

solutions

On the safe side

1/2022



Wind of Change

How we can face the climate crisis

Artificial Intelligence
Smart Agriculture
Renewable Energy

Expertise for technological standards
Sustainable yields through digitization
Hydrogen as a key technology



Climate is everybody's business

Stefan Kölbl on targets and responsibilities

Dear Reader,

The COP26 world climate conference in Glasgow showed that global warming, extreme weather events, and the necessary countermeasures concern us all. That's why we're taking an in-depth look at the topic in this issue. Don't miss the cover story and the interview with Prof. Maarten van Aalst, a key guest expert at COP26.

As the world's largest non-listed expert organization, we support the fight against climate change with our wide range of sustainability services. For instance, we assess the CO₂ footprint of companies and products, inspect wind turbines, or test charging stations for e-vehicles.

We're also fully committed to sustainability within our own operations, and have set ourselves an ambitious goal: By 2025, we intend to be CO₂-neutral as a company. That's why - for DEKRA's 100th anniversary - we've deliberately added sustainability to our Vision 2025: "We will be the global partner for a safe and sustainable world."

Rest assured: DEKRA will continue to support you with our comprehensive expertise in 2022 and beyond.

I wish you a successful new year, good health, and all the best!

Warmest Regards
Your

Stefan Kölbl
Chairman of the Board of Management
DEKRA e. V. and DEKRA SE

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DEKRA solutions online

The DEKRA magazine also has its own website dedicated to news around the topic of safety.



We look forward to seeing you: dekra-solutions.com



Standards

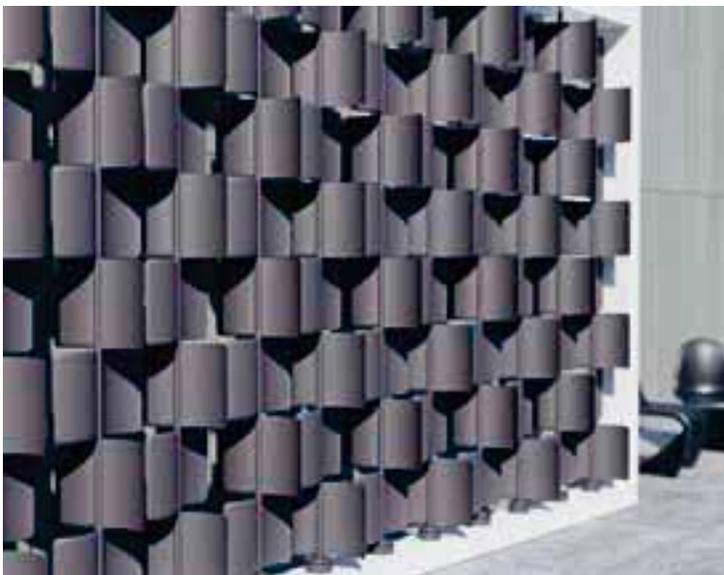
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SUSTAINABILITY

“Business Ambition for 1.5°C” Member

DEKRA is committed to sustainability and reducing its own CO₂ footprint. The goal? To be fully climate neutral by 2025. This is why the expert organization has joined the Science Based Targets Initiative (SBTi) and thereby also the global “Business Ambition for 1.5°C”. Its goals are to reduce greenhouse gases and global warming. Members of “Business Ambition for 1.5°C” have their goals independent validated by the SBTi and become part of the UN Climate Champions’ Race to Zero.

The initiative is the world’s largest alliance of companies taking measures for a “1.5°C future”. Since 2015, more than 2,000 companies have joined the campaign. By joining the SBTi, DEKRA can orientate and express its goal of being climate-neutral by 2025 in criteria with solid scientific foundations. The corresponding reduction targets will be submitted to the SBTi for validation within the next two years. With its Platinum EcoVadis rating, the organization is ranked in the top one-percent of sustainable businesses.



WIND ENERGY

Wind Turbine Wall

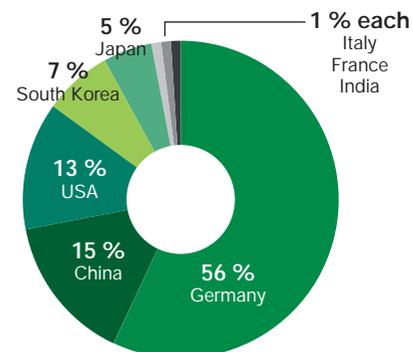
American Designer Joe Doucet has developed the concept of a wind turbine wall which, according to the designer himself, can generate up to 10,000 kilowatt hours of electricity per year. This would mean that the 2.50 meter high and 7.50 meter wide wall could cover the energy needs of the average American household. The expandable wall comprises a series of spinning plates that rotate individually and each drive their own mini-generator. The energy generated can be stored in a battery or fed into the grid. The German Wind Energy Association (BWE) considers Doucet’s calculations realistic, but points out that standard wind turbines are considerably more efficient. They primarily see use cases for the Doucet wall in industrial and commercial areas.

VEHICLE CONCEPTS

From Smartphones to Cars

Smartphone manufacturers turning their hand to vehicles? Xiaomi, the world's third largest smartphone manufacturer after Apple and Samsung, wants to see its own electric vehicles rolling off the production line from 2024. CEO Lei Jun has already presented concrete plans for the facility, which foresees 300,000 electric vehicles to be produced in Beijing each year. Only in August 2021 did Xiaomi fund its newly founded automotive subsidiary with start-up capital of around 1.3 bil-

lion euros. Details of the vehicles themselves have not yet been made public. According to news agency Reuters, Apple is also expected to bring an electric vehicle to market in 2024, having worked on the development of new types of batteries since 2014. British leasing provider Vanarama has visualized what this could possibly look like on the basis of already approved patents (see picture below).



In the Overtaking Lane

In terms of global new developments in connected car innovation, China ranks second and has thus continued on its trend of growth since 2016. This was the result of the 2021 industry study conducted by the Center of Automotive Management, which surveys 30 global automobile manufacturers each year. According to the study, if trends stay on current course, China could take the number one spot in this global innovation statistic as early as 2022.

100% deviation due to rounding differences.



DEKRA in Finland

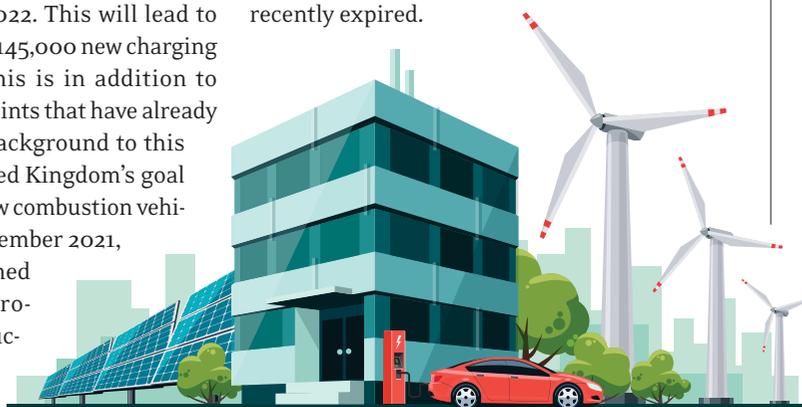
With the takeover of Tähti Katsastus OY in October 2021, international expert organization DEKRA is entering the Finnish vehicle testing market. Six test stations, mostly in the province of Eastern Finland, are intended to be the starting point for further expansion of the vehicle testing business in the country. DEKRA is hoping for another success story in line with its recent achievements in Sweden and Denmark.

ELECTROMOBILITY

Money for Charging Points

According to a decision by the UK government, new or substantially renovated residential and commercial buildings must feature vehicle charging capabilities from 2022. This will lead to the creation of up to 145,000 new charging points annually. This is in addition to 250,000 charging points that have already been funded. The background to this measure is the United Kingdom's goal of ending sales of new combustion vehicles by 2030. In November 2021, Germany too launched a new funding program for the construction of charging points. Councils

and businesses alike can access funding totaling 350 million euros. A funding program for private home batteries with a total value of 800 million euros has only recently expired.





Expanded Know-How

DEKRA has acquired the company k-labor GmbH in Bretten, Germany. The expert organization is thus expanding its laboratory network for chemical analysis and materials testing to include expertise in plastics and environmental simulation testing. As an accredited high-tech laboratory for materials testing and failure analysis, k-labor conducts its tests in accordance with national and international standards as well as manufacturer specifications. The focus of DEKRA's expanded services lies in automotive suppliers and medical technology companies.

Stricter Speed Limits for e-Scooters

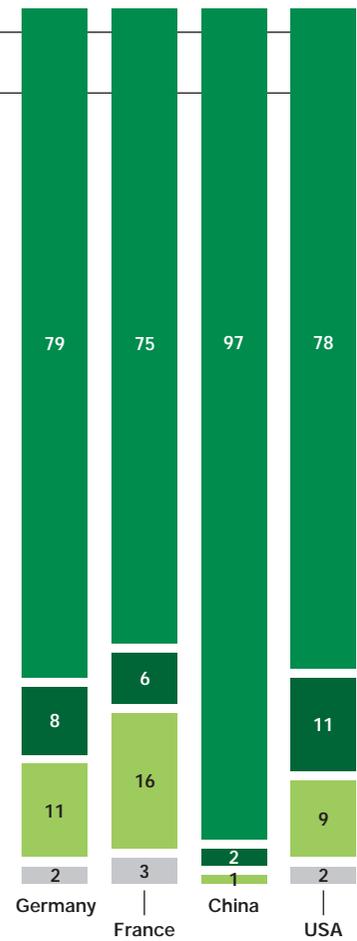
Starting in January 2022, Paris will allow e-scooters to travel at a maximum speed of 10 km/h in so-called slow zones. The reason is the approximately 300 accidents, some of them serious, that happened in 2021. Rental companies have to restrict e-scooters to 10 km/h. They track e-scooters in use by GPS and adjust their speed automatically. Roads with wide lanes, such as for motor scooters, are exempt from this restriction. There, the speed limit is 20 km/h.



MARKET RESEARCH

International Used Car Market Trends

Used car dealers who know what their customers want are benefiting from the rising demand for second-hand vehicles. A recent study by DEKRA and market research company IPSOS reveals what makes potential buyers tick. They asked a representative sample of 1,000 people in China, the USA, France, and Germany about their expectations. In all four countries, internet sources play a decisive role before purchase. In addition, the majority of people surveyed found their current vehicle online. Overall, however, the used car market's digitization is most advanced in China. There, nine out of ten interested parties prefer digital contact with the car dealer.



Did you use internet sources before buying a used car?

(in % / rounded up or down to 100 %)
SOURCE: IPSOS / DEKRA GW SALES STUDY 2021

- Yes
- No, but conceivably would
- No
- Don't know / no response

More info at: dekra.de/sales-study-2021

DEKRA SURVEY

Mental Stress

There's potential for improvement when it comes to occupational health and safety: According to a forsa survey conducted on behalf of DEKRA, just under one third of employees in Germany stated that a mental risk assessment had been carried out in the company. This was not the case for 53%. Just under a third of the people surveyed felt that their employer was a "caretaker". According to German health insurance company DAK, the number of days lost due to mental illness has increased by 56 percent in Germany compared to 2010.

ber of days lost due to mental illness has increased by 56 percent in Germany compared to 2010.



ROAD SAFETY REPORT 2021

Safety First

At the presentation of the DEKRA Road Safety Report 2021 on the topic of “Mobility in Old Age” in Brussels, EU Commissioner Adina Valean praised the expert organization: “Your focus on older people’s road safety is an essential contribution to our understanding of the issues that road users face every day.” At the same time, she said, the report is an impetus for the EU Commission to push forward with its road safety program, putting safety first and keeping their eyes fixed on Vision Zero. The presentation also addressed the fact that complex traffic situations in particular represent a major challenge for the 65+ age group. That’s why it’s of great importance to equip vehicles with modern driver assistance systems. “The potential can only be put into effect if these systems work



reliably over the course of a vehicle’s full life cycle. This, in turn, means that vehicle inspection organizations like DEKRA must be able to check these systems regularly,” DEKRA CEO Stefan Kölbl pointed out in Brussels. Tomorrow’s periodical technical inspection needed ways and methods to do that, as well as a regulatory framework.

AWARD

Lakera Puts AI Through Its Paces



Lakera founders
CEO David Haber (l.) and CPO Matthias Kraft

Lakera from Zurich has won the DEKRA Award 2021 in the “Startups” category. In the finale’s online vote, the Swiss artificial intelligence (AI) specialists prevailed with their validation platform for AI systems. The platform systematically tests under which conditions AI works and makes a risk assessment of the system before its deployment. It has applications in robotics, medical technology, Industry 4.0, and the automotive industry. Lakera’s final competitors were Compredict for AI-based virtual vehicle sensors and Trucksters for AI-based route optimization in logistics. The DEKRA Award is organized by DEKRA and business magazine “Wirtschaftswoche”.



Risk Management in Times of Climate Change

Climate change isn't without consequences. Individuals, companies, and countries are called upon to take preventive action, but also to respond to immediate consequences.

Text Hannes Rügheimer



2021 | 📍 Canada & USA

Heat Wave



2019 | 📍 Southern Africa

Cyclone Idai



2005 | 📍 USA

Hurricane Katrina

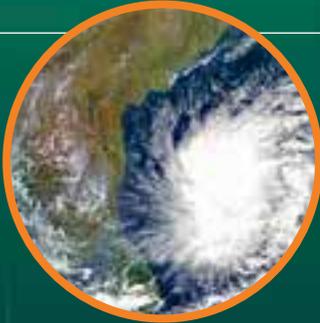
Devastating Climate Events

Selection; 2005 - 2021



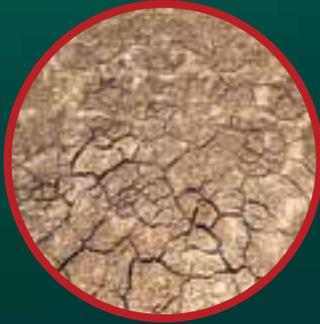
2021 | 📍 Ahr Valley, Germany

Flooding



2008 | 📍 Burma

Cyclone Nargis



2011 | 📍 Horn of Africa

Drought



2021 | 📍 Greece

Forest Fires



2013 | 📍 Philippines

Typhoon Haiyan



2019/20 | 📍 Australia

Bush Fires



Disastrous flooding
Cleanup in Bad Neuenahr
(Germany, 2021) after
extreme heavy rains

The months-long forest and bush fires that ravaged Australia in late 2019 didn't just kill 33 people and over a billion animals, as well as destroy around 3,000 homes. According to reinsurance company Munich Re, they also caused insurance losses of around 2 billion US-dollars, as well as an unquantifiable amount of uninsured damage. The unprecedented heat wave that hit the USA and Canada in the summer of 2021, with temperatures reaching almost 50 degrees Celsius, cost well over a thousand lives - in the Canadian province of British Columbia alone, more than 700 people died in connection with the record temperatures. There are no firm numbers on the economic impact on private households and businesses, but they're likely to be considerable as well.

According to the European Forest Fire Information System, the mid-2021 wildfires in Greece destroyed more than 1,100

square kilometers of forest and cultivated land. Estimates put the damage at a minimum of 700 million euros - the Greek government issued a supplementary budget of 500 million to fund emergency aid for the injured.

After the flood disaster that devastated several villages in the Ahr valley in Germany in July 2021, the number of victims continues to rise. At least 135 deaths are considered certain, with hundreds injured, and people still missing. Again, there is no conclusive figure on the total economic damage, but the magnitude is easy to imagine: The district of Ahrweiler reported that the damage to its municipal buildings alone amounted to around 3.7 billion euros.

Climate change contributes to extreme weather events

These numbers make one thing clear. Extreme weather events, which have

increased in both frequency and intensity in recent years, cost lives and cause ever greater economic damage. Climate researchers emphasize that there's a direct link between climate change and the frequency of storms, droughts, fires, and floods across the globe. Both the probability and intensity of these - by definition unusual - events have increased significantly.

"What's happening now is what we scientists have always warned against," says Prof. Dr. Mojib Latif, President of the German Club of Rome Society and Head of the Maritime Meteorology Research Unit at the Helmholtz Center for Ocean Research Kiel (Germany). He accuses politicians, as well as population and companies, of not taking the warnings of the last twenty to thirty years seriously enough.

Increasing intensity and probability

The World Weather Attribution (WWA) Initiative is an association of interna-

“What’s happening now is what we scientists have always warned against”

tional scientists who investigate the correlation between climate change and extreme weather events.

In so-called attribution studies, they have proven that the Australian forest and bush fires, for example, were partly caused by climate change. Even though some of their calculations have a wide range of variation, the study provides impressive numbers: For example, the WWA concludes that global climate change increased the probability of recent heavy rainfall events in Germany, Belgium, the Netherlands, and Luxembourg by a factor between 1.2 and 9. The intensity of extreme precipitation has increased by 3 to 19 percent.

“We still think that climate change will happen sometime in the future.



Prof. Dr. Mojib Latif
President of the German Club of Rome Society and Head of the Maritime Meteorology Research Unit at the Helmholtz Centre for Ocean Research Kiel

We’re only slowly becoming aware that it’s already here,” says Prof. Dr. Maja Göpel, Secretary General of the German Advisory Council on Global Change and co-founder of Scientists for Future. She says that the difference between dealing with climate change and the coronavirus pandemic, for example, has to do with the different timeframes of these events: With Covid-19, there were often only a few weeks between the decision to take action and the visibility of its effects. “With climate change, we have much longer and often delayed effects.” But these don’t fit with policymakers’ focus on short-term successes, or with modern humans’ ingrained expectation of seeing comparatively short-term effects of their own efforts.

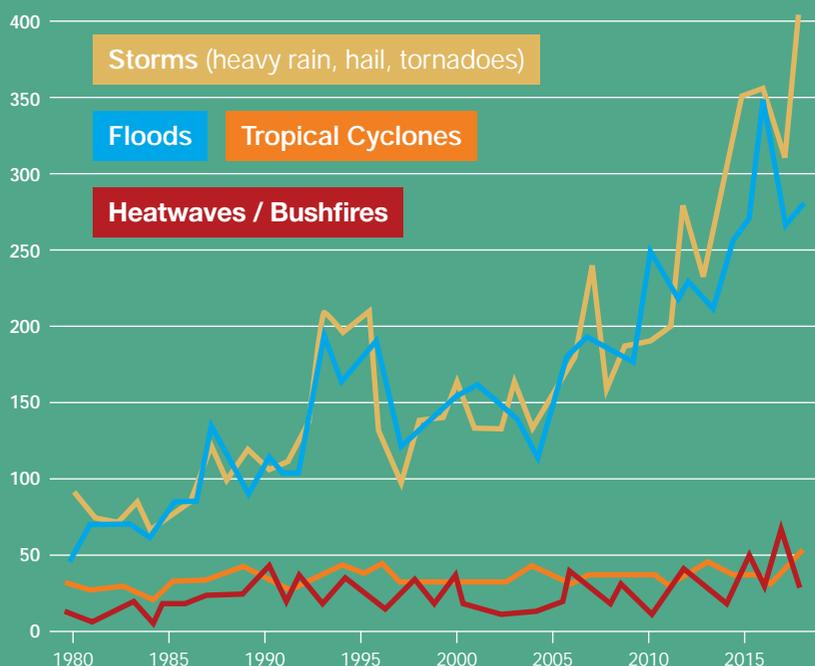
The decisive 1.5-degree target

However, perceptions are changing significantly. This also applies to the 1.5-degree goal that has been emphatically demanded by virtually all climate researchers, the Intergovernmental Panel on Climate Change (IPCC), and many other institutions.

The commitment, which was laid down by the signatory states at the Paris Climate Conference back in 2015, calls for global warming to be limited to well below two degrees Celsius and, if possible, below 1.5 degrees Celsius by the year 2100. The increase refers to that since the beginning of industrialization around the year 1850. If this climate target has so far been thought of as theoretical and long-term by politicians, the population, and many companies, then the already tangible effects underline its urgency: The increase currently lies at just over one degree. If this value alone leads to the consequences that are now perceptible to everyone, it quickly becomes clear that

Global Weather Events (1980 - 2018)

The frequency of natural disasters arising from endogenous and tectonic activity (volcanic eruptions, tsunamis, earthquakes and their consequences) has remained constant over the years. Climate-related disasters, however, have increased in frequency by almost an order of magnitude. Source: Munich Re



“We still think that climate change will happen in the future”

they will again increase significantly with 1.5 degrees or even 2 degrees more. It's hard to imagine a world 2.7 to 4.7 degrees warmer, but without more consistent countermeasures, it's heading towards that very scenario. If this development were to occur, climate researchers such as Prof. Göpel and Prof. Latif bluntly describe the possible consequences as catastrophic.

“The world needs to wake up to the looming threat we face as a species. To even have a chance of limiting global warming to 1.5 degrees, we only have eight more years to nearly halve greenhouse gas emissions,” says Inger Andersen, executive director of the U.N. Environment Programme (Unep). However, with current national climate protection plans, greenhouse gas emissions will only be reduced by 7.5 percent by 2030. To limit global warming to 1.5 degrees, a reduction of 55 percent is necessary – the current reductions would have to be increased approximately sevenfold. Even the 2-degree target would require a four-fold or 30 percent reduction, according to Inger Andersen.

Better preparation for risks too late to avert

But experts also draw attention to another issue: In addition to avoiding much worse consequences in the future, adaptation to already occurring, short-term irreversible consequences has to be part of the plan. The IPCC takes this fact into account with its organizational structure: Its Working Group I deals with the climatic change processes themselves and possible future climatic scenarios.

Working Group II concentrates on impact research, while Working Group III focuses on measures to mitigate global warming and prevent its worst



Prof. Dr. Maja Göpel
Secretary General of the German Advisory Council on Global Change (WBGU) and co-founder of “Scientists for Future”

effects. Prof. Maarten van Aalst teaches and conducts research at the University of Twente in the Netherlands. He's also responsible for risk management in regard to climate change at the International Red Cross and works in the IPCC as coordinating lead author in Working Group II – in other words, he's an expert in dealing with the consequences of climate change.

In an interview with DEKRA solutions, he emphasizes that the consequences of climate change differ significantly depending on location. There are no simple answers – even if the world becomes drier on average, extreme precipitation and resulting floods can be expected locally. Global

Forest fires
Firefighting aircraft are essential for rapid and effective operations, as here in Corsica (France)



warming can nevertheless lead to colder winters with snow chaos. Permanent rain here, water shortages there. The nowadays widely developed and highly differentiated climate models explain these supposed contrasts in a comprehensible way.

Organizations must assess their risk

According to Prof. van Aalst, considering the individual climate risks of companies also depends on the industry, business model, supply chains, and many other aspects. But there's no question in his mind that companies of all sizes need to include the consequences of climate change in general, and of possible future extreme weather events in particular, in their risk calculations and security strategies. "In doing so, we need to prepare for events with low frequency but high intensity. I fear that even the rich countries of the world have not yet grasped this."

At the same time, he gives a sense of the complexity of these issues. Often, for example, convenient coastal locations conflict with higher resilience to floods or storms. Extreme heat presents companies with the challenge of protecting their employees outside the corporate building, while at the same time designing the corporate headquarters to be energy efficient and heat resistant. (Read the full interview with the IPCC expert starting on page 16).

Crisis prevention through top-quality analysis

But how can companies take concrete action to arm themselves against the complex risks posed by climate change? David Salmon, Head of Strategic Development and Technical Service Manager for Service Division Audit at DEKRA, has the assessment and is convinced: "Risk management is a task that must be anchored

The DEKRA BRIA

To help companies better prepare for unexpected loss events, DEKRA has developed the cross-industry self-assessment "Business Resilience Impact Assessment", or BRIA for short. The tool is based on a questionnaire intended as a quick start to resilient risk and continuity management, and is based on relevant standards such as ISO 22301 (Business Continuity Management), ISO 31000 (Risk Management, Finance, Supply Chain), ISO 27001 (Information Security), ISO 37301 (Compliance Management), or ISO 45001 (Occupational Health and Safety).

David Salmon, Head of Strategic Development and Technical Service Manager for Service Division Audit at DEKRA, helped develop the assessment. He emphasizes: "Future viability comes from crisis prevention, namely preparing for conceivable risk situations with appropriate standards and procedures. The quality and efficiency of a business impact analysis are significantly influenced by how completely and critically companies survey their process risks." It's particularly effective, he says, if the almost unthinkable is thought of and success-critical resources are then put in relation to these scenarios.

The assessment starts with a catalog of 40 expert questions that help determine the different levels of maturity in the operating processes in a transparent and comprehensible way. This criteria catalog is free of charge and only available at DEKRA. In the second step, DEKRA experts evaluate the answers and the determined maturity levels. They then identify optimization potential and best practices that can be implemented in operations. Costs for the customer only arise at this second stage. The evaluation takes place remotely so that companies can assess their resilience across multiple sites simultaneously.



at board level or with management. This is where an understanding must develop of the range of risks the company faces and what an appropriate response looks like when relevant scenarios occur." To provide its customers with concrete support in this task, DEKRA Service Division Audit has developed targeted tools for risk assessment and mitigation (see box "The DEKRA BRIA").

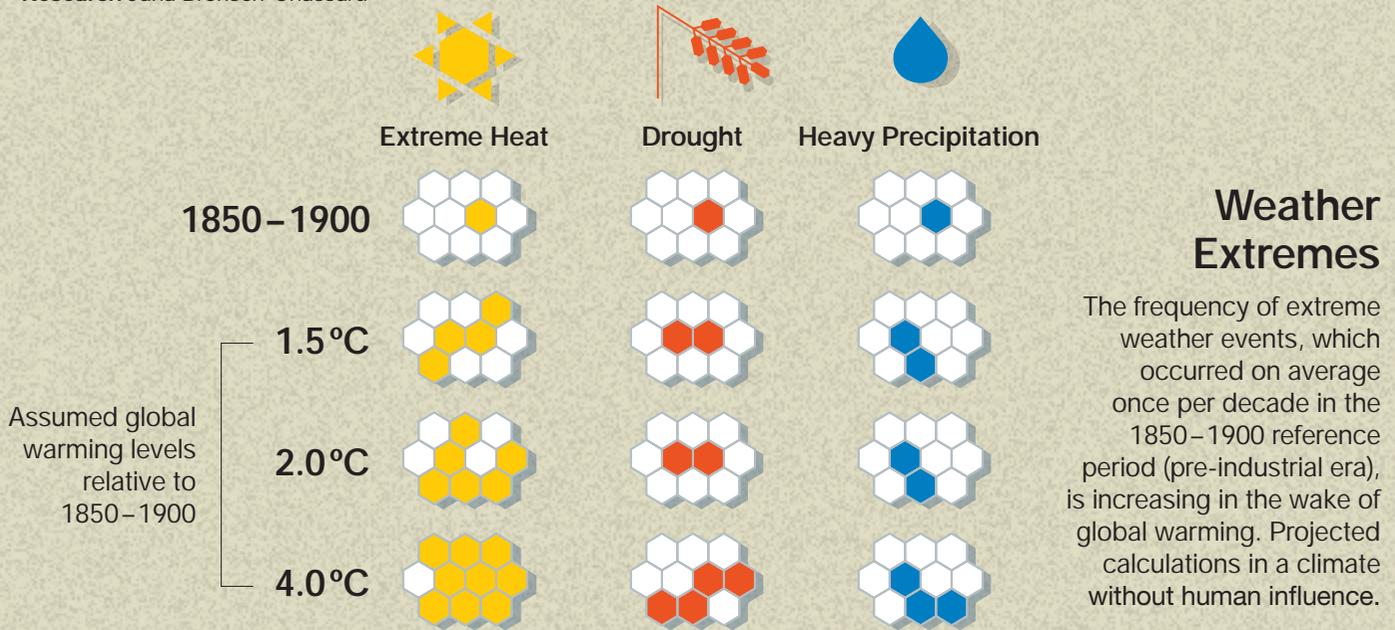
In any case, there's no alternative for both individuals and organizations

but to prepare for the inevitable consequences of climate change. Reducing greenhouse gas emissions is one side of the equation - preparing for extreme weather events and their impact on business processes and supply chains is the other. Past experience isn't a good guide for preparing for this future, emphasizes Prof. van Aalst: "We need to prepare for threats we've never seen before. We need to be ready for more nasty surprises."

Climate Change in Numbers

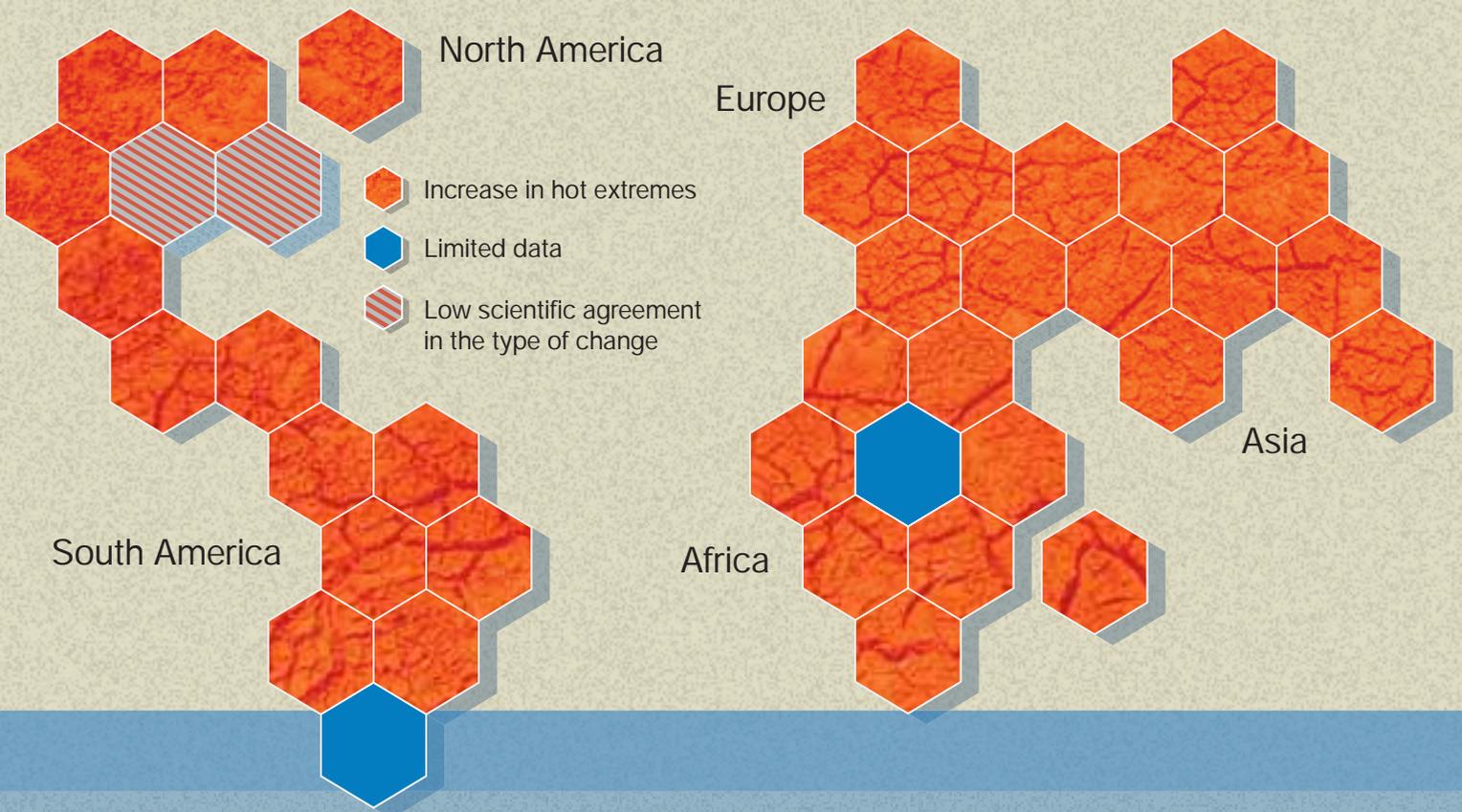
The Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), published in August 2021, shows what can already be observed in many regions around the world: Climate change is here. More than 230 authors from 66 countries evaluated and summarized over 14,000 scientific papers on climate research. An overview.

Research Jana Bronsch-Chassard



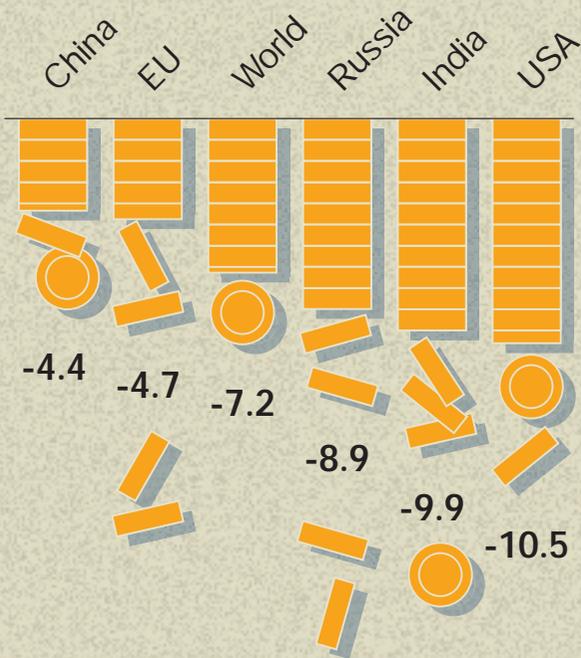
Global Extreme Temperature Events

Observations conducted since the 1950s show that change in hot extremes have increased in nearly all regions of the world and that humans are a contributing factor. For the most part, scientists agree on this.



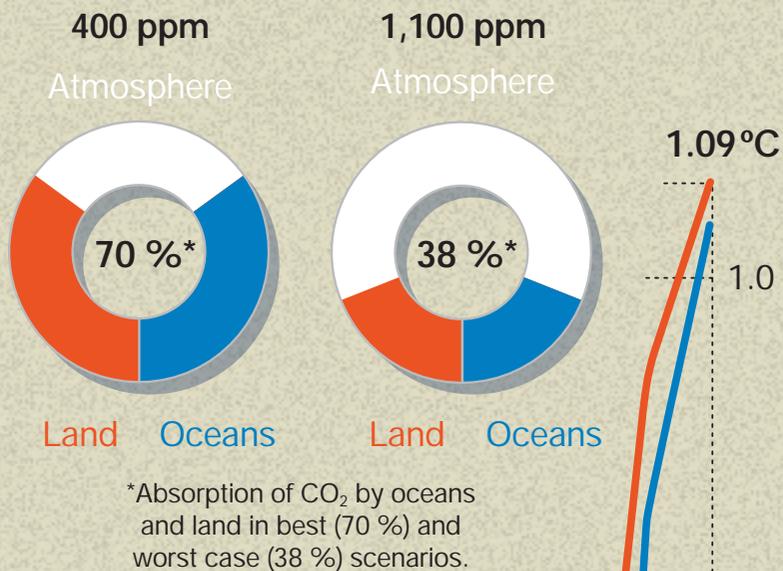
Economic Impact

At an annual temperature increase of 0.04°C, the real gross domestic product (GDP) per capita would decline by the year 2100 as follows (data in %):



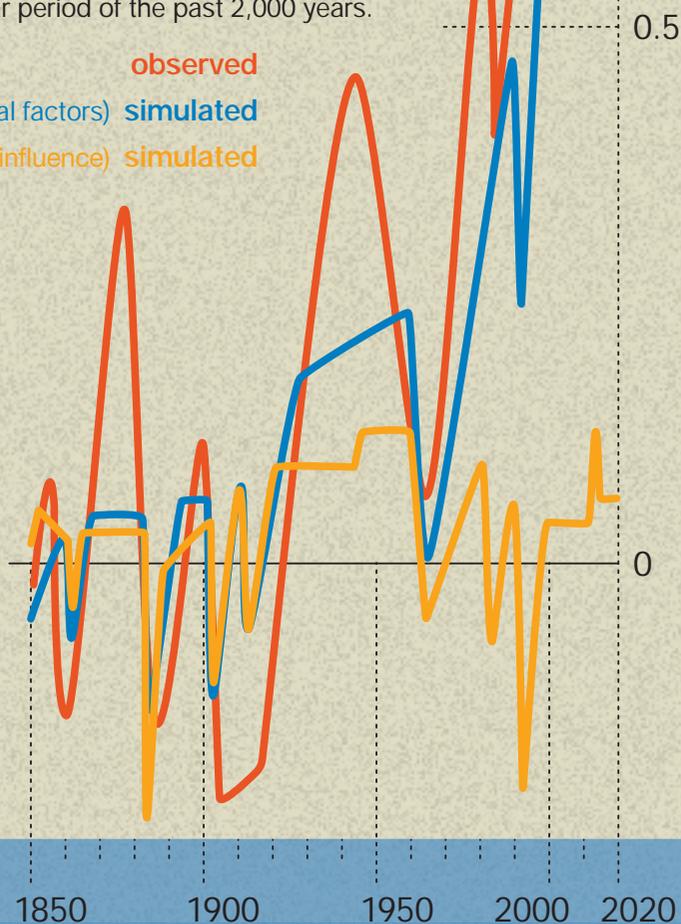
CO₂ Concentration in the Atmosphere

In 2019, every million molecules (parts per million, ppm) in dry air contained a total of 410 molecules of CO₂. In 2100, the value could be 1,100 ppm in the worst case scenario and 400 ppm in the best.



By 2020, the global surface temperature had increased by about 1.09°C since the beginning of instrumental measurement (reference period: 1850–1900). Since 1970, the temperature has increased faster than in any other 50-year period of the past 2,000 years.

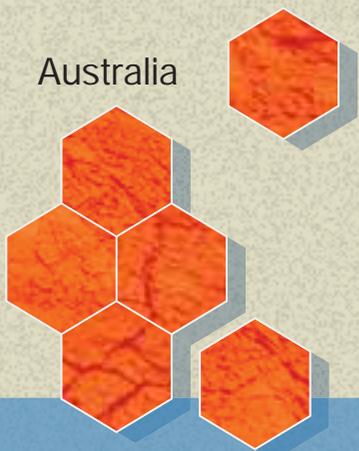
observed (human and natural factors) simulated (without human influence)



Sea Level

Between 1901 and 2018, global mean sea level increased by a total of 0.2 m. The average annual rate of sea level rise was:

3.7 mm (2006–2018)
1.9 mm (1971–2006)
1.3 mm (1901–1971)





**“ Everybody
needs to play
their part
in order to
achieve the
1.5-degree goal ”**

Prof. Dr. Maarten van Aalst is Coordinating Lead Author for the IPCC Working Group II on the key risks of climate change. We talked to him about extreme weather conditions and the approaches to managing these kinds of risks.

Interview Hannes Rügheimer

Maarten, we conduct this interview just a few days after you returned from the Glasgow UN Climate Change Conference. What is your general view on the results?

► **Prof. van Aalst:** I visited Glasgow in my role as a director of the International Red Cross Red Crescent Climate Centre, and I think this signals that the interfaces between science, policy and practice have become a lot more important. Climate change is the most far-reaching problem of our era, and it requires very practical solutions everywhere in society - not only on the side of renewable energy and the avoidance of carbon emissions, but also on the risk management side. That said, I think the outcome of Glasgow is a case of glass half full, glass half empty. It was mentioned that the 1.5-degree target is still critical, but the outcome does not get us there.

On the other hand, this Conference was also expected to help us deal with what we already face today. Particularly the poorest countries, which are more vulnerable, were expecting that the Paris Agreement's third target of 100 billion Dollars per year in financial support for developing countries would be met. The Agreement also specifies this sum "to be balanced" between adaptation for the future and mitigation of already incurred damages - with no clear definition what "balanced" means. Still, the adaptation part used to be 20 billion Dollars. Now the rich countries have committed to doubling that amount by 2025. So small steps forward, but basically not enough to cope with what is facing us.

When we specifically look at extreme weather conditions: Does climate research give a clear indication whether they will occur more frequently in the future?

► **Prof. van Aalst:** If we look at all extremes all over the world, the answer is yes. But it depends on which extreme we look at - and where in the world. On average, we are facing a more volatile climate with more extremes. What we consider an extreme is a property of the statistical distribution of what is happening in the atmosphere. Typically, ecological as well as human systems are more or less adapted to current conditions. So, if things change, the outliers in the new distribution are going to be the new extremes.

In practice we are expecting more heatwaves almost everywhere and we are also seeing a more intense hydrological cycle - which can mean longer periods with no rainfall but also more extreme rainfall when it falls - it comes in bigger chunks. But - and this is important - it very much varies from place to place. For example, if whole Monsoon systems shift in location, some places may suddenly get much more, and others much less rainfall, regardless of changes in average rainfall across larger regions. There are also extremes that are getting less bad. For example, cold extremes will decrease. On the other hand, storms such as tropical storms are getting more intense and more frequent. So, it really varies from extreme to extreme and it also depends on the specific place we are looking at.

What does this mean in terms of risks and consequences?

► **Prof. van Aalst:** This is where we move from the IPCC working group One, which deals with the hazards that come from the atmosphere and the oceans - such as

extreme heat events or extreme amounts of rainfall - to working group Two. Here we look at impacts and risks - basically whether these changes become a problem. And this depends on exposure and vulnerability. A storm somewhere over the sea, where it hits no one, is not a problem. But if it hits a city, then it may become a huge problem - particularly if the city is vulnerable, because for example the people there live in unsafe housing like the shacks in a slum. So, what really matters is the combination of hazards, exposure, and vulnerability - this defines the specific risk.

Are we prepared for it?

► **Prof. van Aalst:** This is where the real problem is: We are actually not well prepared for what is coming, and in quite a few places we actually see exposure and vulnerability rising. For example, in developing countries we see many urban areas grow rapidly and not being well adapted to the coming risks. At the same time, some risks have also gone down. For instance, we have made a lot of progress with early warning systems in the past decades. This means to enable people not only to understand the warning message but also to take the necessary action to save their lives. In Bangladesh last year we lost 124 people in a storm that would have killed hundreds of thousands of people in the 1970's.

Of course, when people die, that is the first thing you want to prevent in any country, because this is a loss that cannot be repaired. But we are still losing many lives in Europe to flooding, or in Europe, the US and Canada to heatwaves. And we are not even counting the effects of heatwaves in developing countries. Even so, for example the European heatwaves in 2019 and 2020 were the deadliest disasters in our global disaster statistics. But there are also other factors that determine the impact of such hazards.

What kind of factors do you mean?

► **Prof. van Aalst:** For instance, in cases like the flooding in Germany, the impact of financial damage is much lower than it

would have been in poorer countries, simply because insurances and governments were able to help. Imagine the same event in a poor country where there is almost no safety net. The people there don't have savings of their own - so they become reliant on humanitarian support such as from the International Red Cross.

This is why these international discussions about how we can support adaptation and preventative measures are so important - and how we can deal with the losses and damages that have to some extent become unavoidable because we are not able to manage the risk down to zero. This includes increased provision of insurances in poorer countries. However, for the poorest people, who cannot afford those insurance premiums, this is probably not going to be the solution.

Therefore, another element of the puzzle is to reduce inequality: if we manage to lift people out of extreme poverty, this would also solve some of these problems. Over the past decades we have seen a steady decline in extreme poverty, but recently due to the Covid pandemic we are seeing a hundred million people falling back down again -

so now we have a much higher vulnerability to the climate shocks coming our way.

What might be strategies for individuals and organisations to cope with these risks?

► **Prof. van Aalst:** We see a lot of interdependencies - a compound nature of risks. For example, in poor countries people are coming to the larger cities to make a livelihood. If they can earn more money there, that should make them more resilient to climate shocks. But if they move to large coastal urban areas, they come to exactly the places where they are most exposed to rising sea levels or rivers coming into a delta or threatening storms. And this is not only true for developing countries.

If we look for example at the most recent heatwaves in Canada, which have taken many lives - would the same heatwave have happened in Las Vegas, there would hardly have been so many casualties. Because there are measures in place even for vulnerable parts of the population - in Canada they just were not used to these kinds of extremes. These heatwaves were even improbable with climate change. You could say they were bad luck. But in the past climate they would just not have happened at all. So, our societies are going to be hit much harder by things they have never seen before. We will have to struggle to be better prepared for "low frequency but high intensity events". This means that we are dealing with unprecedented events where the past is no longer a guide for the future. We must be prepared for more bad surprises. And I'm afraid that even the rich countries have not yet grasped this change.

Can you give us an example of this kind of "bad surprise"?

► **Prof. van Aalst:** Here in the Netherlands, 20 years ago the main concern about climate change was the rising sea levels. Even since the Middle Ages we have built all these diked polders. But then it turned out that the problem is not only the rising levels on the coastal side but also the run-offs of the rivers in the deltas. And it's even more difficult to get rid of this water when

+ **Prof. Dr. Maarten van Aalst,** holds the Princess Margriet Chair in Climate and Disaster Resilience at ITC (Faculty of Geo-Information Science and Earth Observation) at the University of Twente, Netherlands. He is Coordinating Lead Author at the Intergovernmental Panel on Climate Change, IPCC for Working Group II, Chapter 16 ("Key risks"). In addition, he is director of the International Red Cross Red Crescent Climate Centre - where he oversees the support for climate risk management and its links with scientific and policy communities on climate change, disaster risk management and development planning. Maarten has over 20 years of experience bridging climate science, politics and practice, from local to global.

“We are actually not well prepared for what is coming”



the sea level is higher - so it's a combination of challenges.

But we have taken on this and started a program called “room for the river”, implementing nature-based solutions, although providing more space for the rivers is very costly in a densely populated country like the Netherlands. Now in the last couple of years, we had very dry and very hot summers. Then suddenly the problem was no longer getting rid of the water but retaining it. So, you get an idea of the complexity of challenges that lie ahead of us.

What role do companies play in this process?

► **Prof. van Aalst:** When we are looking at enterprises, managing climate change is the defining challenge of our time - it happens on all fronts. Along with governments and individuals, companies also play a critical role in reducing their carbon foot-

print. Everybody needs to play their part in bringing down emissions in order to achieve the very important 1.5-degree goal.

But enterprises also have to be mindful about the changes that already took place. As I already mentioned, although climate change is a global problem, the effects on an individual organisation depend on where you are. If you are in an area where the permafrost is melting, the risk may be that your building slides away. If you are at the edge of a desert, the risk may be desertification. If you are in a coastal urban area, the risk may be flooding both

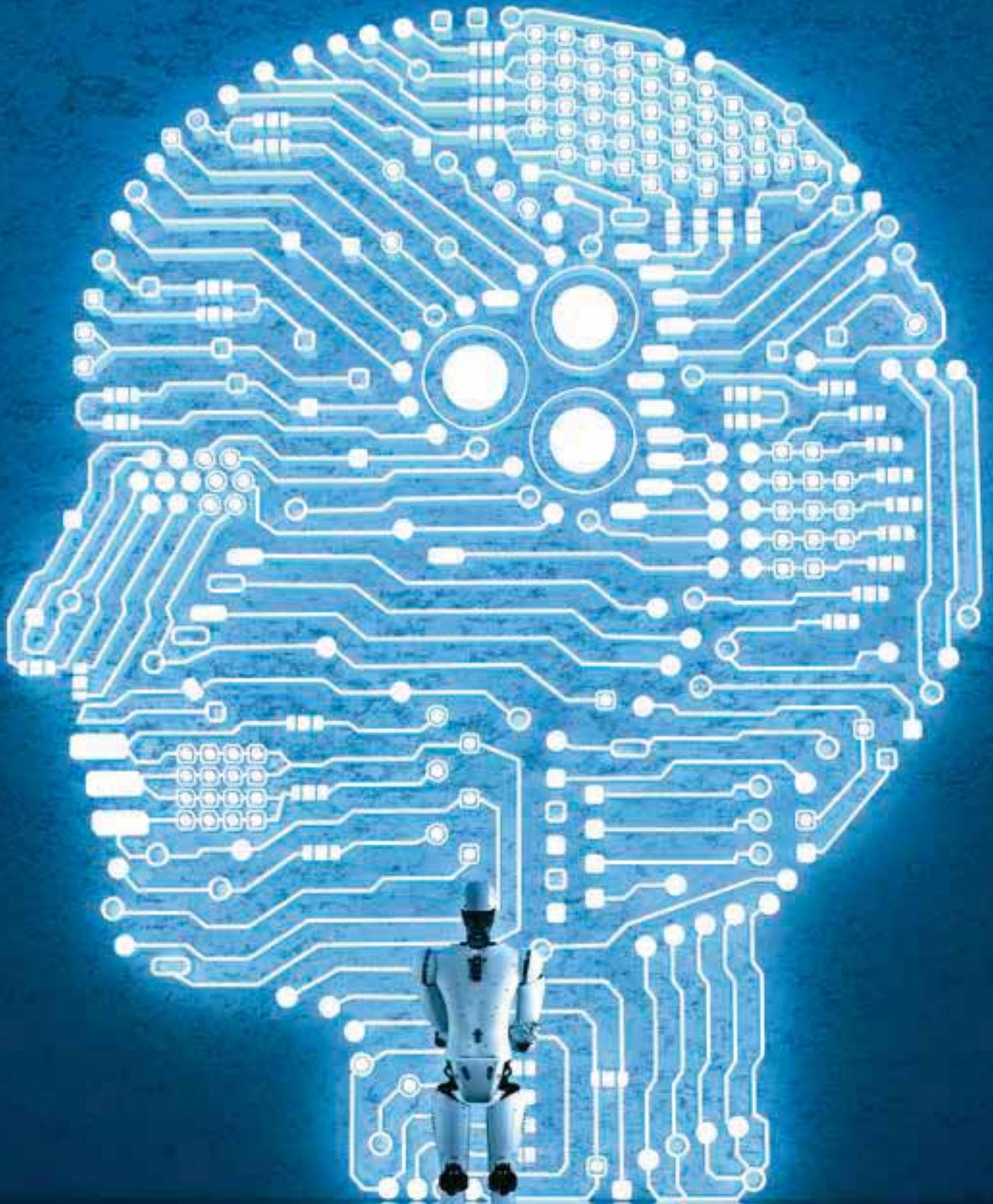
from the sea and the rivers, but it might also be the water supply getting too saline.

And all these risks can have various effects. For example, in many companies, the IT systems used to be in the basement - if this is the part of your building which is most prone to flooding, that may well be a risk to your business. If you purchase a new office, you should not only think about energy efficiency but also how you are going to deal with heat. The answer may be air conditioning, but it may also mean proper shading for example by putting plants around the building.

Are there any other risks which companies have to face?

► **Prof. van Aalst:** And besides the local risks to their settlements, companies should also think about their supply chains. We have come to realize this particularly during Covid, when suddenly all kinds of supply chains did not work anymore. But we are facing this also due to climate shocks.

There are many reasons behind the current shortage of semiconductors - but one of them is a drought in Taiwan, so that the chip manufacturers there cannot work at full production. So suddenly we see an effect of climate change in Taiwan affecting for example the car industry in Germany. If a company wants to be more resilient, it must spread these risks. This applies to many industries - for example, food companies have started to shift their agricultural supply chains over other continents. What I hope is that as a world we will manage to become more resilient by spreading the risks - but that we will also invest in the more vulnerable places.



Smart and Self-learning

Artificial intelligence is capable of amazing things in many different fields. Testing and certification is an absolute prerequisite for operating relevant systems at low risk. DEKRA plays a key role here.

Text Markus Strehlitz

Talking about artificial intelligence (AI) may sound a bit mysterious at first. After all, the term encompasses technologies which ensure that machines can solve human-like tasks. At least, that's one simplified definition. However, a closer look reveals that current AI systems don't have any intellectual capabilities. Such so-called strong AI is still a thing of the future.

Weak AI, on the other hand, is increasingly taking over our everyday lives. These are primarily self-learning processes that are geared to precisely one task. The systems aren't programmed like classic software but trained with a large amount of data. When in use, they're constantly learning.

In the data flow

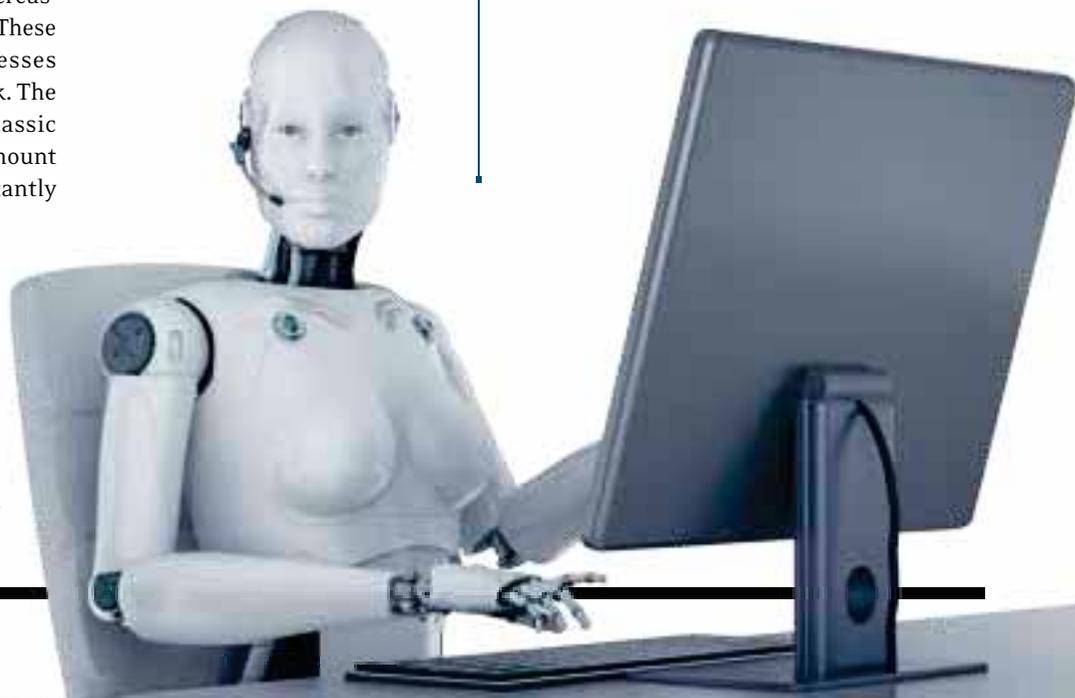
Such systems perform amazing things in many different applications. Intelligent chatbots, for example, take over communication with customers for companies. When people complain or want to exchange a product, they

Chatbots

Pre-trained computer programs replace human contacts in customer communication

don't speak to a flesh-and-blood person but to a pre-trained computer program.

In manufacturing companies, AI systems analyze data gathered from manufacturing machines to detect problems at an early stage. As an example, BMW collects sensor data from 600 welding guns used by robots in the body shop at its Munich plant. Software continuously evaluates the data with the help of AI and reports when failure is imminent.



Artificial Intelligence

Quality control also relies on machine learning. At Fiat Chrysler China, an AI system uses cameras to identify defective assemblies or missing components, such as screws so small that they're difficult for the human eye to detect. The parts in question are then weeded out. AI software works similarly in medicine, for example by being fed images of skin cancer variants. If the number of training images is large enough, the system can then make appropriate diagnoses on its own. In individual studies and under certain conditions, the AI was able to deliver better results than a human doctor.

Framework law for AI

Another area of application for artificial intelligence is automated driving. The more tasks the machine is supposed to take over from humans, the higher the degree of AI application. In this case, however, the application's limits also become apparent. In automated driving, the demands on AI systems are significantly higher than in quality assurance of a manufacturing company. A camera aimed at a product for inspection generally operates under non-varying conditions. By contrast, city center traffic is very complex. Vehicles can run into unpredictable situations.



The field of automated driving in particular makes it clear how important it is to test AI. The relevant systems must be tested and certified in order to be utilized without risk. This applies to assistance systems in vehicles as well as

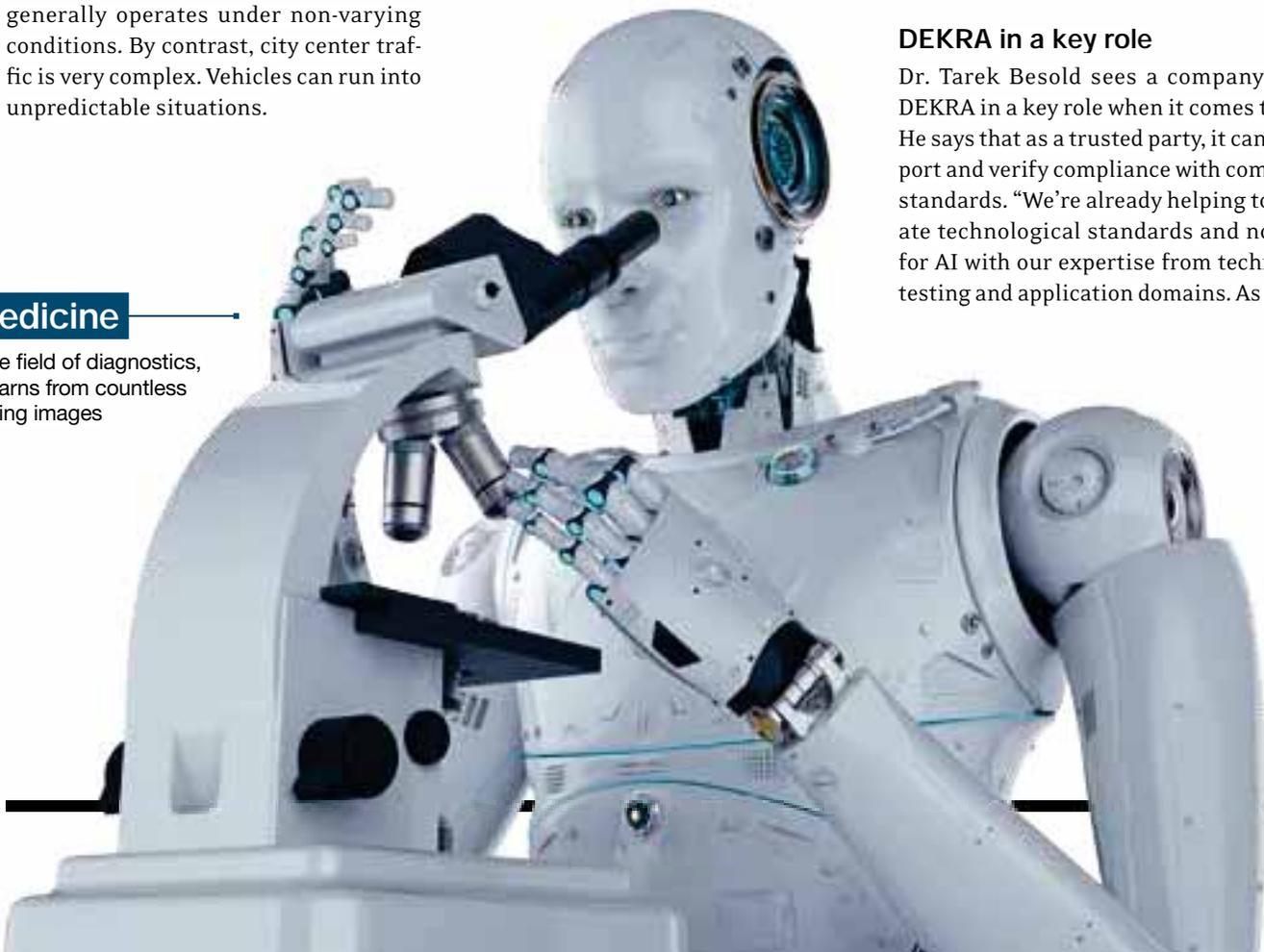
to software that supports companies in the selection of new employees. The EU is currently working on a framework law for the use of AI. A first draft of the Artificial Intelligence Act was published this spring and should ideally be implemented in EU law by the end of 2022.

DEKRA in a key role

Dr. Tarek Besold sees a company like DEKRA in a key role when it comes to AI. He says that as a trusted party, it can support and verify compliance with common standards. "We're already helping to create technological standards and norms for AI with our expertise from technical testing and application domains. As soon

Medicine

In the field of diagnostics, AI learns from countless training images





Factory

In production, artificial intelligence provides support for quality assurance

as there are regulatory defined requirements for AI systems, DEKRA will then also test and certify their compliance as a neutral independent body,” said Dr. Besold, Head of Strategic AI at DEKRA DIGITAL.

In addition, DEKRA is also working on using the possibilities of AI itself - for example, to further develop existing products and services. “Many things are possible, from automatically generated inspection reports to smart camera-based inspection tools,” says Dr. Xavier Valero, Head of Applied AI at DEKRA DIGITAL.

DEKRA has established its AI Hub to drive the topic forward - across the group as well as the divisions. The hub is intended to serve as a contact point for AI initiatives within the organization, support the implementation of corresponding projects, and establish DEKRA as a participant in the national and international AI ecosystem. This way, DEKRA will also help to ensure that AI no longer seems quite so mysterious, but instead works transparently, safely, and reliably.

INTERVIEW

Three Questions for ...



Dr. Tarek Besold, Head of the AI Hub at DEKRA DIGITAL

1 Mr. Besold, what criteria are used to test an AI system?

First of all, there are the classic criteria such as functional safety and cyber security, which remain relevant. In addition, it needs to be checked whether an AI system operates without discrimination. This issue is currently being discussed at the European level. After all, many AI applications automate decision-making – for example in medicine as well as in the granting of loans by a bank. It must be ensured, for example, that the results aren't influenced by the ethnic origin, gender, or sexual orientation of the person in question.

2 Is the fact that AI systems are constantly learning and thus constantly evolving a challenge in testing?

It will become necessary to test AI systems on an ongoing basis. We're already working

internally on scenarios that necessitate what is known as “permanent monitoring”. This is a major challenge. When it comes to machine learning, there are no explicit rules in the systems, only statistical relationships. How a system has changed can only be judged by the result. Thus, just recognizing when the time has come to check it again is a challenge.

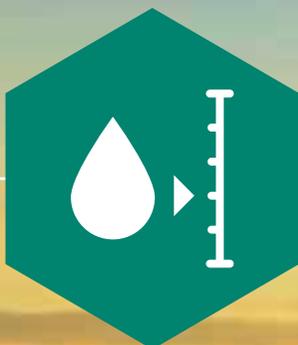
3 This brings us to the black box problem with AI. Their decision-making processes are difficult to comprehend.

That's right. That's why testers need both technical AI know-how as well as expertise about the application domain. In most cases, it will most likely come down to scenario-based testing – in other words, testing for the individual case in question. The nice thing about an organization like DEKRA is that we have a lot of experience with the relevant application domains.

High-Tech on the Fields

Agricultural apps, driverless tractors, and automated drones are not science fiction, but an integral part of modern farming. Smart technology and digitization make it possible.

Text Joachim Geiger





Agriculture 4.0
Digital technologies
for environmentally
friendly production

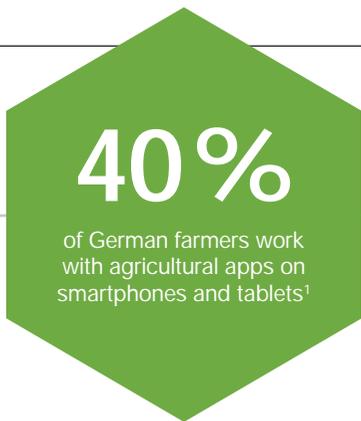


The agricultural industry is marching into digitization with giant strides. Agricultural machinery manufacturers in particular are demonstrating an ingenuity with digital high-tech that even the automotive industry could learn from.

Smart technology and big data for greater efficiency

Crop production is a perfect playing field for high-end technologies. Drones equipped with cameras provide high-resolution images of every part of the field, allowing weeds, fungal diseases, and pests to be precisely identified. Farmers can use the pictures to treat problem areas with pinpoint accuracy, instead of just applying crop protection products to large areas, as has been the case until now. Tractors, harvesters, and attachments are also increasingly equipped with the latest technologies. Agricultural machinery using radar and lidar sensors to determine the composition, moisture, and density of the soil has long been available. Highly automated fertilizing machines open up the soil between the rows of plants with precise accuracy and apply a precisely measured amount of fertilizer.

In Agriculture 4.0, it seems, the line between reality and science fiction is narrowing. Could a farmer possibly steer a fleet of ten fully automated tractors across the field without an operator's cab but instead via smartphone? In fact, he can. In Russia, for example, the manufacturer Avrora Robotics, which specializes in research and innovation in the field of robotics, has been conducting field tests with precisely this setting since the fall of 2016 with its "Agrobot" project. According to an industry report by the Germany Trade and Invest (GTAI) farmers in the US, on the other hand, are focusing not only on expanding their machinery, but also on networking existing technology. The trend here is clearly leaning toward Big Data:



The portfolio of digital options begins with predictive maintenance of machinery and equipment, in which the evaluation of sensor data provides early warning of impending failures. This variant is used by around 19 percent of the companies surveyed. Around a third use sensor technology to measure climate, soil, and plant data.

Also, about a third of companies are planning to use intelligent and site-specific application of crop protection products or fertilizers. 40 percent of all farmers work with agricultural apps for smartphones and tablets, and another 40 percent control their operations with the help of special farm management systems. At 45 percent, the use of agricultural machinery controlled via GPS is comparatively widespread.

Tractors offer assistance systems with sophisticated capabilities

Indeed, tractors play a key role on the path to digital and sustainable agricul-

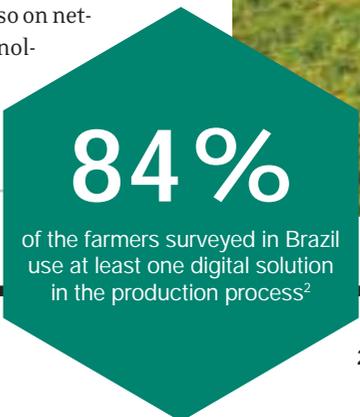
More data must be collected and analyzed in order to save time and production costs. And what about smart agriculture in Germany?

Using digitization to achieve sustainability

Digital technologies are booming in Germany, according to a study presented in April 2020 by the German Association for Information Technology, Telecommunications and New Media (Bitkom) and the German Farmers' Association. According to the study, most farmers are convinced that digitization enables environmentally friendly production.



Driverless systems
A computer calculates the track of the electric demo tractor



All-electric large drone
Crop protection products can be applied remotely or automatically with pinpoint accuracy by drone



7-10%

of agricultural enterprises in Russia use digital technologies (EU comparison: approx. 69%)²

ture. Modern machines and implements have little in common with the legendary farm tractors and agricultural diesel engines from Allgaier, Deutz, and Eicher of yore. They're powerful computer systems that work in tandem with versatile electronic assistants, which process data like soil moisture, soil type, working depth, and attachment, and use it to determine recommendations for the required additional ballast. In future, it's quite possible that the combine harvester could be threshing grain while the farmer does the bookkeeping in the cab. In a joint research project called "Driver's Cab 4.0", the Karlsruhe Institute of Technology is currently researching how an intelligent workplace could give the operator this freedom in harvesting operations.

Does the electric drive train stand a chance in modern tractors?

Of course, the icing on the cake of modern tractor technology would be a drive train with electric propulsion - especially since new tractors have to comply with the Euro Stage V exhaust emission limits since Jan-

uary 1, 2020. It's true that there already are concepts for a hybrid electric drive here and there, in which a generator converts the entire output of the combustion engine into electrical power for the electric motor.

However, a pure battery-electric drive has so far not been able to replace the diesel, at least in the heavy weight classes. After all, a tractor has to be able to plow the fields twelve hours a day with a heavy load. Agricultural experts have calculated that the batteries required would weigh around 15 metric tons. Such a vehicle wouldn't stand a chance in the field.

The future could belong to fully automated swarm robots

In a joint research project, agricultural manufacturer John Deere and the Technical University of Kaiserslautern recently demonstrated what future the electric tractor might be headed for. The 8.5-ton, 400-hp demo tractor draws power from

the public grid via a cable from a mobile transformer at the edge of the field. The cable, which can be up to 1,000 meters long, runs on a drum permanently installed

on the vehicle. The cable is automatically unwound and rewound during the journey. A robotic arm places it next to the first lane with the utmost precision and picks it up again in the next lane.

A computer calculates the ideal lane and controls the drive and robotics applications.

And how do farmers imagine their future in 2030? The Bitkom study has some exciting answers to this question: 46 percent of those surveyed expect fully automated field robots that independently detect weeds, diseases, or pests. 38 percent think that unmanned agricultural machinery will be operating independently in the fields.

16.5%

of farmers in the US use farm management software²

PHOTOS: GLIGATRON/ISTOCKPHOTO, ELENAB/ISTOCKPHOTO, JOHN DEERE, VOLICOPTER
SOURCES: 1 BITKOM UND DEUTSCHER BAUERNVERBAND, 2 GTAI - GERMANY TRADE & INVEST



Fit through Qualification

Together with DEKRA Akademie, Germany's second-largest food retailer REWE is training people from different nations for retail and logistics sectors.

Text Susanne Bader

How do you find skilled workers who are open to changing shift times and physically demanding work? This is the difficulty facing food retailer REWE in Germany. The company, which operates around 3,700 REWE and approximately 2,150 PENNY stores nationwide, advertised an average

of 5,500 vacancies in logistics and sales in 2021. There's still a lack of suitable applicants, because working in retail isn't considered all that attractive, especially among younger people, due to the working conditions. In addition, although the labor market supplies interested individuals, more and more they don't possess the required

skills. That's why the REWE Group Recruiting Center relies on partial qualification as one way of filling vacancies in Germany.

Lateral entrants are welcome

According to a recent study by the Bertelsmann Foundation, companies in the retail sector in Germany are prepared to hire sales staff without full vocational training for 60 percent of their operational activities. A partial qualification provides basic skills for the job and the final certificate is recognized nationwide.

REWE relies on a complementary concept of partial qualification in Germany.



Building blocks of success
The focus is on the individual strengths and interests of the participants

This is aimed at lateral entrants who are placed via job centers. These can be people with a refugee background, but also the long-term unemployed or solo self-employed who need to reorient themselves after lockdowns caused by the pandemic. The selection is made during a four-week preliminary readiness program supervised by DEKRA Akademie.

Practical experience from the start

Those who make it into the partial qualification complete two modules for the underlying occupation within eleven months, in which participants are taught the basic knowledge for working in sales or logistics. From the very beginning, in addition to three days a week of theoretical instruction provided by DEKRA Akademie, the participants work two days a week in a REWE store or at a logistics location. In doing so, they support their colleagues in stocking and pricing goods, as well as at checkout. This way, they can immediately apply the know-how they have acquired and gain self-confidence for their later job. The decisive difference to other qualifications: They receive an employment contract and a salary. "This gives them a higher appreciation for their work," explains Dirk Hoffmann, Senior Consultant Talent Acquisition at REWE.



He instigated the project and brought DEKRA Akademie on board for the Hildesheim and Berlin sites. "It was important to us that we have an education partner who brings high training quality and extensive experience. In addition, we're active nationwide and need a partner who is also active nationwide. DEKRA Akademie brings all of this to the table." The DEKRA team has other important tasks in addition to the actual training. It not only finds suitable applicants, but ultimately advises on who is suitable for the partial qualification.

Profession with opportunities for advancement

"It's a win-win for everyone: The burden on job centers is lessened and participants receive an employment contract and are no longer dependent on job centers," says Manuel Menne-Dörner, Head of Key Account Management at DEKRA Qualification GmbH. In particular, the project offers a great opportunity for the integration of refugees in Germany. The fact that REWE benefits from the measure has been demonstrated by feedback given to Dirk Hoffmann from store managers: "We're successfully recruiting urgently needed skilled workers for our stores. Some of these candidates would probably have had little chance of being hired via the conventional application process."

Ultimately, he says, the demands REWE places on new employees are very high. "With DEKRA Akademie by our side, we give participants the support they need to acquire specialist knowledge and grow into their tasks - and everyone benefits from this," says Hoffmann. People who complete additional supplementary modules to the two offered have the opportunity to take the German Chamber of Industry and Commerce (IHK) examination in their respective training occupation. "The retail sector not only offers secure jobs, but also probably the best opportunities for advancement," Hoffmann says with conviction.

As of the end of November 2021, a total of 26 participants have started their training at the Hildesheim and Berlin locations. Other cities will follow, and part-time qualifications are planned as well. The model will then be rolled out nationwide over the next four years.



Sustainability as an Imperative

In order to achieve the international climate targets that have been set – among other things, limiting global warming to 1.5 degrees – almost all players in the automotive sector are stepping up their efforts to significantly reduce their carbon footprint with a wide range of measures.

Text Matthias Gaul

Closed circuit
BMW's "i Vision Circular" study is a fully recyclable e-car made from 100 % recycled materials

The countdown to the day when only purely electric cars or vehicles fueled with hydrogen, bio-fuels, or e-fuels will be allowed on the roads of this world has begun. Automobile manufacturers are aware of the challenges involved and have been expanding their product portfolios to include alternative drive solutions for years. But also in terms of manufacturing or material selection, as well as on many other levels, they're intensely pursuing the goal of significantly reducing CO₂ emissions along the supply chain. The wealth of examples is already almost inexhaustible and only a glimpse can be provided here.

Recycled materials and renewable raw materials becoming more important

For example, starting in 2025, the BMW Group intends to source steel that generates up to 95 percent less CO₂ emissions during its production and doesn't require fossil resources such as coal. The company has reached an agreement with Swedish start-up H2 Green Steel, which uses hydrogen and exclusively green electricity from renewable sources for their steel production.

Mercedes-Benz already entered a cooperation with green thermoplastics manufacturer UBQ Materials in February 2020. The Israeli start-up recycles household waste and produces a new material from it - which is 100 percent recycled and 100 percent recyclable. This green thermoplastic could soon be used in series production to manufacture a lightweight cargo hold. Prototype construction and the production of bumpers for buses, cable ducts, and load carrier boxes could also be switched to CO₂-neutral recycle.



Circular economy
BMW isn't only breaking new ground in design. They want the entire value chain to be sustainable



A lot is happening in the area of materials in particular, which is demonstrated by the new system solutions, such as for the production of seals for window guides in the automotive sector, presented by US oil company ExxonMobil in January 2021. The thermoplastic polymers used are produced with recycled material and can serve as substitute for synthetic rubber. The production of batteries for elec-

Sustainable raw materials
With the “Conti GreenConcept”, Continental relies on recycled materials and renewable green raw materials in tire production



turer recently presented the “Conti Green-Concept” with a 17-percent share of recycled materials and 35-percent share of renewable raw materials at the IAA Mobility 2021 in Munich. The green materials used include natural rubber from dandelions, silicate from the ashes of rice husks, as well as vegetable oils and resins, all of which significantly reduce the proportion of crude oil-based materials.

Efforts to increase sustainability are continuing in the area of fuels. For example, British oil company BP has launched a project with Danish wind power producer Ørsted to build a 50-megawatt electrolyzer at BP’s refinery in Lingen, Germany, which could be supplied with electricity from Ørsted’s offshore wind farm. This could produce green hydrogen as early as 2024, replacing some of the fossil hydrogen production at the refinery while also serving to produce more sustainable fuels. Both avoid significant amounts of CO₂ emissions. Over the entire project cycle of 20 years, that amount is estimated at around 1.6 million metric tons.

Circular economy remains a major challenge

Just the few examples listed here show that circular economy in particular can make an important contribution to decar-

tric vehicles also promises great future innovation potential. Chinese battery specialist CATL, for example, has announced a new cell chemistry for 2023 that not only works without cobalt and nickel, but also without lithium, relying instead on sodium. Cobalt, nickel, and lithium have long been the subject of criticism due to their scarcity and often questionable mining methods.

Greater sustainability is also one of tire manufacturer Michelin’s declared goals. The plan is to increase the proportion of organically produced or recycled materials in the company’s tires to 40 percent by 2030 and 100 percent by 2050. To this end, Michelin is conducting research with partner companies like Carbios and Pyrowave on high-tech recycling processes that give commercially available PET plastic or packaging waste a second life as tire components. They expect the first tires containing recycled plastic waste to roll off production lines as early as 2024.

The project promises considerable environmental benefits; after all, worldwide all tire manufacturers combined sell around 1.6 billion car tires every year. For their

production, manufacturers process up to 800,000 metric tons of PET plastic fibers. Around four billion plastic bottles could thus be recycled annually into technical fibers for tires. Continental is also committed to rolling into a green future in the truest sense of the word: The tire manufac-

System solutions
Thermoplastic polymers made from recycled materials are used for seals



Sustainability Initiative Mandated and Deployed*

	Highest Adaption Country / Deployment	Lowest Adaption Country / Deployment
Supporting and promoting a circular economy	Germany / 67 %	India / 22 %
Sustainable R&D and product development	France / 56 %	China / 37 %
Sustainable manufacturing	Germany / 55 %	France / 31 %
Product sustainability	France / 38 %	India / 26 %
Sustainable supply chain	USA / 37 %	France / 23 %
Recycling of waste and easy returns for end-of-life disposal	USA / 35 %	United Kingdom / 13 %
Sustainable power procurement	Germany / 31 %	India / 15 %
Fair labor policy	USA / 30 %	United Kingdom / 6 %
Environmentally responsible sourcing of metals, materials and products	Sweden / 30 %	France / 8 %
Sales, marketing, and after-sales sustainability	USA / 28 %	United Kingdom / 13 %
Mobility and digital services	Germany / 23 %	United Kingdom / 3 %
Sustainability in IT	Sweden / 22 %	United Kingdom / 13 %
Due diligence of all material and product procurement	India / 15 %	Sweden / 4 %

* Deployment implies that the organization has a working initiative as part of its standard sustainability practices. Percentages imply the number of executives who have mandated and deployed said initiative. Countries under consideration: USA, United Kingdom, France, Germany, India, China, Sweden.

PHOTOS: BMW (4), LENNART PREISS/CONTINENTAL AG, BARANZDEMIR/ISTOCKPHOTO, TABLE: CAPGEMINI 2020

bonization. In its study “The Automotive Industry in the Era of Sustainability” published in 2020, the Capgemini Research Institute concludes that the introduction of circular economy, particularly on the part of the automotive industry, affects many key areas of sustainability - from the supply chain to recycling, procurement, and after-sales. The study surveyed more than 500 automotive company executives from nine countries and more than 300 sustainability experts. However, according to the study, automotive compa-

nies still have a long way to go before they fully benefit from circular economy. Only 32 percent of companies surveyed said they currently contribute to circular economy through their supply chain, with that figure expected to rise to approximately 50 percent in the next five years.

Prof. Stefan Reindl, Director of the Geislingen Institute for the Automotive Industry, sees major challenges in circular economy and decarbonization for almost all players in the automotive industry as well. “While companies have had costs and qual-

ity on their radar as key leverages in recent years, the issue of climate neutrality is now being added basically on top with regard to the entire value chain,” says Reindl. In his view, the trick for manufacturers worldwide lies especially in efficient monitoring and managing of suppliers in order to, on the one hand, achieve the climate targets set by legislators and, on the other hand, win over car buyers who are becoming “greener”. “In future, sustainability will be a decisive reason for buying,” predicts the automotive expert.



Blue Gold

China wants to be climate-neutral by 2060, while the USA, Canada, and the EU are aiming for it as early as 2050. Hydrogen plays an important role in this plan. For maximum sustainability, the flammable gas must be generated from renewable energies such as the sun, water, or wind. DEKRA also sees a lot of future potential in H₂.

Text Matthias Gaul

I believe that water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable." Is this a present-day statement? Not at all. Rather, the words date back to 1875, when one of French author Jules Verne's main protagonists - more precisely, engineer Cyrus Smith - said them in the novel "The Mysterious Island". According to the imaginary scientist, water broken down into hydrogen and oxygen with the help of electricity would serve as fuel instead of coal in the distant future. A bold vision at the time.

Almost 150 years later, hydrogen is attracting increasing attention as an energy supplier, especially in light of climate change. Politicians, scientists, and industry around the world are pushing the technology more than ever and see great potential with regard to the energy and mobility system's necessary transformation.

"Hydrogen will only play a key role if it's 'green'"

Hildegard Bentele,
Member of the European Parliament (EPP)



For example, the European Commission's Hydrogen Strategy presented in July 2020 states that "between 2025 and 2030, hydrogen must become an integral part of our integrated energy system." It says that from 2030 onward, renewable hydrogen will be used on a large scale in all sectors in which it has been difficult to reduce CO₂ emissions so far.

Kite gas/fuel ship for the production of green hydrogen on the open ocean

Many hurdles on the way to a green hydrogen economy

"However, we still need to put in a lot of effort to achieve this ambitious goal," says Hildegard Bentele, who sits in the EU Parliament for the European People's Party (EPP) and works there in the

The Top 3 Largest Hydrogen Projects in the World

> Asian Renewable Energy Hub

Across an expanse of 6,500 square meters, 26 gigawatts (GW) of hydrogen will be generated with the help of wind turbines and photovoltaic systems in the East Pilbara region in northwestern Australia. However, the mega-project is currently on hold due to concerns raised by the Australian Department of the Environment. A final investment decision has been set for 2025.

> North₂

In the north of the Netherlands, Shell, Equinor, Gasunie, RWE, and the port of Groningen Seaports want to jointly build a system of offshore wind farms, electrolyzers, gas storage facilities, and pipelines. A capacity of 4 GW is planned by 2030, and more than 10 GW by 2040.

> AquaVentus

On Helgoland, a development association consisting of around 40 companies is planning a generation capacity of 10 GW for green hydrogen from offshore wind energy and its transport to the mainland by 2035.

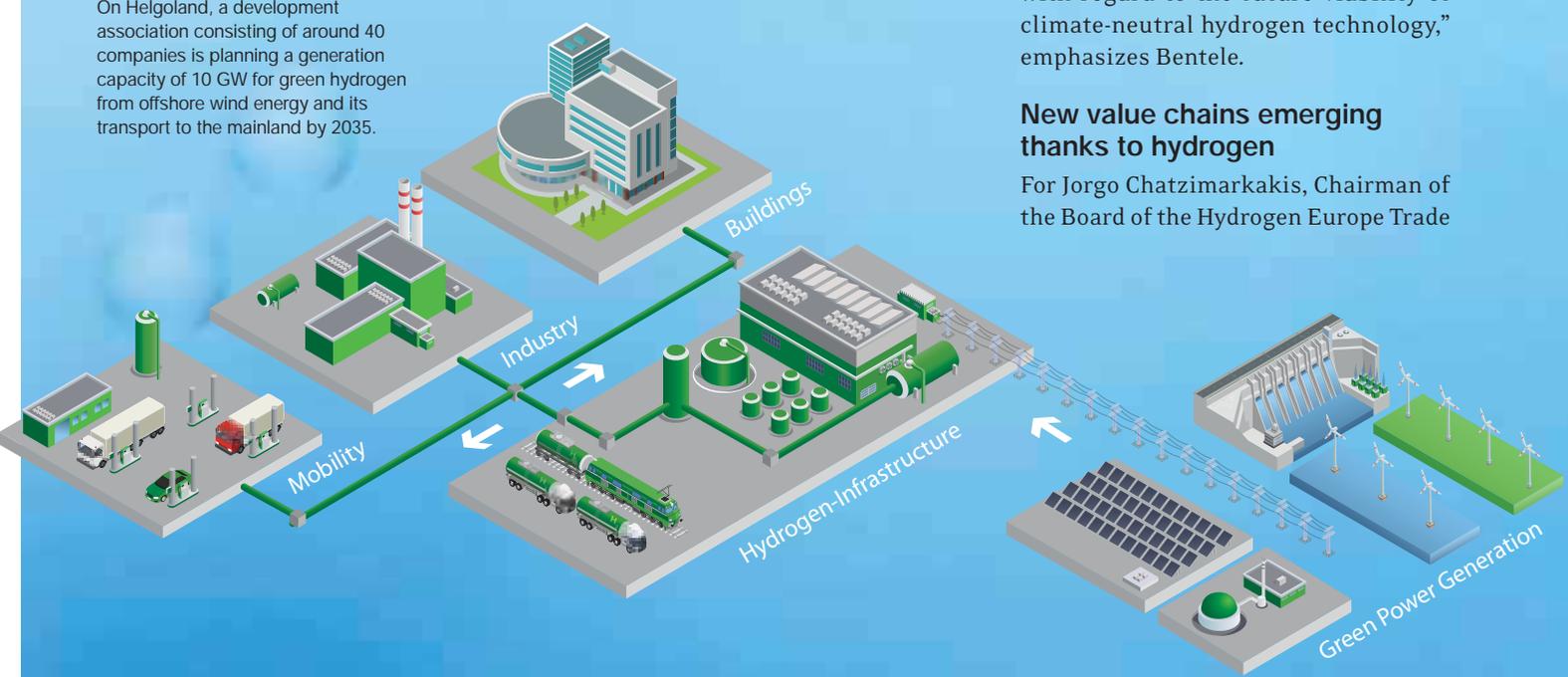
Development, Environment, and Industry Committees, among others. In light of the fact that up to 95 percent of hydrogen currently used in industry is still of fossil origin, research as well as investments in applications with hydrogen from renewable sources must be significantly expanded. “As far as the production of green hydrogen is concerned, the EU must strategically deepen partnerships in particular with countries where a lot of cheap renewable energy is produced, for example in Africa,” advises the MEP. Bentele is addressing an acute problem. After all, alternatives to fossil fuels are needed for the long-term success of the energy revolution and for climate protection. However, hydrogen will

only play a key role here if it’s “green”, i.e. if the electricity required for the electrolysis of water comes from renewable sources such as the sun, water, or wind, therefore making its production CO₂-neutral.

However, the politician also sees numerous other hurdles along the way. For example, the fastest possible certification of low-carbon hydrogen in order to further investments, the revision and adaptation of corresponding guidelines, as well as the stipulation of safety standards and recycling regulations. “I see diverse fields of activity for independent expert organizations such as DEKRA, particularly in the area of certifications as well as safety standards. With their know-how, they play an important role with regard to the future viability of climate-neutral hydrogen technology,” emphasizes Bentele.

New value chains emerging thanks to hydrogen

For Jorgo Chatzimarkakis, Chairman of the Board of the Hydrogen Europe Trade



How the Hydrogen Cycle Works

Green hydrogen is produced by electrolysis of water, using electricity exclusively from renewable sources. The gas can be stored in large-scale storage facilities and transported in pipelines and is then available for a wide range of applications – for example in transport, industry, and buildings.

“This is the beginning of a new era”

Jorgo Chatzimarkakis, Hydrogen Europe

Association, whose 300 or so members have included DEKRA since July 2021, norms and standards as globally applicable as possible are also a basic prerequisite for a successful transformation to the hydrogen economy. “This would be good for climate protection as well as the competitiveness of the players involved,” affirms the German-Greek agricultural and political scientist. In his view, these players could include the Stuttgart-based start-up Oceanergy in the near future. Funded by the state government of Baden-Württemberg, among others, the company is developing the so-called Kite Propulsion System K1 as the heart of a high-altitude wind propulsion technology for innovative kite gas/fuel ships. With the help of generators and turbines, green hydrogen is produced and stored on the open sea and then delivered to port terminals.

Chatzimarkakis cites many more examples of the hydrogen economy’s momentum toward decarbonizing industry and mobility. These include European mega-project HyDeal, in which green hydrogen produced from solar power in Spain will be transported via pipelines to France, Spain, and Germany. The instigators want to build electrolysis capacities of 67 gigawatts in Spain by 2030. More than 230 electrolyzer projects have been announced in EU countries by 2040, totaling around 136 gigawatts. “We’re at the beginning of a new era that is creating entirely new value chains,” says Hydrogen Europe’s CEO. Politicians are now called upon to think big and not get bogged down in the details.

INTERVIEW

Three Questions for ...



Joakim Wikeby, Executive Vice President of DEKRA Group, Head of Service Division Industrial Inspection

1 How do you assess the potential of hydrogen technology?

The fact is that phasing out fossil fuels in line with the Paris Climate Agreement can ultimately only succeed through the implementation of technology based on green hydrogen. Overall, the potential applications are very diverse – whether as fuel in the mobility sector, as raw material solution for emissions-intensive industries such as the fertilizer, chemical, steel, and cement industries, or as fuel for commercial and residential building heating. In addition, hydrogen is ideal as a storage and transport medium for green energy.

2 Where do you see the biggest challenges for the future?

For a reliable supply of green hydrogen, policymakers must create the necessary framework conditions in terms of infrastructure and economic efficiency as quickly as possible so that consumers, companies, and countries can

rely on uninterrupted access to sufficient quantities of hydrogen. At the same time, the highest standards of safety and environmental compatibility must be ensured for all parties involved in production and transport as well as storage and supply of hydrogen.

3 What services and solutions does DEKRA offer regarding hydrogen?

We’re already well positioned in this area with hazard and risk analyses, certifications of pressure equipment, inspections of high-pressure gas pipelines and storage tanks, and services in the field of explosion protection. At the same time, we’re working hard to sustainably expand our portfolio of competencies – for example, to include pipeline inspections. We have recently recruited new staff and appointed a hydrogen program manager specifically to coordinate our services across all DEKRA Service Divisions and to provide advice. Our goal is to offer customers a one-stop solution platform.



Wind Energy

The Heavenly Resource

In fairy tales of old, wind is considered a “heavenly child”, but in times of climate change it’s becoming an indispensable resource. Europe, it has long been clear, needs more wind energy. But how can this potential best be harnessed? On land or at sea? DEKRA solutions has taken a closer look at current technologies and projects.

Text Joachim Geiger

Overview

Important Offshore Projects Past, Present, and Future

Alpha Ventus

Alpha Ventus, the first offshore wind farm in Germany, went into operation in the German Bight back in the spring of 2010. The wind farm, installed at a water depth of around 30 meters and located 65 kilometers off the coast, consisted of turbines with a rotor diameter of 126 meters and a hub height of 93 meters. By 2019, the wind farm had fed as much electricity into the grid year after year on average as 57,000 average households in Germany consume. Currently, wind turbines with a capacity of around 6,700 MW are installed in the German Bight.

East Anglia One

One of the world's largest offshore wind farms is located 43 kilometers off the British east coast on a level with the county of Suffolk. Covering an area of around 300 square kilometers, East Anglia One comprises 102 wind turbines with a rotor diameter of 154 meters and a total capacity of 714 MW. The turbines are located on a 65-meter-high, three-legged steel platform weighing over 800 metric tons, which extends 45 meters down to the seabed. East Anglia One was completed in July 2020 and is the first of four farms to be built in the region with a capacity of 3,500 MW.

Kriegers Flak

Denmark put into service the Kriegers Flak offshore wind farm in early September 2021. The wind farm is located 15 to 40 kilometers off the Danish coast in the Baltic Sea and covers an area of 132 square kilometers. The facility consists of 72 wind turbines with a rotor diameter of 167 meters and total height of 187 meters. The foundations weigh up to 800 metric tons each. With an installed capacity of 604 MW, Kriegers Flak is considered the largest wind farm in Scandinavia. It's expected to cover the annual energy consumption of around 600,000 Danish households.

Continued on the next page 

The EU Commission's European Green Deal is in dire need of support from heavenly powers. After all, the climate law approved by the EU Parliament in June stipulates that greenhouse gas emissions in the Union must be reduced by 55 percent compared to 1990 levels. Ultimately, these targets can only be achieved through the consistent use of wind energy or, more precisely, through the wind's kinetic energy that produces electricity. As the European industry association Wind Europe recently stated in Brussels, it's high time for the EU to greatly increase the expansion of its wind energy capacities in order to achieve the climate target - from 15 gigawatts (GW) in 2020 to at least 30 GW installed year after year in the future (total capacity onshore and offshore in the EU 2020: around 220 GW). These are ambitious goals for the wind industry, especially since landscape and environmental protection as well as lengthy approval procedures repeatedly take the wind out of new wind turbines' rotors in many European countries. Nevertheless, chances are high that wind power generation can be increased. Highly efficient turbines will play a role in this.

Wind turbines growing significantly

In several countries, startups are experimenting with innovative airborne wind turbines that climb to altitudes between 200 and 400 meters to harness the high-yield high-altitude winds for electricity production with the help of generator rope winches. However, there's more development work that needs to be done before these turbines can make a significant contribution. For the time being, the main burden of power generation lies with the classic onshore wind turbines that include a tower, nacelle, and rotor. These systems have become much more efficient in recent years. A study published in October 2020 on behalf of the German Wind Energy Association shows that modern onshore wind turbines now produce around ten times as much electricity as they did 20 years ago. This increase in output was made possible primarily by significant growth in turbine size - the average rotor diameter has roughly doubled from around 60 meters in 2000 to 2019. Today, rotor diameters range between 133



DEKRA experts support installers and operators of wind turbines with tests and inspections

Here's How It Works

Two different wind turbine design principles have prevailed:

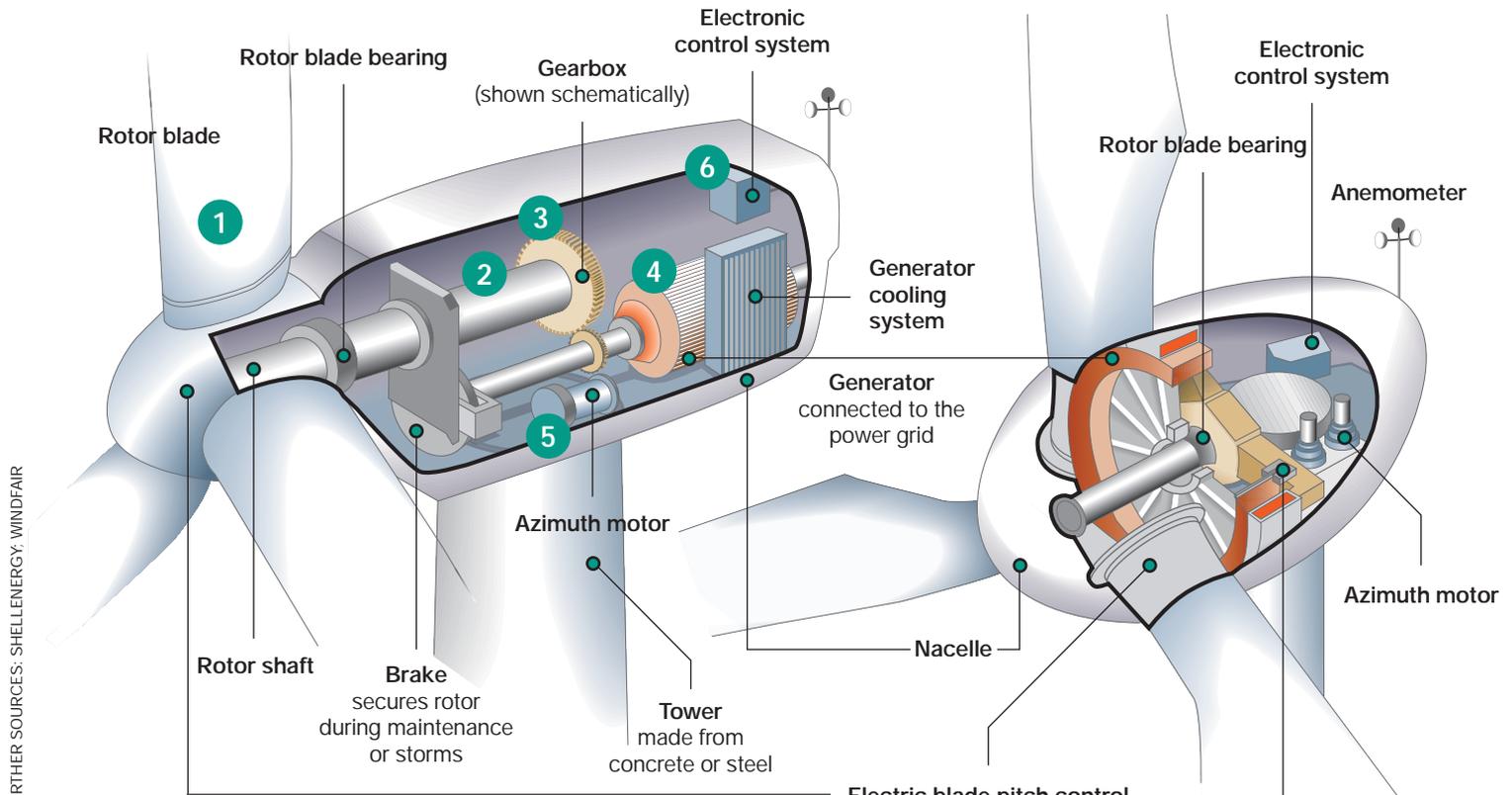
Turbines with gearboxes (A) increase the rotor's low rotation speed to a speed favorable for the generator. In gearless systems (B), the generator's rotor sits directly on the rotor shaft.

A/Example of a system with gearbox

Power: 3.3 megawatts
 Rotor diameter: 126 meters
 Hub height: 117–137 meters
 Rotational speed: 5–16 revolutions/minute

B/Example of a gearless system

Power: 3 megawatts
 Rotor diameter: 116 meters
 Hub height: 67–149 meters
 Rotational speed: 4–13 revolutions/minute



Grid connection

The wind turbine is connected to the power grid via an intermediary DC circuit. The alternating current generated by the generator is first converted into direct current and then back into alternating current with the correct frequency and voltage. This enables variable-speed operation of the wind turbine and minimizes mechanical loads.

Electric blade pitch control

In pitch-controlled turbines, the angle of attack can be changed to maintain a consistent rotational speed at varying wind speeds

Brake secures rotor during maintenance or storms

How wind turbines work

- 1 The wind sets the wind turbine's rotor blades in rotating motion
- 2 The rotary motion is transferred to the gearbox
- 3 In the gearbox, slow rotary motion is converted into fast rotary motion
- 4 The generator converts the gearbox's rotation into electricity. Gearless systems don't use a gearbox to convert rotation speed. In exchange, their generator is larger and heavier
- 5 The azimuth motor always turns the nacelle so that the rotor is favorably positioned in the wind
- 6 In case of too strong winds or maintenance work, a regulator switches off the system

Continued from page 40 

Hywind Scotland

The world's first floating wind farm is "Hywind Scotland", which opened in 2017 and is installed around 30 kilometers off the coast of Scotland in a water depth of 95 to 120 meters in the North Sea. The park, which covers an area of around four square kilometers, consists of five wind turbines, each with a tower almost 100 meters high and rotor blades 75 meters long. The total capacity of the plant is 30 MW. The turbines sit on floating bodies around 90 meters long and weighing 3,500 metric tons, which are held in position by steel chains.

Nezzy²

The Nezzy² research project of North German engineering company aerodyn engineering consists of two wind turbines on a floating foundation made of precast concrete elements, which aligns itself independently with the wind flow and is anchored to the seabed with six lines. The two wind turbines are supported by two towers set at an angle in the center of the foundation. Nezzy² currently exists only as a 1:10 scale model 18 meters high, which recently successfully passed a two-month test in the Greifswalder Bodden in the Baltic Sea. A full-scale prototype is scheduled to make its debut off the coast of China in early 2022. An output of around 15 MW is planned.

Windcatcher Norway

The Windcatcher from Norwegian company Wind Catching Systems, founded in 2017, is a square lattice tube frame with a side length of around 320 meters, which is fixed to a floating body anchored in the seabed. Around 100 small rotors are mounted in this framework, which together deliver five times as much electricity as the largest wind turbines. Compared to conventional turbines, the Windcatcher takes up only one-fifth of the surface area. At the same time, it has a larger effective range because the smaller rotors produce electricity at full power even at wind speeds beyond six Beaufort. So far, the spectacular project exists only in simulations; the first prototypes will be deployed in 2022.



and 170 meters. Hub heights vary between 90 and 166 meters and the rated output of larger turbines is 6.6 megawatts, while smaller units produce around four megawatts. But what are the bottom-line benefits of these characteristics? Using Germany as an example, the authors of the wind energy study come to a clear conclusion: By using modern wind turbines, wind power generation could be doubled to more than 200 terawatt hours (TWh) by 2030 - which would correspond to around 40 percent of electricity demand - on the areas designated for wind energy in Germany alone.

For wind farms, less is sometimes more

At first glance, it seems sensible to design wind farm capacities as generously as possible. However, planning according to the motto "more is better" can lead to incorrect calculations. The expected higher electricity yield is countered by physical and economic laws, as DEKRA expert Christian Leward explains. The Swede is Director of Wind Energy in the DEKRA Service Division Industrial Inspection. DEKRA supports installers and operators of wind turbines in all project phases with com-

prehensive consulting and testing services - including material selection and development, certification and approval procedures, accompanying tests and inspections during the construction phase, all the way through to commissioning and operation. "If several turbines are positioned behind each other downwind in a wind farm, this can result in mutual shading. They take wind away from each other and can't perform to their full potential," Christian Leward knows. For smaller areas, it can therefore make sense to reduce the number of turbines if this improves the efficiency of the overall system.

Wind generation 2020 in EU + UK¹

	Offshore	Onshore
Wind energy capacity	25 GW	195 GW
Inner-european electricity demand share	3 %	13 %
Average capacity factor*	42 %	25 %

* The capacity factor is a way to measure a wind turbine's utilization. It describes the turbine's average power output over a defined period of time in relation to the maximum power output. For onshore turbines, the value varies between 15 and 34 %. The offshore sector achieves higher capacity factors between 35 and 47 %.

Future of wind energy out at sea

But perhaps the future of wind energy doesn't lie on land at all? When installing new capacities, more and more turbine manufacturers and electricity producers are drawn out to sea, where strong winds blow undisturbed across the water. Experts assume that wind turbines at sea generate around 20 percent more electricity than comparable turbines on land. Manufacturers are already pushing into incredible performance spheres with their offshore turbines. The international front-runner is a prototype from General Electric Renewable Energy: The Haliade-X-14 MW, equipped with three rotor blades, each 107 meters long, rises 260 meters into the air and generates a nominal output of 14 MW - one rotation of this turbine's rotor is enough to supply a house with two days' worth of energy. In fact, the European Union sees offshore

	Denmark	48 %
	Ireland	38 %
	Germany	27 %
	United Kingdom	27 %
	Portugal	25 %
	Spain	22 %
	Sweden	20 %

technology as a major future component of Europe's energy system.

By 2050, the EU aims to install 300 GW of offshore wind power capacity using ground-based and floating turbines. So far, offshore turbines dominate at sea, anchored in shallower coastal waters up to 50 meters deep with elaborate foundations in the seabed. However, only about five percent of marine areas are suitable locations for these technologies. There are currently 12 GW installed with this technology in EU waters. In future, the electricity yield could be even better with floating wind turbines - they can be deployed at ocean depths no longer accessible to conventional offshore technology. At the moment, the portfolio of floating turbines is still manageable - the installed capacity in the EU is around 40 MW. However, several member states have already announced larger projects.



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