

“We need to slow down the water cycle”

Today a large proportion of our freshwater is disappearing unused into the ocean, causing additional rising of the sea level. The hydrologist Dr. Johannes Cullmann works as a scientific advisor for the United Nations. He believes that the water challenge can still be solved at the global level—if the steps are implemented at a faster rate than climate change

INTERVIEW JÖRG WAGNER & CHRISTIAN BAULIG

Watching the water: For Johannes Cullmann, it's only a short walk from his office at the World Meteorological Organization to the shore of Lake Geneva. Just under 60 percent of the lake belongs to Switzerland, and just over 40 percent to France. With an average volume of 89 cubic kilometers, it holds more water than any other lake in central Europe



Dr. Cullmann, the media are devoting more and more space to water shortages and water surpluses—in reports on events ranging from forest fires in the Rocky Mountains to sinking water levels in the Rhine and floods in Pakistan. Is this topic currently receiving the attention it deserves?

JOHANNES CULLMANN I think it’s basically a good thing that the media have become attentive to the topic of water, because the entire debate about sustainability and resilience is strongly connected to water. About 80 percent of all natural disasters are related to water. Climate change is always a process of water change as well. Our societal and economic resilience also depends on water. How can we continue to engage in agriculture? Who is suffering the greatest long-term damage as a result of hydrological changes? Unfortunately, the media generally focus on spectacular events. These are unavoidable, and they will increase in the next 60 to 100 years. But droughts and floods are only one part of the overall picture.

Where should we look more closely instead?

At the causes that underlie these catastrophes—and at the consequences that ensue. First of all, we need to slow down the water cycle. As a result of human beings’ shaping of our landscape, the water cycle has been accelerated more and more by construction measures. That started to happen as long ago as the Roman Empire. For a long time, we’ve been trying to keep water away from our direct surroundings, either because we’re afraid of floods or because we want to use the land for agriculture, for example. When there are periods of no rain, the increased rate of drainage heightens the risk of droughts. At the same time, flooding situations are dangerously exacerbated because too much water is flowing at once to the same point.

So, slowing down—what else should we be doing?

The second important point is that we need to reintroduce more water into our overall system. With the help of satellites, the US-German space mission Grace is monitoring the places where we are losing freshwater all over the globe. To a large extent, this is in the form of snow and ice, which are melting and flowing

1,400
LITERS

of water are needed to produce half a pound of butter

into the oceans. But this is also happening in warmer regions where there is no snow and ice, such as Brazil and parts of the USA. Here we are losing groundwater because agriculture is expanding without any regard for the natural resources. In Germany as well, the amount of water that is lost from our system every year is greater than the amount of water that Germans drink. All of these factors thus contribute to the proportion of the rise in the sea level that is not due to thermal expansion, which is defined as the expansion of the ocean water that already exists. We need to create additional reservoirs in order to compensate for these losses, whether it’s through biosystems and in the groundwater or by means of new infrastructure.

In the case of climate change we have realized that it can mainly be traced back to the excessive emission of greenhouse gases. In the case of the hole in the ozone layer, we knew at some point that we would have to give up our use of CFCs. Why is it so difficult for us to acknowledge the connections in the case of water?

Because it still does not represent an urgent problem for most people. The ozone hole seemed directly dangerous to people because they were afraid of getting skin cancer. People are at least vaguely aware of the fact that climate change is an existential issue affecting their future. We still haven’t reached that point with regard to water. For most people, water is still affordable and available in practically unlimited quantities. But here we’re ignoring the fact that our water consumption far exceeds the amount that comes out of our faucets at home every day. Our total consumption is many times larger if we look at how much water is contained in all the food and other goods that we consume. This is what we call our water footprint.

What needs to be done in order to raise people’s awareness of this fact?

For example, we have to provide people with more information about the conditions under which the inexpensive roses we buy in a discount store are grown in Kenya. The water that is needed for these roses is not available to the local population. We have to explain that the production of half a pound of butter requires about 1,400 liters of water, and that margarine may be a better alternative. We shouldn’t lay down any rules about who can consume what and when, but everyone ought to know what consequences result from their behavior.

When people consume goods more consciously, they deserve praise. But wouldn’t it be more important to regulate water consumption in ways that reward frugality and punish wastefulness?

We can certainly achieve a great deal through subsidies and taxes—for example, if the government generally supports processes in which water is reused. That could also have an effect on municipal sewage treatment plants, most of which have until now simply channeled the purified water into rivers. The purified water could also be used to re-irrigate land or replenish groundwater—in other words, to slow down the water cycle and create reservoirs. No municipality does that of its own accord, because it costs more than the practices that prevail today. The difference in costs has to be offset in financial terms.

It was only the pricing of carbon dioxide that led to a significant change in people’s behavior. Shouldn’t water also have a price that gives us an incentive to be frugal? Why should people in Saudi Arabia limit their consumption of water if a cubic meter of water from the faucet costs only three cents?

You’re right. There should be a global agreement to re-evaluate water as an economic commodity. At the same time, we need international agreements to prevent consumers from switching to products from neighboring countries where water is cheaper or even free of charge. However, making water more expensive across the board without enacting reasonable regulations would be dangerous, because this always affects the poorest people rather than the large-volume consumers. The situation for carbon dioxide is different. If you increase the price of CO₂, you’re not putting a disproportionate burden on lower-income groups.

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is the price of a cubic meter of drinking water in Riyadh, the capital of Saudi Arabia

How realistic is the concept of such a global agreement? In view of the urgency of the problems, we haven’t got much time for negotiations.

Together with the UN Climate Secretariat, in 1992 we succeeded in installing a mechanism in which all the countries of the world work together to limit global warming. The most important result of that was the Paris Agreement of 2015, in which 195 states committed themselves to limit climate change and restructure the global economy in climate-friendly ways. At the UN Water Conference this spring, the participants launched a process that will lead, among other things, to a committee in which the UN member states talk with one another and develop guidelines. However, we clearly cannot once again take 23 years to reach a consensus, as we did in the case of the climate agreement.

Agriculture is the sector that consumes the most water all over the world. What would a more frugal use of water look like?

Having fewer monocultures would be a start. For some plants, it’s also smarter to simply confront them with a bit of water stress during their maturity phase instead of constantly watering them, because the fruit then becomes better. You might get one, two or three tons less yield per hectare, but you’ll be able to sell your crop for a higher price. For high-quality agricultural products, it can make sense to install smart irrigation systems, even though they’re slightly more expensive. →

“We’re ignoring the fact that our water consumption far exceeds the amount that comes out of our faucets at home every day”

And what can be done by industry, which is among the biggest water consumers in most of the prosperous countries?

Today there are still many unsustainable processes that date back to a time when people didn't have to think about the frugal use of water. They simply regarded water as a remainder in economic terms. You can save a lot of water by using it in a cycle. That also helps to reduce heat pollution. As a result of human activities, the Rhine is as much as four degrees warmer in the winter than it was before the age of industrialization. Through practices like these we are heating up our environment, and the heat that is produced through so much effort is lost. It's as though we were holding an immersion heater in the river—it just doesn't make sense. And instead of channeling the purified process water from manufacturing industries into rivers, it would be better to use that water for agriculture or landscape maintenance.

Industry causes problems. But to what extent can it also be part of the solution by facilitating developments that promote water conservation?

Thanks to innovations, the purification of wastewater from industry and elsewhere has improved so much that the resulting water can be used without any risks today. That's a giant step forward. I think there will be lots of potential in the desalination of ocean water if we use less climate-damaging alternatives instead of fossil energy sources. The products and processes in the agriculture sector also harbor tremendous opportunities for using water in smarter ways—such as drip irrigation. All of these are innovation fields in which industry and science play a major role and which offer tremendous benefits for humanity.

“Making water more expensive across the board without enacting reasonable regulations would be dangerous”

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MEASURES
are to be implemented worldwide as the result of the most recent UN Water Conference

In addition to these approaches, there are some ideas in circulation that sound like science fiction. They involve tapping freshwater resources under the ocean bed or towing glaciers to regions where water is scarce. Do projects like these have a future?

There may be a good applications for them somewhere in the world, but I would always prioritize improving something that I know I can improve.

Do we have sufficient resources to finance a comprehensive global restructuring of our water management?

When I look at how much money we've made available for combating the COVID-19 pandemic, I think it can certainly be financed. Some people say that we need several trillion US dollars in order to solve the water problem at the global level. The money is available. We only need to have the determination to spend it in the right way.

You're talking about tax money. What about the capital market?

Governmental financial instruments alone won't be sufficient to get this problem under control—especially because a large proportion of water use affects private companies. That's why we also need the capital market to participate in this refocusing process. I think the problem is not the lack of financing options but the shortage of smart implementations of transformational programs.

At the UN Water Conference this spring, you celebrated it as a success when the participants voluntarily committed themselves to 689 measures for combating the water crisis. In view of the dimensions of the problem, is this voluntary commitment really moving us forward?

Voluntary commitments are an important step that generates involvement. They are a good mechanism for clearly showing people where opportunities exist to make things better.

As a scientist, you know that we have to find and implement solutions quickly. But as a member of a political organization, you need to participate in tough decision-making processes. Do you sometimes feel despair?

Of course I would like to see things moving faster. However, in my experience the past two years have been extremely positive, because I'm finally seeing people's willingness to deal with the issue of water—and to reach agreements. This willingness did not exist 15 years ago. At the same time, this topic is often treated as being off limits in terms of security policy. Today the private sector is realizing that water is a resource, recognizing its value, and developing sustainable solutions. That's why I'm confident that we can make progress relatively quickly.

This may sound cynical, but do events that hit the headlines all over the world—such as low water levels in the Rhine, forest fires in the Rocky Mountains, and floods in Asia—help to keep up the pressure on public opinion?

People accomplish relatively little on the basis of pure reason. And the existing system is extremely beneficial for many people in the world. As long as this mentality is firmly embedded in our society, change won't happen without moments of shock such as these. Unfortunately, this is what things look like: We set our alarm clock every morning so that we can get to work on time. And in the same way, we need a small catastrophe once in a while in order to understand that sustainable development doesn't automatically happen on its own. —



Prof. Johannes Cullmann, 50, has been a scientific advisor to the President of the UN General Assembly since 2022. In this capacity he coordinates issues related to sustainable development. He previously headed the water and climate-related activities of the World Meteorological Organization (WMO) in Geneva for eight years. In his function as a head of division at the Federal Institute of Hydrology, he represented Germany on the International Commission for the Hydrology of the Rhine. He was one of the organizers of the first analysis of the impact of climate change on the Rhine. In his capacity as a hydrologist, from 2012 to 2014 he was a Senior Advisor for the water-related activities of the WMO and the President of the UNESCO's Intergovernmental Water Council.