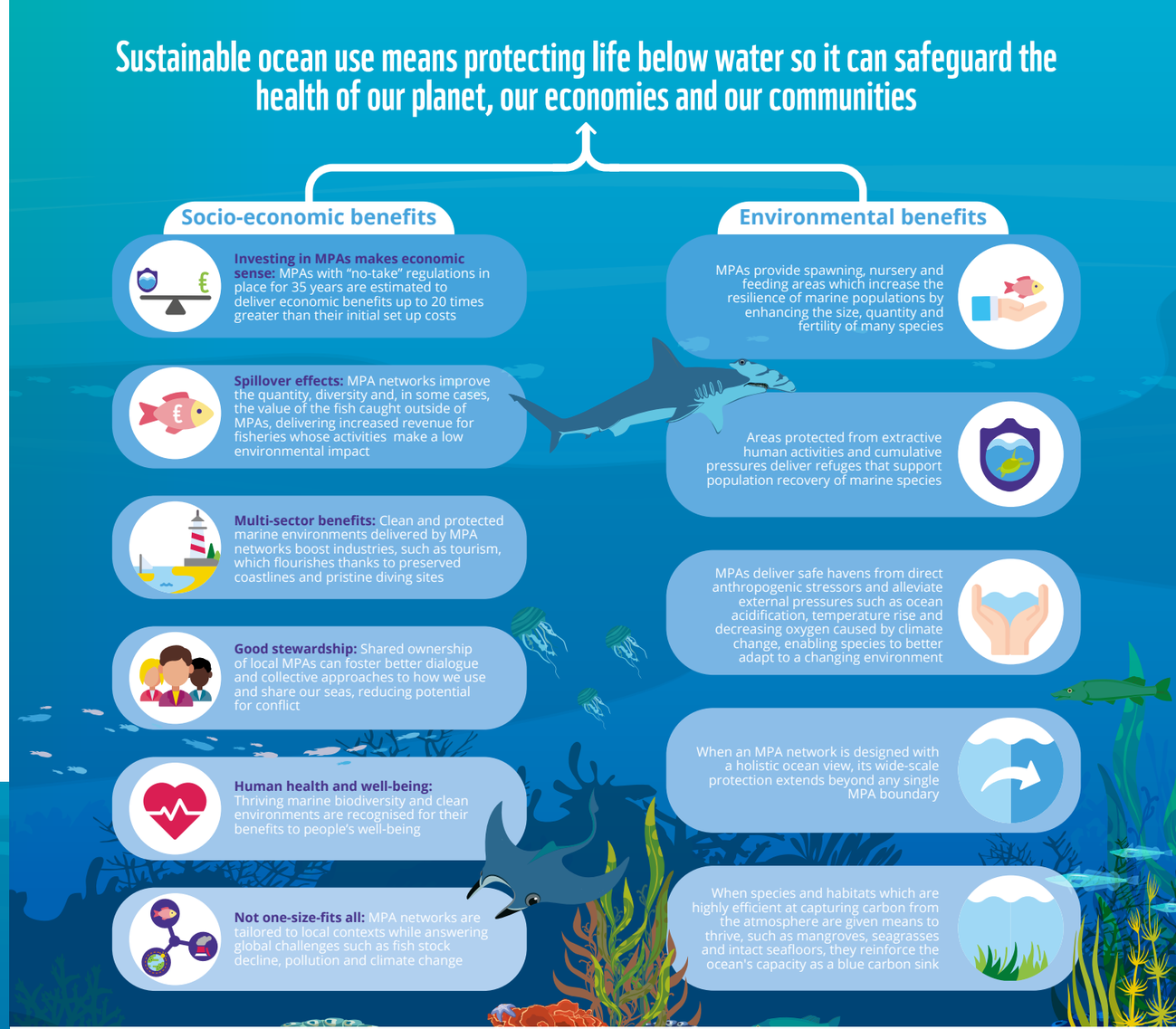
As poorly managed MPAs do not provide the intended results of richer and more robust ecosystems that support our demands for seafood and desires for beautiful seaside escapes, stakeholders are left with little motivation to set aside further areas for protection. We must not let our objective for a sustainable relationship with our ocean continue to slip through our fingers and, with it the benefits for our communities and economies. The implementation of MPAs must be enshrined in the wider framework of good ocean governance.

4. WWF / Sky Ocean Rescue *Marine Protected Areas: Delivering ocean resilience to alleviate the effects of climate change*.

5. WWF / Sky Ocean Rescue *Effective conservation and restoration to support good ocean governance*.



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Merely designating an area for protection limits any intention to help our ocean thrive to the pages of such a declaration. To truly deliver, MPAs must benefit from effective ocean management that is based on a set of good practices including stakeholder involvement and transparent decision-making, robust and long-term funding, monitoring and control and, whenever needed, enforcement of the rules by our authorities.

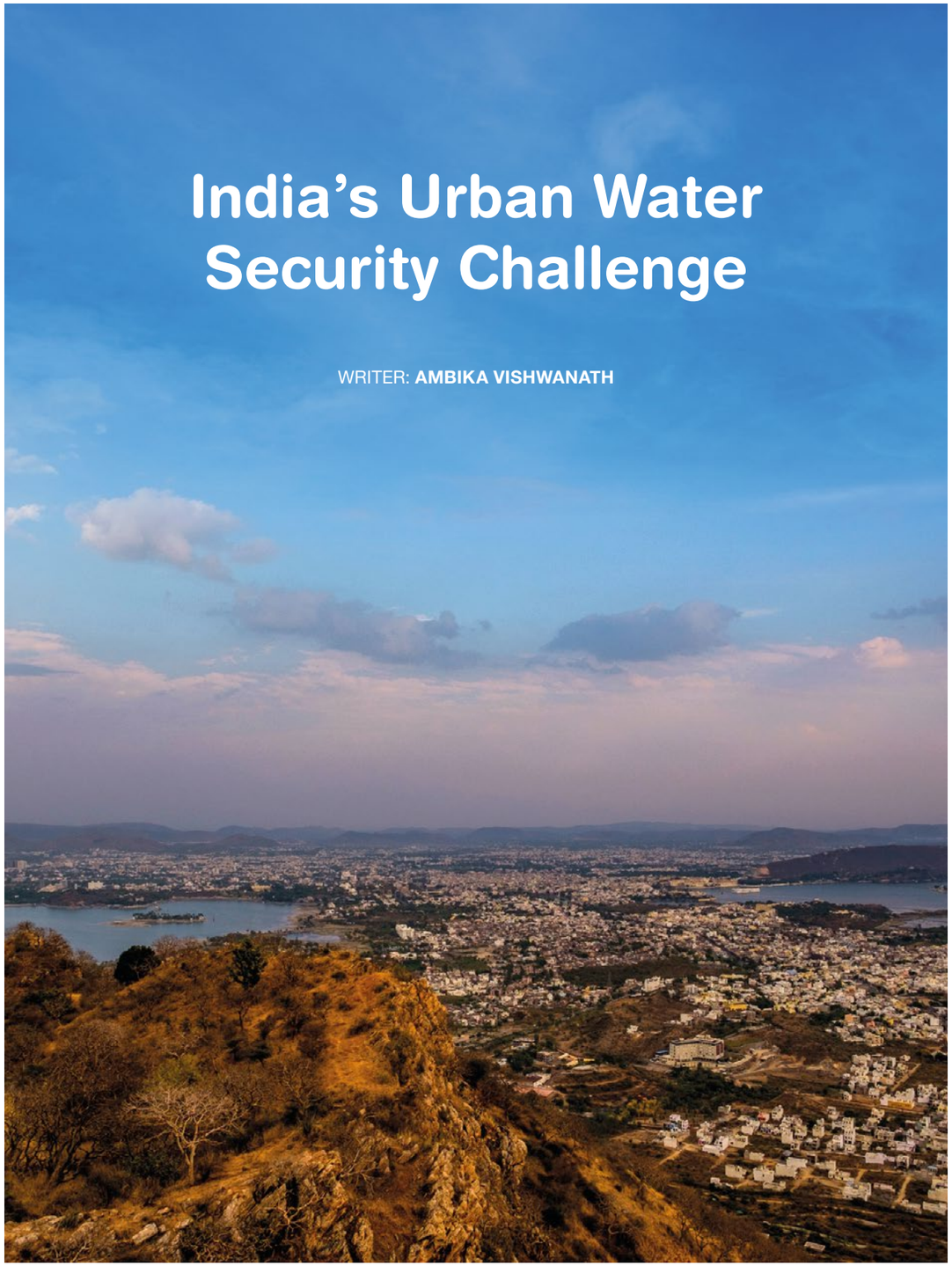
The home-stretch of 2020 has seen our ocean in the spotlight of wider biodiversity, food and energy issues. At the international level, government representatives discussed the global biodiversity framework during the Summit on Biodiversity of the United Nations General Assembly. At the European level, the European Commission published its long-awaited Strategy on offshore renewable energy and Member States endorsed the EU Biodiversity Strategy's roadmap for environmental recovery by 2030. While such high-level discourses and public-faced commitments are welcome, political impetus and concrete actions are urgently needed to bring true protection and restoration to our ocean.

Effective networks of MPAs constitute the low-hanging fruit, delivering scientifically, legally and politically supported leaps for ocean resilience. It's time for the EU to be the global biodiversity recovery and climate mitigation torchbearer it claims to be. ●

6. WWF / Sky Ocean Rescue Effective conservation and restoration to support good ocean governance.

India's Urban Water Security Challenge

WRITER: **AMBIKA VISHWANATH**



1

As the world become increasingly urban, propelled by a lifestyle change and economic opportunity, almost 70 percent of the population is expected to live in cities by 2050 according to a 2018 report by United Nations. In India, the estimates state that by 2030 urban residents will be over half the population. For rapid urbanization to be sustainable the implication of delivering water to residents needs to be at the centre of the city, state and national level development agenda.

In the wake of the ongoing pandemic, as India debates the evolving concept of space, infrastructure, health and opportunity in crowded urban areas, it is imperative that India integrate urban water security into the wider conversation.

Some of India's cities – including Mumbai, Bengaluru, Surat and Chennai – are some of the fastest growing in the world, both in terms of population and economic growth. Many of these cities are also some of the most water stressed in the country, stemming from a number of problems including access, governance issues and poor quality of potable water. In India urbanization is currently driven by a complex set of factors, where the availability of clean sustainable water is not usually considered an issue. While focusing on the access to water along with employment opportunities, clean air, and health care should be an important consideration, current migration movements indicate that in less than a decade by 2030, about 160 million Indians will live in cities that are water stressed. The Central Water Commission states that in 91 important reservoirs across the country, levels have not crossed more than half the total capacity in the past five years, though owing to a good monsoon this year 103 reservoirs have more storage than the average of the last decade.

Water accessibility for all

The Central Government's Jal Jeevan Mission marks a shift from the earlier practice of community water supply to providing potable water to all households; which will vastly benefit urban slums and poorer urban communities that often depend on community taps or expensive tankers. No Indian city currently provides 24/7 clean water to all of its residents. It is often the marginalised communities, illegal settlements, and the floating population that pay more and bear the brunt of water stress. If the mission succeeds,



2

1. Udaipur City is set around eight lakes interconnected by an age-old system of canals, that keeps the city cool in the summer and ensures a steady supply of water. Photo: Hoshner Reporter.

2. An Indian woman collecting water from one of the town's wells, that happened to be situated adjacent to this community's refuse dump, which had the potential of contaminating this source of potable water. Photo: US Centers for Disease Control and Prevention.

it could be a game changer not only for India but also provide a model for other developing nations to study and to adapt. The provision of potable water to every household not only addresses health issues exacerbated by global pandemics and localised epidemics, but also reduces the stress on women and girls who oftentimes bear the brunt of lack of access, especially in poorer communities and slum areas of cities.

However, the concept of urban water security is a multi-faceted one and needs to be closely interrelated with the larger urban development and management question: be it migrant services, housing and infrastructure development, health and sanitation, energy or the wider question of urban climate resilience. A clearer understanding of the integrated nature of water with these other development frameworks will aid in ensuring that urban growth will be sustainable in the long term. This understanding is at a very nascent stage in India, where policies and public sector programmes have largely been siloed. While the COVID-19 pandemic has started some of these conversations, many still lack the component of long-term urban water security.

India's economic lifeline

Water is also about the economic growth of the city and ultimately the country. An ongoing Kubernein Initiative study finds that in the worst-case scenario water stress in Surat and Bengaluru, both in the top ten contributors to India's GDP, place at risk 90 percent of the nation's diamond export industry and 40 percent of the IT industry respectively. Despite this there is still a distinct lack of investment in urban water security to meet current and future demand.

3



Water related policies are currently largely supply side driven, with marginal focus on elimination of waste and productivity of use. Both policies and the integrated nature of water need to be addressed if India is to achieve its development goals and transform its cities. This can be done in two ways; firstly, bring these two parallel tracks together where all relevant aspects of urban development and water security are discussed in tandem and secondly ensure that public policy and programmes are more circular and holistic in nature from the source to the user and back.



4

Climate risks

There is the added aspect of climate risk, where low probability events are slowly becoming the norm. In 2019, India announced a global Coalition for Disaster Resilient Infrastructure at the U.N. Climate Action Summit. While it works towards potentially creating a plan on national and local levels, the subject of water security needs to play a bigger part in that. Any city heat action plan for example, such as the one developed by Ahmedabad, needs to ensure that the effects on future water availability are taken into account.

India's national disaster management authority responses have vastly improved over the years. The response to 2019 Cyclone Fani in Odisha, working with the state disaster management authority showed remarkable success which was adapted and put into play to also deal with the ongoing pandemic in the state. While disaster management focus might be geared towards extreme weather-related events, a shift and expansion of focus could include strategic thinking on stress caused by extreme floods, drought and other water and health related challenges.

The power of data

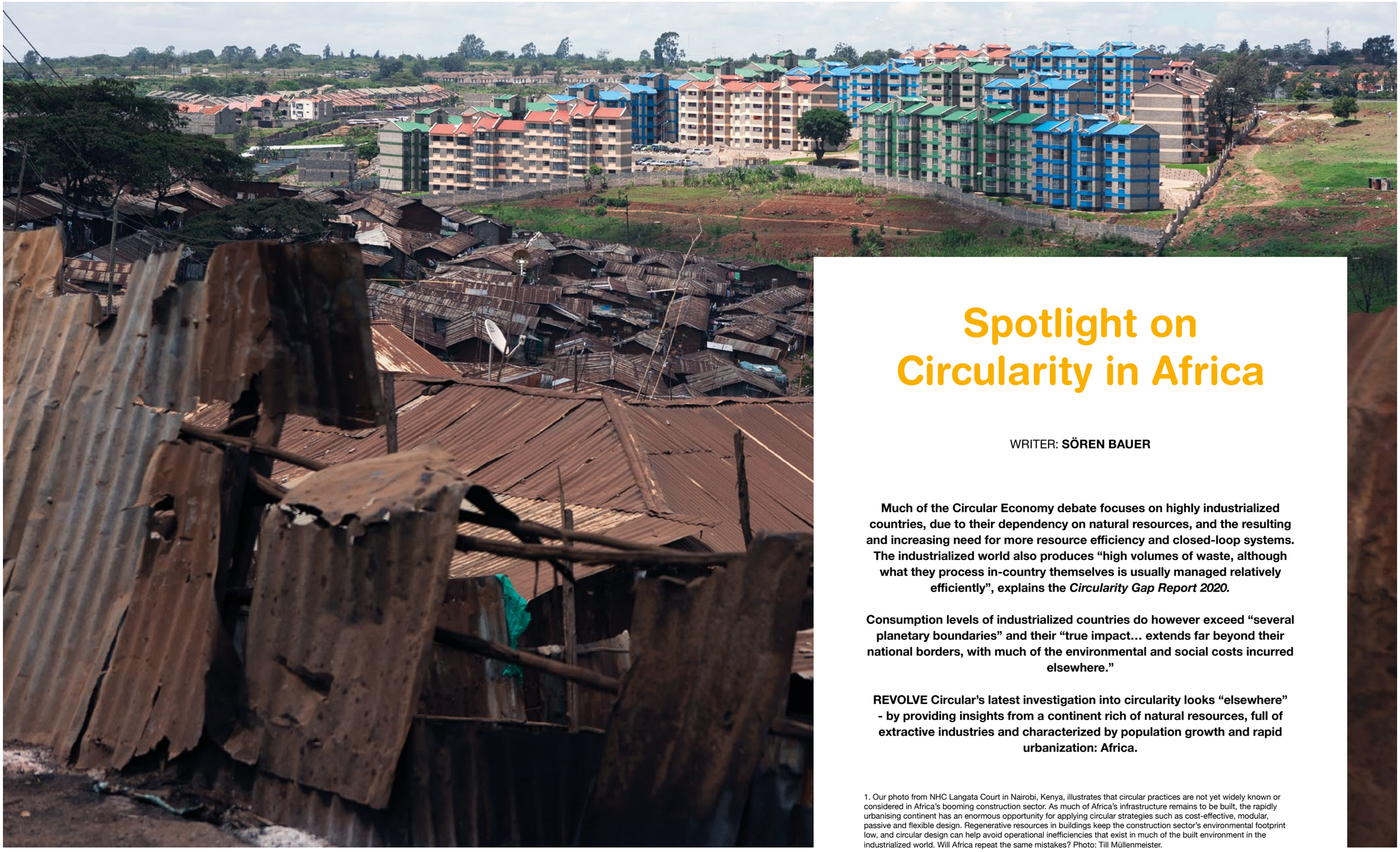
The key lies in the expansion of data collection and using technology and digitization to its advantage. In this way India can make its water management more pre-emptive and predictive and connect this into the wider city data systems. Casting a wider net here and thinking innovatively ensures addressing issues from source to user, such as: monitoring conditions of water systems; unchecked sewage; contamination; loss and theft; and non-revenue water amongst others.

Granular data that is transparent, not only aids in city wide planning and informs national level risk analysis, it also places an onus and responsibility on the end user, something that is critical to urban India. The country also needs to place greater emphasis on cross-learning in two sectors: on a geographic level within the country and from global experiences on water security, and on a sector basis where knowledge and innovation is adapted from experiences on tackling pollution or sanitation challenges for examples.

It is time India moved on from thinking of water security as a purely a development agenda but shift the paradigm to focus more on transforming India's cities, making them water smart for India's future to be truly global. ●

3. A water tank in a mosque in Bhopal City. Small water tanks in religious establishments are used as natural water storage units and also to replenish groundwater, though many have now been paved over or concretised. Photo: Hoshner Reporter.

4. A Lakadhi child play with roadside hand pumps found in villages along the valley. Photo: Hoshner Reporter.



Spotlight on Circularity in Africa

WRITER: **SÖREN BAUER**

Much of the Circular Economy debate focuses on highly industrialized countries, due to their dependency on natural resources, and the resulting and increasing need for more resource efficiency and closed-loop systems. The industrialized world also produces "high volumes of waste, although what they process in-country themselves is usually managed relatively efficiently", explains the *Circularity Gap Report 2020.*

Consumption levels of industrialized countries do however exceed "several planetary boundaries" and their "true impact… extends far beyond their national borders, with much of the environmental and social costs incurred elsewhere."

REVOLVE Circular's latest investigation into circularity looks "elsewhere" - by providing insights from a continent rich of natural resources, full of extractive industries and characterized by population growth and rapid urbanization: Africa.

1. Our photo from NHC Langata Court in Nairobi, Kenya, illustrates that circular practices are not yet widely known or considered in Africa's booming construction sector. As much of Africa's infrastructure remains to be built, the rapidly urbanising continent has an enormous opportunity for applying circular strategies such as cost-effective, modular, passive and flexible design. Regenerative resources in buildings keep the construction sector's environmental footprint low, and circular design can help avoid operational inefficiencies that exist in much of the built environment in the industrialized world. Will Africa repeat the same mistakes? Photo: Till Müllenmeister.

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Pineapple leather? Plastic buildings? What is driving Africa's circular agenda?

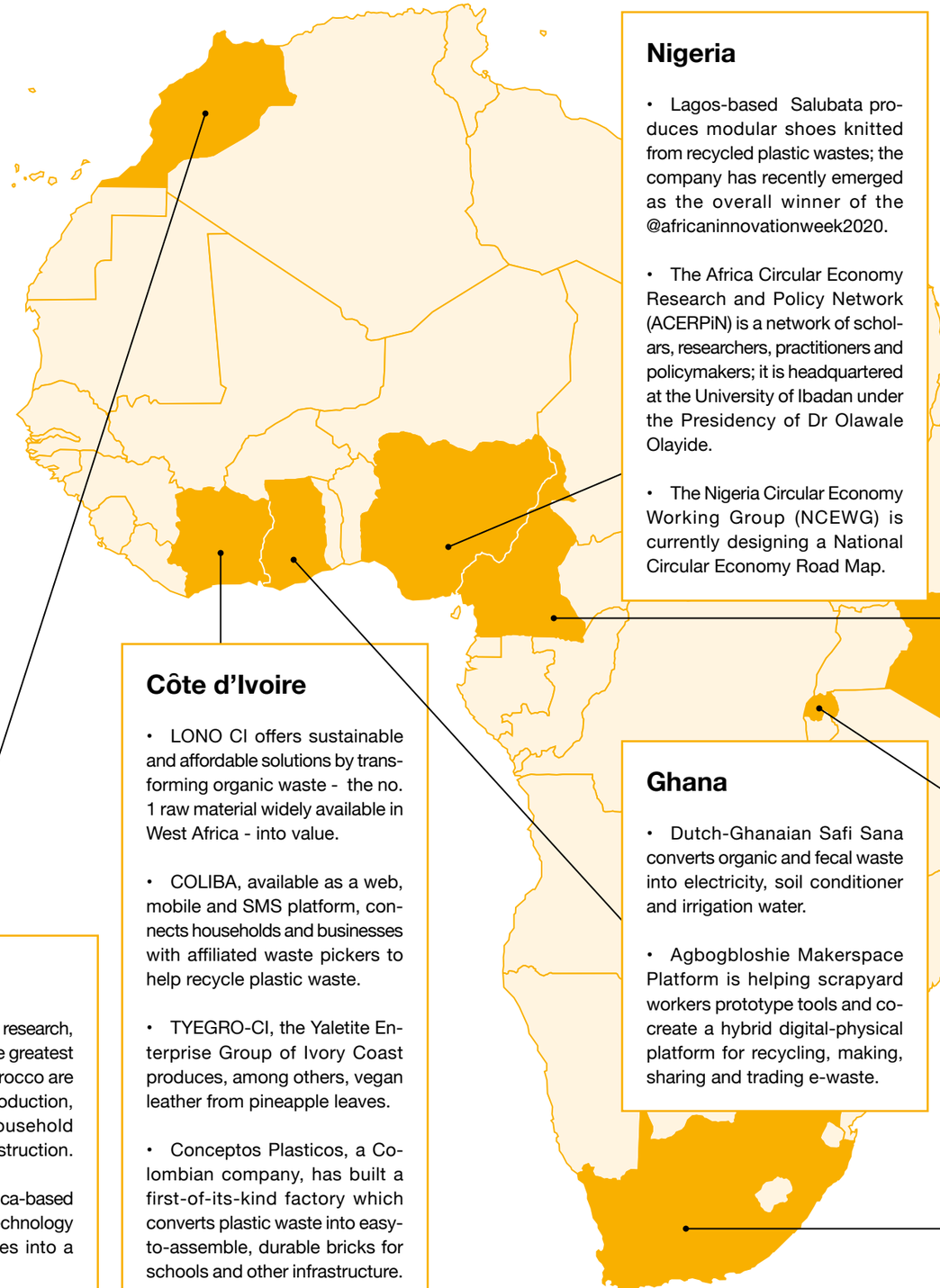
Circular practices have always existed across the African continent, and are now gaining traction. Gracia Munganga from the African Circular Economy Network (ACEN) explains: "Strong emphasis is seemingly on agri-food and forestry related topics, and includes food security and access to required information and infrastructure."

Part of the circular movement is also the African Circular Economy Alliance (ACEA), co-founded by Nigeria, Rwanda and South Africa. Dr. Nyong of the ACEA explains that Ghana and Côte d'Ivoire joined the Alliance in 2020 and "other countries such as Niger, Senegal, Malawi, Cameroon, and the DR Congo have indicated an interest to join."

These organizations bode well for a more circular Africa - but what exactly are individual governments, businesses and other stakeholders doing? Where are circular business models already playing a role?

From organic waste for producing pineapple leather to plastic buildings and industrial symbiosis in eco-industrial parks, Africa is finding its own way to advance circularity in the 21st century.

Discover what some active businesses and individual governments in selected countries are already doing.



Nigeria

- Lagos-based Salubata produces modular shoes knitted from recycled plastic wastes; the company has recently emerged as the overall winner of the @africaninnovationweek2020.
- The Africa Circular Economy Research and Policy Network (ACERPiN) is a network of scholars, researchers, practitioners and policymakers; it is headquartered at the University of Ibadan under the Presidency of Dr Olawale Olayide.
- The Nigeria Circular Economy Working Group (NCEWG) is currently designing a National Circular Economy Road Map.

Cameroon

- In September 2020, Cameroon created a parliamentary network to promote circular economy in Cameroon (PANCEC); its establishment is related to heavy floods during which poorly disposed-of waste blocked drainages.
- Kemit Ecology has developed an innovative process to convert household organic waste into ecological charcoal.
- AMABO blends mixed, post-consumer plastic waste with sand to produce near indestructible, cost-efficient, eco-responsible and 100% recyclable roof tiles.

Kenya

- According to ACEN, agriculture is the key intervention area for circular practices in this East-African country, followed by construction and waste management with a focus on plastic and the experienced environmental pollution prevention challenge.
- There are policy initiatives for three eco-industrial parks, and research into circular retrofitting of an industrial zone in Nairobi looks into cascading waste streams and industrial symbiosis.

Morocco

- According to ACEN's research, the four sectors with the greatest circular potential in Morocco are agriculture and food production, waste (particularly household waste), water, and construction.
- Ecofertil, a Casablanca-based company, is using biotechnology to turn organic residues into a range of fertilizers.

Côte d'Ivoire

- LONO CI offers sustainable and affordable solutions by transforming organic waste - the no. 1 raw material widely available in West Africa - into value.
- COLIBA, available as a web, mobile and SMS platform, connects households and businesses with affiliated waste pickers to help recycle plastic waste.
- TYEGRO-CI, the Yaletite Enterprise Group of Ivory Coast produces, among others, vegan leather from pineapple leaves.
- Conceptos Plasticos, a Colombian company, has built a first-of-its-kind factory which converts plastic waste into easy-to-assemble, durable bricks for schools and other infrastructure.

Ghana

- Dutch-Ghanaian Safi Sana converts organic and fecal waste into electricity, soil conditioner and irrigation water.
- Agbogbloshie Makerspace Platform is helping scrapyard workers prototype tools and co-create a hybrid digital-physical platform for recycling, making, sharing and trading e-waste.

Rwanda

- Rwanda has had a very proactive approach to overcoming environment and climate change challenges through green growth and climate resilience approaches – such as its plastic bag ban in 2008.
- Sectors that show the greatest circular economy potential are based around waste management, agriculture, manufacturing, construction, and transport.

South Africa

- Cape Town-based Agriprotein loves flies. In its animal-feed business, the company is recreating the natural way animals feed themselves, for example from dry fly larvae.
- Nedbank is scaling aquaponics entrepreneurs to create jobs and improved incomes. Aquaponics minimizes land and water demand (~90% less) and reduces climate reliance.
- Barloworld-Caterpillar is one of the largest re-manufacturing plants in the world, and a circular economy leader in Southern Africa.

Circularity and social inclusiveness for a different Africa

REVOLVE Circular got together with the eight current members of the ACEN Executive Team Susanne Karcher (South Africa), Sally-Anne Kasner (South Africa), Murielle Diaco (Côte d'Ivoire), Sarah O'Carroll (UK), Alex Lemille (France), Peter Desmond (UK), Chris Whyte (South Africa) and Gracia Munganga (DR Congo). The answers are an amalgamation of the team's responses.

ACEN is the African Circular Economy Network, a civil society network of Circular Economy thinkers and do-ers advocating for a more circular economy in Africa. ACEN is registered as a Non-Profit Company in South Africa and has around 100 representatives in over 30 African countries. In summer 2020, ACEN published its new membership policy and regulations, now accepting corporate, media and civil society organizations as its members. In 2021, ACEN is planning to organise a series of five online workshops for different geographical regions of Africa, culminating in "Africa Circular" as a pan-African summit and in-person event planned for 2022.

Let us talk about the early days of ACEN - when did you establish ACEN, and what were your main objectives at the time?

ACEN was established in July 2016 when a group of circular economy experts came together in Cape Town to discuss how to accelerate the circular transition in Africa. The main vision is still the same today: the association of circularity with social inclusiveness. We aim to build a restorative African economy that generates well-being and prosperity for all. To achieve this, we must utilise new forms of economic production and consumption which maintain and regenerate environmental resources. We have been inspired by sustainability visionaries from the Global North such as Gunter Pauli, Walter Stahel, and Ellen MacArthur as well as practices that have been seen across Africa for decades.



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One might argue that much of Sub-Saharan Africa has always been or is already circular – would you agree? What are the most important needs – and the biggest opportunities – for African countries and businesses to consider and embrace circularity?

Indeed, we strongly believe Africa is one of the most 'ready-for-circularity' continents, mainly because its ecological footprint is still very low. The chances of moving into a circular business model are easier than in other continents where most infrastructures are already built without their next life cycles in mind. One of the biggest opportunities for Africa is remanufacturing and refurbishment. Imagine a network of remanufacturers in charge of restoring products back to their original state to send back to their markets or to resell to Europe and the Middle East. Remanufacturing hubs can be created in many African countries and would generate countless jobs.

2. Workers are melting down metal scraps to berecycled. Empowering the informal sector is one of three main recommendations for African countries by the Circularity Gap Report 2020. Photo: ACEN.

3. During agrobootcamps such as in Tori-Bossito in the Republic of Benin, young Africans learn about closed loop farming practices that recycle nutrients and organic matter material back to the soil. Circular practices are essential in Africa's agriculture development, particularly to protect the fertility of soils, avoid further decline of biodiversity and ensure sustainable water management. Photo: AgroBootCamp.

4. Kemit Ecology in Cameroon produces eco-friendly charcoal from household waste. Photo: Kemit Ecology.

5. 400 kg of organic waste can be turned into 150 kg of compost; here, a collaborator of the Ivorian company LONO explains their Kubeko composter to cocoa farmers. Photo by LONO.

Looking towards the future: what are your most important plans for 2021 and beyond?

Our next big step is to secure funding for "Africa Circular" and its preparation via five online workshops on circular practices which we aim to conduct in 2021. They will provide input to this main event planned for 2022 – this is a journey, not a destination, towards helping to create a just transition to a circular economy in Africa which will contribute to achieving the Sustainable Development Goals and mitigating the negative impacts of climate change.

Read the entire conversation and the full answers at **www.revolve.media/circular-africa**

How public finance supports Africa's circular transformation

REVOLVE Circular met up with Dr Anthony Nyong, Director of Climate Change and Green Growth at the African Development Bank (AfDB). In this position, Dr. Nyong is also responsible for the secretariat of the African Circular Economy Alliance (ACEA).

ACEA is the African Circular Economy Alliance, a government-led coalition of African nations and global partners committed to advancing the circular economy transition at the national, regional and continental levels. Today, the ACEA serves as a centralized platform for knowledge-sharing and best practices identification, the creation of enabling legal and regulatory frameworks, as well as the building of partnerships for financing and the creation of circular economy projects in Africa. The Alliance is open to membership from public sector entities, international organizations, funding institutions and research centres. The ACEA Secretariat is hosted by the African Development Bank with support from the World Economic Forum.



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Dr Nyong, tell us a bit about how ACEA came to be? Is it correct to say that the governments of South Africa, Nigeria and Rwanda were the driving forces? Which other countries are already involved?

Yes, that is correct. The African Circular Economy Alliance (ACEA) was founded by Rwanda, Nigeria, and South Africa who currently serve as the Co-chairs of the Alliance. It was conceived in 2016 during the World Economic Forum on Africa in Kigali and formally launched at the COP 23 in Bonn in 2017. This year, Ghana and Côte d'Ivoire joined the Alliance and other countries such as Niger, Senegal, Malawi, Cameroon, and the DR Congo have indicated an interest to join.

What are the main challenges for more circular policies and practices in Africa? Which questions do African governments ask?

The main challenges in establishing more circular policies and practices are around: the understanding of the concept as most people easily equate it to waste collection and recycling, the lack of business support programs, availability of data and knowledge, adequate financing, access to technology and necessary infrastructure. Each of these plays an important role to developing the continent's circular economy. For instance, business support services, access to technology and adequate financing are key activities in scaling circular businesses while increased availability of data and knowledge on Circular Economy will support advocacy and increased awareness. The main question that governments and other stakeholders ask is "How do we mobilize the technical and financial resources to demonstrate that the incorporation of circular economy principles will actually create decent jobs and stimulate the entire economy?"

What do you see for the future of ACEA?

Through the ACEA's Theory of Change, we envision our short to medium term goals around policy development, leadership and advocacy, and the scaling of circular economy businesses and projects. This will include three main activities: One, development of country work streams for the Alliance's priority areas and the harmonization of policies across countries. Two, increase country membership, development of Circular Economy academia and exploration of circular innovations and businesses in member countries; and three, support to existing circular economy projects in member countries and fostering of partnerships between organizations working in the Circular Economy space.

We are already piloting the operationalization of our Theory of Change through a Nigeria Circular Economy Working Group (NCEWG). This voluntary working group is currently designing a National Circular Economy Road Map.

Read the entire interview and the full answers at **www.revolve.media/circular-africa**



6

5. Dr Anthony Nyong, Director of Climate Change and Green Growth at the African Development Bank (AfDB).

6. The Yaounde Sanitation Project (Cameroon) is a project of construction of drainage canals aimed at cleaning up the city and improving the living conditions of its inhabitants. Due to drainages blocked by waste, Cameroon recently established a parliamentary circular economy network. Photo: African Development Bank.

7. Transport Facilitation programme for corridors in between Chad, Cameroon and the Central African Republic. Photo: African Development Bank



7

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