

VOLKSWAGEN

AKTIENGESELLSCHAFT

Shift

LIGHT

Brilliant minds are developing exciting concepts and rebuilding the company for lasting sustainability.



SHADOWS

After two years of the diesel crisis, there are questions – both old and new.



Shift

That which appears to be a fact today can tomorrow prove a mirage. Those who aren't able to comment can at least convey their attitude. *Shift. The Sustainability Magazine* is born of the crisis.

Our motto: Have the courage to deal with conflicting goals openly. We want to foster change within the company and generate understanding outside.

Shift seeks out the opinions of others. We want not to smooth things over, but to stay argumentative. Not to unthinkingly follow the pack, but to ask what really helps reestablish trust.

In this spirit, we want to hear your opinion, too.
Tell us at shift@volkswagen.de

Editorial

Dear Readers,

How can we talk about sustainability without drawing ridicule? That was the question that Michael Scholing-Darby, Head of Political Communication, answered a year ago with a shift: He gave the floor to our stakeholders. At the same time, people in key positions within the company have been practicing dialogue: how to listen and respond. For this we have received much recognition – from readers, but also from communications professionals, who have honored *Shift* with awards.

If I didn't believe that we were on the right path with *Shift*, I almost certainly wouldn't have signed a contract of employment at the start of the year. But I am asking myself – and you: can a publication like this, however self-critical and combative, do reassure individuals? Can it promote change within the organization as a whole?

I want to believe it can. Changing our corporate culture needs more than just time. It needs leaders who send out strong signals of modernization, and staff who are convinced that the signals are genuine. *Shift* aims to encourage everyone who wants to take this opportunity to become an agent of change. We are not just communicating content, but also an attitude. Read the second issue of *Shift* as documentation of light and shadows along this path.

We start with a “deep dive,” looking over the shoulder of Larry D. Thompson, the monitor appointed by the US Department of Justice, to see how

he and his team are helping to make the company better. Gesine Schwan, a political science professor and President of the Humboldt-Viadrina Governance Platform, analyzes what can happen when an industry is considered “too big to fail.” Equally fascinating is the debate about diesel between two experts whose awareness of the importance of environmental and climate protection no one will question: Tobias Austrup, Greenpeace Germany's transport expert, argues against it, while Professor Michael Braungart, champion of the cradle-to-cradle principle, argues in its favor.

In this magazine you will also get to know the members of the Group's Sustainability Council and their focus areas. And we present company employees who have spoken to us about work aspirations and realities during this time of change. Finally, two longer features take us into the future of mobility – an area where the Volkswagen Group is working with cities and IT companies and recently extended its work to Africa.

Shift would be nothing without the frank words of our external authors. Nor would the magazine be possible without the encouraging support from so many colleagues. My sincere thanks to all of you!

Kind regards,




Daniela Blaschke,
29, works in Public Affairs and Sustainability at the Volkswagen Group. She is convinced that it is not just the people of her generation who are looking for meaning in their work.

“How can
communication
change
organizations?”

Content

06 The untouchables

How the special team around US lawyer Larry Dean Thompson is monitoring Volkswagen.

10 With considerable effort

Massive amounts of data are being collected in getting to the bottom of the diesel crisis.

11 Supporting the change or just pretending?

Georg Kell on the mixed feelings of the Group Sustainability Council.

12 Still just talk – or transformation?

How stakeholders see Volkswagen's will to reform.

16 Between ambition and reality

Bjørn Otto Sverdrup and Prof. Dr. Gerhard Prätorius discuss about sustainability management.

18 Two years later

On September 18, 2015, the diesel crisis came to light. Steps in coming to grips with it.

20 Rebuilding trust

The results of an international reputation study.

21 “Too big to fail” breeds ignorance

Prof. Dr. Gesine Schwan on narrow-minded power thinking.



22 Let's speak frankly

How employees are experiencing the cultural change.

28 Scapegoat or polluter?

Prof. Dr. Michael Braungart and Tobias Austrup – pro and con on diesel.

30 The curse of variety

Facts, challenges, and future options for sustainable individual mobility.

34 Autonomous, digital, emission-free: mobility tomorrow

Volkswagen aims to be a leading player in the new business areas.

“The transformation won't be easy. But we're confident that Volkswagen wants this change.”

Georg Kell

42 “Drivers” of climate change

How innovative concepts are making freight transport cleaner.

43 “Nothing but excuses”

Margo T. Oge on regulations for heavy commercial vehicles.

44 “We need to get the pricing right”

Connie Hedegaard and Prof. Dr. Ottmar Edenhofer discuss paths to decarbonization.

46 The air is getting thin for combustion engines

On emissions, immissions, and concepts for better air quality.



48 Forecast-Based Financing – preparedness reduces suffering

Elhadj As Sy on the role of prediction in responding to natural disasters.

50 Rush hour in Rwanda

Volkswagen seeks to bring a ride-hailing system to the streets of Kigali.

58 When algorithms make the decisions

Johann Jungwirth in a chat on risk and opportunity.

60 How to make sure your innovations fail

Five not perfectly serious tips from Christoph Keese.

62 Off with the blinders!

The labs where Volkswagen is reinventing itself.

PUBLISHING INFORMATION

PUBLISHER

(Responsible according to the German press law)
Volkswagen AG
 Dr. Thomas Steg
 Head of Public Affairs and Sustainability
 Letter box 1882
 38436 Wolfsburg

PROJECT MANAGEMENT

Daniela Blaschke,
 Michael Scholing-Darby
 Administration and Policy Planning
 Public Affairs and Sustainability

CONCEPT AND REALIZATION

Rat für Ruhm und Ehre GmbH,
 Düsseldorf/Berlin

Chief Editor

Sepideh Honarbacht

DEVELOPMENT AND CREATIVE DIRECTION

Angela Ziegler (ZIEGLER., Berlin)

Image Editor

Anne Grobler

Layout

Laura Böhmer, Angela Ziegler

STAFF FOR THIS ISSUE

Project management

Anika Schulze (Volkswagen AG),
 Tanja Iwas (Rat für Ruhm und Ehre)

Text

Thomas Beck, Daniela Blaschke,
 Britta Bauchmüller, Anette Frisch,
 Sepideh Honarbacht, Gerrit Harms,
 Christian Kassyda, Daniel Kastner,
 Dr. Elmer Lenzen, Kirsten Milhahn,
 Michael Scholing-Darby,
 Dr. Stefan Schmerbeck, Valdis Wish

Images

Ériver Hijano, Jonas Holthaus,
 Kirsten Milhahn, James Carey/Début Art,
 Uli Knörzer, Gregory Gilbert-Lodge,
 Ole Häntzschel,
 Mathis Rekowski/2agenten

COPYEDITING

Gabi Kämpken (correc-tour online,
 Bad Zwischenahn)

LITHO

twentyfour seven
 creative media services GmbH, Berlin

PRINTING

oeding print GmbH, Braunschweig
 www.oeding-print.de

Paper

PAPYRUS RecyStar Polar

Edition

14,000 copies

Press deadline

Sept. 30, 2017

Volkswagen supports a forest protection project in Germany's Harz region to offset the CO₂ emissions caused by the printing of this publication.



Druck | ID 11339-1709-1025

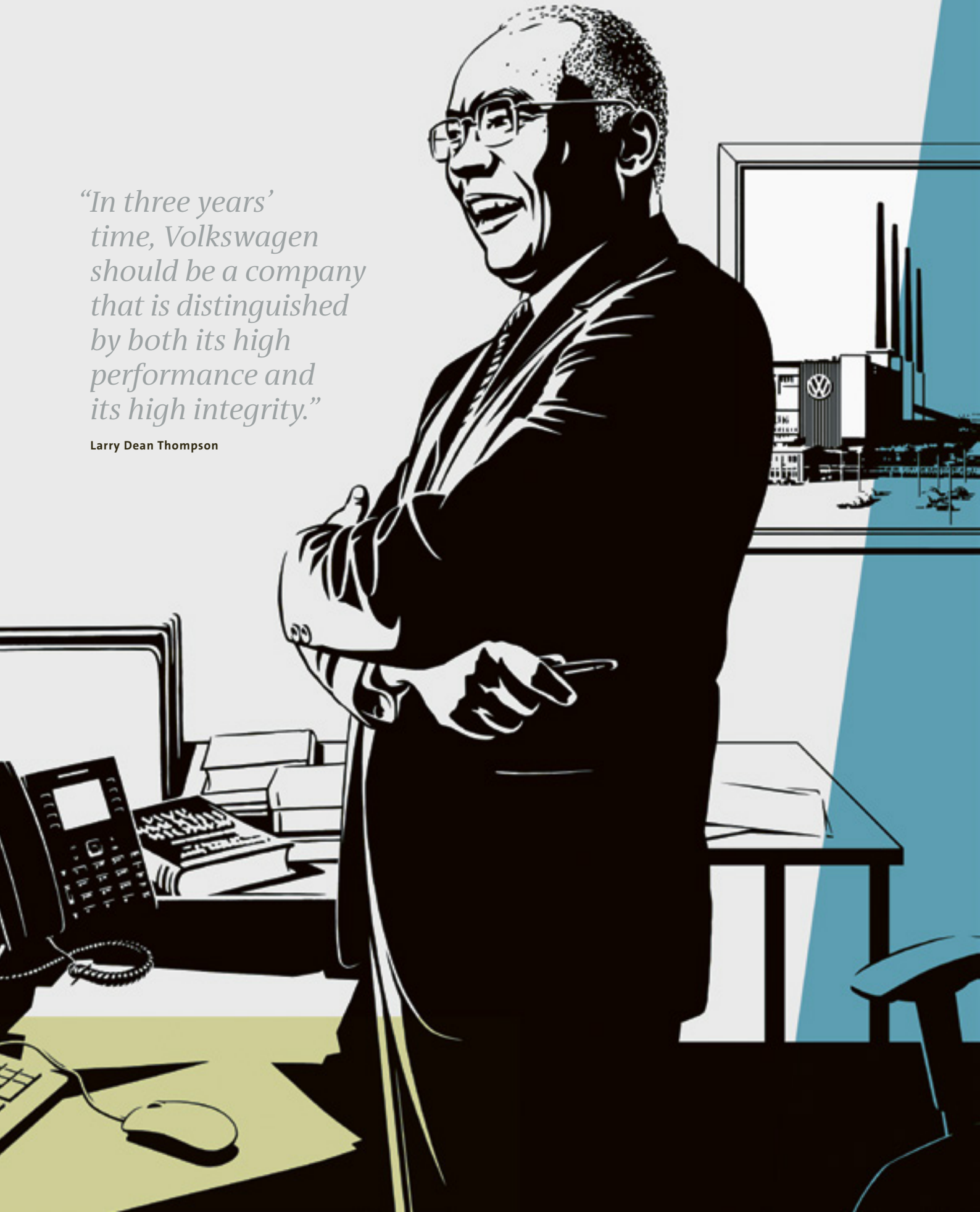


Dieses Druckerzeugnis wurde mit dem Blauen Engel ausgezeichnet.



*“In three years’
time, Volkswagen
should be a company
that is distinguished
by both its high
performance and
its high integrity.”*

Larry Dean Thompson



The Untouchables

Larry D. Thompson and his team are what you could call a special task force. It is their job to ensure that Volkswagen fulfills the conditions of the settlement concluded with the US Department of Justice in early 2017. Having the monitor on-site underlines the gravity of the situation. Everybody knows that cooperation is essential. The company can not afford to jeopardize the deal in the USA.

Text ___ Sepideh Honarbacht **Illustration** ___ Gregory Gilbert-Lodge

There is nothing terrifying about the amicable, elderly gentleman with a velvety voice. He peers curiously through his round glasses and casually talks about his impressive career. Larry Dean Thompson seems so likeable, he is the kind of man you would like to go for a beer with to chat about the state of the world in general, the USA in particular, and anything else that springs to mind.

But the top-ranking lawyer's reputation precedes him. He was appointed as Volkswagen's monitor, some say overseer, by the US Department of Justice (DOJ) in spring 2017. His remit for the next three years is to ensure Volkswagen fulfills the conditions imposed in connection with the criminal plea agreement and consent decrees in the USA.

Thompson is certainly up to the job. Between 2001 and 2003, he was deputy attorney general in Washington – the second-highest position at the DOJ. He un-

covered the accounting fraud at the energy company Enron – one of the most spectacular white-collar cases in American history. The result: hefty fines, dishonorably discharged managers and lengthy prison sentences for the executives. Now he is turning his attention to Volkswagen.

Officially, the 72-year-old Republican is actually retired. He has turned down several other invitations to act as a monitor. So why did he say yes this time? Larry Thompson is sitting in a quiet corner of a lounge at the International Motor Show in Frankfurt. He rests his elbows on the bistro table and laughs: "My wife says it's my ego. But I say: Volkswagen is an icon." At the front, the Group's impressive stand is packed with journalists and industry insiders. Thompson says he wasn't just interested in investigating the compliance side of things: he was also very intrigued by environmental engineering processes. "The complexity fascinated me."

Thompson's new role has seen him go from a late university lecturer to Independent Compliance Auditor and Monitor. Among his new colleagues are lawyers, engineers, and environmental experts.

A strong team

Just like Thompson, his deputy Jonny Frank has seen it all. The 63-year-old is also overseeing the remediation work

at Deutsche Bank as Compliance and Business Ethics Monitor. The division of labor between the two men is clear: Thompson defines subject areas and teams and holds talks with the most senior overseers and decision makers, such as supervisory board members and executives. Frank makes sure that things keep running: he submits requests, collects documents, and hires specialists to analyze data.

Jonny Frank is the only member of the monitor team with whom Larry Thompson had not previously worked. "Jonny was recommended to me. I was impressed by his knowledge and personality," says Thompson. The other members of the leadership team have known one another for years: Scott L. Marrah, Deputy Monitor Anti-Fraud, Ethics and Compliance, Benjamin F. Wilson, Deputy Monitor Emissions and Environmental, Michele Edwards, Chief of Staff, and Counsel Michael A. Sullivan, a law firm partner.

Since the end of May, Thompson has been spending about a week at Wolfsburg every month. Travelling there from his home in Atlanta takes 12 hours. He got to know the Group's key divisions at a "boot camp" and introduced himself to the members of staff at a works meeting in Wolfsburg. However, hardly anyone knows exactly what he and his team do all day just yet.

A MORAL CHAMPION

Larry Dean Thompson (born 1945) is a renowned US lawyer. Between 2001 and 2003, he was deputy attorney general in Washington – the second-highest position at the US Department of Justice. As US attorney for the Northern District of Georgia (Atlanta), he also dealt with complex cases such as the Enron scandal. He teaches corporate and business law at the University of Georgia School of Law.

In early September, the first Americans moved into open-plan offices at the Wolfsburg site. They are based in the fully secured, recently renovated former computer center, “Eingang 80.” It may not be the most appealing workspace – huge gray desks covered with piles of documents, large pictures of cars on the walls, and the occasional potted plant – but it has one advantage: the monitor team is just a few steps away from the executive complex, “BT10.”

Under scrutiny

The team of monitors meticulously goes through the conditions set out in black and white in the official documents that make up the resolutions with the US authorities – the Third Partial Consent Decree, the Third California Partial Consent Decree, and the Plea Agreement (the

“I don’t like being retired.”

Larry Thompson

“Criminal Resolutions”). Among other things, the monitor team must check, for example, how technical problems are treated by the management, quality is certified, and product safety is ensured. They have to check how emission certifications and audits are conducted. They also have to check whether compliance processes really are thorough. Checking, checking, checking. You could liken it to checking that the Group doesn’t flout its probation conditions.

HOW THE MONITOR CAME TO WOLFSBURG

As part of its plea agreement, Volkswagen AG has agreed to plead guilty to three felony counts under US law: conspiracy, obstruction of justice and using false statements to import cars into the US. As part of the resolution – comprised of four settlements including the plea agreement – Volkswagen has agreed to pay penalties and fines totaling \$4.3 billion and to a series of measures to further strengthen its compliance and control systems, including the appointment of an independent monitor for a period of three years. The monitor is selected by the DOJ from a shortlist of candidates presented by Volkswagen. In accordance with the Criminal Resolutions, Larry Dean Thompson was appointed as Volkswagen’s compliance monitor in April 2017. Since assuming the role, he has set up 23 specialist teams focusing on issues such as emissions, the environment, and anti-corruption; there are also three teams at the sites in Wolfsburg, Ingolstadt (Audi), and Herndon, USA. In his final report, which will be completed in 2020, Thompson has to confirm that Volkswagen fulfills all the conditions imposed by the Department of Justice. Otherwise, Volkswagen may be subject to additional criminal sanctions.

Thompson is given broad discretion within the scope of Volkswagen’s agreements with the U.S. Government. He has already established teams focusing on culture and integrity and even one which is responsible for the newly established Sustainability Council.

Sustainability is one of Thompson’s favorite topics. He published on corporate social responsibility while he was teaching at the University of Georgia School of Law. “Companies that want to succeed today need to serve all their stakeholders. Not just shareholders, but customers, employees, authorities – and yes, the environment too.” The latter is “a very important stakeholder” to Thompson’s mind.

Anything which represents a reputation and compliance risk is important to Thompson. However, he explains that he only talks to people: he doesn’t interrogate them. “Some members of staff think I’m the long arm of the American law and I can put people in jail,” Thompson says and laughs. “I can’t do that, of course.”

Monitoring is not about investigating past misconduct. Instead, it is about examining sensitive processes at the firm and identifying any weaknesses. With this in mind, it would be “very much a problem” if Volkswagen personnel chose not to cooperate, warns Thompson.

The facilitators

The monitor’s work schedule for the first year has been in place since mid-August. “It is an investment. But we expect to have long-term benefits,” says Dr. Thomas Meiers, Chief Coordinator for the monitor. He reports to Hiltrud D. Werner, the board member for Integrity and Legal Affairs. His past experience includes establishing a worldwide compliance management system at MAN Truck & Bus.

Meiers and his hand-picked team of 50+ employees now assist Larry Thompson’s team. Meiers’ people are based in the open-plan office right next to Thompson’s. Responses to the monitor team’s requests always have

Larry Thompson and his team are in direct contact with the department of Dr. Thomas Meiers, Chief Coordination for the monitor, in Wolfsburg.



to comply with tight deadlines – often within 24 hours.

“That means extra work for the people here,” says Meiers, adding that this is tough. But the consequences if the monitor does not write a good report at the end of the three years would be much tougher. He mentions a positive aspect, too: “Volkswagen will have a much more robust set-up in the future.”

Meiers goes on to say that the Group has already made a number of changes on its own initiative by introducing a whistle-blower system to uncover inap-

propriate behavior early on and revising its code of conduct. Meiers sees himself and his team as facilitators between the monitor team and the company.

Meiers studied in the UK and the USA, where he was also admitted to the Bar. He is familiar with Americans’ trademark openness and enthusiasm: “Just because Larry Thompson is amicable, it doesn’t mean he will go easy on the Group.” The tall, slim 46-year-old counts his steps each day using a fitness tracker. “I rack up a good 10,000 every day.” He is active and thinks ahead when it comes to the mon-

itor’s report, too. “I have never known a monitor’s first report to be free from suggestions for improvement: ours won’t be either.” Apart from anything else, Thompson has a reputation to lose.

So how does Larry Thompson view things? “This is probably the last big thing I’ll do in my career,” he speculates: “If there were to be another serious misconduct like the diesel scandal after our certification, I wouldn’t just be disappointed: I would be ashamed. I will do everything to make sure that doesn’t happen.” This time, Larry Thompson doesn’t smile. ◀

With considerable effort

In order to investigate the diesel crisis, an enormous amount of data is being collected. An overview.

In 2015, Volkswagen AG commissioned the US law firm Jones Day to conduct an “external investigation” to shed light on events and responsibilities in the context of the diesel scandal. The internal audit department also conducted investigations and handed its findings over to the external legal experts. In January 2017, the company reached a settlement with the US Department of Justice, which was accompanied by the publication of a “Statement of Facts.” When the settlement agreements came into effect, Jones Day’s original task was fulfilled. In the light of international proceedings against the company, the fact-finding mission continues, however, assisted by a number of other law firms. An auditing company is providing the teams with operational support.

550 terabytes

is the approximate amount of data seized in the course of the investigation by US law firm Jones Day. This is one of the largest volumes of data ever collected in business history.

700-plus

interviews were conducted by Jones Day with employees of the Volkswagen Group in Germany and abroad.

800

This is the approximate number of people whose data was seized in Germany and the US for the Jones Day investigation.

9,200

data carriers such as servers, computers and cellphones were accessed to obtain the data.

500-plus

internal and external experts, including attorneys and technicians, have been involved in the investigation thus far.

“The investigation into these events is still ongoing. It will keep us busy into next year.”

Hans Dieter Pötsch,
Chairman of the Supervisory Board of the Volkswagen Group

HOW DO YOU REVIEW MASS VOLUMES OF DATA?



1. Less is more

In the first step, experts use keywords to filter out relevant information. They also target specific individuals, organizational units and time periods.



2. Separating the wheat from the chaff

The data that is obtained is then reviewed by a large team for its actual significance. The reviewers flag the relevant documents.



3. The devil in the details

A smaller team of specialists then checks documents flagged as relevant. If a certain number of relevant documents is reached, the rest of the data can also be analyzed using algorithms.



4. Putting the pieces together

The specialists attempt to ascertain the background to the events. For example, they might interview people about the origins of the documents.

STATEMENT

Supporting the change or just pretending?

Can the Sustainability Council really help Volkswagen to become a better company?

A statement from Georg Kell, spokesperson for the council, one year into its establishment.

How sincere is Volkswagen when they talk about change? This is what all nine members were asking themselves when we were first convened one year ago. Despite our initial doubts, we accepted, because we knew one thing for sure – a crisis is an opportunity to implement changes. With the unfolding diesel story, Volkswagen now has the chance to transform into a modern, more digitalized, clean-powered, and people-centric company.

We came to our first meeting with Matthias Müller with mixed feelings. But by the end of it, we were quite optimistic. We then met with the works council, board members and others to get a better grasp of the situation. We held workshops to discuss how we could use our experience to help with the transformation.

We have identified three main work streams. First of all, encouraging the company to make a policy shift. When it comes to regulatory issues regarding environmental and climate protection, it should no longer be about finding the lowest common denominator. We have initiated stakeholder dialogues between company executives and NGOs and made very specific recommendations to the board of management: data sharing, greater transparency with regard to an impending EU regulation on heavy-duty vehicles and a gold standard for the measurement of real driving emissions.

Second, we want to support technological development and cultural change in the direction of greater openness and innovation. This requires contact with communities and a fine feel for outside impulses. We

have developed an open lab concept for sustainable mobility, which is set to start next year in Germany.

Third, we want to promote organizational change. We know that compliance issues are in good hands with the monitor team – there won't be any repeat of past mistakes. But Volkswagen needs to put more focus on areas that involve more than just compliance; for example, creating a collaborative environment which motivates employees through bottom-up concepts and a shared-purpose-driven approach.

The diesel crisis has become a top-priority issue for the country, and rightfully so. The public realizes that there was a social contract with the automotive industry which afforded great economic benefits to Germany – at the expense of the environment. We know that the transformation won't be easy. Naturally, there is some resistance. And some trepidation.

Our job is to provide reassurance and offer a road map to guide the transformation. We are confident that Volkswagen wants this change. And we are optimistic that good will come of it. ◀



Georg Kell, 66, is spokesperson for the Group Sustainability Council. He is the founding director of the United Nations Global Compact, the world's largest voluntary corporate sustainability initiative.

ABOUT THE COUNCIL

In September 2016, Volkswagen established the Group Sustainability Council. The independent council is comprised of internationally renowned experts from politics, science and research. Its members advise the Group management board on the issues of sustainable mobility, environmental protection and social responsibility, as well as integrity, the future of work and digitalization. In September 2017, the council welcomed its tenth member, Yongtu Long, Dean of the School of International Relations and Public Affairs at Fudan University in Shanghai.

Still just talk – or transformation?

In the wake of the diesel crisis, the company is showing its will to reform. Volkswagen is implementing changes in a number of areas. But are these measures enough?

We are open to dialogue: In the following section, we provide a platform for critical opinions from our stakeholders. Under the respective subject headings, we make our own position clear.

Edited by — *Daniel Kastner*

When the diesel scandal broke at Volkswagen, it came as a shock to millions of car owners. And while North American VW customers received speedy and full compensation, two years later, European customers are still left with a lot of unanswered questions. Will the software fixes make my car clean? Why aren't I being compensated? Who will reimburse me for the falling residual value of my car? What if my diesel engine starts having technical problems after the update? Volkswagen needs to take these questions



Ingmar Streese, 53, has headed the Consumer Policy Division at the Federation of German Consumer Organizations (vzbv) since July 2014. He holds a degree in biology and has previously worked for the German embassy in London, the Mars food corporation, and as division director in the German Federal Ministry of Consumer Protection.

very seriously and provide binding responses. It isn't enough to offer buyer's premiums on new cars – especially on bigger models like the Amarok, that aren't very environmentally friendly. And a promise that complaints in connection with the retrofitting will be addressed is no substitute for a warranty. Along with humility, honesty, and the genuine desire to find a solution – including in the area of new drive technologies – legally binding warranties are a basic prerequisite for regaining consumers' trust.

CUSTOMER RELATIONS

The situation in the USA and Canada has important specifics compared with the EU and the rest of the world. In both countries, courts have ruled that Volkswagen has to implement modifications to affected vehicles free of charge. Under US law, customers also received compensation, and some cars were bought back. Meanwhile, the regulations governing nitrogen oxide emission limits for vehicles in the USA are much stricter than in other parts of the world. Thus engine variants are also very different to those in the rest of the world, and technical solutions for the affected vehicles in the USA are more complex, also to implement. In Europe, the Group is offering a technical solution that ensures vehicles continue to meet legal requirements. So far, already seventy percent of the affected vehicles in Europe have been fixed. In Germany, this number is as high as 90 percent. The relevant regulatory authorities have confirmed that application of the technical measures does not adversely affect fuel consumption figures, CO₂ emissions figures, engine power, maximum torque or noise emissions. The brands of the Volkswagen Group are voluntarily offering their customers incentives for switching either to modern diesel vehicles, compatible to Euro 6 standard or to electric cars. Recently conducted independent testing has shown that the Group's new diesel models in particular have nitrogen oxide emissions far below EU limits.

A lot has happened over the last two years. We have become aware, and been made aware, of many things. It takes time to make changes. We see this for ourselves every day. Learned behaviors can be stubborn. They don't change as quickly as we would like. This can sometimes be hard to accept – and sometimes also frustrating. We still have a long way to go as we learn to think critically

– rather than doing things just because that is the way they have always been done or have always worked, or because it seems easiest that way. However, this also means that we will have to grapple much more with the outside world. It is important that we really want to pay attention, cooperate, and work together. I feel that this motivation is still lacking. People remain focused largely on their own division. If we really want to move forward, this urgently needs to change. It is about approaching the “other” area of expertise with respect, incorporating it into your own considerations and working together to drive development forward. This should be reflected in our systems as well.



Cornelia Schneider, 53, heads the Volkswagen Group's experience space “DRIVE” in Berlin. She studied sociology and social psychology and held positions at the broadcaster Norddeutscher Rundfunk, Sony, and AOL Time Warner, among others, before joining Volkswagen in 2003.

CORPORATE CULTURE

In the Code of Cooperation, we find the following passage regarding communication and exchange within the company and between the brands: “The right choice can only prevail over the one dictated by power if rank, position and origin are not as important.” The fact that management chats with employees live on the company's own social media platform and that we are finding more ways to have an open dialogue that extends beyond hierarchies are important signals. But they are just the beginning. It is crucial to establish a corporate culture in which hierarchy does not get in the way of good ideas – one in which employees feel comfortable approaching their superiors and are not afraid to voice grievances. This is the cultural transformation that Volkswagen is actively pushing forward.

SUSTAINABLE MOBILITY

The company continues to add to its range of alternative drive vehicles. In the spring of 2017, the portfolio already included 21 vehicle models with electric, plug-in hybrid, or natural gas drives. By 2025, the Group aims to launch 50 new electric cars and 30 new plug-in hybrids. By 2030, there will be an electrified version of every model in the lineup. The Group has also developed its first self-driving concept car, known as “SEDRIC,” and, with the founding of the MOIA unit, taken a big step in the direction of mobility service provision – think carpooling and ride hailing.

It is high time for a realignment. The Volkswagen Group must seize this opportunity. Shifting the focus to future-oriented vehicle drives is absolutely the right decision. It is time to phase out combustion engines in favor



Michael Müller-Görnert, 48, transport policy officer at the eco-friendly Verkehrsclub Deutschland (VCD). Müller-Görnert holds a degree in geography. Since 2009, he has been a board member of “Transport & Environment,” the umbrella organization of European environmental and transportation associations.

of electric cars – by which I mean true battery-driven models. There is no point in taking a heavy SUV and equipping it with an additional electric drive that reaches only good results under lab conditions. China and California are already “charging ahead” in the switch to electric cars, and we have to keep pace. It is also smart to invest in mobility concepts that are fit for the future. After all, mobility must and will change, especially in urban areas. Our cities are already suffocating from automobile traffic. Besides causing pollution and noise, cars take up a lot of space. The days of the car-centered city are numbered, with the different modes of transportation now increasingly blending together. The keyword is “multimodal mobility.” And the only cars that will be accepted here are models that are emission-free and can be shared.

Volkswagen has its eye on the horizon, searching for sustainable mobility concepts to launch on the market. The big picture has been sketched out, which is a good start. But the details will decide whether or not stakeholders accept the vision. And that is where Volkswagen has been burned in the



Volker Weber, 55, has served as Chairman of the Board for the Sustainable Investment Forum of Germany, Austria and Switzerland (FNG) since 2007. After earning his degree in business management, he began his career at the German Central Bank in 1988. Currently, he serves as Managing Director of the Stuttgart-based company Invest in Heads Beteiligungs GmbH.

past. Sustainability is not defined in ecological terms alone. It is also an ethical and social concept. A brilliant sustainability strategy isn't at all sufficient. It has to be internalized and credibly and responsibly applied by people in every division and at every level. Otherwise issues like bribery, corruption, and questionable business practices can be grounds for exclusion from the sustainable capital market. And that would push a good, goal-oriented sustainability strategy into the background and defeat the whole purpose. Ultimately, it is in the interest of the cause and of everyone involved to agree on a sort of *conditio sine qua non*: the entire management must make a commitment to the sustainability strategy and do everything it takes to ensure that it is fully integrated and implemented in workflows, and monitored accordingly. Reaching sustainability goals could be incorporated into a performance-based remuneration model. This would be a good way to create incentives for people to follow the strategy and put it into practice.

SUSTAINABILITY MANAGEMENT

With the international Sustainability Council, Volkswagen now has an external advisory body to support the company's own organizations. The council will support Volkswagen in implementing "TOGETHER – Strategy 2025," the major transformation program intended to help Volkswagen become a leading provider of sustainable mobility. In the course of the transformation, the company plans to return to active participation in bodies including the United Nations Global Compact and the World Business Council for Sustainable Development. Currently, Volkswagen has suspended its memberships in these and several other initiatives, but remains committed to their goals.

CLIMATE PROTECTION AND THE ENVIRONMENT

In coordination with its brands, the Group has identified "climate protection and decarbonization" as a new field of its sustainability management program. The company wants to be a "role model for environment," which means continually reducing its carbon footprint. The "decarbonization index" will allow to measure and monitor this goal. Recently, the Group has consolidated all its environmental protection and nature conservation activities in an own field.



Dr. Wiebke Zimmer, 46, a chemistry graduate and doctor of physics, has served as Deputy Head of the Resources & Transport division at the Oeko-Institut in Berlin since 2013. There, she conducts research into sustainable mobility and runs the "Renewability" transport research project.

The fact that climate protection and decarbonization have only lately been identified as a "new" sphere of activity is surprising and stands in contrast to Volkswagen's claim as a pioneer. The law has already established a wide range of pollution- and climate-protection guidelines. But the urgently needed reduction in CO₂ and nitrogen oxide emissions was never realised in real operations. The main reason is that in product development, all energy was devoted to trying to take advantage of the perceived leeway in interpreting the standards – at the expense of the environment and consumers. With half-hearted approaches like software updates or attempts to block ambitious CO₂ goals from being set, it seems hard to believe thus far that the board members have the intention to change. The only way Volkswagen

can restore its credibility is with a comprehensive energy and environmental strategy. This will mean setting ambitious targets and specific milestones – four sentences are nowhere near enough.



Prof. Dr. Gertrude Lübke-Wolff

64, is a member of Volkswagen's international Sustainability Council. A native of Austria, she served as a judge of the Federal Constitutional Court of Germany from 2002 until 2014. She teaches law at Bielefeld University and is a recipient of the Grand Cross with Star and Shoulder-Sash of the Order of Merit of the Federal Republic of Germany.

In the area of integrity and compliance, a lot has been done at VW. In September 2015, it became apparent that changes had to be made. There was, and still is, a need for organizational measures and intensive communication. The goal is to limit liability risks, satisfy the compliance monitors, and offset the damage to the company's image. But how do you ensure that employees are expected not just to meet strategic goals, but also to uphold standards of integrity? Structural changes, codes of conduct, and other messages about integrity aren't enough. Only when the words are followed by deeds will there be clarity. The values that are propagated have to be lived out. For example, executives must

encourage personnel to speak out against targets that can't be legally achieved, and they must penalize violations and reward their prevention.

INTEGRITY AND COMPLIANCE

Volkswagen has greatly increased its commitment to ethical standards and integrity. At the boardroom level, in early 2016, the company established the Integrity and Legal Affairs department. October 2016 marked the start of the "Sounding Board Program." Since then, 152 employees from all departments have been actively working to develop a culture of integrity at the Wolfsburg location. As part of the program, they have, for example, compiled a set of guidelines for making decisions in target-related conflicts, as well as an "action package" to help improve communication. Volkswagen is also working to more strongly anchor integrity and compliance in the selection of personnel and in human resources development processes, and has revised its Group-wide Code of Conduct.

COLLABORATION WITH SUPPLIERS

The transformation also affects the Group's suppliers. The company needs to invest in the development of new products which could also profoundly alter supply chains. Some new drive units require different raw materials and different qualifications. And they come with new sustainability risks. For this reason, Volkswagen will, for example, partner with the World Economic Forum to help enforce and monitor compliance with sustainability standards along the supply chain for raw materials for batteries. For many years now, the company has also supported a fair and collaborative dialog with its suppliers. For example, we provide sustainability training for employees of our suppliers. In 2016, over 1,300 people on four continents received training.

On the path to the mobility of the future, many suppliers and manufacturers are faced with enormous challenges. At Continental, we see it as very positive that Volkswagen is tackling these tasks. Sustainably transforming the way the company works with suppliers will be a long and tedious



Sven-Uwe Niemann, 55, has been Senior Vice President "Key Account Executive Volkswagen" with Continental since 2010. As such, he is responsible for his company's business with Volkswagen.

process, both organizationally and mentally. We look forward to our continued work with Volkswagen to develop innovative solutions. And we would like to encourage the company to try new things and see new business models as an opportunity. When it comes to e-mobility and connectivity, we have to act boldly. With innovations like the modular electric drive kit, Volkswagen is already clearly signaling a transformation, and we are very pleased with the speed and direction that it is taking.

Between ambition and reality

The Volkswagen Group is committed to becoming a “role model for environment, safety and integrity” in the future, pursuing “sustainable growth.” But how sustainable is this strategy? And how do you prove that? Bjørn Otto Sverdrup and Prof. Dr. Gerhard Prätorius discuss with Dr. Elmer Lenzen, publisher of the Global Compact International Yearbook, these questions.

Photo — Jonas Holthaus

Dr. Elmer Lenzen: Peer Gynt is a farmer boy who tries to escape from reality by inventing his own realities. A cynic would say: ‘That sounds like CSR management in big companies.’ What characterizes good corporate sustainability for you?

Bjørn Otto Sverdrup: To me, it means navigating the relationship between the company and society – and nature. Good sustainability officers are change agents, they are concerned about actual performance, and they work very closely with the long-term strategic agenda of their companies.

Prof. Dr. Gerhard Prätorius: Two years ago, I would have answered that a

company with a strong division, deep-rooted values and a good performance concerning social aspects – all that Volkswagen stood for – had a good basis for corporate sustainability. The big shock came with the diesel scandal. **Does something always have to happen before things change?**

Prätorius: People tend to get complacent after a long period of success. Our business was very successful, and it still is. And that does not necessarily foster openness to change. The crisis can now help accelerate the necessary change. Sverdrup: Some say, never waste a good crisis.

Prätorius: Good and secure jobs are traditionally just as important to Volkswagen as economic success – this also guides us during the process of transformation. In our factory in Kassel, today there are 17,000 employees producing gear boxes. They will produce electric engines in the future as the demand for gear boxes declines. This is how we try to balance ecological requirements and job security on the path to economic success.

Do you need to do your normal business differently, as former United Nations Secretary-General Kofi Annan has demanded?

Sverdrup: It is about constantly asking yourself: can you do better? Our sustainability strategy aims to build resilience, which means to be flexible, adaptable, grounded and also connected with our stakeholders.



“We are now working on topics that would have been impossible to discuss in this way before the diesel crisis.”

Gerhard Prätorius
Head of Sustainability at Volkswagen AG



“From time to time, shifts are necessary. They are a sign of vitality.”

Bjørn Otto Sverdrup

Bjørn Otto Sverdrup, Senior Vice President of Sustainability at the Norwegian oil and gas company, Statoil

Prätorius: It doesn't happen without a strategy. Then you have to define the right goals, KPIs and management practices. As sustainability officer, you should, however, never forget that you are a forerunner. You have to get your colleagues on board and openly address conflicting interests early on.

Sverdrup: *Our team is part of the strategy unit. We have embedded climate and environmental issues in all decision-making processes. We measure performance the same way we measure costs and earnings. This way, soft issues have become hard realities.*

What figures are we talking about? And what makes you confident that these indicators are appropriate?

Prätorius: We use recognized environmental KPIs and, on the basis of the new strategy, we are working on a decarbonization index. In addition, we are introducing a diversity indicator. With these steps, our new strategy has the potential to be a sustainable strategy.

Sverdrup: *At Statoil, one out of five KPIs is related to climate and sustainability. For example, energy efficiency, or CO₂ per barrel produced. But we also*

have KPIs for measuring growth in other areas, making sure to shift the capital in time, like investing in renewables and promoting what we think will contribute to long-term success.

One instrument you use at Statoil is an internal carbon price?

Sverdrup: *Yes, we believe that you need to show the cost of CO₂. So whenever we make investment decisions, we put a price tag on CO₂. This means, that CO₂-intensive projects are becoming less attractive as investments. At the same time, it stimulates environmental technology and makes it more profitable.*

Would this be an option for Volkswagen, too?

Prätorius: Yes, with an adapted design, this could be a driver for further transformation.

How do you make sure that profit targets do not override sustainability?

Sverdrup (laughing): *Our voice is heard, but there is never just one way to improve a company. It is really about finding the right balance, because you cannot have everything. But it's true: if you find a sustainability officer who is happy with everything, he or she is probably not ambitious enough.*

Prätorius: You have to make sure that you are part of the usual day-to-day business, but also have a good feel for new developments and are creative in dealing with them.

What is the role of investors?

Sverdrup: *I met an investor who said, 'I am a long-term investor in Statoil.' I asked him how long he usually holds a stock. He said, 'three weeks.' I think, however, the G20 have worked to raise the awareness among investors, in particular on climate-related issues.*

Prätorius: Particularly for investors, we have to try to measure sustainability. But there are limits to measurement, of course. This is why I think we also need a convincing narrative for the transformation.

Our system is built on the idea of bigger, faster, farther. Can growth be sustainable at all?

Prätorius: I cannot imagine that in an innovation- and market-driven economy we could follow a degrowth strategy. But we can decouple economic development from the use of resources and energy. This is what you call innovation. Especially in with the combination of digitalization and sustainability, I see new opportunities.

How do you bring such ideas into the company?



Two years later

The date is inscribed in the collective memory of the Group: on September 18, 2015, the diesel crisis came to light. Here are key events from the second year.

Text — Britta Bauchmüller

10,3 million

Sales remain high

Volkswagen sold 10.3 million vehicles in 2016. This is the strongest sales result in the company's history and makes Volkswagen the world's largest automaker. Despite the diesel crisis, sales revenue also rose to €217 billion, a €4 billion gain on the previous year.



Sustainability Council

Nine independent experts convene in Berlin for the first meeting of the Group Sustainability Council. The newly created body gathers information, drafts recommendations and initiatives, and advises the Executive Board on strategic topics.

1/30/2017

3/8/2017

Parliamentary investigations

The German parliamentary committee investigating emissions concludes its work. As the final witness, Chancellor Angela Merkel states that she was unaware of the accusations against Volkswagen until they were reported by the media. In late February, the European Parliament's Committee of Inquiry into Emissions Measurements in the Automotive Sector submitted its final report. Both committees had investigated possible misconduct on the part of the responsible authorities.



10/24/2016

1/11/2017

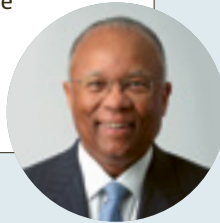
Statement of Facts

The US Department of Justice publishes a statement that lays out the findings and facts established as to the origins and evolution of the misconduct under U.S. federal law. On March 10, before a court in Detroit, Volkswagen pleads guilty to three felony counts under US law.



Monitor in Wolfsburg

Former US Deputy Attorney General Larry D. Thompson is appointed Independent Compliance Monitor at Volkswagen. For a period of three years, he will oversee and assess the fulfillment of the conditions set forth in the settlement reached in January 2017.



Antitrust-related questions

According to “Der Spiegel”, Volkswagen and other automakers are alleged to have made competition-relevant agreements since the 1990s concerning technology, costs, and suppliers. Volkswagen has not commented on the details of these questions.

4/21/2017

7/21/2017

5/31/2017

8/2/2017



Trust Building Measure

With its Trust Building Measure, Volkswagen is informing its customers in Europe and other countries outside North America that it would consider any complaints that are established to have arisen as a result of the implementation of the technical measure on vehicles with EA189 type diesel engines and that relate to certain parts of the engine and exhaust treatment system.

“Diesel summit”

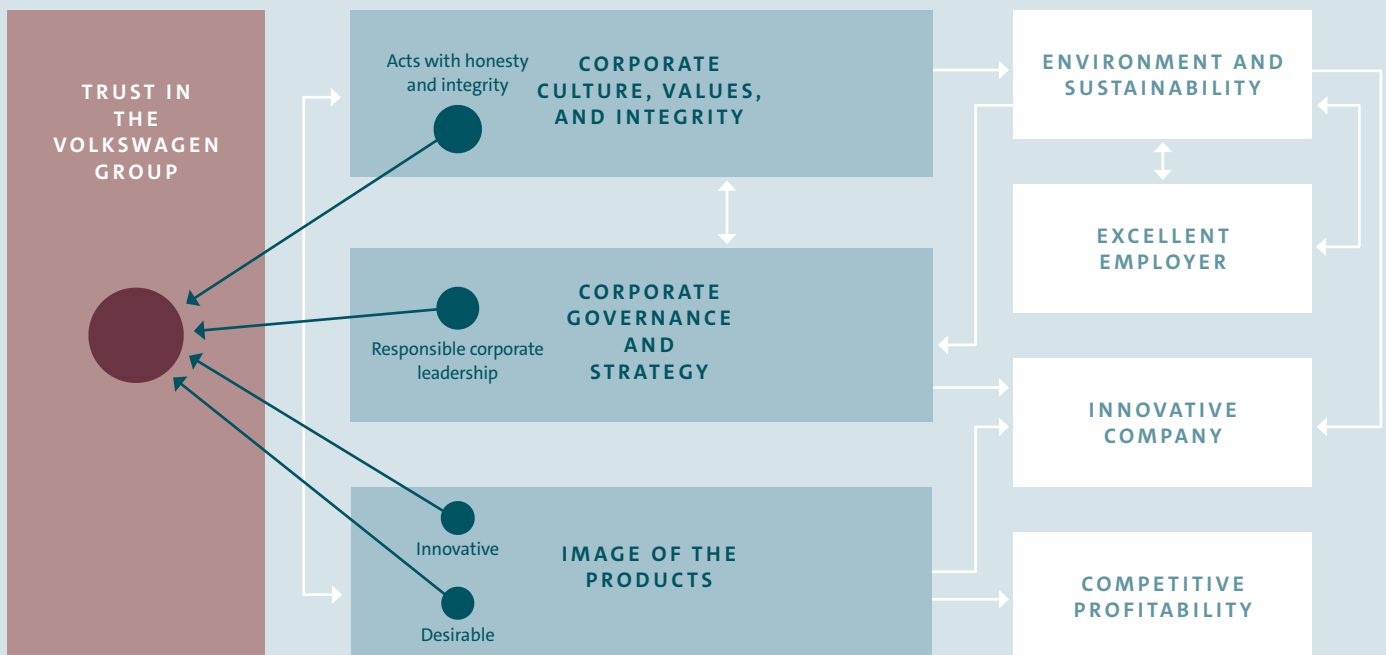
At the invitation of the federal government, representatives of the automotive industry and the German states meet at the National Diesel Forum in Berlin to discuss the future of diesel. The manufacturers pledge to provide software updates – but no hardware retrofitting – for the over 5 million EU 5 vehicles currently licensed in Germany and a small number of EU 6 vehicles. Through mid-2017, the Volkswagen Group had already retrofitted 5.3 million vehicles worldwide, including nearly 1.8 million in Germany. The manufacturers additionally announce scrapping and environmental premiums.



Rebuilding trust

Two years of crisis, two years of change – what does that mean for the reputation of Volkswagen?
A study offers insights.

Text — Thomas Beck



In the course of the emissions scandal, Volkswagen was excluded from various sustainability ratings. During the period that followed, many customers and stakeholders felt unsettled and disappointed. The company's previously good reputation was damaged. The new corporate strategy adopted in June 2016 was an important step in regaining trust.

Which aspects of the new program, the TOGETHER – Strategy 2025, have the greatest impact on the company's reputation and the potential to regain stakeholders' trust? A global reputation study conducted jointly with the opinion rese-

arch specialist Ipsos provides initial answers.

The findings: in addition to product perception, our stakeholders consider corporate culture, values, integrity, and corporate governance as being key to building trust. And this is precisely where they still see the need for action.

The credibility of our corporate messages was most strongly compromised in Germany and the United States. By contrast, Chinese opinion leaders have little interest in the diesel crisis. Instead, they are focused on the intense competition for top positions in e-mobility, digitalization, or mobility solutions for megacities. ◀

Schematic diagram showing which factors drive trust in the Volkswagen Group. To reduce complexity, only aspects with a direct impact are shown. Further information is available on request from shift@volkswagen.de.

Volkswagen reputation study 2017

In 20-minute telephone interviews, Ipsos questioned a total of 300 opinion leaders from academia, civil society, the media, politics, and the capital market in Germany, the USA, and China. Along with the TOGETHER strategy, the design of the study integrated Volkswagen's code of values and an analysis of key issues, as is required in sustainability reporting. The study is to be continued in the coming year.

ESSAY

“Too big to fail” breeds ignorance

In the wake of the diesel disaster, the industry is in danger – and condemned to sustainability. Obsession with power is obsolete. When will executives recognize NGOs as partners and stop looking at politicians as helping hands?

There is no doubt that the automotive sector is of huge importance for the German economy – in terms of both the invested capital and the number of people employed at all levels, including in the supply industry. Following the diesel disaster, which is by no means confined to the Volkswagen Group, the industry now finds itself in serious danger and able to survive over the long term only if it designs its products sustainably in the future.

It is widely accepted that changing track to focus on eco-friendly, socially responsible products is in everyone’s long-term interests, so why hasn’t this transition long since taken place? The sad, but true, answer is that the greatest enemy of sound sustainability is the professional narrow-mindedness, complacency, and short-term thinking and planning which is widespread among executives.

In today’s world, it is no longer enough to negotiate with legal and political representatives to secure the most-advantageous-possible business framework and then extract the utmost profit from it. It is vital that companies share responsibility for sustainable economic policy, that they exercise not just technical, but also

social and cultural imagination, and that they engage with diverse voices in society to answer questions of how we want to live and travel in the future. This is hard to accept when one is accustomed to almost unlimited power. The Harvard professor Karl Deutsch once defined power as the freedom from having to learn. In other words, “too big to fail” breeds ignorance.

But this has dire consequences, as we can now see. The situation doesn’t demand traditional power thinking. It calls for creative entrepreneurial will and corresponding action – for bravely exploring the future, debating with inconvenient nongovernmental organizations, and viewing political representatives not as objects of expensive lobbying efforts, but as allies in the fight for mobility concepts that are future-proof and serve the common good. This even promises to be more exciting

and meaningful than the perpetual chase for the best returns and the highest bonuses, which is ever fraught with the fear of defeat and humiliation. Dealing intelligently with – and for – others also happens to be a recipe for sustainable personal happiness. <



Prof. Dr. Gesine Schwan, 77, political scientist, was President of European University Viadrina in Frankfurt/Oder, Germany, until 2008. She habilitated with a thesis on Karl Marx’s social criticism. She chairs the basic values commission of the executive committee of the Social Democratic Party of Germany (SPD)

Let's speak frankly

The Volkswagen Group, according to currently common assumptions, is a typical company of the German automotive industry – hierarchical, authoritarian, dominated by men. But does that still hold true? What are the changes occurring through the technological revolution, the generational shift, and the cultural transformation taking place in response to the diesel crisis? We ask our employees.

Collected by ___Anette Frisch Photos ___Ériver Hijano



Thaddäus Kustra

64, head of automation and testing technology,
Volkswagen employee since 1985

“More listening and fewer monologues”

When I started at VW 32 years ago, we had a corporate culture. And it has evolved since then. It has gotten neither better nor worse. Because it can be only as good or as bad as the people shaping it. In my opinion, social competence and culture are inseparable. What good is it if someone talks about respect but then gets personal during discussions? A good corporate culture has to do with listening. That's what I expect from managers – they should listen and not just hold monologues. There are still too many decisions made that get stuck up at higher management levels and never reach the people in production. It's not enough that they can go and read up on it online. They need explanations in order to make sense of these decisions. All in all, I think communication needs to be more transparent and open. And we can do without the buzzwords. We hear enough of those as it is.



Anke Tesch

46, department head at Technical Development, has been with Volkswagen for 29 years

“With women, there’s a different atmosphere”

When it comes to women’s issues, Volkswagen still has a long way to go. In Wolfsburg, there are 10,000 people working in technical development. Only 1,500 of them are women. In upper management, there are currently just seven of us women, compared to 156 men. And in vehicle development, so far, I’m still the only female executive.

From the moment a woman takes part in a meeting, there’s a whole different atmosphere. The tension goes down within the group. The tone becomes friendlier, and discussions get calmer. Volkswagen is living out the ideals of diversity more and more and doing away with conservative reservations. The fathers on

my team take parental leave, stay at home when their kid is sick, or leave early for their daughter’s birthday party. Family is no longer just a women’s issue.

Executives have a big impact on corporate culture. They’re role models. But there are still some managers to whom power is extremely important. That’s why I think that executives should have their skills evaluated and examined on a regular basis, especially their social skills. HR needs to look more carefully at how each person deals with their coworkers, makes decisions, acts, and gives feedback on eye level. Call it supervision for managers, I suppose.

The wind of change

How the company intends to support employees in the cultural transformation.



NEW PATHS TO MANAGEMENT

The training of prospective managers is changing. The Assessment Center will be done away with, and the career path will now be focused on daily work performance. Anyone who thinks they have what it takes to be a junior manager will now be able to nominate themselves. We plan to introduce this new human resources development path for the Volkswagen brand by mid-2018 and implement it throughout the group by 2020.

“The transition has to be shaped in collaboration with the employees. We have to take their concerns seriously, talk to them, and provide socially just and equitable answers. Going forward, work has to still be safe and humane.”

Michael Sommer

former chairman of the German Confederation of Trade Unions (DGB) and member of the Sustainability Council



MORE WOMEN IN THE BOYS' CLUB

It's obvious – Volkswagen's top management is male. But the shortage of female executives is not the only area where the company needs to improve. People from other countries and cultures are also underrepresented in management. The goal of our new diversity strategy is to have more female decision-makers and more internationality in management.

ALLIANCE FOR THE FUTURE

9,000

new jobs

The “pact for the future” was concluded in order to support the socially compatible restructuring occurring at the Volkswagen brand. The partial early retirement program is being expanded; any positions that open up will be filled from within the company. In addition, we will offer 9,000 new jobs in the areas of digitalization and e-mobility; 700 of these have been created so far in 2017. Over 20,000 employees have registered within the span of two months for the digital internal job market.



DIGITAL SPACES

Many departments of Volkswagen work agile and implement new methods. In pair programming, teams of two work on the same project content. There is also international pair programming, called cross pairing. As the business world changes, spatial concepts are changing, too. The new IT-City in Wolfsburg is a prime example.



Astrid Bremer

47, assembly worker in components, Volkswagen employee since 2011

“I’d like to have clarity”

To me, integrity means acting in accordance with my own convictions and openly addressing the things that go against my conscience. That’s really important to me, which is why I’ve been an integrity ambassador since 2016. I hope to raise awareness on this subject among my coworkers. And it’s no easy task. Some people aren’t interested or don’t understand it. They say: “Simply explain to me what you really mean.”

I think the issue should be publicized more in the company. In any case, the production staff should be brought up to speed, too. Sure, there’s always information and discussions on integrity online on Group Connect. But most

of the staff who work in assembly, for example, don’t have internet access. They can’t even use Group Connect. Maybe we could use more printouts to reach everyone. Ever since Dieseltgate, I’ve noticed that the atmosphere at work is more tense. Some of my coworkers feel like they’re in limbo, because they don’t know what’s coming and what’s going to happen. They fear for their jobs. From all the talk about the future of diesel and electromobility, it’s clear that there will be some changes around here. Whatever happens, I hope that Volkswagen shows compassion. And that, instead of secrecy, we have clarity.



Dr. Stefan Wolf

54, Product Strategy, VW Commercial Vehicles, Volkswagen employee since 2002

“We need to change the way we communicate”

You can't turn a corporate culture around in the span of two or three years. If management thinks there are tools that you can use to influence corporate culture directly, they're mistaken. Corporate culture depends on the way we deal with certain things and the way we talk about mistakes. We need the courage to be critical of ourselves and more freedom to be able to strike out on new paths.

There are two areas where our corporate culture could potentially open up and improve. Firstly, we should have a real dialog with our stakeholders instead of trying to claim the right to decide who to talk to and who not. And second, we

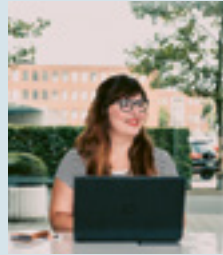
should be more tolerant of mistakes and allow more time and space for new things to develop. That's something we're still only doing halfway in our innovation process, to the effect that we're much too fast with the product and much too late with the user.

I'm disappointed at how we deal with crises. It has to be clear that a company should communicate openly about issues of public interest, instead of only shining the spotlight on the things that are going well. This type of sustainability communication we can do without. In the long term, we're only as good as our word.

MORE VOICES AT SHIFT.VOLKSWAGENAG.COM

“A cultural transition is not a one-time thing”

Iain Fraser, 34, doctoral candidate, Volkswagen employee since February 2017

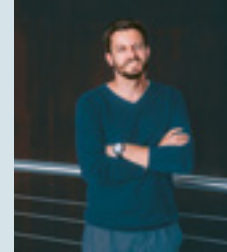


“We’re developing new relationship models”

Bitu Daryan, 31, future researcher, Volkswagen employee since 2012

“Simply do it!”

Christoph Köhler, 27, trainee at New Business Models & Connectivity, Volkswagen Truck & Bus employee since November 2016



Nils John

29, working in Digital & New Business since September, Volkswagen employee since January 2016

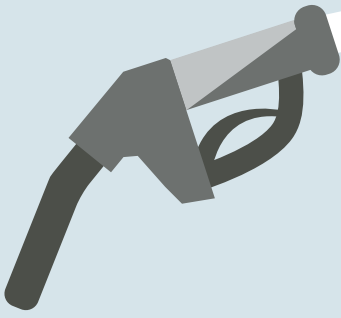
“I’d like to be given confidence”



During my training, I was able to work with digital technology in different departments. I noticed that people were really eager to experiment. There’s this drive, like: “Come on, let’s try it!” I really liked that.

As a trainee, I got to work in a different department every three months. I got to know a lot of coworkers that way both in Germany and abroad, and I was able to build up a big network. I think that personal contact is the key to good collaboration.

In a company that’s caught up in a crisis and going through major changes, a lot of opportunities open up. As a newcomer, I would want Volkswagen to have confidence in me. I’d want them to give me a chance, as a young man, to really do something. And I mean now, and not ten years from now when I’ve been with the company long enough.



Scapegoat

The diesel engine was the pride and joy of the German automotive industry. Does it still have a future? Two experts, two opinions.



The EPEA has been aware of automakers tampering with emissions software since 2013. As far back as 2010, every higher education institution in the world that teaches combustion technology knew that the legal standards could only be achieved by cheating.

In Germany, air pollution kills twelve times as many people as car crashes. We have modern diesel engines today that are capable of achieving the standards. That means the problem can be solved, and there is no need to ban the technology. But this doesn't take into account other sources of air pollution. In many brake pads, for example, asbestos has been replaced by antimony sulfide, which is high-

ly carcinogenic. Tire rubber is another source of air pollution, and with longer utilization times, we will be exposed to even more rubber particles than before. Gasoline engines have their own serious problems when it comes to particulates, and we don't have the material means for electromobility. The diesel ban, which reduces pollution by only a small percentage, is just a pretext!

Indoor pollution is many times higher than in the outdoor air. Asthma is the most common childhood disease by far. Forty percent of our homes contain mold. To really help clean up the air, what needs to be reduced, in addition to all the sources mentioned, is pollution from waste incineration plants, coal-fired power plants, agriculture (fine particles and ammonia) and especially indoor pollution. This includes, for example, bad vacuum cleaners, sooty candles, outgassing furniture and, above all, laser printers. With every page we print, we release billions of ultrafine harpoons that slice into our cells. The worst laser printers of all are made by a Japanese company that for many years now has been a sponsor of an environmental organisation, which might as well change its name to the "Kyocera Action Germany." Hypocrites!



Prof. Dr. Michael Braungart, 59, is a chemist and process engineering expert. He holds the academic chair for "Cradle to Cradle" at the Erasmus University in Rotterdam and at the Leuphana University of Lüneburg. He is the head of the Environmental Protection Encouragement Agency (EPEA) Internationale Umweltforschung and of the Hamburger Umweltinstitut (Hamburg Environmental Institute). His current maxim is "in dubio Korea."



"The anti-diesel campaign is just a pretext."

... or polluter?

“Software fixes are just painting over the problem. They won’t be enough to protect people’s health.”

Does the diesel engine still have a future? That’s witty – a pro-and-con debate on a rhetorical question. These days, even the biggest car nuts will tell you that there is no future for climate-damaging combustion engines, including diesels. How long are automakers going to keep denying reality? The sooner they accept the truth, the better. After all, there isn’t a single substantial argument left in favor of diesel. But there are plenty against it.

Climate Not long ago, politicians and industrialists were both singing the same song: diesel is the only way to reach our climate goals. Of all people, it was Germany’s minister of transport who proved them wrong. He had to admit that, on average, diesels release even more greenhouse gas than gasoline-powered cars. The fact that CO₂ emissions from traffic have not gone down since 1990 says it all. If we don’t quickly begin phasing out oil, climate protection will fail.

Air Diesel cars are the main cause of high nitrogen oxide levels in urban areas. Software fixes are just painting over the problem. It won’t be enough to protect people’s health. The updates are too ineffective for that. The only way to have clean air would

Tobias Austrup, 36, is a political advisor with the political office of Greenpeace in Berlin. His work focuses mainly on renewables, energy markets and sustainable mobility.



be to install an effective exhaust gas treatment system – or fewer polluting diesel.

Jobs The automotive sector is a pillar of German industry. If it is going to survive, it can’t just get rid of the diesel engine – it has to say goodbye to all combustion engines. If it doesn’t switch to electric cars quickly, it will be left behind for good. France, the UK and Norway have all committed to phasing out combustion engines. China, the biggest automotive market of all, looks set to follow suit. With every country that drops out, the market for combustion engines gets smaller. Every year, competitors like Tesla are gaining strength.

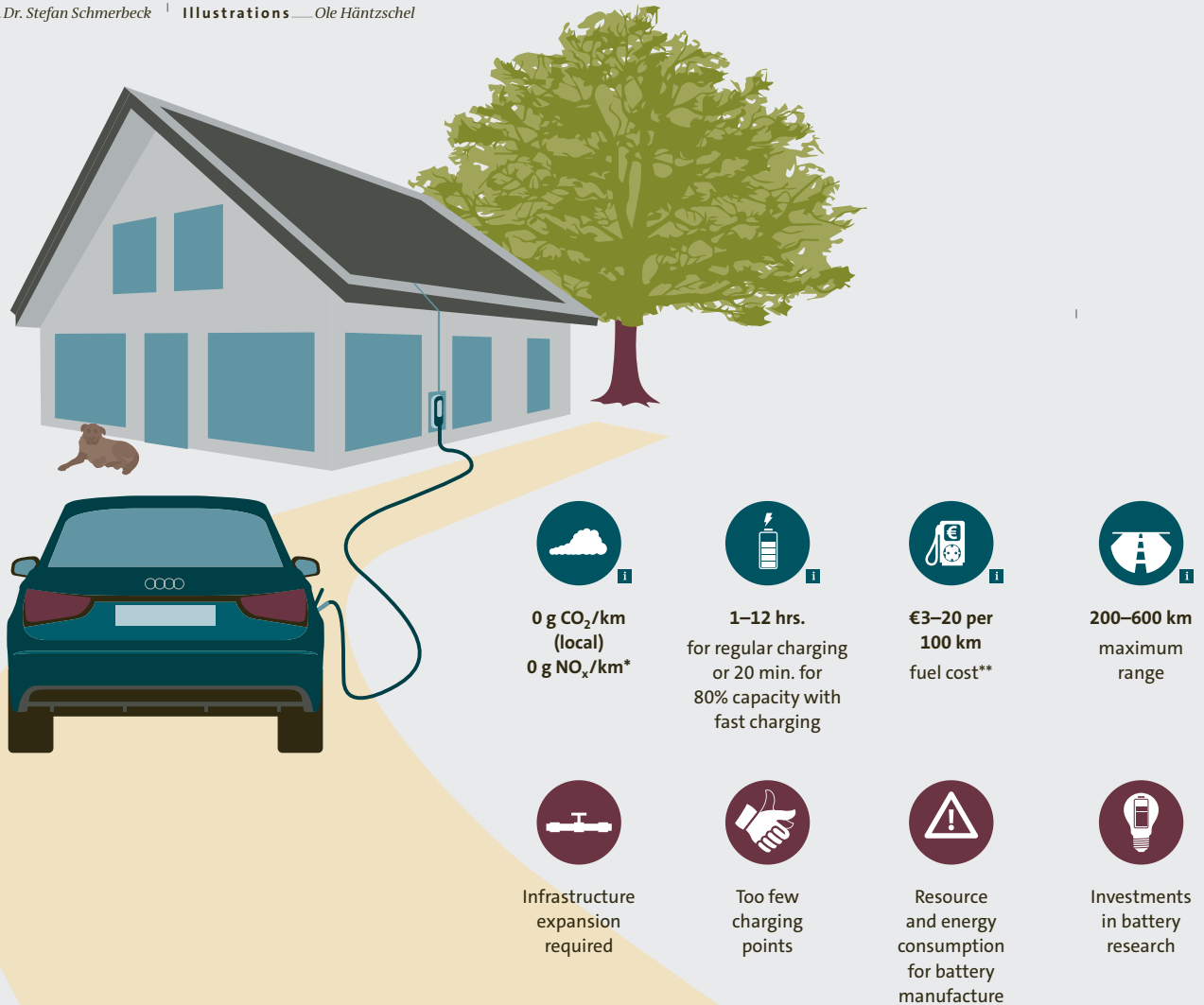
The automakers continue to turn big profits, but anyone still developing combustion engines is investing in the past. The future is electric. If we don’t devote all our energy to it today, it will happen somewhere else tomorrow. <



The curse of variety

The future of mobility is open. It is hard to say at this point which drive technologies will prevail and when, so automobile manufacturers are putting a lot of energy into researching and developing different technologies all at once. What follows is an overview of the facts, challenges and scenarios for sustainable individual mobility.

Text — Dr. Stefan Schmerbeck | Illustrations — Ole Häntzschel



E-mobility on the rise

Electric drives hold the promise of emission-free local mobility. And the electricity for charging stations in private garages on the urban periphery can be provided by photovoltaic panels on the roof. Employees and customers are already able to charge their cars on the premises of some large companies. Municipal authorities are also expanding the infrastructure in city centers.

Wherever possible, underground and multistory parking garages are being equipped with charging stations. Street lights are being fitted with power outlets. The German government is incentivizing the purchase of electric cars through premiums and tax breaks. Thanks to EU funds, 15,000 new charging stations are to be built nationwide by 2020, including 5,000 fast charging stations. And automakers are also building fast charging stations. However, frequent turbo-charging damages the battery.

* Zero emission vehicle as per CARB standard ** depending on charging performance

The values marked with **I** do not represent data on any specific or planned vehicle models of the Volkswagen Group. They are abstract, rounded values or estimates based on the current state-of-the-art technology.

Fuel-efficient gasoline and diesel engines

Combustion engines, especially diesels, have more than ever come under the general suspicion of polluting the air and contributing to climate change. Political pressure is rising. Short-term, cities are planning to implement driving restrictions. Medium- to long-term, governments are discussing a departure from the combustion engine. But even if one in every four cars is entirely electric in less than a decade, most of the vehicles on our streets will still run on gasoline or diesel. Combustion engines are popular, and not only among high-mileage drivers who appreciate their long cruising ranges. The infrastructure operates throughout the country and beyond national borders. And the engines are becoming more efficient with every generation. Synthetic liquid fuels produced from renewable energies will make a major contribution to the energy revolution.



120 g CO₂/km*
60–80 mg NO_x/km**



2 min.
to fill
the tank



€7–9 per 100 km
fuel cost



500–1,000 km
maximum
range



Transportation
revolution



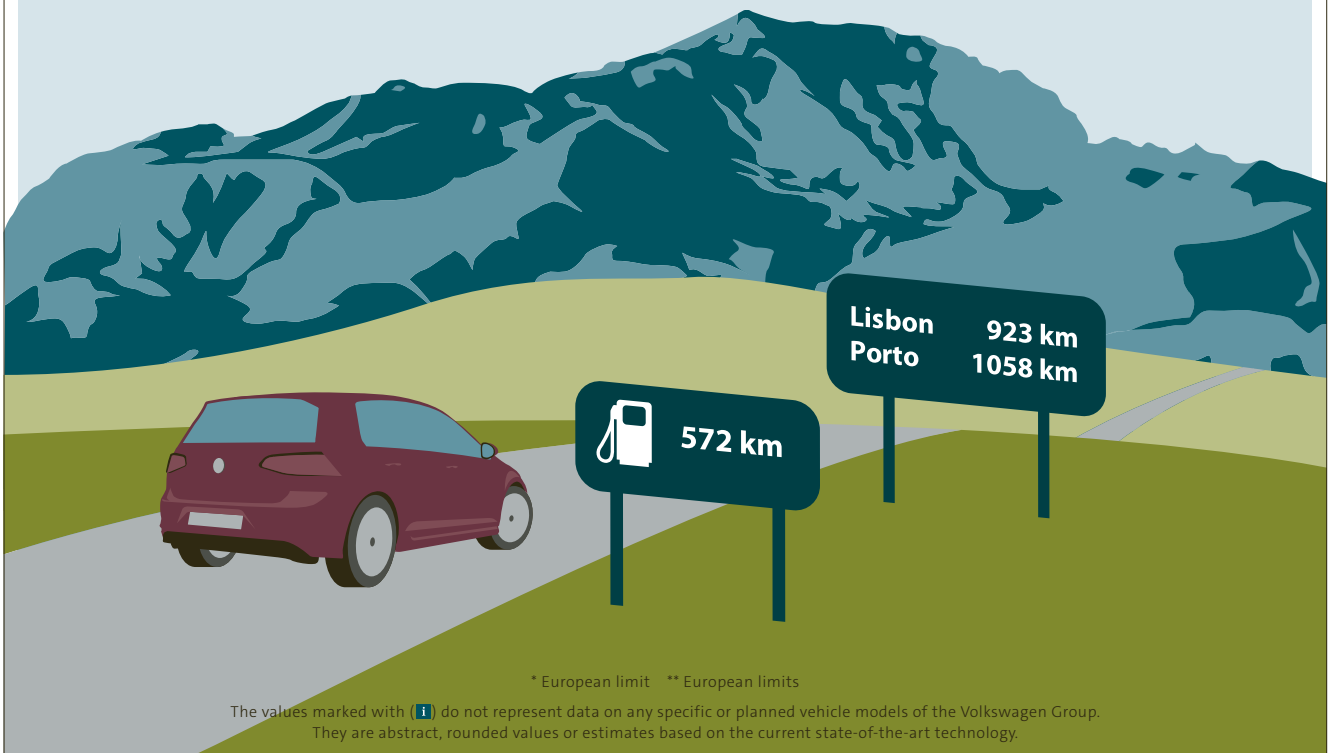
Driving
restrictions
in cities



Fossil
fuels



Increased
efficiency and
CO₂-neutral
fuels



* European limit ** European limits

The values marked with **i** do not represent data on any specific or planned vehicle models of the Volkswagen Group. They are abstract, rounded values or estimates based on the current state-of-the-art technology.

Cleaner with natural gas

Combustion engines that run on CNG (compressed natural gas) are the cleanest, and they benefit from a reduced energy tax. However, the fueling station network hasn't yet reached sufficient density in rural areas. Volkswagen, CNG fueling station operators and gas providers want to change this. Together, they want to bring the number of fueling stations up to 2,000 by the year 2025. Bivalent engine models that can run on both gasoline and CNG are well-suited to longer trips across country borders. For many consumers, though, the price comparison with other fuels is complicated. While many private customers are still unfamiliar with this technology, more and more city governments are switching their public transit fleets over to natural gas.



Up to 20% less CO₂*
only minor NO_x
emissions



Approx. 5 min.
to fill
the tank



Less than €7 per
100 km
fuel cost



400–600 km
maximum
range



Europe-wide
expansion
required



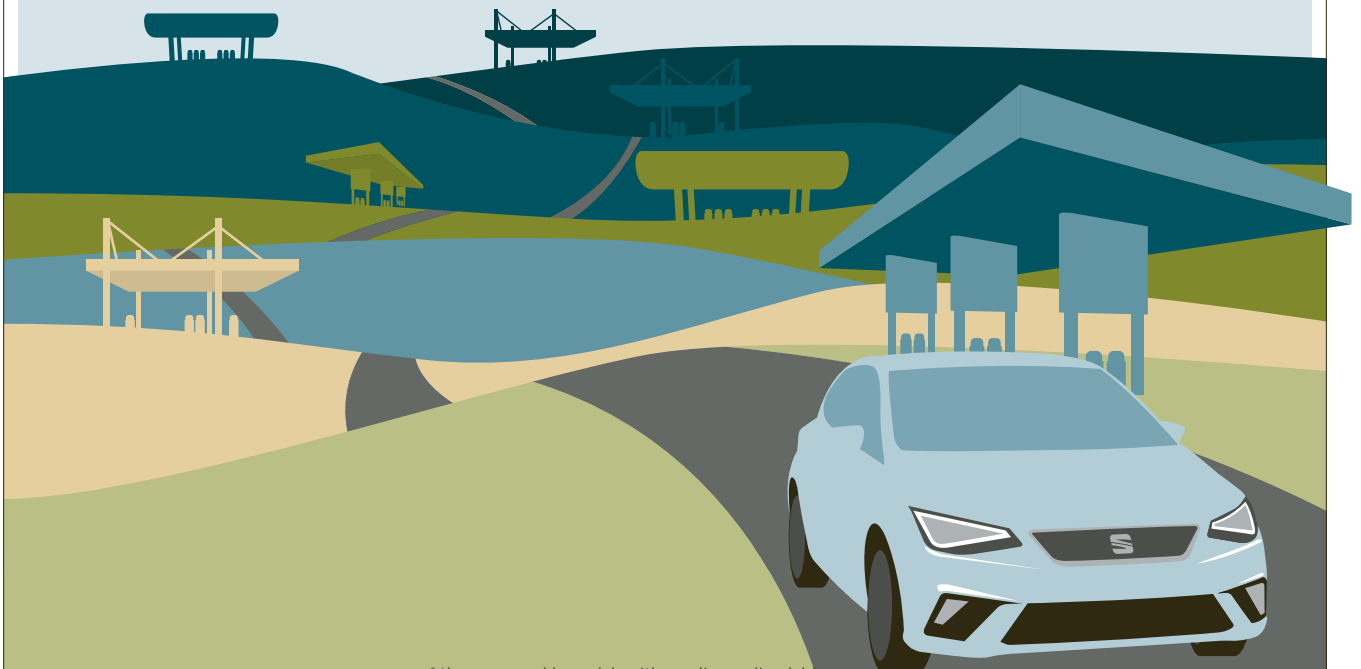
Concerns about
CNG tanks



Bridging
technology



Addition
of methane
from renewable
sources



* than comparable models with gasoline or diesel drives

The values marked with **[i]** do not represent data on any specific or planned vehicle models of the Volkswagen Group. They are abstract, rounded values or estimates based on the current state-of-the-art technology.



The potential of hydrogen

Hydrogen is another component found in a forward-looking drive portfolio. Produced from renewable energies, it emits no CO₂ or NO_x. Hydrogen is considered an integral part of the energy revolution, because surplus electricity from wind turbines, for example, can be converted and stored as hydrogen and then utilized later on. Long cruising ranges and fast fueling make this drive a generally attractive option for long-distance electric transportation. However, the fueling infrastructure isn't yet in place. Germany plans the construction of 400 stations by 2023. But for nationwide coverage, 3,000 would be necessary. Despite the limited number of fueling stations, the fleets of mobility service providers, taxis, buses and street cleaning vehicles could operate on hydrogen in larger cities – and, in doing so, cut down on emissions.



0 g CO₂/km*
0 g NO_x/km**



3 min.
to fill
the tank



€7–9 per 100 km
fuel cost



500–700 km
maximum
range



Expansion
required



Too few fueling
stations



Cost per vehicle and
infrastructure



Fuel cell
research

* with hydrogen from renewable sources ** Zero emission vehicle as per CARB standard

The values marked with (i) do not represent data on any specific or planned vehicle models of the Volkswagen Group. They are abstract, rounded values or estimates based on the current state-of-the-art technology.



Autonomous, digital, emission-free: mobility tomorrow

Self-driving cars, electric drives, and mobility services: these are the new business areas of the automotive industry. The Group is determined to be one of the front-runners.



Relax, make a phone call, or work: Self-driving cars let passengers take care of other business – or just kick back.

With a soft whir, the electric shuttle comes to a stop at the curb. Marie puts away the smartphone that she just used two minutes ago to order the self-driving car to its virtual stop in Berlin's Friedrichstraße. She crosses the bicycle and e-scooter lanes and gets in the car, taking a seat up front on the left side.

She looks out the window, daydreaming, as more passengers gradually get in. The big screen in front of her, which has linked automatically to her smartphone, tells her the ride "has just been charged to your credit card."

Right after that, Marie receives a push notification from the supermarket where she'd placed an order earlier: the delivery drone will drop her purchases off at her door at precisely the time she arrives there on the shuttle.

Marie might be a fictional character, but ten years from now, this scene or something very similar to it could be a reality. "With more and more connectivity and automation, we're going to see a fundamental transformation in the way that people get from A to B," says Ludger Fretzen, Head of Group Strategy for New Business at the Volkswagen Group. "We're experiencing a radical change."

Electric drives, automated driving, and mobility services – these are the areas that will determine whether the German automotive industry will continue to shape mobility in the future or whether these new business opportunities will go to others.

Volkswagen is now racing to catch up, investing heavily in electromobility. Starting in 2020, for example, the company will be rolling out a whole new line of battery-powered vehicles and plug-in hybrids. Just five years later, it is estimated that two to three million electric cars are sold worldwide.

One car, many users

With equal intensity, the company has set about exploring the much less familiar field of mobility services. It seems that the time is right for it. In 2015, carsharing, carpooling and ride hailing accounted for barely four percent of all kilometers driven. But according to a study commissioned by the US bank Morgan Stanley, by the year 2030, this portion could increase to a quarter of all driving worldwide. "In the more mature markets of the West – and in the densely populated regions of the world at large – it's becoming increasingly more important to sell customized, integrated mobility solutions than cars,"

says Yves Leterme, former Prime Minister of Belgium and member of the Volkswagen Sustainability Council. "Particularly in the cities, more and more young people are choosing not to buy their own car," says also Ludger Fretzen. "These are customers we can't afford to lose."

So it is not by chance that our subsidiary MOIA is now preparing to test run a new mobility service in Hamburg. The plan is to deploy around 200 specially developed electric shuttles in the city to serve commuters who don't own a car, thus closing the gap between public transportation and taxis. Unlike their major competitor, Uber, which provides their customers with access to franchised cabs, MOIA will be hiring their own qualified drivers.

Of course, in order to run the electric shuttles, we'll first need to set up the necessary infrastructure. "Our team has been talking to local power companies, public transport operator Hochbahn, and the city in order to decide, for example, where to park the cars and charge them," says MOIA spokesperson Michael Fischer.

Ultimately, MOIA plans to establish a city-wide virtual network of shuttle stops. An app shows the user the nearest available stop and an image of the surrounding area. The app is also required in order to hail the shuttle. "The street," explains Fischer, is where "the demand for mobility" arises.

Researching what this demand actually looks like is currently the task assigned to Laura Gebhardt of the Institute of Transport Research at the German Aerospace Center (DLR). Her research project, entitled "Urban Mobility," centers on the concept of intermodal transport, also known as mixed-mode commuting. Someone

"Particularly in the cities, more and more young people are choosing not to buy their own car."



Filling up on electricity:

at the EV charging stations of tomorrow, charging your car won't take more than a few minutes – just enough time for a coffee break.

who switches modes of transport (e.g. bikes part of the way and then hops on the subway) at least once on their way to work, home, or to the store is said to be using intermodal transport. “It’s not necessarily something you do for fun – it’s a way to save time,” explains Laura Gebhardt. “It’s especially common to see people doing this in large cities in order to streamline their daily routines and commutes.”

Gebhardt’s team conducted a survey of 1,100 residents of Berlin to find out which means of transportation they use when and for what purpose. Based on the results, they were able to produce several prototypical “mobility types” which reveal how city-dwellers would like to get around. Three examples:

Type 1 is Sylvia, 44. A mother of two, Sylvia shares a car with her husband. Together, they decide who gets the car when and who has to take the bus or the train. In her free time, Sylvia enjoys riding her bike. She also takes her bike to the railway station. From there, she switches to the commuter train. Sometimes, she does take the car, though – to go shopping, for instance, or to drive the kids to sports practice.

Type 2 is Peter, a man over 50 and an “all-purpose car user”. The kids are all grown up, Peter and his wife have two cars all to themselves. They don’t like taking buses or trains, and would sooner call a cab. “Eighty-one percent of the people in this category use their cars on a daily basis,” says Laura Gebhardt. “Nationwide, these folks are still the majority in Germany.”

Type 3 – Steffen, 36, academic – lives with his girlfriend in the city center and takes the subway to work; it’s too far to go by bike. He has an annual pass for the bus and rail and is registered with a car-sharing service. “Less than half of all households in this category have their own car,” says Laura Gebhardt.

Whether or not these target groups end up changing their mobility strategies is going to depend on how attractive the alternatives are. Sylvia, for example, might benefit from a user-friendly app that integrates different means of transportation – in case, let’s say, she unexpectedly needs to rent a car to get home with her purchases from the home improvement store. Peter might take an interest in autonomous cars that let him work or talk on the phone to his grandkids or – once he reaches

a certain age – that he can use to drive to the doctor's. Steffen might like the idea of micromobility – electric scooters or even electric skateboards that are like something out of “Back to the Future” (except that they can't fly, at least for now).

But it's not just our mentalities that have to change. The cities themselves do, too. And there are bound to be some conflicts along the way. “The cities are growing, but road space is staying the same, especially in downtown areas,” says Andreas Rieckhof. As Hamburg's State Council for Transportation, he's accustomed to seeing these types of conflicts in his day-to-day work.

When his agency decided to set up a depot for a carsharing provider, a weekly market was forced to relocate. “There was a lot of discussion, just like there is every time we allocate a new cycling path or reserve a parking lot for electric cars,” says Rieckhof. But the task set before municipal authorities is to ensure mobility for all.

Nowadays, we already have apps that open car doors or rent bicycles.

In the future, we'll be using apps to order shuttles and taxis ... with or without a driver



That's why Rieckhof would like to see mobility concepts like MOIA incorporated into public transportation – the way that Hamburg's Hochbahn is already doing it with rental bikes and carsharing fleets.

The MOIA shuttles are part of a mobility partnership between Volkswagen and the city of Hamburg. “The partnership is intended to make transit safer, cleaner, more efficient, and less noisy,” says Rieckhof.

Within the next ten years, as those involved hope and plan for, we're going to see shuttles (and private cars) that drive through the city autonomously with no need for a driver. The German Federal Ministry of Transportation has already approved test tracks for driverless cars. In the summer of 2017, the ethics commission appointed by Minister of Transport Alexander Dobrindt wrote in its final report that automated and connected driving was, in fact, an “ethical imperative if the systems cause fewer accidents than human drivers.”

The future is cuddly

German automakers are not satisfied with just supplying the sheet metal for Google's intelligent car – they want to get actively involved. “When it comes to data, software, and IT, there's no doubt that Google has advantages. We know that,” admits Ludger Fretzen. “But a lot of tech players underestimate the complexity of automotive manufacturing.” Automotive engineers, on the other hand, are, according to Fretzen, “perfectly capable of mastering the new digital technologies.”

At the Geneva Motor Show in March 2017, Volkswagen introduced one of its first prototypes. The SEDRIC (short for “self-driving car”) needs no steering wheel and no gas pedal. It looks like a cuddly cartoon character on the outside and a lounge on the inside. Potential buyers might be transit authorities looking to add

“Autonomous vehicles need their own ecosystem.”

What drives Müller

Here's how the Chief Executive Officer is preparing the Volkswagen Group for the mobility of tomorrow

„ROADMAP E“

BY 2025

80 new electrified models

By 2025, the company aims to bring 80 new electric models on the market, including 50 purely electric vehicles and 30 plug-in hybrids. Every fourth new car built by the Volkswagen Group could be purely electric. That would be up to three million electric cars a year – with ranges of up to 600 km and charge times don't take longer than a coffee break.

BY 2030

20 billion euros

The company plans to invest 20 billion euros or more in electromobility – cars, factories, charging infrastructure, and staff qualification at all the brands. We also expect to have at least one electrified version of every one of the roughly 300 Volkswagen Group models.

AND THEN?

1,000 km

The next generation of batteries will have 1,000 km of range. In collaboration with international partners, Volkswagen will be advancing research into solid-state batteries.



AUTONOMOUS VEHICLES

During pilot testing, SEDRIC will soon be getting employees at the Wolfsburg plant from A to B. The SEDRIC team is working on ideas for an entire range of cars:

- Fully-autonomous cars for the city
- Spectacular sports cars
- Luxury long-distance mobility
- Self-driving delivery vans
- Heavy trucks

BRIDGES TO THE FUTURE

Today, every new diesel engine is already equipped with a SCR catalyst, and every new gasoline engine comes with a particle filter. And the company is working on more solutions:



Even higher efficiency

Fuels from renewable energy sources



Natural gas

Fuel cell technology



“Anyone who clings to the status quo during times of historical upheavals puts themselves on the sidelines.”

Matthias Müller
CEO of Volkswagen AG

SEDRIC to their bus and train networks. They might be companies interested in using SEDRIC to take their employees to work or business meetings. And, of course, they might also be private consumers. After all, SEDRIC could also be used to get kids to band practice or pick up their parents from the bar in the evening.

The cars aren't enough by themselves, though. "Autonomous vehicles need their own ecosystem," says Mario Rautenberg, Director M&A and Business Development at on-demand mobility provider Gett. "Carmakers, fleet operators, power providers, insurance companies, and logistics sectors all have to play ball." Founded in Israel in 2010, Gett has since become the largest and fastest-growing app-based mobility provider in Europe. In addition to Israel and the UK, the service is now also available in Russia and the US. Aside from ride services for private consumers, the company also relies on corporate clients; with over 7,000 customers, Gett is the world leader in this segment.

Gett cars are still driven by people. But the company is preparing for the day when more and more robotaxis start hitting the streets. That's why, in 2016, Volkswagen made a strategic decision to purchase a \$300 million share in Gett.

Already today, Gett algorithms can predict with almost down-to-the-minute accuracy when and in what street a driver will be able to score a passenger – and guide the driver there with a push notification before

the order is even placed. One day, these very algorithms will also be guiding autonomous vehicles.

The map service "HERE," which, in late 2015, was acquired from Nokia by the Group's brand Audi, together with BMW and Daimler, will be leading the way to the future of autonomous driving. And they won't be taking any detours through Google to get there. "HERE's data is already being used in a million places," reports Roland Pfänder of Audi Electronics Venture. "In the new Audi A8, for example."

In the future, "HERE" data will be able to do much more than just show traffic congestions. It will be helping autonomous vehicles to navigate based on precise real-time maps. "The data will be generated by the vehicles themselves using for example radar or cameras," explains Pfänder. There will also be external data involved, e.g. from cities or weather services.

More room in the city

In April 2017, the Roland Berger consultancy published the results of a survey conducted in ten countries, including Germany, the US, and China. Forty-six percent of the respondents said they would get rid of their cars if they had the option of taking a low-fare robotaxi instead. "And this number is going to rise," predicts Mario Rautenberg of Gett. "At some point, it won't make sense anymore to have your own car in the city." The emotional attachment to cars will start to fade – even for Germans.

There's an added bonus in all this when it comes to the environment. The number of cars in the cities could drop significantly, leaving more room for bike paths, parks, and playgrounds. Rautenberg cites a Berylls study, also conducted in April 2017. According to the findings, in Munich alone, 200,000 of the 700,000 cars registered in the city could be replaced with just 18,000 robotaxis. And no, there's not a zero missing there. "The goal should be for more and more people who live in overcrowded cities to start using these other mobility services instead of having their own car," says Michael Fischer of MOIA.

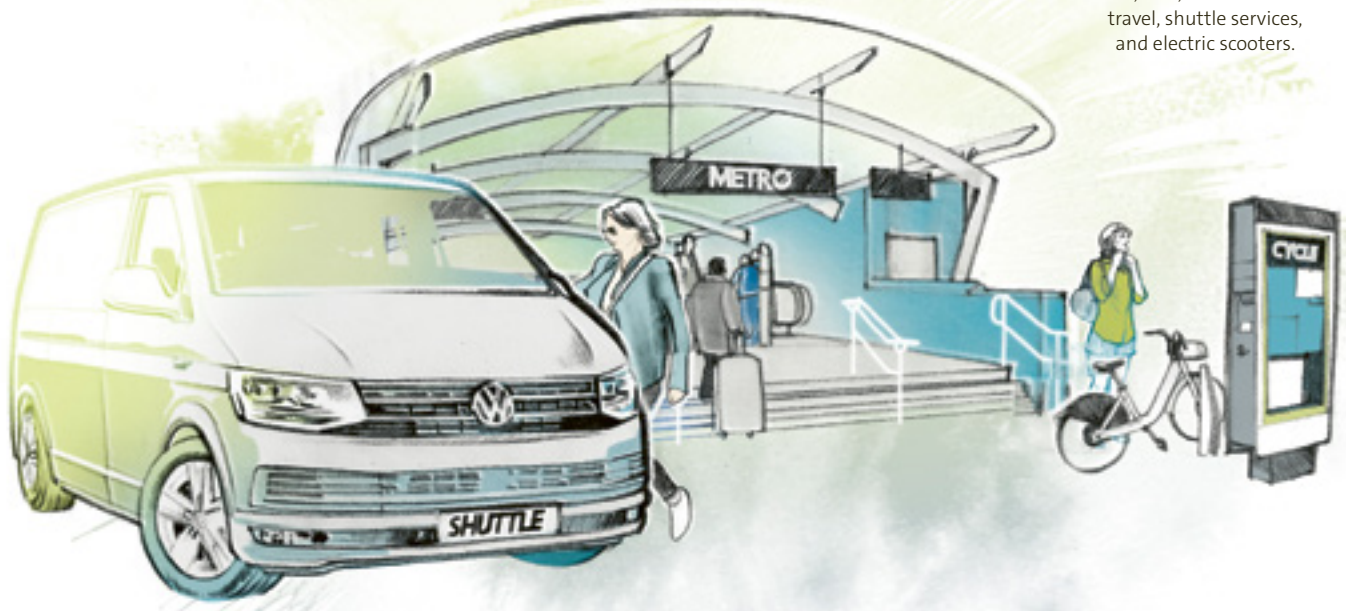
Others are more skeptical. "Carsharing is going to become more common for future generations. In the best-case scenario, we'd have a lot of people who share

SHARING THE DRIVE: A GLOSSARY

Carsharing Several people share cars, which they take turns using for limited time periods and individual trips. Commercial carsharing generally works through apps. Depending on the provider and the model, users either bring the car back to a set pick-up location, or they can drop it off anywhere within a certain part of the city.

Carpooling A group regularly shares a car and drives to a shared destination together – the good old-fashioned carpool to work, for example.

Ride hailing Users spontaneously flag down a passing car or order one using an app. Depending on the provider and the country, drivers might be private individuals or employees of the provider and may or may not be certified. Unlike with traditional taxis, other passengers might get on and off along the way.



Please, transfer:

Even more than today, city dwellers are going to be using intermodal transport, combining car, bike, bus and train travel, shuttle services, and electric scooters.

a car, and that really would free up some space in the cities,” says Laura Gebhardt of DLR. “But in the worst-case scenario, autonomous cars could make driving so easy that we’ll end up with even more cars in the cities than we have today.”

A study conducted by the company had some surprising interim findings. Self-driving shuttles would, in fact, reduce the number of kilometers driven in the city. Self-driving taxis, however, might actually cause an initial increase in traffic volume and, as a result, an increase in traffic congestion. “Deadheading, especially, would increase mileage and, as a result, increase local traffic volume,” explains Florian Kranke from the Group environmental research unit. Deadheading refers to drives from one destination to the next pick-up location or back to the depot or to the charging station. That’s why Gett and other companies are considering the possibility of using those drives in the city for delivery services.

Whether they’re dealing with autonomous cars or regular taxis, Yves Leterme of the Sustainability Council has two pieces of advice for city governments

and mobility companies. “First of all, cities should avoid the mistake of creating a monopoly for a single provider. They need to give the market free reign.” And secondly, he says, life in his part-time home of Stockholm has shown him the benefits of “locally negotiated mobility solutions”: “You listen to what the locals have to say, and then the cities and other mobility providers find efficient, sustainable solutions based on the needs and wants of the people who live there.”

This approach could also prove beneficial in rural areas where buses are rare and the distances are too far to travel by bike, where you can’t get by without owning a car and carsharing is limited to the occasional ride with your neighbor. “The debate could catch on in those areas, too,” predicts Laura Gebhardt. “Autonomous buses could be used as shuttles to help people get to the nearest commuter train stop. That could help prevent some traffic congestion.”

In this brave new world of mobility, instead of downtown Berlin, Marie could also be hailing her self-driving electric shuttle in a remote little village in the countryside. ◀

“Drivers” of climate change

By 2050, freight transport should be largely carbon neutral. While commercial vehicles are becoming more and more economical, the number of trucks on European roads is growing. Environmental associations are demanding fuel efficiency standards for truck fleets, but official consumption values don't have to be indicated until 2019. The competition to develop the most economical truck is intensifying. MAN and Scania, the two truck manufacturers of the Volkswagen Group, are working on innovative concepts for the future of freight transport.

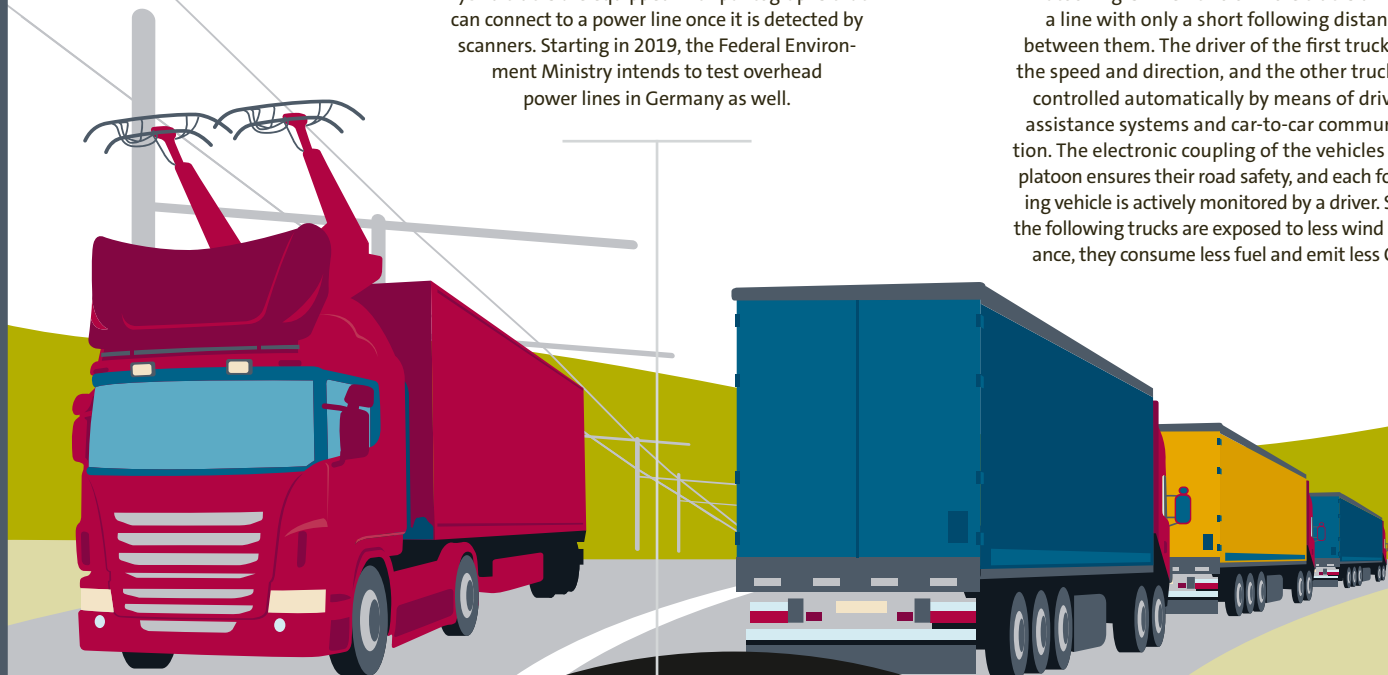
Text — Britta Bauchmüller Illustration — Ole Häntzschel

FULLY WIRED

Since June 2016, Scania and Siemens have been jointly testing a system to supply electrified hybrid trucks with power through overhead contact lines. On a motorway in Sweden, they've built a two-kilometer test track. Scania's Euro 6 hybrid trucks are equipped with pantographs that can connect to a power line once it is detected by scanners. Starting in 2019, the Federal Environment Ministry intends to test overhead power lines in Germany as well.

CO₂NVOY!

In collaboration with DB Schenker, MAN is working to develop connected and automated truck convoys. In 2018, the two companies plan to conduct truck platooning trials on the A9 autobahn between Munich and Nuremberg. Platooning is when two or more trucks drive in a line with only a short following distance between them. The driver of the first truck sets the speed and direction, and the other trucks are controlled automatically by means of driving assistance systems and car-to-car communication. The electronic coupling of the vehicles in the platoon ensures their road safety, and each following vehicle is actively monitored by a driver. Since the following trucks are exposed to less wind resistance, they consume less fuel and emit less CO₂.



Overhead power line



Electric mode



Platooning



LOCALLY GROWN TRANSPORT

In collaboration with the Swedish cooperative Lantmännen, Scania intends to create a market for trucks that run on bioethanol made from surplus wheat, which generates 90 percent less CO₂ emissions than conventional diesel fuel. Since the fall of 2016, Scania has supplied the Arla dairy corporation with a total of 23 ethanol-powered trucks. Arla is using the new Euro 6 trucks in its daily business in the Stockholm and Uppsala region. Lantmännen is providing the infrastructure and the bioethanol.



GREEN DELIVERIES

In August 2017, MAN introduced the first electrically powered trucks for inner-city deliveries. At the end of 2017, the electric trucks will be delivered to the Council for Sustainable Logistics, an association comprised of 15 of the largest companies in Austria. Starting in 2020, they intend to increase the use of electric vehicles in urban distribution transport and will be testing the electric trucks in daily use. In 2021, the e-trucks will go into series production.



Electric truck



Next bioethanol station



Fuel level

INTERVIEW

“Nothing but excuses”

Margo T. Oge on the positive effect of regulations

Ms. Oge, thrifty fleet customers are already pushing truck manufacturers to increase efficiency – why do you call for regulation?

Trucks are responsible for one-third of CO₂ emissions from transportation and history shows that market forces are not enough. So the leaders have found a way to turn regulation into a competitive advantage. Tom Linebarger, CEO of Cummins, is quoted in my book speaking to this point: “Meeting EPA emissions standards in the US has helped us innovate and be ahead of the competition, and grow overseas markets.”*

The European market for commercial vehicles is complicated.

There are many different types of trucks and different companies involved in the final product.

Nothing but excuses. Why should solutions that work in the US, China and Japan not work in Europe?

The manufacturers have also long opposed standards for passenger cars. I believe that regulations have been a key factor in the revolution we see today in the automotive sector.



Margo T. Oge, born in 1949, is a member of Volkswagen’s Sustainability Council. She previously served as Director of the Office of Transportation and Air Quality for the US Environmental Protection Agency (EPA).

Illustration (portrait): Uli Knörzer * Cummins is a US manufacturer of diesel and alternative fuel engines and generators. Cited in: Oge, Margo. “Driving the Future: Combating Climate Change with Clean, Smart Vehicles,” 2015, New York, NY: Arcade Press

“We need to get the pricing right”

Connie Hedegaard is the former European Commissioner for Climate Action, and Prof. Dr. Ottmar Edenhofer is Chief Economist at the Potsdam Institute for Climate Impact Research and Director of the Mercator Institute on Global Commons. Both members of the Volkswagen Group Sustainability Council discuss the decarbonization of the transportation sector and Volkswagen’s responsibility.

Text — Valdis Wish **Illustration** — Uli Knörzer

Shift: One important aspect of the Paris climate agreement is the decarbonization of the transport sector by 2050. Is this actually possible?

Prof. Dr. Ottmar Edenhofer: It is, but it will be complicated and time-consuming. For example, with Germany’s current energy mix, which includes a high share of coal, e-mobility could even increase emissions. The same is true in China. E-mobility only makes sense if it is complemented by the full decarbonization of the power sector.

What are the quickest steps to get there?

Connie Hedegaard: *I would say the two big things are getting the pricing right and not shying away from new regulation – of course, balanced regulation that considers what is technically possible. A third aspect is the behavioral side. There is something in the new business models – the new ways of getting access to individual mobility – that will help us. If we embrace this smartly, it can get us to where we need to be faster.*

Edenhofer: We also need to think about reforming the whole tax system, because how we subsidize mineral oil and underprice carbon emissions in Europe is highly dysfunctional.

Could you explain that?

Edenhofer: The dramatic decline of the oil price was one important reason for high emissions from combustion in the transport sector. As long as the oil price is far too low, the evolution of e-mobility will be hard. Last but not least, we need to push innovation. When we think about smart regulation, we need to favor regulation with the highest potential to unlock innovation across sectors. Carbon pricing could steer technological progress in the right direction. This is important because innovation is the main driver for keeping costs low.

Hedegaard: Volkswagen is planning to introduce four sizes of electric cars ready by 2019 or 2020 – each at the same price as a comparable combustion engine car. I think that could be a game changer.

What else should carmakers do to support the transition?

Hedegaard: If you’re a company, why wait around to see what kind of regulation is coming? We will have better regulation in Europe if companies proactively come forward with innovative ideas about how we can solve the enormous task of decarbonization together. If the industry was outspoken about ending fossil fuels

“Smart regulation can improve people's well-being.”



subsidies, consistent pricing of externalities, and real reform of the European Emissions Trading Scheme, I'm absolutely sure that would help correct the current market failures.

Up to now ...

Hedegaard: ... automobile associations have tended to stick to the lowest common denominator, so there is a trust issue among regulators. I would like to see Volkswagen really push the European Automobile Manufacturers' Association – the ACEA – to be more proactive. And policy makers should stop referring to regulations as red tape. It is not red tape to have good standards with long time frames so that sectors know where they must be by when. I really think this can give a meaningful push to innovation.

Edenhofer: I couldn't agree more. Many people perceive regulation or the push for a new transport system as a burden on society. To the contrary, when we reduce local air pollution and congestion and develop a more effective transport system with electric vehicles, this fundamentally enhances people's welfare. If we really want to be leaders in this area, we should not be as defensive as we are in Germany. We should seize the opportunity to promote the

Between Brussels and Potsdam:
Connie Hedegaard and Prof. Dr. Ottmar Edenhofer spoke to *Shift* editors in Frankfurt by phone, saving over 300 kg CO₂ compared to flying in.

next-generation transport system. And here I hope that companies like Volkswagen push and tell a more compelling narrative: that smart regulation can improve people's well-being, not diminish it.

But don't higher prices always lower public acceptance?

Edenhofer: Well, the more innovative the business sector is, the less price increases are necessary. And the better people understand what will happen with their money, the higher the social acceptance will be – even in low-income households. In British Columbia, for example, the government was able to foster public understanding and acceptance for a carbon tax by recycling the revenues to the people.

So, you tend to generally agree about the way forward.

Hedegaard: Yes. Now we just need Volkswagen to do it. ◀

The air is getting thin for combustion engines

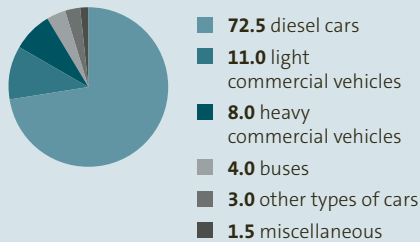
There are currently 513 regulations governing automobile traffic in Europe; 224 of them benefit alternative drive technologies such as electric or hybrid cars. Since 2008, 77 new restrictions have been put in place in Germany alone. Sixteen European cities now collect a city toll.

Text — Gerrit Harms and Christian Kassya

Nitrogen oxides are produced in combustion processes and can be harmful to people and the environment. The European Union therefore requires its member states to adhere to strict immission limits on nitrogen dioxide (NO₂). In highly populated urban areas, however, these limits are exceeded much more frequently than the World Health Organization (WHO) considers tolerable.

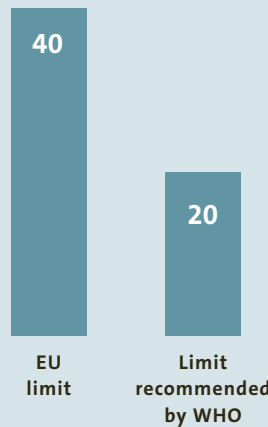
NITROGEN OXIDE (NO_x)-EMISSIONS

In 2015, traffic was responsible for 38 percent of the nitrogen oxide emissions in the air. The main sources thereof, by percentage:



NITROGEN DIOXIDE (NO₂)

Limits as annual averages in micrograms per cubic meter (µg/m³) of air



EMISSION AND IMMISSION

How the output (emission) of nitrogen dioxide affects the environment (immission)

- On main roads, the NO_x immissions correspond to decreasing emissions.
- However, in many regions subject to European limits, NO₂ immissions have remained virtually unchanged. This is a problem for the local authorities in charge of compliance.
- The causes of high NO₂ immissions are complex: immissions are affected by factors such as traffic volume, weather, and city architecture.

NO_x emissions in road traffic have dropped by more than 70 percent since 1990 – even though traffic volume has increased by half.

Sources: German Federal Environment Agency, German Association of the Automotive Industry (VDA), Bavarian State Ministry of the Environment and Consumer Protection



Bogotá

UNUSUAL VARIETY

Bogotá's "Pico y Placa" policy (meaning "spear and shield") goes all the way back to 1998. It allows only vehicles with certain plates to be on the streets during set morning and evening rush hours. All other vehicles are banned from driving during these times. Once a year, the city also holds a "Dia sin carro", a "Car Free Day." Already, on Sundays and public holidays, parts of the road network are closed to motorised traffic from 7am until 2pm, leaving the streets to pedestrians, cyclists and skaters.

Germany

MOBILITY FUND

In August 2017, Germany established a fund under the name "Sustainable Mobility for the City." Within a few weeks, the fund was doubled to €1 billion. The automotive industry is to contribute €250 million. So far, only German automakers have agreed to pay, pledging to contribute according to market share. Local authorities will receive assistance, for example, to help them regulate traffic more efficiently or use vehicles with lower emissions for local public transport.



Hamburg
NO THRU TRAFFIC

Hamburg plans to ban older diesel cars and trucks on two arterials, Stresemannstraße and Max-Brauer-Allee. Max-Brauer-Allee is located near the harbor, where 80 percent of the NOx emissions can be attributed to ship traffic. It is still unclear, however, whether the ban can be enacted. The Federal Administrative Court is to decide in early 2018 whether municipal authorities even have the authority to establish local restrictions.



Oslo

SYSTEMATICALLY CAR-FREE

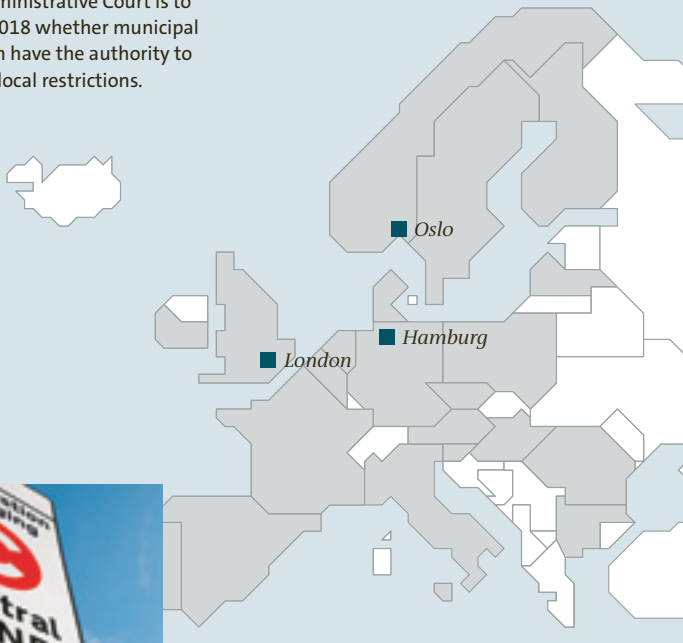
As of 2019, the center of Oslo is going car-free. As a first step, all parking spaces along the city's inner beltway will be removed. From 2018, pedestrian zones will be expanded, more bike lanes added and some streets closed to private traffic. Starting in 2025, the Norwegian government will only issue new permits for emission-free vehicles.



Beijing

LUCK OF THE DRAW

In Beijing, a permit is required to register a gasoline-powered vehicle. Permits are granted based on a lottery. And currently, the odds of winning are less than one percent. Permits for electric cars are also restricted, though to a much lesser extent. Those buying an electric car also receive public subsidies and are exempted from driving bans: Since February 2017, cars with Euro 1 or Euro 2 emission standards have been banned on weekdays from central Beijing.



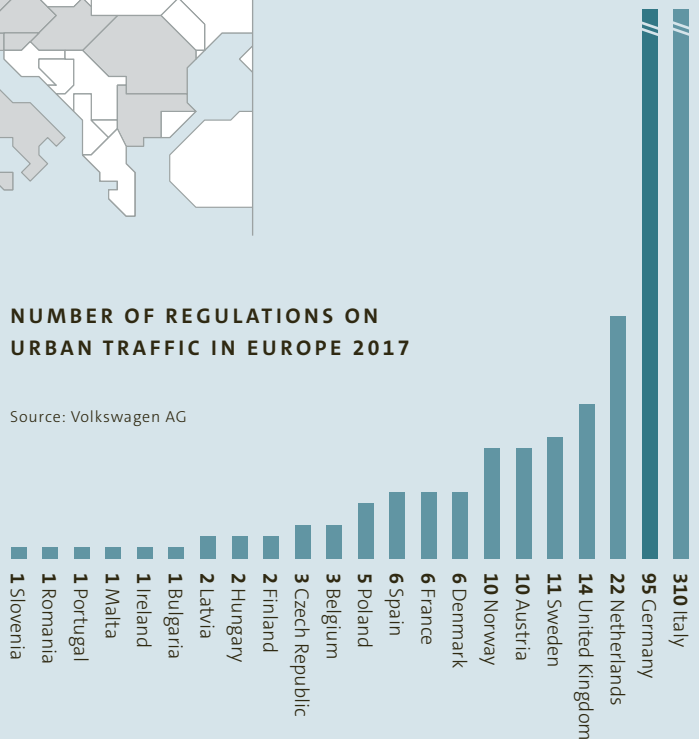
London

CLEANER WITH PENALTIES

With the introduction of the "Ultra Low Emission Zone" (ULEZ), London's mayor Sadiq Khan raised the city's environmental standards. From April 2019, anyone driving into the ULEZ will have to meet certain minimum standards or pay a daily fee. The charge is £12.50 for cars and £100 for buses and trucks. As of October 2017, owners of older vehicles are required to pay an additional charge of £10 per day in the city center. And starting in 2018, all newly licensed taxis will have to be emission-free. The British government is also discussing a ban on the sale of gasoline- and diesel-powered cars to be implemented in 2040, although no decision has yet been made.

NUMBER OF REGULATIONS ON URBAN TRAFFIC IN EUROPE 2017

Source: Volkswagen AG





The Caribbean is one of the most disaster-prone regions in the world, given its vulnerability to tropical storms. The first hours after a hurricane has struck are absolutely critical.

Forecast-Based Financing – preparedness reduces suffering

With climate-related risks rising worldwide, the international community could do more than wait to take action only after a disaster has happened. Forecast-based Financing releases humanitarian funding based on forecast information.

Text — Elhadj As Sy

With horror, the people of Mozambique recall the great flood of 2000, when two tropical storms in quick succession caused all of the country's rivers to overflow their banks at once.

By the time international aid was approved, relief supplies were delivered, the chaos at the Maputo airport was halfway sorted out, disaster relief teams had arrived and diverse activities were finally orchestrated, days had passed – during which the number of victims and economic losses rose considerably.

The German Red Cross isn't willing to put up with such unnecessary suffering any longer. The renowned aid organization is coordinating a program of the German Federal Foreign Office, the ambitious goal of which is to activate humanitarian aid before a natural disaster has even taken place. Experience has shown that the first hours after a flood or hurricane are critical. People quickly need water, food, and hygiene facilities to prevent diseases from spreading.

“We cannot prevent natural shocks and hazards from occurring, but we can prevent them from becoming a disaster.”

The “Action Plan for the Humanitarian Adaptation to Climate Change”, as it is formulated in bureaucratese, operates as follows: when meteorologists recognize a high risk of an extreme weather event – whether flooding, cyclone, or drought – a previously established regional “early warning system” is activated that allows an aid organization to prepare the population in a targeted manner. The program’s key concept: forecast-based financing.

After four international dialogue platforms on Forecast-based Financing, as the program is officially called, a first regional conference was held this summer in Vietnam. Heat waves have brought considerable health risks to the country, especially in urban areas with high levels of air pollution. UN agencies, like the World Food Programme, Welthungerhilfe, climate scientists and many Red Cross and Red Crescent National Societies took part in the network conference.

When governments and their partners work closely together, disaster preparedness will be more effective. Ultimately, this will help people to withstand

shocks and bounce back better. Humanitarian funding could also become more cost-efficient than it has been up to now. This requires expanding the funding base in the business and corporate community.

As a globally active automaker, Volkswagen has been invited to support the German Red Cross in setting up the Forecast-based Financing program in Southeast Asia. The willingness to play a greater role in preventing and combatting the humanitarian consequences of climate change would benefit a corporation that is oriented to sustainability.

Seventeen years ago, a half-million Mozambicans were left without shelter and 700 to 800 people drowned. Damage amounted to some 500 million US dollars. If funds for flood preparation had already been released when the Limpopo River dramatically rose and the early warning system was activated, the casualty figures and damage would certainly have been much lower.



Elhadj As Sy, 64, is the Secretary General of the International Federation of Red Cross and Red Crescent Societies (IFRC) and a member of Volkswagen’s international Sustainability Council.

The IFRC is the world largest humanitarian network, bringing together some 190 National Societies and supporting them in the face of disaster, disease, displacement and more. Working alongside the German Red Cross, it has pioneered Forecast-based Financing, and is increasingly seeing it being used worldwide.

Just in time

Many climate-related hazards can be predicted (1). Forecast-based Financing releases humanitarian funding based on this information (2). The allocation of resources is agreed upon in advance, enhancing preparedness and response to a natural event. Before a disaster occurs (3), relief organizations can initiate preventive early actions that help immediately and more effectively (4).





Rush hour in Rwanda

Buses, matatus, mototaxis: there is a growing need for mobility in the Rwandan capital of Kigali. Volkswagen is looking to launch a ride-hailing system there to relieve pressure on local public transport – another piece in the mosaic of the Group’s Africa strategy.

Text ____ *Kirsten Milhahn, Daniel Kastner* **Photos** ____ *Kirsten Milhahn*

Impatient, Robert Kazahura shuffles around in his seat. He passes the chip card that he has just used to purchase his ticket back and forth between his hands. He has been waiting for a solid half hour for the bus to finally leave from the bus station in Kimironko, in the center of Kigali. The driver, Jean Karambizi, sits behind the steering wheel and shrugs his shoulders. “You know the rules, my friend,” he barks over his right shoulder at his only passenger. What he means: he’s not going anywhere until the bus is full. Then he taps calmly away on his cell phone.

Kazahura frowns and looks out of the window.

Long lines have formed at the other city buses this morning – just not his. “I guess there’ll be a few people late to work again,” he growls through his teeth. Having worked as a cook in an international hotel for several years, Kazahura is now looking for a new job and is on his way to an interview in Kinyinya, in the north of the city. He needs the job because he has to provide for his two children and his wife. He can’t afford to be late, he says.

Public transport in Rwanda’s capital city is actually considered one of the most modern throughout sub-Saharan Africa: 560 buses wind their way along roughly 200 km of paved road. Many offer free Wi-Fi, and thanks to chip card readers, people can even make cashless payments.



Tap & Go: Kigali’s city buses are fitted with card readers. When they board, passengers hold their chip card up to the reader and the fare is automatically deducted.

Left: Four women who live in the capital waiting at a stop in the upscale district of Nyarugenge.

Unlike the cities of neighboring countries, Kigali is also surprisingly clean, the streets are wide and free of potholes. Traffic cops stand on duty at each intersection, the digital traffic light systems flashing over their heads.

But with around 380,000 passengers daily who, like Robert Kazahura, need to get to appointments or to work on time, the public transport system is hopelessly overloaded – especially at peak times. Every morning and evening, long lines form at bus stops, and the buses have no fixed timetable.

Mobility partners who can help solve these traffic problems are therefore in demand in Rwanda. Volkswagen wants to be one of those partners. The Group is currently realigning its sub-Saharan strategy and has identified four countries that play a key role: one of these is Rwanda. Up till now, activities – especially of the Volkswagen Passenger Cars brand – have concentrated mainly on South Africa.

“Rwanda is the most progressive country in Africa,” says Thomas Schäfer, CEO of Volkswagen South Africa, who coordinates the Group’s activities on the continent. “There is almost no corruption, and the population is very young, eager to be educated, and Internet-savvy.”

With a tight program of reforms the government of President Paul Kagame plans to transform the rather rural state into a “modern middle-class society” by 2050. Rwanda is still one of the poorest countries in the world and ranked 159th of 188 countries in the UN’s Human Development Index in 2015. But since the 1994 genocide, the country has made great leaps forward and is now regarded as a model for the entire continent.

In 2005, 57 percent of the population was considered poor; by 2014 this number had dropped by one-third.

The economy has been growing by about 7 percent a year for the last two decades. Kigali now offers good starting conditions for young IT companies: the city has 4G mobile coverage almost everywhere, and thousands of kilometers of fiber-optic cable have been laid across the country. To investors, Rwanda is positioning itself as a future financial center of Eastern Africa and pushing digital technology.

Along with the economy, the middle class is also growing – and thus also the demand for reliable mobility.

Last year, in 2016, Volkswagen representatives spoke for the first time with the Rwanda Development Board, a kind of state-run development authority – and by December, both sides already signed an agreement. It concerns “a complete mobility bundle,” says Schäfer, rather than just selling cars to private individuals. Because, despite the modern roads, cars are still a luxury in Rwanda. Although the population stands at around twelve million people, there are just 200,000 vehicles on the roads, including buses and motorcycle taxis.

The core of the agreement therefore focuses on shuttle solutions for Kigali: car sharing and ride-hailing that can be ordered and paid for using an app on fixed or

“There are just 200,000 vehicles for twelve million people.”

Robert Kazahura Passenger

Even if the buses get him to his interview late, the cook depends on them in his search for a new job.



Sadiki Businge Taxi driver

The 30-year-old picks up customers when hailed. He is considering joining an app-based service.

Clare Akamanzi Politician

The head of the Rwanda Development Board is familiar with the capital’s transport needs – and sees potential for investors.





Time for a break: After the morning rush hour, Kigali's city bus drivers park their turquoise vehicles at Remera Taxi Park in the city center. Below: There is a lot of traffic but not much congestion on the streets around the central bus station – which is not central at all. In fact, it is located on the northeast edge of Kigali.





individual routes, with a price somewhere between that of buses and taxis.

An offering like that could be a boon to the business of Sadiki Businge. The 30-year-old – athletically built, carefully trimmed mustache, always with a smile on his face – quit his job as a cell phone salesman three years ago, bought a used car from his savings and set himself up as a self-employed taxi driver. Nowadays, he finds most of his clientele when they hail him from the roadside. “These are middle-class people who do not want to wait a long time and are willing to pay higher fares for greater flexibility and timeliness,” explains Businge. Now he’s considering the idea of joining an app-based transport service like “250 Taxi.” Connection to an app could provide him wealthy customers, he hopes. But still, the majority of Rwandans can only afford public means of transport.

“Private transport services, similar to those seen in European or American cities, could be a useful addition to Kigali,” says Clare Akamanzi, the head of the Rwanda Development Board. Seeing as the infrastructure is



As yet, smartphones are the exception rather than the rule in Rwanda’s capital, but the government is promoting digitalization. The city buses already offer Wi-Fi. Left: It is easier for this passenger to pay than board the bus at Kinyinya Taxi Park.

already available, but only the cars are missing, she views this as a big opportunity. It creates “potential for investors,” explains the politician sitting at the mahogany conference table on the top floor of a new, mirror-glass office building in the capital’s business district. The public transport network needs to be expanded, local transport requires significantly more vehicles – and, in the private sector in particular, Akamanzi recognizes the need for sustainable transport concepts such as shuttle services.

In a first step, Thomas Schäfer’s team plans to deploy 400 to 600 vehicles in a so-called community car-sharing scheme. They would be reserved at first for selected user groups – the employees of public authorities, fleet customers, perhaps even tourists.

Because there is no car industry in Rwanda but the vehicles are supposed to roll off the production line here, Volkswagen is providing a special kind of development aid. The principle is called “semi knocked down” (SKD). This means that the cars will initially be fully assembled and then partially dismantled by the 4,000 employees at the South African Volkswagen plant in Uitenhage. “We’re taking out all the ‘underwear’: engine, axles, brake lines, seats,” explains Schäfer. Volkswagen then wants to transport the partially assembled components to Rwanda where they will be reassembled by employees of the local importer.

It sounds absurd, but has a pragmatic background: many African countries levy high tariffs on finished vehicles. However, if you import components and have them locally assembled, customs duties often fall to zero – and people in the country have a chance to qualify as vehicle mechanics. “This is, of course, only an intermediate stage,” explains Thomas Schäfer. Over the next two to three years, the vehicles being sent to Rwanda will gradually be dismantled more and more, so that the technicians can continue to develop their skills.

In the long term, the concept should lay the groundwork for a dedicated Rwandan automotive industry, with full-scale production, a network of suppliers, dealers and workshops, and – last but not least – a training system and a stable labor market. The principle has proven itself in places like China and South Africa – and is being introduced by Volkswagen in Kenya, which is also one of the initial four countries of the new sub-Saharan strategy.

In Thika, near the capital Nairobi, locals have been assembling the subcompact Polo Vivo according to the



At sunset motorcycle drivers wait for customers. Below: A bus company employee tops up a passenger's "Tap & Go" chip card at the bus station. Passengers pay with cash here, then the card reader collects fares on the bus.



SKD principle since December 2016. “Other models, like the Tiguan, will follow soon,” explains importer Zarak Khan. The 58-year-old is the CEO of the former family business DT Dobie Kenya, which belongs to the multinational CFAO Group.

The numbers are still quite manageable, for now – but that is not the main factor. Khan is looking to build on years of the 1970s, back when vehicles were last assembled completely in Kenya. But production became ever more demanding, and at the same time used cars from Japan flooded the continent. And that was the end of the Kenyan car industry (and several others).

Khan wants to rebuild the industry over the next few years – “langsam, aber sicher” (slowly but surely), he says in German. As a young man, he trained at Daimler in Stuttgart after studying automotive engineering in the UK. Khan believes that the fact that Volkswagen now “wants to revive a nearly deadened industry” is an “innovative move.” The framework conditions for such an economic commitment are also ideal, he says: stable economic growth, a growing middle class, a vibrant capital city, and a young population pushing for work on the labor market. Very much like in Rwanda.

In Kigali, Robert Kazahura’s bus finally trundles out of the dusty bus station – after 40 minutes of waiting. It is now full up to the last seat. Driver Karambizi puts on the radio, pop music blares out of the speakers. Then he steers the vehicle out onto the main road, past countless fruit stands, garages and carpenters. Kazahura points out of the window at the motorcycle taxi drivers waiting on the street corners for customers and laughs. “Do you seriously believe that they’ll find all their customers on smartphones?” he asks.

Almost everyone in Africa has a mobile phone, but smartphones are expensive – and therefore an exception that only the small middle class has been able to afford up to now. However, Thomas Schäfer expects the number of smartphone users – especially in Kigali – to increase significantly, partly because the government has scrapped the tax on smartphone sales.

Sometimes, progress happens faster than expected. Up until three years ago, matatus still dominated the streetscape. In the meantime, the government has banished the rusty minibuses to the very edge of town. From the central bus station, Nyabugogo, they are only allowed to run out to rural regions. Nyabugogo is also regarded as Kigali’s gate to the “land of a thousand hills.” Shared taxis

and buses run from here in all directions; huge long-distance buses set out for the main cities of the region, like Nairobi or Kampala. The countless bike taxis that carry their customers on padded luggage racks, especially in the poorer quarters of Kigali, are expected to face the same fate as the matatus. But due to a lack of any affordable alternatives, it has not yet been possible to implement the decision.

Like Robert Kazahura, the average capital city resident relies on the city buses. Finally, the bus turns into the fenced-in Kinyinya bus station. People are already waiting there in long lines to get to the center. For his late arrival at the job interview, he’ll make the usual excuse, says Kazahura: that his bus was late, unfortunately. His dream? “Having my own car. Sometime, maybe.” And he could even imagine sharing it – with relatives or even the neighbors. But before that happens, he’ll have to find another job.

Different countries, different brands

Other Volkswagen Group brands also have production facilities in Africa and are involved in funding education and healthcare.

MAN Sites

Olifantsfontein (South Africa)
MAN Bus & Coach (Pty) Ltd.
production site, 160 employees
Pinetown (South Africa)
Solar-powered assembly plant,
125 employees
Centurion (South Africa)
Commercial vehicle dealership
Partnership with independent importers who employ more than 1,000 people in total, some with CKD production, in Algeria, Egypt, Ethiopia, Morocco, Nigeria, Sudan and Tunisia.
MAN Diesel & Turbo acquired a service provider for turbo engines in South Africa in 2014.

Corporate social responsibility

MAN helped finance a vocational training center in Kaliti (Ethiopia) and also provides tools and expertise. The center teaches young people how to repair and service commercial vehicles, which gives them the opportunity to kick-start their careers. MAN is also a long-standing partner of SOS Children’s Villages and as such

supports the initiative “Bildung für eine bessere Bildung in Afrika” (Promoting Better Education in Africa).

SCANIA

Sites

Johannesburg (South Africa)
Assembly plant with xKD production and pre-delivery inspection,
69 employees
There are additional South African plants in Durban and Cape Town.

Corporate social responsibility

SCANIA is involved in preventing HIV in South Africa.

Volkswagen Commercial Vehicles (VWCV)

Sites

Relizane (Algeria)
Multi-brand factory with four assembly lines (VW Caddy, VW Golf, Seat Ibiza, Škoda Octavia),
550 employees
A project for SKD production in Nigeria is currently on hold. Other projects are currently being assessed on the basis of the Volkswagen Group’s sub-Saharan strategy.

Corporate social responsibility

In 2014, VWCV auctioned twelve used, reconditioned VW Amaroks in Ghana to support the education initiative “go4school” and raise money to build schools.

When algorithms make the decisions

Self-driving cars promise greater safety and increased access to mobility. But if we let machines do the driving, could we simply be trading old risks for new ones – hackers, algorithms without ethics, data exploitation? A chat with JJ, Chief Digital Officer at Volkswagen.



Valdis Wish, 39, lives in Berlin. He works as an editor, develops digital concepts and regularly publishes articles on sustainability and digital technology.

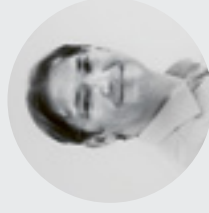
So, JJ, what's going to stop a hacker from steering my self-driving car into a tree?

The self-driving system will secure all communications through state-of-the-art security. There will be no way to manipulate steering, braking or acceleration remotely; this can only be done by the system aboard the vehicle as with us humans as drivers today.

But it seems like everything gets hacked eventually.

Our security by design approach including over-the-air updates is very similar to what's used in aviation. Planes are always connected to the internet, satellites and GPS, yet a plane's controls have never been taken over by hackers.

Hacked or not, let's imagine I'm still headed for that tree. Is my self-driving car programmed to protect me?



Johann Jungwirth, 44, joined Volkswagen in November 2015. He plans to see the Group's first self-driving models hit the streets in 2021. Jungwirth is married and father of three children.

The strategy for our self-driving system is to avoid accidents altogether.
The system doesn't fall asleep, drink alcohol, get agitated or distracted, react slowly, run red lights, take drugs, have limited angles of view – the very human causes of 91 percent of all accidents that occur today.

An ethics commission of the German government has presented 20 guidelines for automated driving. Algorithms shouldn't prioritize some lives over others when an accident is inevitable. What do you think of the commission?

I support it. I'm glad we have a dialogue to make sure that self-driving systems on the road comply with the same standards and rules.

What if I don't want to share my vehicle data with Volkswagen?

That will be up to you to decide. We're prioritizing "digital fairness," which means being completely open and transparent and letting the customer control their own data. Customers decide what they share with us.

And now for the litmus test: would I entrust his own kids to a self-driving car?

For sure – from the very first day that we release these cars.

The Di Fabio Commission

The German government's Ethics Commission on Automated Driving – led by former Federal Constitutional Court judge Professor Udo Di Fabio – published the world's first ethical guidelines for self-driving vehicles in June 2017. They include 20 propositions for automated driving systems to ensure safety and protect human dignity, freedom of choice, and data autonomy.

How to make sure your innovations fail



**Every company wants to be innovative.
But so many fail. Why is that?
Here are five tips guaranteed to stifle
innovation in your company.**

Text — Christoph Keese
Illustration — Mathis Rekowski/Zagenten

1.

Look for an idea that everyone agrees on!

Take this advice, and your innovation is guaranteed to have nothing novel about it. Something that everyone thinks is right always represents a sample of what already exists. All the better! That will show the market that people in your company are happily agreeing with each other. You'll come out with a cool new version of something familiar, but definitely no trailblazing new ideas.

2.

Assemble a working group!

Make participation in the working group consequence-free for all members. Anyone can go back to their old job at any time. Success or failure of the project shouldn't affect the income or wealth of the members in any way. Make sure that all members still have to do their day job on the side, meaning they have to do a million other things. This way, you'll be sure that no one can devote their full energy to the project and nothing groundbreaking will come of it.

3.

Compile a set of specifications!

Take all the suggestions from all the departments and combine them into one specifications manual. Everyone should be equally represented on the specifications committee. Appoint a skilled diplomat to head the

committee. Allow internal politics to determine how you approach the contents of the manual. Nothing in it should step on anyone's toes. Finally, pass the specs on to a contractor, and push the price down as far as you can. Set tight deadlines and miss them constantly so that you'll be sure to launch a finely aged product.


4.

Let the committees decide what features the new product should have!

Committees know more about the market than the market itself, so always leave all the decisions to them. Give the consumers a product that represents the best recommendations of all the highest-paid experts. Pay no attention to the layperson, even if the layperson is your customer.

5.

Bring a perfectly optimized, comprehensive product onto the market!

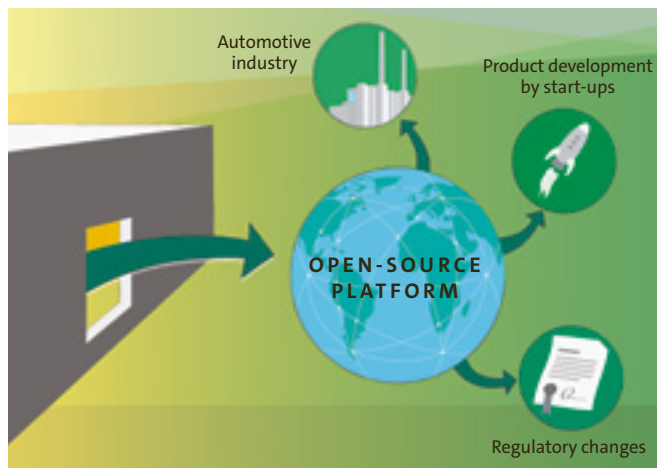
Very important: your product should have as many features as possible. This will ensure that its success or failure cannot be attributed to any of its individual characteristics. It will also prevent uncomfortable questions from being asked in meetings or blame being reciprocally assigned. German quality products are always brimming with features and fully optimized. Let those disruptive competitors rush ahead if they want. You'll catch up in the long run. Quality always wins in the end. Right? 



Christoph Keese, 53, is an economist, author ("Silicon Valley," "Silicon Germany") and CEO of Axel Springer hy GmbH, the media company's subsidiary assisting businesses in the digital transformation.

Off with the blinders!

Over the last 100 years, automakers have barely had to change their business model. But Tesla, Apple and Google are putting them under more and more pressure. Volkswagen, too, has to reinvent itself.

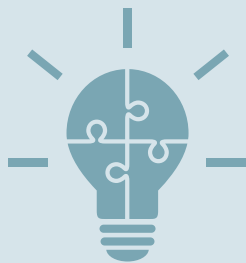


OPEN SOURCE LAB – AN INITIATIVE OF THE SUSTAINABILITY COUNCIL

The Berlin-based lab is working to develop new approaches to sustainable mobility – from concepts for emission-free cities to 3D-printed cars. Starting in early 2018, the lab will be announcing challenges, each of which will be curated by a member of the Sustainability Council. Anyone can apply. For three months, the teams who are invited will develop prototypes with technical and financial assistance from the lab. All the results will be made publicly available.

“A company has to be open for exchange with the outside and has to reinvent itself in order to create innovative products. It needs teams that think outside the box, that think big. And leaders who can bring these odd characters together.”

Prof. Dr. Gesche Joost, Professor for Design Research at the Berlin University of the Arts and member of the Group Sustainability Council



With 43 think tanks

around the world, Volkswagen is working on the future of technology – like big data, industry 4.0, artificial intelligence, connectivity and virtual reality. We now have over 2,000 experts researching and testing new technologies and working models. The **Ideation:Hub**, for example, brings young entrepreneurs together with Volkswagen’s own experts for pilot projects. The hub is looking for exciting start-ups to invest in, and to involve in the **Incubator at “Die Gläserne Manufaktur”** in Dresden, where six teams have been working since August to develop their ideas for the market. They are given six months’ time, €15,000 and the expert support.

DATA:LAB

This Munich-based lab is the Volkswagen Group’s center of competence for artificial intelligence, machine learning and big data. In collaboration with universities, start-ups and tech companies, the lab develops IT solutions for the analysis of the enormous volumes of data generated in connected driving. The goal is to improve processes and product characteristics.



VIRTUAL ENGINEERING LAB

Based in Wolfsburg, this lab investigates how virtual and augmented reality can help make product development more efficient. It has developed a type of software for HoloLens, the Microsoft mixed reality glasses. Engineers can use the software to work on virtual vehicles: Using movements and voice commands, you can change the equipment and redesign components. The results are projected onto a plasticine model.



Exhibition

At the Volkswagen Group's experience space "DRIVE" in Berlin, you can explore *Shift* with all of your senses. Learn how the Group is planning the mobility of tomorrow and what lessons it is drawing from the diesel crisis. *Shift*. The Exhibition opens on November 16, 2017. Admission is free.

Microsite

Shift is also online. At shift.volkswagenag.com, you will find information about the exhibition, as well as long versions of several articles.



