SINGING IN THE RAIN

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EPISODE 16 – Featuring Jo Harrison Executive Director of Environment, Planning and Innovation at United Utilities

The summer of 2022 has seen significant and sustained droughts across the world, with serious ripple effects from energy shortages to severe food insecurity. But how can we possibly have a water problem when water makes up close to 3/4 of the Earth's surface?

In this new episode of 2050 Investors, Kokou Agbo-Bloua looks at how climate change is disrupting our planet's water cycle. He brings in Jo Harrison, Executive Director of Environment, Planning and Innovation at United Utilities to understand how we will need to adapt to prevent water scarcity in the face of global warming and growing world population.

SOCIETE GENERALE

2050 INVESTORS – EPISODE 16 SCRIPT

Singing in the Rain

Welcome to 2050 Investors, the podcast that deciphers economic and market mega-trends to meet tomorrow's challenges.

I'm Kokou Agbo-Bloua, I head up Economics, Cross-Asset, and Quant Research at Societe Generale.

In each episode of 2050 Investors, I'll investigate a key mega-trend that relates to the Economy, the Planet, Markets and You.

(Beginning of episode 16)

[music of ocean waves]

The '2050 Investors' crew is back! [taadaaa] I hope you were all able to rest, relax, spend quality time with your friends and family … and more importantly recharge your batteries…. renewable ones of course. Especially after the gruelling trial by podcast of hydrogen in our last episode.

In the month of August, every year, a lot of people indulge in revenge holidaying… migrating away from city centres to sunny bliss. This summer, this also meant a lot of first-hand experience of exceptionally high temperatures, droughts, and even ferocious forest fires that set new records across the world. The same can be said about inflation too, prices for goods and services are going through their own global warming.

We might need to update Benjamin Franklin's quote "Nothing is certain except death, taxes… climate change and inflation"

[Siri] Sometimes, I can't decide if you're an optimist or a pessimist Kokou.

Anyhow, how were YOUR holidays? Mine were great, I'm working on my podcasting skills, machine learning by relistening to all the 2050 Investors episodes while exploring the metaverse. I'm sure you've also enjoyed a full recharge with "premium blue hydrogen". Wink wink.

Talking about Blue, I spent my holidays near three different oceans in three different countries. First, a long weekend in Norfolk where we slept in a treehouse, not far from the North Sea [sounds of ocean waves / seagulls sound] then a few days in Perros-Guirec, in Northern Brittany with my in-laws, on the shores of the North Atlantic Ocean and finally two weeks with my parents in Lome, Togo next to the South Atlantic Ocean [Sound of the sea]. These were … BLUE holidays

[Siri] You mean, GREY holidays given your generous carbon footprint.

Touché, Siri, I'll do better next time. But here is an interesting anecdote. I remember driving down the highway to the airport to catch a plane when a discussion on the French radio caught my attention. It was about record drought and water scarcity in Europe.

[Siri] That radio program was spot on Kokou. Several news articles highlight the fact that this summer has seen significant and sustained droughts across the world, from Europe to China to the US and Africa with serious ripple effects from energy shortages to severe food insecurity.

But hold on a second, I thought to myself, with my brain cells in "Do not disturb 'holiday' mode", How can we possibly have a water problem when water makes up close to ¾ of the earth's surface? After all, earth is called the Blue Planet, not the RED planet.

[Siri] Unfortunately, clean water might not be as abundant and affordable around the world as we think... and don't even get me started on what it will be like for future generations.

In this case, some important questions spring to my 'back to work' mind.

Why are we running out of clean water and how many countries are in water poverty? Is there a link between carbon footprint and water intensity across industries and the products we consume? Can't we simply build planet-wide desalination facilities and process sea water? Finally, how are water utilities looking to address this issue in the face of climate change and growing world population?

Or in other words, for the Sci-Fi fans out there, will the world end up looking like Frank Herbert's book Dune where inhabitants of the desert planet Arrakis wear stillsuits to capture any moisture that leaves the body? And then recycle it back into drinkable water?

Let's start our investigation.

There are several misconceptions and misunderstandings about water. So, let's review two important concepts, shall we?

First, quantity over quality: When one thinks about clean water in the West, the first thing that comes to mind is running water from the tap when brushing one's teeth or taking a shower. It looks infinite. One might even think about the unlimited supply from rainwater, or even floods. Let's face it, there are not that many valuable resources in life that simply fall from the sky… humm… well, except helicopter money from central banks, but this was covered in our episode about inflation.

In fact, it is hard not to picture the 1952 musical film "**Singin' in the Rain**" with the iconic performance of Gene Kelly dancing through puddles in a rainstorm. "*I'm singin' in the rain, just singin' in the rain. What a glorious feeling, I'm happy again*". One could have even mistaken this love song for a rain dance performed by many First American tribes, such as the Cherokees in the Southeast. [music of rain dance]. By the way, every society across time and across every continent has its own rain induction techniques and prayers.

But only the Chinese thought about firing rockets into the sky to scatter rain clouds ahead of the 2008 Beijing Olympic Games to ensure perfect weather [explosion]. To use an expression from the book and recently from the movie Dune, only **water-fat** countries can afford to do such a thing.

Ok, back to quantity and quality. According to an article entitled "How much water is on earth" from EarthHow.com, 71% of earth's surface is water. Our planet holds 326 million trillion gallons

of water or 1.2 billion trillion litres. However, 97.2% of that water is salt water in the oceans, so not drinkable. Only 2.5% is fresh water…of which 2.1% is trapped in glaciers. Only 0.65% is in ground water and the rest, i.e. 0.02%, is in lakes and soil moisture.

Second key concept, Stock vs Flow. When it comes to water, one should clearly think in terms of where the water is found (stock) but also how it moves around (the flow effect). *"Water moves continuously in nature in three stages: evaporation, condensation, and surface runoff. Ocean currents are like giant conveyor belts moving huge amounts of water all the time".* That's the very important and delicate water cycle which allows for surface water reservoirs to replenish themselves. Think about a natural Clean Water Capture & Storage mechanism.

[Siri] Clean Capture & Storage… another Hydrogen concept. That trial really left an impression, Kokou…

Ah ah ah Siri. But back to water, and here is now a key question: how does climate change disrupt this ingenious water cycle?

An article from the Climate Reality Project points to an apparent contradiction. Climate change increases risks of both heavy rains and extreme droughts. In fact, the water cycle is very dependent on temperature and atmospheric pressure. Think about the butterfly effect. Rising temperatures directly affect water vapour concentration, cloud formations, precipitations, and stream flow patterns.

And here is the catch, climate change intensifies this cycle. Higher air temperature means more water evaporation. Warmer air can hold more water vapour, which leads to intense rainstorms, causing flooding around the world. Such vast amounts of water in a short period of time cannot be absorbed by the ground as quickly – think of the current tragedy in Pakistan.

In a nutshell, water is abundant on earth but only a tiny portion is clean for human consumption. The flow of water plays a key part in replenishing our rivers and lakes, but climate change is wreaking havoc on the water cycle. This is in turn creating massive water inequality in countries around the world, famine, drought and devastating floods. These impacts are discussed at length in the 4000 page long "IPCC Climate Change 2022: Impacts, Adaptation and Vulnerability report". [sound of report dropped on a table]

Now, let's investigate the question of water consumption. What are the 'water-fat' countries, industries and food items?

While water-fatness is not yet a thing, water footprint definitely is. Do you know what yours is? And did you know that one's water footprint is in fact very much connected to one's carbon footprint?

An eye-opening episode of "Explained" on Netflix on the Water Crisis talks about the city of Cape Town in South Africa. It was the first major city to actively plan to indefinitely shut off its water supply due to empty reservoirs. If conditions had not gotten better, 4 million people would have stopped getting clean water on the 12th of April 2018. This was called Day Zero: the day the city's

taps were scheduled to dry out. People would have had to stand in line to collect a daily quota of water from water collection points around the city. This tragedy was barely avoided.

In the next few decades, cities such as São Paulo, Melbourne, Jakarta, London, Beijing, Istanbul, Tokyo, Bangalore, Barcelona, and Mexico City could also face their own Day Zero because of climate change. And by 2040, that show demonstrates how most of the world won't have enough clean water to meet demand year-round.

Hmmm that's a scary thought that highlights a good question: demand. How much water do we consume as humans?

Well, water consumption is going through a similar trend as the world's energy consumption and the burning of fossil fuels as we saw in "The Frog and Climate Change" episode. Population growth, urbanisation, intensive farming… and **talking about frogs, isn't it ironic that we might even be running out of water to boil our proverbial frog?** [Frog sounds] Hum… I think we might have to rename that particular episode **The Frog and the Frying Pan**. [Sizzling sound]

Ok, joke aside. Water consumption increased seven-fold in the last century. According to ourworldindata.org, global freshwater use went from 671 billion m3 in 1901 to 4 trillion m3 in 2014 and that was eight years ago.

According to water.phila.gov, the average US person uses around 380 litres of water every day.

- A full bathtub is 137 litres
- 6 to 8 toilet flushes per day, 90 litres
- A 10-minute shower at 7.6 litres per minute, that's 76 litres
- A washing machine load, 57 litres
- Washing your face, brushing your teeth, that's about 10 litres
- And the list could go on….

That was for our own personal uses. Numbers grow significantly when it comes to industry?

I came across an article on smarterbusiness.co.uk entitled "Top industries with the highest water consumption" and here are the five most thirsty sectors.

- In first place: fruit and vegetable farming, with the thirstiest crops being: wheat, corn, rice, cotton and sugarcane.
- In second place, we have garments and textiles. A single pair of jeans requires close to 7600 litres of water to produce. Water is indeed used for the fabric dyeing process (!!).
- In third place, the meat industry. Roughly 1/3 of the total water footprint of agriculture.
- In fourth position, we have the beverage industry.
- And in fifth position, we have the automotive industry. It takes 147, 631 litres to produce the average domestic vehicle. The bulk goes into surface treatment and coating, paint spray, washing, cooling, air conditioning systems etc.

The main take-away though is this: 70% of the world's freshwater is used for agriculture. According to Ourworldindata, 19% of total water withdrawals are used for industrial purposes.

[Siri] Hold on a second Kokou, isn't agriculture also one of the industries with the highest carbon emissions?!

Yes, good memory Siri. Agriculture is indeed guilty as charged, not once, but twice. This is clearly a deja-vu of our episode on the future of food.

An interesting website, waterfootprint.org, has some very eye-watering (pun intended) statistics on the water footprint of the food items we consume every day.

A glass of beer has a water footprint of 74 litres. A cup of coffee? 130 litres. A cup of tea? 27 litres. [Sound of Kokou sipping tea and spoon in a teacup]

1kg of banana? 790 litres. 1kg of cheese? 3180 litres. And finally, 1kg of beef is a whooping 15,000 litres. To put this into perspective, 1 litre of water weighs 1kg, so that's 15 tonnes of water. And don't forget the 36.4kg of C02 for that 1kg of beef as a bonus.

But that's not the worst. 1kg of chocolate, a mouth-watering food item that might go extinct by the way, consumes 17,200 litres of water to produce. **This is an expensive way to entertain our taste buds**.

These numbers look significant but there is another important component to consider. It is the colour of the water that is being used. Similar to hydrogen, there is also Blue, Green and Grey water.

[Siri] You're doing it again… #Hydro Obsessed, sorry I meant #HydrogenObsessed

Your humour is drying up, Siri (pun intended).

But more seriously, waterfootprint.org is able to break down the colour of the water that is being used in any production process. Let me explain:

- **Blue water footprint** is the volume of surface and groundwater consumed as a result of the production of a good or service. Consumption refers to the volume of freshwater used and then evaporated or incorporated into a product.
- **Green water footprint** is the volume of rainwater consumed during the production process. This is particularly relevant for agricultural and forestry products, where it refers to the total rainwater evapotranspiration plus the water incorporated into the harvested crop or wood.
- **Grey water footprint** is an indicator of freshwater pollution that can be associated with the production of a product over its full supply chain.

Ok this might have been too much information, but they are important concepts that will become quite relevant in years to come.

Now, let's discuss solutions. Will we need to wear those Dune style stillsuits in a not-so-distant future?

To answer this question, there is an interesting documentary that was aired on CNBC called "Can sea water desalination save the world?" It argues that 1 person out of 3 in the world does not have

access to safe drinking water. And that by 2050, more than half will live in water stressed areas. That is 4bn people (!!).

[Hey Siri, can you please order 5 stillsuits on amazon now before blueflation makes them unaffordable?]

More seriously, there are two types of desalination:

- **The first type is Thermal desalination**: this is the oldest form. You boil water (hopefully with no frogs in it). You then capture the steam and turn it into freshwater.
- **The second type is Reverse osmosis**: it was invented in the 1960s. It does not use heat. You pressurise water and force it through a membrane to separate it from salt. It is more cost efficient and is used in the Middle East and in Africa.

Saudi Arabia and the UAE, clearly not the most water-fat countries in the world, account for 25% of water produced by desalination in the world.

But there is a catch... [Siri: I knew it!] Desalination is very energy intensive; it is expensive and has negative environmental impacts on marine life. You need a lot of energy to break the bond between water and salt. And it takes even more energy to break hydrogen from a water molecule. It is in fact 25x more energy intensive to desalinate than simply go for other alternatives. And this is not all.

The by-product is a hyper salty water called BRINE, which when rejected back into the ocean, sinks to the seafloor and destroys marine life on the seabed. Finally, this process is only 50% efficient. For each litre of desalinated water, we produce 1.5L of Brine.

The real solution is to improve the efficiency of our water supply and value chain with the use of technology. Think about Smart Cities and smart water. The documentary talks about the successful experience of Israel that is now in water surplus. Best practices discussed are:

- Drip irrigation instead of flood irrigation.
- Drought resistant crops
- Sewage water treatment, to be reused in agriculture.
- Moderation in our usage of water.
- Water pipe network leakage. And this is a real issue. 42% of water is wasted on average.

And of course, another simple solution, if I may, is to put a price on it. Putting a price on water will limit waste. We will undoubtedly be less likely to waste something that is expensive. It is a similar concept to the idea of implementing a carbon tax to create business incentives to lower emissions.

Do you remember the Cape Town Day Zero story from earlier? Well, when people started to care about water and take it seriously, they managed to push back Day Zero, by a few weeks, then a few months and now indefinitely. The city's consumption fell by 50% … and also it rained….[Siri: which clearly helped too, for now]

So, this theme of water management leads us to the final part of this investigation: water utilities. What sustainable solutions are being put in place to address this daunting challenge?

To discuss this theme further, let's have a discussion with Jo Harrison from United Utilities, a company that provides water and wastewater services in the Northwest of England.

[Interview starts]

Kokou: Hello, Jo. Thanks so much for joining us on the show.

Jo: I'm very pleased to be here, thank you for inviting me.

Question 1

Kokou: Great. So on this episode of 2050 investors, we've been spending quite a bit of time on the future of water and water supply. We have a few questions for you. The first one goes as follows: How is climate change, in your opinion, impacting freshwater supply?

Jo: So climate change is going to impact fresh water supply in a number of different ways. We're going to be impacted by the changes in rainfall and the changes in temperature and some of the wider impacts that has on the natural environment.

So one of the impacts that we are already seeing is the change in temperatures of our reservoirs. So over the last ten years we've seen a one degree change in the temperature of our reservoirs, they've increased by one degree and so that's led to an increased propensity to have algal blooms and that leads to changes in the turbidity of water but also the taste, smell and appearance of that water. And all of that means that we have to put extra treatment processes in order to be able to use the water and sometimes we can't. And so that then means that we have a more limited availability of water across our region.

So that's sort of an immediate impact that we see. And high temperature is also going to impact the way we treat our wastewater. Because if the temperature of rivers increases, then that means that we're going to have to treat to ever higher standards to ensure that we don't have a detrimental impact on the downstream water quality.

And we'll also see changes in rainfall, so we're going to see warmer wetter winters which is going to have more intense storms and again more sort of tendency to have flooding around those areas, particularly in urban areas.

And then we're going to see drier, hotter summers. And it's very important for us here in the northwest of England around sort of looking at what this impact of drier and warmer weather is

going to be in the summer because most of our water supply, over 95% of our water supply, is from reservoirs.

And when you have an area that's fed by reservoirs you see the double impact of increased usage because it's nice warm weather. And the sort of reduction in rainfall means that your water supply immediately reacts and reduces in level.

So that's something that we are really thinking about in the northwest, about how do we change that mix of our water supplies and how do we have more water coming into supply from groundwater sources.

And then all of that sort of can lead to other impacts, secondary impacts as well.

So we're seeing an increase in the number of landslides which impacts water quality and that's just caused by destabilisation of land due to sort of more intense storms. And we're also seeing increased likelihood of wildfires. Many of our upland areas around our reservoirs are covered in peat and that peat can very easily catch fire and we've had to deal with a number of wildfires over the last few years which has then impacted on water supply as you see the water quality impacts.

So climate change is going to impact us in a whole variety of different ways. It will also obviously change the resilience of our communities that we serve. And this the is impact on health, potentially of the people who we're supplying to, which will have some consequential impacts on the way that we have to operate as an organisation.

Question 2

Kokou: Well, this is fascinating and quite scary given the challenges ahead in terms of water supply diversity and resiliency as well. How are water utilities like yourself preparing for such water scarcity for the future? Or do you think they might be a day zero like the event of Cape Town in 2018?

Jo: So we are working very closely with Government and our regulators in the UK to really think about what we're going to have to do in the future. So we have a very structured approach to what we call water resources planning.

So every five years we produce a new water resources management plan which looks very specifically at the long term requirements for water. So we look at the impacts of climate change, those changes in temperature and rainfall, we also look at changing population and the impact on the economy in terms of local businesses within an area. And we use sort of complex analytics to look out over the next 100 years and understand how we need to make changes in our water supply areas and how we think about planning for water over that longer term.

So in the UK, we're just in the process of going through that five yearly cycle now and we've identified where we need to invest in new water sources over the next sort of five to ten years, but also how we need to think about working with customers to reduce the demand on water.

So in particular looking at leakage that occurs from our own pipes, but also the amount that customers use every day, and we call that per capita consumption. So we have overall sort of targets and ambitions to reduce the level of usage very considerably over the next 25 years.

And we don't just look at our region alone, the Government has introduced a way of sort of integrating that planning activity across the country. So across England and Wales, we build regional water resources plans and we're looking at how we can trade water from areas that are quite water rich and where water is plentiful. So areas in the northwest of England as an example, and in Wales, and how we can transport that water beyond our region to other areas.

So we're looking at trading water from the northwest of England down to the southeast and London, where there is a greater need because it's drier, but also population growth is increasing more significantly.

So we're not predicting a day zero in the UK. But what we are really mindful of is that there's going to be a lot more water scarcity and we're going to have to treat water as a much more precious commodity going forward and really focus our own company activities. But also, the use and the behaviour around water from our customers in order to be able to meet those challenges.

Question 3

Kokou: So one key element that we discovered in our investigation is that 97% of the earth's surface is water that's clearly seawater. Do you think that water utilities will have no choice but to invest massively in these desalination facilities in the future to guarantee water supply for the growing population?

Jo: So at the moment, desalination is mainly used in very hot and dry countries, so places like the Middle East. It's a very expensive process and it's very carbon intensive because of the amount of power and electricity that it uses. So, it will be sort of the emergency option that will be the default where there is no other source. But in other parts of the world where water potentially is a bit more plentiful. I think desalination will always be that sort of option of last resort and we will look at other solutions before that.

So as part of our long-term planning that I was talking about before, we look at a range of different scenarios. So we don't just look at how we can build more reservoirs or more boreholes to be able to obtain water, we look at how we could recycle grey water, so how we could turn our wastewater into potable water going forward

And we look at all sorts of other technologies. We look at things like cloud seeding where you can in essence create rainfall, we look at things like towing icebergs across the sea.

And so there are a variety of very sort of sounds like quite outlandish and innovative ideas that you might want to sort of use before you touch on desalination. But ultimately that seemingly plentiful supply of salty water is going to have to be utilised increasingly in places where water becomes really scarce. And I think the challenge will be how can we develop that technology so that it is less carbon intensive, has less energy requirements and can be done in a more sustainable way.

Question 4

Kokou: So another question that we were wondering, do you think water utilities are doing enough to address to address the water pipe leakage issues?

Jo: So in the UK, companies lose about 20% to 30% of their water through leaks. And historically we've sort of looked to what we call the economic level of leakage. So does it cost more to look for and repair the leaks than it does to take the water out of the natural environment?

And that was the way that the water industry operated for many, many years. But that really didn't value the environmental impact of taking the water out of rivers and reservoirs in the right way and it's not a sustainable way to manage our water supplies going forward.

So we now have really ambitious targets set by government to reduce leaks and we have committed to half the level of leakage that we have as an industry by 2050.

So we're doing a number of different things. So we are obviously replacing pipes and renewing our asset base. But we're also looking at how do we use technology so that we can have a better understanding of where leaks are occurring. The technology in the past has used acoustics and so to listen for leaks and that has enabled us to make the improvements that we've seen over the last ten years.

But now we need to become even more sophisticated. So we and all other water companies in the UK and across Europe are rolling out a very large number of monitors that can listen and sense leaks in a much more sophisticated way to really be able to pinpoint where they are. And so we can then have a much more efficient way of then repairing our mains, because only a small proportion of leaks end up with water on the surface. So the types of leaks that you might see as a customer or walking down the road, but a large proportion of them actually never appear on the surface because they're leaking into the ground and you're not seeing them. So that's what we need to look for by using technology.

So by using a wide range and a wide network of monitors and using artificial intelligence and sophisticated ways of analysing that data, we can be much more efficient at finding and repairing those leaks before they ever cause a problem or in terms of interrupting our public water supply.

We're also using other techniques as well. We're using things like satellite imagery and drones to look at where you might see changes in biodiversity along the pipeline, which might be an indication that there is water present that we can't see. And we're also using sniffer dogs.

So you are aware of dogs being used in airports to sniff out drugs? Well, dogs can be trained to sniff out a wide variety of things and one of the things that they can do is to sniff out chlorinated water. So we've got several sniffer dogs now that we use across our region to try and find leaks and in particular they're really great at trying to find them in rural areas. So where you might have pipes running across lots of fields, they are really great at operating in that type of environment.

So we're really trying to drive innovation and look for lots and lots of different ways in which we can identify leaks. But I think the industry is really focused on achieving those targets and reducing their leakage.

Question 5

Kokou: This is really brilliant. I have to admit I've learned quite a lot, and it's amazing how innovation can come up with such a fascinating solution. Last question for me is really around the future of the price and the cost of water. Do you think that the imbalance between demand and supply might lead to the price of water being eventually as expensive as liquid gold by the end of the century, at least at the planetary level?

Jo: I think you're absolutely right. I think society and communities around the world haven't necessarily valued water as they should, and particularly in sort of Western and European communities where water has been plentiful, there just hasn't been that sort of view that it is a really precious commodity.

And so whilst companies need to do more and to play their part in protecting water resources, people need to do that too. And there are lots of changes, obviously, we can all make in our own homes to do that, but increasingly it's not until you get that sort of the physical value understood that you're really going to change those behaviours.

So we will see water as an increasingly precious commodity and you can already sort of see the instability that can be caused around the world where changes are sort of made in terms of one country's use of water that then has a significant impact on another. And we see that playing out in parts of Africa and the Middle East and the Far East as well.

And I think it's balancing that, isn't it? It's sort of the reduction in the availability of water resources with them, the impacts of climate change and the overwhelming impacts of too much water. As we've seen over the past few weeks in Pakistan, it's just been a tremendous impact on communities of having too much water and it not being managed. So I think it's a tale of two halves, really. It's huge impacts on rural and poorer communities of too much or too little water.

Kokou: Thanks a lot, Joel. I think we could carry this because this conversation for many hours, but it was really insightful and really appreciate your time and thanks again for sharing these thoughts and ideas with us.

Jo: Thank you very much for inviting me. I've really enjoyed it. Bye.

[Interview ends]

(Conclusion)

To pay tribute to the late Queen Elizabeth II, I'll conclude this episode with one of her most famous quotes about change. Having been the longest serving monarch with a reign that spanned over seven decades, she did have some interesting insight about change. Here it goes ***"It is worth remembering that it is often the small steps, not the giant leaps, that bring about the most lasting change".***

(Credits)

Thank you for listening to this episode of 2050 Investors. Thanks to Jo Harrison for her insights.

I hope this episode has helped you get a better glimpse of the future of water and how we will need to adapt by 2050! You can find the show on your regular streaming apps. Please subscribe, leave comments and stars anywhere you like and spread the word!

See you at the next episode and of course, stay hydrated!

(Disclaimer)

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