

AN INVENTORY OF THE FOSSIL FUEL AGE

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PHOTO: MARK AGNOR / SHUTTERSTOCK

Black wasteland:
open-pit coal mining
has a massive impact
on the landscape.

The changing climate necessitates saying farewell to oil and coal. But our society, and especially our ideals of freedom and prosperity, are heavily dependent on the use of fossil fuels. Researchers at the Max Planck Institute for the History of Science in Berlin are investigating just how strong this dependency is and how we can free ourselves from it.

There are days in Germany when the energy transition is on every channel. For example, on the day in January when the Chancellor discusses life after the internal combustion engine with automobile industry leaders at noon and then meets with the Prime Ministers of the four coal-producing states for the coal summit in the Federal Chancellery in the evening. Two meetings that make it clear: there's much more at stake than just oil and coal and billions of euros. Tens of thousands of jobs, structural policy, the already sensitive relationship between East and West and deeply rooted traditions are also affected.

If you ask Benjamin Steininger from the Max Planck Institute for the History of Science, fossil resources have an even greater impact on our world than such days make it seem: "We live in cities that can only be reached in motorized vehicles, we wear Goretex and nylon, we use artificial fertilizers in our food production and we rely on drugs – all based on oil, gas and coal. From both a concrete and an abstract viewpoint, our lifestyle is affected by fossil resources in ways in which we are only dimly aware." Steininger adds that even a sociopolitical achievement such as the abolition of labor by children and workers without rights became possible only when and because their tasks were taken over by machines powered by fossil fuels. Fundamental modern concepts such as individual freedom, prosperity and progress have also developed alongside the technical system of utilizing fossil fuels.

But this is not an appeal to cling to the mass combustion of resources that is harmful to the climate. Instead, it is a call to recognize that it's not enough to switch to electric motors and say goodbye to plastic bags. Steininger demands – and promotes – a study of the intangible heritage of our fossil fuel-based modernity that has been largely ignored until now: "For two centuries, fossil resources have been pushing the limits of technical feasibility and with them our understanding of growth, of freedom, and our desires." Together with Alexander Klose, Steininger is curating an exhibit on petro-modernism at the Kunstmuseum Wolfsburg and is producing a cultural atlas of oil, which was also the source for the image on this page. "You can't just leave a house you've been living in for 200 years," he says. "We have to take an inventory."

A small group is taking just such an inventory within a larger group at the Max Planck Institute for the History of Science. In addition to media and cultural theorist Benjamin Steininger, the smaller group includes ethnologist Gretchen Bakke and historian Helge Wendt. The larger project group is called "Knowledge in and of the Anthropocene" and takes a comprehensive approach to understanding the



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BENJAMIN STEININGER



Oil production in 1932: because the tanks of the production plant in Zistersdorf in Lower Austria were not large enough to contain the escaping oil, workers directed the excess into hastily-dug pits. This image illustrates just how much the methods of handling crude oil have changed in Europe.

geological period influenced by humans. It is cooperating in this project with the Haus der Kulturen der Welt in Berlin, which has been working since 2012 on event series, publications and exhibitions about the presentation and understanding of all the processes with which people are significantly changing our planet. The Max Planck Institute is inviting scientists to participate and is working on an Anthropocene curriculum and an “interdisciplinary culture of knowledge and education.” It was last involved in an event and research project on the Mississippi River over several months in 2019, also with Benjamin Steininger.

Historian Helge Wendt is focusing on the resource that is still very much present in Germany: coal. Wendt is studying a process around the world that was also an energy transition – that from wind, water and wood to the entire range of coal types from lignite to anthracite. “Even the Romans knew of hard coal,” explains Wendt. “But to this day, it is not really known what they used it for.” From the 16th century onwards, coal was mined on a larger scale in a number of countries, ranging from China and India to Eu-

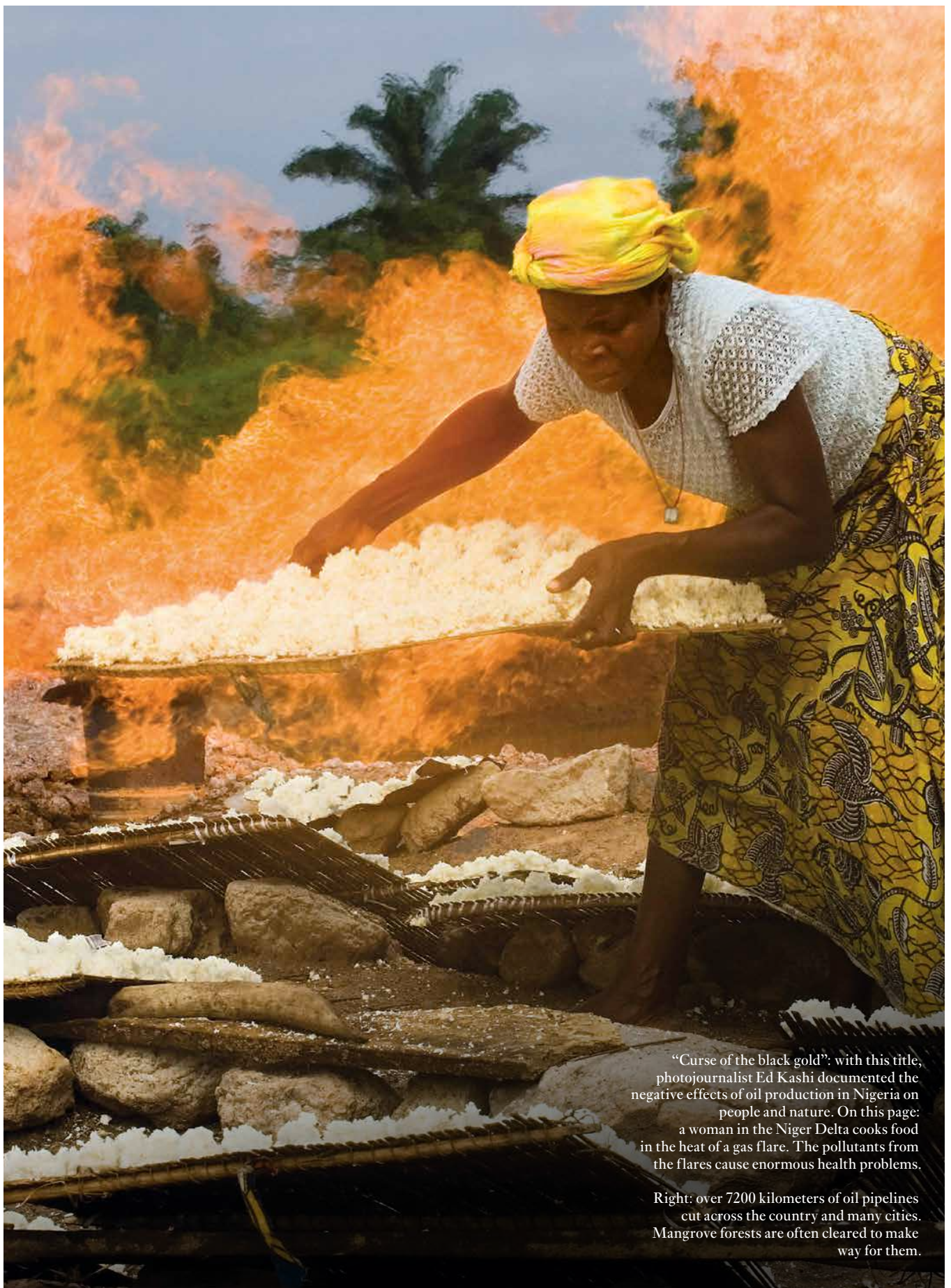
rope. This mining began relatively simultaneously, even though the global flow of knowledge at the time was sparse. The greatest hurdle to mining that had to be overcome everywhere was that of groundwater. It was not until the invention of the steam engine that the mines no longer had to be laboriously drained by horses. The first steam engine, Wendt explains, was not at all the one invented by James Watt in 1769 and described in schoolbooks around world. A certain Thomas Newcomen had already invented a model, albeit not a very energy efficient one, in the early years of the 18th century. This engine first helped to supply water for the English royal family before being used for mine drainage.

Contrary developments often occur at the same time

Wendt collects not only anecdotes but also knowledge: about combustion temperatures and the storage properties of different types of coal, as well as about their implementation, such as in coking. This process releases detrimental sulfur and phosphate components from the coal and produces coke, with the help of which metal smelters were developed on a large scale in the 19th century, leading to the German steel industry and later the automotive industry. Even more interesting is a consideration of “all the byproducts and waste products that led to industries we hardly even think about when discussing coal.” For example, the coking process also produced coal gas, which was found to be useful for illuminating factories, homes and streets, and coal tar laid the foundation for the paint and pharmaceutical industries. It is also largely forgotten by the public today that the acronym BASF stands for “Badische Anilin- & Soda-Fabrik” – aniline is a byproduct of coal processing.

Starting from all these somewhat hidden uses for coal, Helge Wendt rolls back history, as it were, and asks in each case what could have been used instead. And consequently: “Can coal be replaced everywhere? What can or should we do without? And is it conceivable – as a parallel to the energy transition towards coal – that today’s shift towards renewable energies will also lead to useful byproducts?”

Benjamin Steininger explains that when considering the key resources of modern culture and history, it is just as important to focus on the chemical processes resulting from them. His research therefore takes him to both the Max Planck Institute for the History of Science and the UniSysCat Cluster of Excellence at the Technische Universität Berlin, which is dedicated to the contribution of catalysis to a more sustainable chemical industry.



PHOTOS: ED KASHI/VII/LAIF

“Curse of the black gold”: with this title, photojournalist Ed Kashi documented the negative effects of oil production in Nigeria on people and nature. On this page: a woman in the Niger Delta cooks food in the heat of a gas flare. The pollutants from the flares cause enormous health problems.

Right: over 7200 kilometers of oil pipelines cut across the country and many cities. Mangrove forests are often cleared to make way for them.



Dependent on coal and oil:
a transition to sustainable
material cycles is also necessary
in the chemical industry.



“In the case of oil, it is not a black natural substance that has determined our history. Rather, it is a substance that has seeped into every aspect of our lives through chemical reactions,” explains Steininger. This is especially the case in Germany, a country which has hardly any raw materials, but a tremendously strong chemical industry. If the social sciences and humanities are essential for a successful energy transition, wouldn’t it be good if this also became common knowledge in the chemical research industry? “Certainly,” answers Steininger, “because that would mean accounting for these long-term effects from the start and thinking in terms of sustainable cycles of both energy and materials. That would be a radically new innovation.”

The Max Planck Society has been implementing such approaches for a number of years now. Scientists from the Max Planck Institutes for the History of Science and for Chemical Energy Conversion regularly combine their perspectives and work on common agendas. Shortly after the kickoff event, Directors Jürgen Renn (History of Science) and Robert Schlögl (Chemical Energy Conversion) published a joint manifesto on the energy transition in April 2017.

This states with a directness that is atypical for scientists: “In both climatological and geopolitical terms, now is the right time to undertake a massive transformation of the system.”

Now, almost three years later, at least a deadline has been set for the exit from coal. After years of tough negotiations, the aforementioned coal summit in the Federal Chancellery succeeded in deciding on a deadline for the end of production within Germany: 2038. However, many climatologists say this is far too late, with a bluntness that is no longer so unusual today.

The good news: there are many encouraging approaches for the more sustainable use of resources. This is pointed out by ethnologist Gretchen Bakke, who is involved in the Anthropocene project through a guest professorship at the Humboldt University of Berlin. She has achieved a certain degree of fame in the U.S., and was only recently directly attracted to Germany – and thus to a place where great importance is attributed to climate research. She was conducting research in Quebec, Canada until 2018. She recently wrote a book that Bill Gates put on his

top 5 book list: “The Grid,” meaning the power grid in the U.S. In addition to establishing that this grid is (dis)organized by an incredible number of 3600 utility companies, Bakke acquired insights that she can now apply in Europe. Of these, a key one is that there are many, often contrary, developments that occur simultaneously, and these are not always consistent with common expectations. For example, sunny Florida uses hardly any renewable energy – while wind energy supplies 50 percent of the power to the currently Republican state of Iowa. Bakke: “What is interesting for me is when change takes place, and where: which culture, which values and which incentives promote or prevent transformation?”

She is therefore searching for dialog partners in politics and science, as well as in civil society, but she also deals with questions that, as she says, “are increasingly also being aired in the elevator: why do people use cars instead of trains, trains instead of cars, planes instead of trains? The fact that these discussions are even taking place is a sign of change,” she explains: “There are always pioneers, and there are always areas where there does not – yet – seem to be any progress.” She also brought with her an American example of the effect pioneering can have: “Just ten years ago, the idea of using the sun as a source of energy was still considered absurd in the U.S. – that was something for hippies or Germans. Today, solar energy is slowly but surely spreading in the U.S. as well.”

The ethnologist points out that essentially, there is not one energy transition, but two – one towards renewable energy and another away from fossil fuels. This soon becomes clear when she considers less obvious innovations, such as the production of cement and steel by more climate-friendly processes that release less CO₂. “It’s technically possible,” she says, “but political support is necessary for such products to become marketable – including approaches that make previous technologies less attractive.” Now political solutions such as the coal compromise always take time – just like the construction of factories and changes in production. Bakke therefore sums up her findings as follows: “Change is happening. Whether it’s happening fast enough, I can’t say.”

<https://www.mpg.de/podcasts/bioeconomie> (in German)

SUMMARY

The last energy transition, in which water, wind and wood were replaced by coal, shows that such a transition has many side effects.

Today, coal and oil are not only an important source of energy, but also form the basis for countless chemically produced substances and materials. Thus the chemical industry will also have to undergo a reorientation.

In addition to politics, the present energy transition is also affected by factors such as culture, morals and convictions.
