# We live sustainability

Sustainability report
2023/2024

wte
EVN Group


## Content

# Clean water for a liveable future

**Wastewater disposal**
to the highest standards

**Water supply**
with reliable quality

**Sewage sludge utilisation**
with optimal self-sufficiency

As a reliable and experienced partner working with municipalities and companies, we use our broad spectrum of services to preserve and care for one of the most valuable elements: water. We set standards in terms of processes and technology and ensure quality of life for future generations with our precise solutions.

# Preface

Dear WTE business partners,

Water is life. Enabling access to this precious resource and securing it for the future is one of the most important challenges of our time – roughly two billion people worldwide currently do not have access to clean drinking water. As a water management provider, we have a special responsibility to provide more people with a reliable water supply and to implement solutions to recover water and other essential resources.
One of the ways we do this is through innovation: by digitalising our plants and processes over the years, for example, we have been able to create consistently more efficient and sustainable structures. We are now taking things one step further: currently, we are developing artificial intelligence models in-house that are being trained with data from selected plants. The aim is AI-supported optimisation of the entire operational management. These AI solutions are currently still in the prototype phase, but the simulations are already showing enormous potential. In the long term, we are planning to implement AI in plant operation as an integral part of our control philosophy. We are confident that our technology has the potential to further increase the efficiency and performance of our plants – benefiting local residents and the environment, in line with our mission of holistic sustainability.
Another project in which we take into account all dimensions of sustainability is the construction of the new wastewater treatment plant with sewage sludge mono-incineration in Skopje (North Macedonia). Designed for a capacity of 650,000 population equivalents, the new plant will represent roughly 75 per cent of the country's total waste treatment capacity following its planned completion in 2028. With a solution that combines sludge treatment and incineration, it will be possible to exploit synergies in future, such as those taken into account in the project's green energy concept: thanks to the smart interlinking of sustainable energy sources, an efficient design and energy-optimised processes in operation, we expect the completed plant to be fully energy self-sufficient. It is expected that the plant's energy requirements will be covered at a rate of 150 per cent, so the surplus energy will be available to supply the City of Skopje. This is in part enabled by our in-house technology solutions designed to fully embed the processes on site into a digital framework from the outset.
We are convinced that as a company we will be able to redefine water management within the sector with projects of this scale. We show that energy efficiency, environmental protection and profitability are interdependent and that they can be increased by using groundbreaking innovations. We are conscious of our responsibility and remain focused on our vision – for a liveable future, for people and the environment.

Source for statistics in the first paragraph: The United Nations World Water Development Report 2023.

With kind regards,

Essen, April 2024

Dr.-Ing. Ralf Schröder
(Spokesman of the management board)



Dr. Robert Dick
(Member of the management board)





# Management board

**Dr. Robert Dick**
- Managing director since 2021 (member of the management board)
- Doctoral studies in Business Administration at Linz University
- Joined EVN Group in 2007

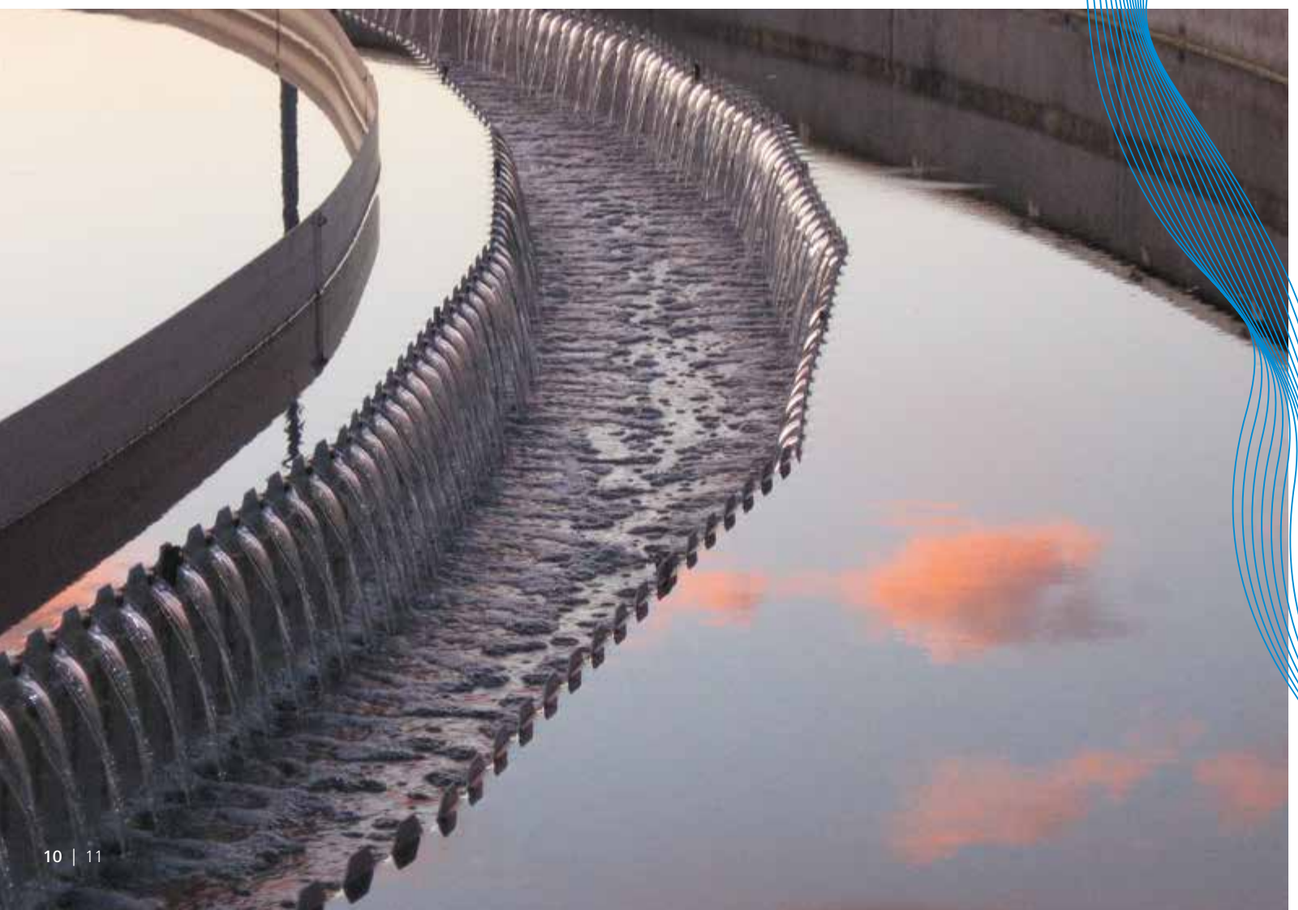
**Dr.-Ing. Ralf Schröder**
- Managing director since 2006 (spokesman of the management board)
- Industrial engineering studies
- Obtained doctorate in engineering at Rostock University
- Joined WTE Group in 1996

# About this report

## Giving you some insight into sustainability at WTE

WTE is dedicated to promoting clean water and renewable energy. In doing so, we put sustainability into practice: this is the principle that determines our actions and that we aim to fulfil in all the diverse work we do – for a liveable future.

We have compiled this report to give you some detailed insight into sustainability at WTE. Beginning with an **introduction to the WTE Group** (page 11), we present the **sustainability goals of the United Nations**, which serve as a basis for our actions (page 12). This is followed by a description of the measures we take to pursue our own sustainability goals, categorised into the three **sustainability dimensions economy** (page 18), **environment** (page 48) and **social affairs** (page 68).







# WTE Group

## Specialising in effective water management

The WTE Group is now one of the leading providers of municipal and industrial water management headquartered in Europe. We play a leading role in the industry and supply tailored solutions worldwide for wastewater management, water supply, sewage sludge treatment and energy recovery.

Since we were founded in 1984, we have been committed to providing sustainable and technologically advanced solutions that can improve the quality of life for local residents. On the basis of intensive research work, clear commitment to environmental protection and awareness of our social responsibility, our company does valuable work today for a better tomorrow.

> ‘For 40 years, more than 20 million people in 18 countries have placed their confidence in our expertise in wastewater disposal, water supply and the treatment of sewage sludge.’

**Dr.-Ing. Ralf Schröder,**
WTE Wassertechnik GmbH,
spokesman of the
Management Board

**> 700**
dedicated employees

**> 125**
projects realised

**> 10.000.000 m³**
wastewater treated per day

## Members of the WTE Group

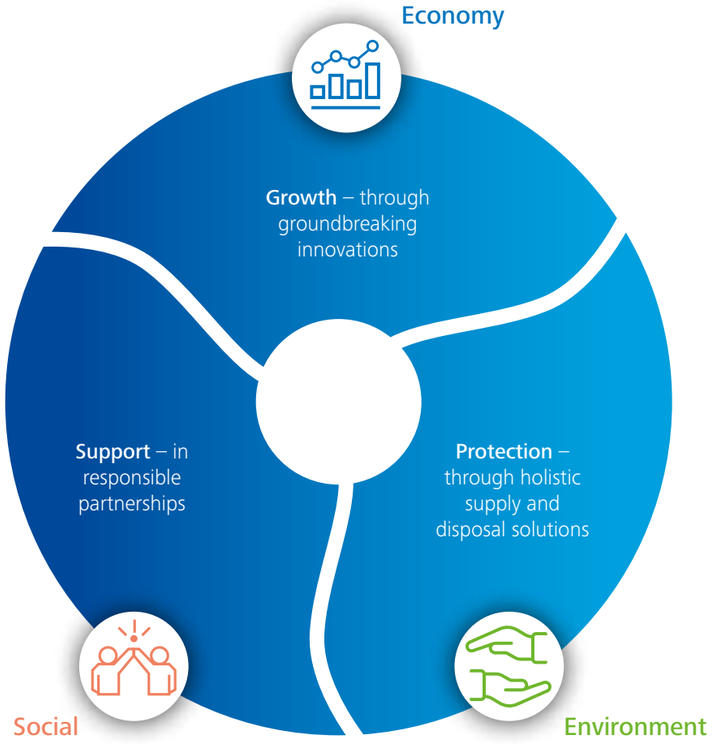
In addition to its parent company, the WTE Group includes several affiliates that operate in various countries. This includes:

- WTE Betriebsgesellschaft mbH (Germany)
- WTE Polska (Poland)
- WTE Baltic (Lithuania)
- WTE Projektentwicklung GmbH (Austria)

> ‘Every day, we work in accordance with our mission of responsibility with vision, with a clear focus on clean water for nature and people.’

**Dr. Robert Dick,**
WTE Wassertechnik GmbH,
member of the
Management Board

For more information about the WTE Group:
**wte.de/en/company/**





# Our sustainability goals

## Principles for our day-to-day work

WTE's sustainability goals are split up into the three classic dimensions economy, environment and social affairs, which we see as equivalent to the key areas of action growing, protection and providing support.

We defined our sustainability goals (see right-hand side) on the basis of the 17 goals for sustainable development contained in the United Nation's Agenda 2030.
As a water cycle and energy management company with global operations, we can and must help to create a fairer world and to allow more people to share in global prosperity.

**Agenda 2030**
With its 2030 Agenda, the United Nations developed a global plan for promoting sustainable peace and prosperity and protecting the planet. Since 2016, all member states have worked towards implementing this shared vision in national development plans to that the 17 goals can be achieved by 2030.

### Economy

**Customer orientation**
- → Design custom plants
- → Plan projects in line with customer needs
- → Take specific regional features into account

**Quality and reliability**
- → Give clients a genuine feeling of safety
- → Create planning reliability in the process

**Innovation**
- → Create technical industry standards
- → Help to drive scientific progress

**Ethics and integrity**
- → Act in accordance with code of conduct
- → Follow ethical principles

**Digitalisation**
- → Continuously digitalise plants
- → Automate processes step by step

### Environment

**Resources and resource cycle**
- → Use resources conscientiously
- → Exploit synergies to the full
- → Close the resource cycle
- → Create recycling structures
- → Recover valuable resources
- → Dispose of pollutants safely

**Climate-relevant emissions**
- → Constantly reduce emissions
- → Optimise processes for climate protection

**Energy efficiency**
- → Plan energy-efficient plants
- → Use renewable energy

**Operating materials**
- → Reduce use of chemicals

### Social affairs

**Health and safety**
- → Make workstations safe
- → Prevent accidents effectively
- → Create awareness of risks
- → Protect employee health
- → Constantly improve the work environment

**Working conditions and corporate culture**
- → Actively strengthen employee satisfaction
- → Keep employee turnover low
- → Cultivate an inclusive workplace culture
- → Foster a diverse and accepting corporate culture

**Support and development**
- → Create opportunities for further training
- → Provide freedom for development
- → Give constructive feedback
- → Develop individual potential

**Social responsibility**
- → Provide support specifically for newcomers to the industry
- → Create opportunities for young talent
- → Support social projects

# Integrated sustainability in North Macedonia

## Wastewater treatment and sewage sludge incineration plant Skopje

Skopje, the capital of the EU accession candidate North Macedonia, will be needing a new wastewater treatment plant in the coming future to serve its constantly growing population. As North Macedonia is looking to join the EU, this plant will need to be both powerful and set up in line with EU requirements. For this major project, the local client Vodovod i Kanalizacija Skopje (water supply and sewer system in Skopje) chose to work with WTE.

The project was officially given the go-ahead in mid-2023. This means that a new, cutting-edge wastewater treatment plant with connected mono-incineration plant for sewage sludge will now be set up on a plot covering 13 hectares in the south-eastern district Gazi Baba. This plant is designed for a total capacity of 650,000 PE.

The design and construction phase is set to take three years, followed by two years of trial operation. During this test phase, the client's employees will receive training in operating the plant so that they can then handle all workflows and procedures themselves.

Economy

Environment

Social affairs





## Environmental protection integrated

The Vardar River, which flows through the City of Skopje, has significantly suffered in recent years from the introduction of wastewater from the entire city area. The new wastewater treatment plant is set to change this: in future a good 90 per cent of the municipal wastewater will be treated at the wastewater treatment plant. This professional wastewater treatment will significantly improve the water quality of the river in the long term and benefit the river as a whole.

Harmful gases that can form in the thermal treatment of sewage sludge are rendered harmless by modern flue gas treatment methods. The BAT standards of 2019 are applied here. This means that safe local utilisation is guaranteed for the future, without any negative impact on the region's air quality.

The aim is to make the plant in Skopje one of the most sustainable and technically advanced disposal plants in Europe. The entire project will be implemented in line with the latest European standards and is intended to serve as a pioneering project for responsible wastewater treatment and sewage sludge incineration in south-east Europe for years to come.

**'In terms of energy efficiency in particular, the construction project in Skopje represents a milestone for our company. The goals are ambitious, but realistic. This makes us all the more excited to see this project progress.'**

**Dr.-Ing. Bojan Pelivano**
WTE Betriebsgesellschaft mbH,
Managing Director

# Green energy concept for energy self-sufficiency on site

Using resources responsibly and efficiently – this philosophy is part of the project's focus. We want to not only reduce waste and exhaust gas, but also to make optimal use of all available resources and energy potential in the process. On this basis we have compiled an energy concept for the plant in Skopje that is impressively efficient.

**Key pillars of the energy concept**

→ Use of biogas (combined heat and power generation)
→ Use of steam for turbines
→ Use of solar energy (photovoltaics)

Energy that is already contained in the system is systematically used for other processes wherever possible. For example, hot steam generated in the procedure will be used to dry sewage sludge in future. This will later enable autothermal incineration of the sludge. In this, we are able to draw on vast experience from our previous projects.

Thanks to the consistent use of modern process engineering, we will be able to equip the wastewater treatment plant in Skopje in accordance with the strictest energy-efficiency criteria. Given our sophisticated and sustainable energy mix, we are currently confident that we will be able to make the entire plant energy self-sufficient.

According to our latest calculations, the energy produced by the wastewater treatment plant with sewage sludge incineration in Skopje will cover 150% of its energy needs. As it is fully self-sufficient, the plant will be highly profitable in operation and set new industry standards for green energy.

# Reliable maintenance, repair and overhaul with WARIOS

With our in-house software solution, we ensure that required maintenance, repair and overhaul measures do not disrupt operations. Our WARIOS software, which we are already using in other plants with great success, will be used for the wastewater treatment plant in Skopje. The computerised maintenance management software (CMMS) enables extensive automation of all processes, and as a result plant failure and malfunctions can not only be rectified promptly but often prevented in the first place. This guarantees that all segments (treatment / pipes / pump stations / generators) remain fully functional long after the construction work has been completed.

**Financing from EU resources**

The construction of the wastewater treatment plant is made possible by financial support from the following institutions:
→ European Investment Bank (EIB)
→ European Bank for Reconstruction and Development (EBRD)
→ Western Balkan Investment Framework (WBIF)
The entire project has an order volume of roughly 184 million euros.





Focus area **economics**

# Growth –
# New challenges in the future


Creating new technologies and procedures and optimising existing ones enables the WTE Group to achieve responsible growth, directly benefiting our customers, who profit from our commitment to future-proof water management. Accordingly, we are able to utilise entirely new efficiency potential in water management thanks to the ongoing digitalisation and automation of our processes – partly supported by artificial intelligence, which we are developing ourselves.

Main topics
→ Digitalisation
→ Innovation
→ Ethics and integrity
→ Customer orientation
→ Quality and reliability

# Digitalisation

We are working tirelessly to ensure that all processes that are crucial for the design and operation of plants are **digitalised** and **automated** in the medium term.

## Object-oriented plant design

Future-proof plants require future-oriented design. This is why we use groundbreaking developments in the digitalisation of the industry, including the software solution COMOS from SIEMENS and building information modelling (BIM)..

### COMOS

**COMOS** is an object-oriented planning tool for centralised, standardised engineering as well as for the management of plants across their entire life cycle.

- → Design changes implemented in real time
- → Simultaneous read and write access to the current design status
- → Creation of a single source of truth
- → Data transfer with a database
- → Creation of the plant's digital twin

We use **BIM** to draft detailed 3D models that serve as a basis for later design steps and realistic visualisations.

- → Simplified visualisation of complex structures / cross sections
- → Software: AutoCAD, REVIT, Navisworks
- → Simple export/import of data for design and procurement
- → Incorporation of other building trades via software modules
- → Creation of photorealistic renderings
- → VR visualisation is possible (Lumion)

With the support of object-oriented design software, we can map even the most complex plants in detail and incorporate any building trades that are involved. This improves data exchange both internally and with external planners and suppliers, so high-quality solutions can be developed even in the earliest phases of the design process.

Over **250 installations**,
**160 Hosting customers** and
**570 users**

# Digital operational management with WARIOS

Long before digitalisation started making general progress, we were putting solutions on the market to make operational plant management and the maintenance, repair and overhaul of water management plants paperless – all combined in the WARIOS software suite, which is made up of four key software products:

**WARIOS|cmms**
Planning, execution and documentation of maintenance and repair measures

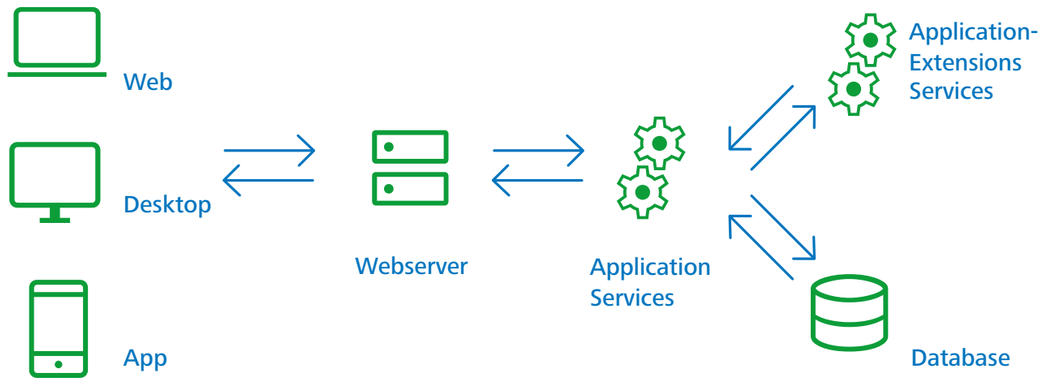
**WARIOS|kanal**
As-built documentation, condition assessment and planning and organisation for the operation of sewer networks

**WARIOS|reports**
Recording and evaluation of operating data and information relating to technical systems

**GBM4**
Organisation of data relating to calculating surface area and optimisation of administrative processes

**Software tailored to meet your needs**

All products in the WARIOS software suite contain our client-server technology – for a high level of scalability in both the amount of data records processed and the number of users, regardless of the individual site. This gives each customer a large amount of flexibility so they can meet the needs of their plant.




> ‘In the coming years, our software suite will be able to show the added value that powerful digital solutions can have for such large-scale projects.’

**Benjamin Fischer,**
WTE Betriebsgesellschaft mbH,
Operations manager

**Successful WARIOS software suite projects**

The first sewage sludge incineration plant to use our WARIOS software suite is the sewage sludge mono-incineration plant Halle-Lochau. Since its launch in 2023, all aspects of the plant’s operation are continuously logged and evaluated by our software solution in order to constantly optimise processes and workflows on site.

The WARIOS software suite also plays a special role in the largest plant project in our company’s history thus far, the wastewater treatment plant Umm Al Hayman (Kuwait). With a capacity of 1.5 million population equivalents, the plant and the project are of such an enormous scale that it would be practically impossible to implement operational management adequately over the long term without a digital framework.

Our in-house WARIOS software suite ensures that all parts of the plant function correctly and in harmony with one another, from day-to-day operation to the maintenance and repair of tanks, pipelines, pumping stations, etc.

For more information about the project:
wte.de/en/references/

# AI-based operational optimisation

WTE Wassertechnik is playing an active role in shaping the future of artificial intelligence. We are making extensive investments in our company's internal know-how in relation to AI. At this stage, we are also working towards developing our own AI solutions on the basis of our operational data. Our data scientist is working in close collaboration with the process engineers at our plants. This is how we achieve a symbiosis between data-based knowledge and practical benefits, which is the foundation of all AI applications at our plants.
On the basis of this approach, we have already created a concept for integrating AI into the control philosophy of wastewater treatment plants, for example. In the future, our AI will also be used to reduce chemical and energy consumption and optimise the aeration of activated sludge tanks.

**Digital experiments**
We are currently drawing up plans for a virtual lab where our AI developments can be used together with the data. This is based on a hybrid solution, with some of the data saved on an internal server and the rest in the cloud. Software for external use is also currently in development, along with a communication gate where authorised users can share knowledge.

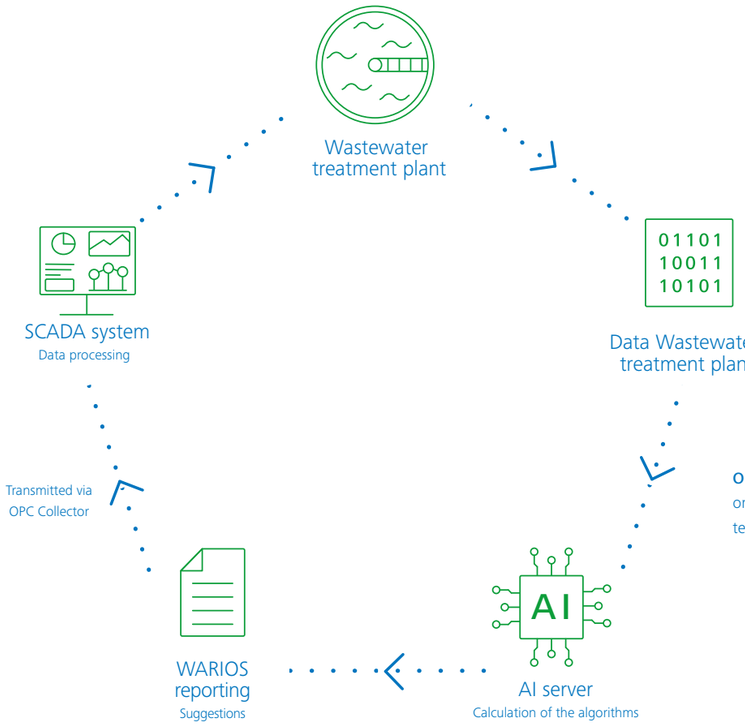
To avoid the use of AI having a negative impact on the wastewater treatment plants during the development phase, this cycle is initially separated: the WARIOS reporting data are sent to a simulation of the SCADA system, rather than to the system itself. The cycle will be closed once our AI development work has been completed.

> 'Greater efficiency, better use of resources and maximum safety – our AI is full of potential for the future of water management.'



**Dr.-Ing. Bojan Pelivano,**
WTE Betriebsgesellschaft mbH,
Managing Director

**SCADA =** Supervisory Control and Data Acquisition, in this case the control station for treatment plant operations




**OPC =** Open Platform Communications, software interface in automation technology

**COD =** chemical oxygen demand, specifies the total amount of substances present in the water that can potentially be oxidised

**Prototypes for practice**
We currently use our AI in two prototype applications for generating predictions that are to be integrated into the control philosophy of our wastewater treatment plants:

**1. COD inlet concentration**
At the central wastewater treatment plant Windeck-Rosbach, a prototype of our AI is used to predict the COD inlet concentration. It uses over 18 years' worth of data (with the exception of data from the past two years). Validation of the results revealed an error rate of only 3%, so the predictions were correct in 97% of cases. This means that AI can inform the wastewater treatment plant manager of the relevant conditions early on and help them make appropriate decisions. The responsible lab is also informed of the expected values. If the lab findings significantly differ from the AI forecast, a repeat test is recommended.

**2. Pump operation**
AI is used at the central wastewater treatment plant Zagreb to predict when specific pumps should be turned on or off. The AI uses a weather app to analyse the expected water feed volume. If rain is predicted, for example, the plant manager can be promptly informed that an additional pump should be switched on to deal with the extra volume of incoming water.

**Focus on law**
Ensuring that our AI solution is used in compliance with the law is a top priority for us. We make great efforts to ensure that our development work is in line with all legal requirements and that it corresponds to the stipulations of the EU AI Act.

# Reliable standards in construction planning

The WTE Group supports towns and municipalities in collecting and publishing all relevant construction and design data in compliance with XPlanung specifications. Integrating the standard into the process ensures maximum efficiency and precision.

**Standard for maximum compatibility**
XPlanung is a standardised data format for lossless transfer of land-use planning, landscape planning and regional planning documents between different geographical information systems. This XML-based standard is intended to ensure that all planning-related information can be made available to all relevant stakeholders in a uniform format. At the same time, it aims to allow all the systems used to evaluate and process the relevant data without any restrictions. Since 2023 at the latest, use of this new standard (XPlanung/XPlanGML) has been mandatory for all procedures/applications at national and regional level.

**Relevant data – overview**
We support partners at municipal level in preparing or digitising the following data records:

- Land-use plans
- Development plans
- Plot information
- Information on infrastructure
- Stipulations and arrangements
- Environment-related information
- Information on relevant stakeholders

**Automation and digitalisation taken one step further**
For many years, we have intensively focused on optimising our operational processes. With our expertise in this area, we can help our clients to not only collect data in compliance with XPlanung specifications but also to further simplify their data collection and processing across different formats and to extract key information from documents, construction plans, etc. even more easily.

In this way, we ensure that data records can be identified and referenced correctly. Vectorial geographical data from provided data records are checked comprehensively for correctness and any potential gaps or overlaps. Properties can also be generated easily on the basis of data, using known geometries and specifications, for example to check the feasibility of certain concepts in advance.

**Future potential of XPlanung**
Collecting data in compliance with the XPlanung standard is a concept that is highly scalable and that has potential in a vast range of areas:

- **Sustainable urban planning**
  From the perspective of water management, a uniform standard for construction and planning areas can help to promote the creation of environmentally friendly infrastructure, ecological corridors, green spaces and more in urban areas. Data models can be used to simulate complex scenarios and building structures, plan them more easily and realise them with less expense – even interdependently.

- **Smart city concepts**
  Well-structured, standardised data records will in future make it possible to consider planning projects for individual boroughs in an overall urban planning context. This could significantly help to revitalise neglected neighbourhoods and to emphasise the significance of cities and functional units.

- **Internationalisation**
  Establishing XPlanung as a municipal planning standard could play an important pioneering role. On the one hand, this uniform framework could set an international example and thus gain importance as an individual standard. On the other, the basic structure is the perfect starting point for further developing the standard – for example on the basis of new technologies.

’
**Thanks to the support they receive from us in digitising their construction and planning data, our municipal partners benefit from consistent data records and more efficient processes.’**

**Eileen Stanik,**
WTE Betriebsgesellschaft,
Engineering services

XPlanung


- XPlan – compliant data collection
- Land-use plan
- ALKIS data

**ALKIS** = official land survey register information system

# Collaboration with Siemens

In 2023, WTE concluded a framework agreement on cooperation with Siemens in order to realise joint projects involving drinking water, water, wastewater and sewage sludge. The two companies also want to advance the automation of infrastructure plants and digitalisation and support each other with mutual product placement.

**Multi-faceted collaboration**

WTE and Siemens are currently identifying concrete opportunities for joint projects and a strategic partnership. Regular meetings are set to be held over the next two years to evaluate ideas and possible forms of collaboration and define them in more detail, with plans for specific working groups.

Collaboration is hoped for in the following areas in particular, and our options are currently being assessed:

- Mutual support in sales for mega-projects in the water sector
- Implementation of joint communication measures for reference projects
  > global visibility of successfully completed projects such as those in Kuwait and Hanover via the Siemens Global Network
- Integration of WTE software products for servicing, maintenance, reporting and operational management of water infrastructure into the Siemens Xcelerator platform > global online marketing of WARIOS
- Joint development of operating software
- Installation of test versions of products such as Siemens Water (SIWA) applications at WTE operating facilities
- Integration of WTE for the water infrastructure at sites where Siemens is involved in smart urban development (for example Germany and Saudi Arabia)

> ‘We are looking forward to working with Siemens on ambitious joint projects and advancing development in digital transformation and data science.’

**Dr.-Ing. Bojan Pelivano,**
WTE Betriebsgesellschaft mbH,
Managing Director

**Partnership on equal terms**

WTE and Siemens have already collaborated successfully in the past, for example on the sewage sludge mono-incineration plant in Halle-Lochau, where Siemens products were used in the market development, as well as at the sewage sludge utilisation plant in Berlin that is currently being set up and where Siemens products are also used.

# Innovations

Our buildings incorporate the latest developments in technology. At the same time, we develop and improve process engineering, helping to shape the **state of the art** and make a contribution to a sustainable **circular economy**.

## Recycling and energy positivity

**Wastewater treatment Umm Al Hayman, Kuwait**

In the plant, **the purified wastewater, biogas** and **treated sewage sludge** are made available for efficient re-use.

For more information:
see page 12.

**Technical features for sustainability**

- The construction work and advanced technologies in compliance with European and Kuwaiti standards and regulations, along with the use of tried-and-tested plant technology, enable low maintenance and replacement costs.
- The plant is equipped with fully automated open- and closed-loop control, so the workload for the supervisory and operating personnel can be optimised.
- Thanks to the use of low-energy venting equipment and the overall system's convenient hydraulic design, energy consumption has been reduced. Furthermore, the energy requirements are met by means of combined heat and power plants (CHPs) with biogas generated during sludge digestion.
- As biological processes are used, no additional chemicals are needed in order to achieve the required reductions.

**Wastewater treatment and sewage sludge incineration plant Skopje, North Macedonia**

The new wastewater treatment plant in Skopje will cover sludge treatment including sludge drying and incineration along with additional solar power plants for energy generation. This means that all process treatment stages will be interlinked to ensure the largest levels of efficiency that are possible today in terms of energy savings, sustainability and performance.
Accordingly, all available resources – biogas, steam and sunlight – are to be put to optimal use. Not only to fully cover the plant's energy needs: the wastewater treatment plant is to produce more energy per year than it needs for its own purposes. The plant therefore already takes into account the planned EU regulations for energy-neutrality in the wastewater sector, which will be implemented by 2040.

**Energy bonus for the capital city**
Based on a 'green energy concept', the plant in Skopje will be a fully energy-autonomous and sustainable wastewater treatment plant. This approach is in line with the current European philosophy of a climate and environmentally friendly wastewater treatment plant and it represents the most inexpensive and profitable solution in the long term for the beneficiaries and for the people in the community.

| | |
|---|---|
| **2 solar power plants** | 2,00 MWp |
| **2 CHP modules** | 0,92 MWp |
| **1 steam turbine** | 0,22 MWp |
| **Energy generators** | 3,14 MWp |

## Bioelectrochemical systems for wastewater treatment

Microbial fuel cells (MFCs, a type of bioelectrochemical system) are one of the current innovations in the energy sector that could prove to be a key technology with enormous technical and economic potential. Thanks to the experience and the contacts that we gained from the AGaBZ research project, we are able to make sound assessments of other development activities in order to exploit the potential of microbial fuel cell technology.

**AGaBZ** = automated microbial fuel cells with extended gas utilisation in municipal wastewater treatment plants; see 2022 Sustainability Report wte.de/en/sustainability/

A report on the fundamental operational results is provided in the peer-reviewed publication in **'Water Science & Technology' (Heinrichmeier et al., 2023).** Other laboratory findings and principles relating to MFC technology have been documented and published as part of the essay **'Development of a comprehensive mathematical model for municipal wastewater treating microbial fuel cells' (Littfinski, 2023).**

**Focus on energy-positive wastewater treatment**

Over the course of the AGaBZ project, focus was increasingly placed on energy-positive wastewater treatment. In particular, the laboratory facility was able to show that the hybrid MFC technology is able to combine aerobic and anaerobic metabolic mechanisms and other physical/chemical processes. This means that such systems could be used to remove nitrogen in significant amounts, as well as organic material. The energy positivity is the result of energy no longer being needed for ventilation when bioelectrochemical systems are used:

**Energy consumption/production**

| | Without MFC | With MFC | Potential energy saving |
|---|---|---|---|
| Biogas | 15,9 | 10,8 | - 5,1 |
| Sludge treatment | 4,0 | 2,7 | 1,3 |
| Biology | 21,0 | 9,9 | 11,1 |
| Bioenergy | | | 1,6 |
| **Total** | | | **8,9** |

Relevant energy consumption and generation from a reference wastewater treatment plant with and without integrated MFC technology in the outlet of the primary settling basin | Values = $kWh_{el}$ $PE^{-1}$ $a^{-1}$

**The challenge of profitability**

Using the MFC in the main flow of the wastewater treatment plant would theoretically result in energy savings of 50%. This would require extremely large electrode surfaces, however – a design challenge that would make implementing this method economically unfeasible at the current time, given the high costs of the cathode material.

**'The energy-positive treatment of wastewater and the reduction of greenhouse gas emissions remain key goals of our research and development.'**

**Dr Ekaterina Vasyukova,**
WTE Wassertechnik,
Head of Research & Development department





# Energy generation and nutrient recovery from wastewater

In addition to the assumed nitrification process in the cathodic biofilm identified in the previous research project, a new, previously unconsidered, nitrogen elimination method was identified that provides a new perspective on the technology and its potential uses and applications: electrochemical ammonia stripping.

One area where the high efficiency of ammonia stripping could be put to good use is in sludge water, as its pH, temperature and concentration gradients correspond to, or at least come close to, the required levels. Using concentrated subflows also reduces the required overall volume of the MFC reactor, because of the mass flows that are needed in the thinner main flow. To generate these subflows, new reactor designs are being developed on the basis of alternative membrane materials such as terracotta, which can be used for years, according to the laboratory trials that have been published thus far.

**Some of the advantages of these reactor forms:**

- Easier access to the cathodes
- Reduced scaling
- Option of extracting nitrogen
- Solves the problem of leakage in the system
- Lower material costs

The system is profitable, provided that the right electrodes are chosen.

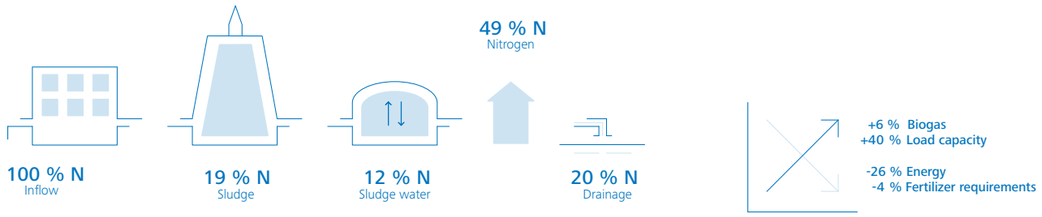
**Innovation in the test phase**

This groundbreaking approach of reorienting the MFC technology towards a microbial electrosynthesis cell (MES) for eliminating ammonia from sludge water is currently being trialled by WTE on the basis of components that have already been tested successfully. The new design has been set up at lab scale and installed in the wastewater treatment plant in Hecklingen. The initial findings from the plant operation are promising.

*The MFC technology is being used on wastewater from wastewater treatment plants.*

**Less energy, more capacity**

An initial assessment of the potential of integrating MFC technology into the sludge water flow found a theoretical reduction in energy consumption of ~26% and an increase in the load capacity of the activated sludge process of up to 40% (assuming complete elimination).




Nitrogen mass balance and potential impact of sludge water treatment with MFC in municipal wastewater treatment plants.

**Additional positive side effects:**

- Helps to cover fertiliser requirements (if nitrogen is recovered as ammonium sulphate)
- Increased biogas production
- Reduction in greenhouse gas emissions (direct and indirect)





# Collaboration

WTE's innovative strength is also the result of our collaboration with many enthusiastic stakeholders who want to help shape the future of water management. In our collaborations, which we constantly maintain and expand, we share our many years of know-how, gain new insight, and help to decide on the sustainable water supply and wastewater disposal of tomorrow.

- Universities and research organisations
- Associations
- Industry
- Water sector networks

**DWA =** Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.
**EWA =** European Water Association e. V.
**GWP =** German Water Partnership e. V.

'We are now working with more than 10 professorships and research institutions – in Germany and beyond. We are pleased to be making important contributions to science together.'

**Dr.-Ing. Leon Steuernagel,**
WTE Wassertechnik GmbH,
Head of Business Division Tendering

**Active participation in committees and conferences**

Our committee work includes regularly taking part in the sessions of the DWA committee, for example. The work focuses on compiling and updating the DWA Code and helping to put together specific technical standards at national and international level.

In the IWA network, we are involved in a number of activities. This year, WTE is sponsoring the IWA Leading Edge Conference on Water and Wastewater Technologies (LET) 2024, one of the sector's largest international technical IWA conferences in the industry, which takes place in Germany in June. We will also be actively taking part in various parts of the programme: from giving a welcome speech to holding a workshop and presenting our developments.

iwa-let.org

**Research for practice**

Our research projects often involve small and medium-sized industrial companies active in the water sector, who collaborate with WTE on the (further) development of procedures for water and wastewater treatment as well as on analytical measurement equipment and software for the automation and control in wastewater treatment plants.

We publish the latest findings of our research projects regularly in international peer-reviewed journals such as **Water Research** and **Water Science & Technology.**

# Ethics and integrity

Our aim is to operate ethically and proactively in accordance with our **code of conduct.** We want to prevent any breaches of legislation or directives at all times.

## Compliance management system

In all that we do, we make great efforts to observe all relevant laws. To make this possible, we use a tried-and-tested compliance management system that applies for all locations where WTE is active.

**Living compliance culture**
Our compliance management system is based on a respectful compliance culture that involves all employees and that is run by our executive managers. At WTE, this culture is lived out in day-to-day work on the basis of three fundamental areas of action:

### Prevention (raising awareness)

- → Build up a positive attitude to compliance and its benefits
- → Enable access to internal rules and regulations
- → Provide training

### Identification (guidance)

- → Use whistleblower system
- → Advise on compliance issues

### Reaction

- → Adjust compliance organisation
- → Continuously improve processes

**Proactive approach → Benefits from compliance**


### Proactive

- → Helping to shape a pro-compliance attitude from the outset
- → Conveying the true benefits of compliance

### Benefits

- → Creating a safety net
- → Space for flexibility
- → Avoidance of penalties and damage
- → Upholding the company's good reputation
- → Safeguarding future business

**Compliance training: understanding what protects our values**
In order to familiarise our employees with the mandatory code of conduct and to avoid conflicts of interest in day-to-day work from the outset, we provide regular training and communication initiatives at all locations. We address both the individual requirements that apply for the employee and the local risks and requirements in accordance with the risk-based approach of our compliance management system.

As aspects of compliance need to be observed during all activities of the WTE Group, we also commit our contractors to observe the EVN integrity clause, which includes complying with the basic principles of the EVN code of conduct.

**Human rights: respected at all our locations**
The WTE Group is committed to respect for human rights at an international level – even in countries where there is less awareness of these rights.

**Advanced whistleblower system**
The new Whistleblower Protection Act (HinSchG) came into force in Germany in July 2023. Accordingly, WTE and EVN have an established whistleblower system that can be used to report suspected compliance breaches in an atmosphere based on trust. An internal reporting channel is available to employees, customers and suppliers for this purpose.

When a report is received, it is reviewed and processed by the Compliance Officer in accordance with legal and internal specifications. Both the report and the personal data of the whistleblower are treated with strict confidentiality. The aim of the procedure is to enable seamless, objective and efficient clarification of reported breaches.

**'We have set up an especially straightforward procedure for reporting compliance breaches – a key element for strengthening the company's resilience.'**

**Lena Kwiatkowski,**
WTE Wassertechnik GmbH,
National Compliance Officer

For more information about the project:
see page 28.

equator-principles.com

## Sustainable financing

All project partners that were involved in the construction of the Umm Al Hayman Wastewater Treatment Plant committed themselves to observing the 'Equator Principles'.

**Principles for people and the environment**
The Equator Principles are a recognised set of rules adopted by international banks and export-credit insurers that cover strict environmental protection and social standards for the implementation of projects. In Kuwait, compliance with these standards was regularly checked by an external consultant working for the banks.

Furthermore, as with all our projects, all of the EVN Group's standards relating to human rights, ethics and integrity applied to the implementation of the project in Umm Al-Hayman.

## Sustainable procurement and the German Supply Chain Act

As a general contractor, we make a significant contribution to reliable waste disposal and environmental protection in the construction of sewage sludge incineration plants. Quality throughout the entire supply chain is the basis for successful project implementation. Our aim is to work with our suppliers to develop and realise innovative environmental solutions for our customers – with resources used in the best possible way.
In all of our procurement activities, we therefore believe in a cooperative approach, fair business practices and open dialogue. To achieve this, we act in accordance with the following principles:

- Profitability
- Free and fair competition
- All bidders treated equally
- VConfidentiality throughout the entire business process
- Transparency and documentation of results
- Protection of environment, conservation of resources
- Social responsibility
- Respect for human rights and work safety
- Sustainability in the supply chain

**Centralised procurement, common goals**
The operative and strategic procurement of material, services and construction work that are needed to realise all projects of the WTE Group is implemented centrally by WTE Wassertechnik GmbH – for unified communication with direct decision-making channels. Furthermore, this enables the same standard to be upheld in every project: procurement that is responsible from the perspective of overall profitability and sustainability, for example through energy-efficient plants and long-lasting components.

**Our standards for our suppliers**
Our supplier companies make a significant contribution to the sustainable and energy-efficient set-up and long-term operation of our plants. This is why we select suppliers that conserve resources and close resource cycles along the entire supply chain, with the ability to be highly innovative even when it comes to tackling new environmental challenges. Additional criteria include very high standards for qualified processes and technologies, as well as transparency and resilience in the supply chain, beginning with the sub-suppliers.

**'We ensure sustainable procurement by relying on long-term partnerships with providers that share our commitment to environmental protection and long-lasting quality.'**

**Stefan Schulte,**
WTE Wassertechnik GmbH,
Head of Procurement, Purchasing and Logistics

# Customer orientation

Our strong customer orientation allows us to realise all of our plants according to **individual requirements** and local conditions, helping our customers to achieve their sustainability goals.

## Custom solutions

**Wastewater treatment plant, Prague, Czech Republic**
The state-of-the-art wastewater treatment plant is located on the 'Emperor's Island' Cisarsky. Its extension therefore needed to be implemented on a comparatively small area. The solution: an underground construction that offers both flooding protection measures and efficient odour and noise treatment, so visitors to the park above will not be disturbed.

**1.200.000**
population equivalent (PE)

**354.240 m³**
wastewater treated per day

**600 x 130 m**
width and length

**Wastewater treatment and sewage sludge incineration plant Skopje, North Macedonia**
In our implementation of the new turnkey project, we are setting new standards for environmental protection specifically for the Skopje region and the Vardar River, which runs through North Macedonia to the Aegean Sea. For example, we applied the BAT standards from 2019 for the flue gas treatment of the thermal sludge utilisation in order to protect the sensitive local environment as much as possible.

**650.000**
population equivalent (PE)

**150 %**
electrical self-sufficiency

**2 Years**
of trial operation by WTE

For more information about the project:
**wte.de/en/references/**

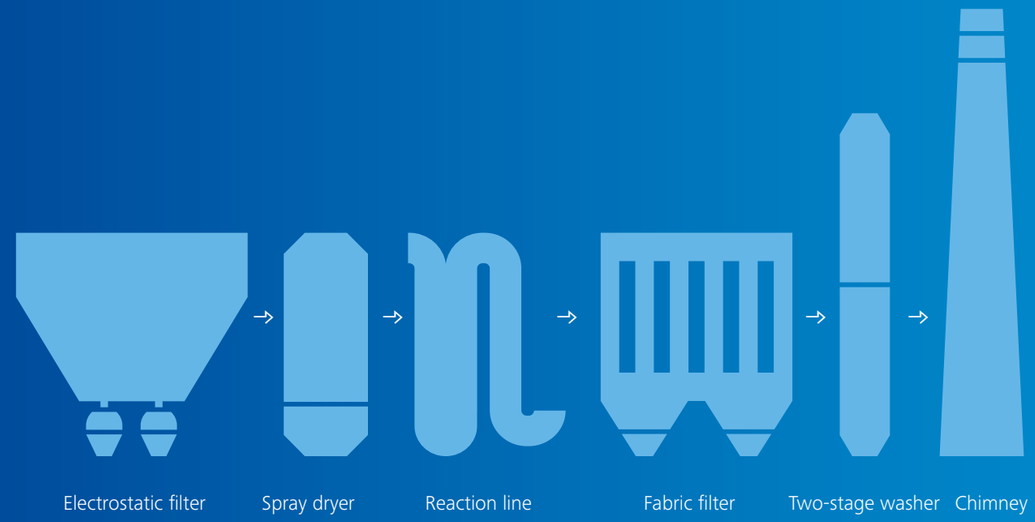
## Sustainability concepts

**Sewage sludge incineration plant Berlin-Waßmannsdorf and Munich**
Concepts for effective flue gas cleaning are also being implemented in Berlin and Munich:

- in these two locations, cutting-edge multi-stage flue gas cleaning will ensure compliance with the requirements of emission law.
- At the Berlin and Munich based plants, the waste heat from the incineration will be used to generate electrical energy.

**'By implementing these measures and procedures, and many others, we are enabling our municipal clients to sustainably protect the environment.'**

**Jörg Köring,**
WTE Wassertechnik GmbH,
Business Unit Manager
Technology/Plant Planning




*Flue gas cleaning at the plant in Munich*

# Quality and reliability

Our aim is to maximise **reliability** and **plannability** for our customers.

We design our plants to have the longest possible service life, maximum operational reliability (plant availability) and minimal maintenance requirements. We are not bound to any specific manufacturers or partners – WTE works and plans with complete independence. We have a free choice when selecting technical components, and can decide for ourselves which are most suitable for our customers' projects.

## Quality assurance concepts

For us and our customers, it is extremely important that commissioned plants start operation on schedule, legal requirements are taken into account in full and set budgets are complied with. For this reason, we have developed an extensive quality assurance concept over the years, which has become a standard element in our operational quality management. This enables us to minimise potential project-related risks effectively while ensuring the highest standards of service.

The items covered by a quality assurance concept of this type include the following:

### Documentation

- Inpecting and assessing all documentation relating to the project
- Planning and creating checklists (for building trades)
- Creating preliminary documentation (in trial operation)
- Validating and approving the documentation status

### Tracking deadlines

- Jointly creating an implementation schedule
- Defining project milestones
- Defining production schedules
- 'Schedule Planning Manager' as central supervisory body

### Quality control plan

- Defining minimum requirements and key procedures
- Requesting skills-related inspection and test plans (ITPs)
- Checking plausibility and conformity of components (including third-party checks)

### Initial discussions

- Early scheduling of initial production/assembly discussion
- Presenting and discussing the up-to-date and complete papers
- Official confirmation and precise record keeping of the approval

This quality assurance concept has already been used in various national and international projects. Accordingly, the key components of boilers and their peripherals, for example, undergo strict quality testing before being permanently installed in large-scale plants like those in Tubli (Bahrain), Berlin and Munich.

In our major project in Kuwait, consistent implementation of this concept ensured that all pipelines precisely met the prescribed specifications. This also involved working with external testing laboratories such as the TÜV. Thanks to this strict quality assurance in accordance with power station standards, we were able to start operation of the plant on schedule without any major delays.

At the same time, our concepts also undergo continuous optimisation: the QA measures and documents are constantly evaluated on the basis of the project and application procedures. In this way we create the foundation for ensuring that our concepts are as universal as possible and can be applied in future project work.

**'The more precisely you can define exactly what you need and who is responsible at the beginning of a project, the better the chances of a professional and rapid implementation. We work with clear concepts that ultimately benefit our customers.'**

**Volker Hessenbruch,**
WTE Wassertechnik GmbH,
Head of Quality and
Work Safety Management

## Maintenance and repair with WARIOS|cmms

When it comes to ensuring that a plant can run smoothly and be operated professionally, maintenance and repair are enormously important. With this in mind, WTE developed WARIOS|cmms, its in-house ‘computerised maintenance management system’ that combines all processes and intricate workflows in one software solution. The software helps to ensure long-lasting professional maintenance of various types of plants and to sustainably increase their longevity.

Key features of WARIOS|cmms

- Automatic creation of maintenance assignments thanks to coupling with SCADA systems
- Management and allocation of assignments in accordance with the resources available
- Native GIS integration
- Access to manufacturer documentation
- Statistical evaluation at detail level
- Available as app for mobile devices
- Interfaces with ERP and plant engineering systems

**‘WARIOS|cmms is an all-in-one solution that combines all subdivisions of your maintenance and repair activities – from planning and implementation to documentation – in a single software product.’**

Alexander Staedtke,
WTE Betriebsgesellschaft mbH,
Head of IT Department

The planning, organisation and execution of maintenance can be planned by a central body – even across multiple plants and with the integration of third parties such as subcontractors. From the long-term scheduling of maintenance intervals and precise resource scheduling to the strictly separate documentation and billing of work performed by individual service teams, WARIOS|cmms covers all key points.

For more information about WARIOS:
warios.de/en/

When procuring machine and process technology, we opt for top European quality wherever possible. We assess the potential suppliers in terms of where they are located in relation to the project site and choose the ones that are best suited to supply us.



## Integrated management system

The WTE Group’s international environmental project business requires decisions with an extensive impact to be made on a daily basis - from Group level right down to the individual plants. To make the individual projects manageable and enable targeted decisions, we have established a group-wide integrated management system (IMS) as a standard. This standardised system provides employees and customers with reliability in their work together.

The IMS helps us to streamline our workflows precisely and to achieve maximum efficiency even in international projects. This means we can complete projects more quickly, with consistently high quality – which directly benefits our customers and project partners.

### → Pioneering role
We are the first provider of municipal and industrial water management to have all its processes successfully certified, from acquisition and quotations to design, construction and operation.

### → International validity
All subsidiaries and branches are integrated into the WTE Group’s IMS system. The concept acts as an international standard that enables us to work successfully with each other and with our customers.

### → Transparency meets efficiency
The entire management system is designed to be well-organised, with clear, streamlined workflows. Information, communication and documentation play an essential role in all processes.

### → System in development
Our IMS is not a complete, finished project. It is modified and updated regularly. This ensures that the defined specifications for processes and standards are consistently up to date and relevant.

### Independent assessment of our management system

To ensure that we are living up to our commitment to high standards at all times, we have our systems audited and assessed on a regular basis. Internal and external audits are performed to verify our compliance with international quality, environment and energy management standards and our observance of relevant occupational health and safety regulations.
Thanks to these independent audits, our partners can be sure that we provide all services in accordance with recognised national and international standards. Our services are always in line with the industry’s best practices and the local legal regulations – for successful projects the world over.

# Using environmental and energy management systems

Selected sites are certified in accordance with an environmental and energy management system. Our objective is to steadily increase the environmental and energy performance of these sites by continuously improving workflows and processes.

The following sites have been certified in accordance with our environmental management system (ENV) / energy management system (EN):

| Sites | ENV | EN |
|---|---|---|
| WTE Essen | X | X |
| WTE Hecklingen | X | X |
| Drinking water supply and wastewater disposal plant Windeck | X | X |
| Wastewater treatment plant Anthoupolis with membrane technology | X | |
| Zagreb Wastewater Management and Operation d.o.o. Zagreb | X | X |
| WTEB operational site KSVA Halle Lochau | X | |
| WTEB operational site Walkenried | | X |
| WAMS Buckow | | X |

**Climate protection and energy self-sufficiency – hand in hand**
With its professional wastewater treatment on site and the provision of top quality drinking water, the WTE company group is already actively putting environmental protection into practice. We design our plants with the aim of making them as energy self-sufficient as possible by using renewable energy sources.

In this way, our environmental management and energy management intertwine and complement each other – directly helping to conserve resources and lower running costs in plant operation. This means that our company environmental management and energy management systems benefit both our customers and the climate as a whole.

**'The certifications create transparency in the workflows and highlight opportunities for optimisation. Continuous optimisation of our plants' efficiency is something we take very seriously – in line with our commitment to continuous improvement.'**

**Nina Hustadt,**
WTE Wassertechnik GmbH,
Responsible for environmental and energy management

Focus area **Environment**

# Protection –
# Sustainable thought and action

Our valuable resources are becoming increasingly scarce, so using them responsibly is more important than ever. This is why we endeavour to realise each of our projects as resource-efficiently and sustainably as possible.
Cutting-edge procedures help us to treat water, reduce emissions and set the course for future phosphorus recovery. At the same time, we use multiple combinations of renewable energy, as appropriate for the particular site, to achieve maximum energy self-sufficiency. Our methodical optimisation measures improve the carbon footprint of our plants, creating additional value for our customers and for the environment.

Main topics
→ Resource and material cycle
→ Energy efficiency
→ Climate-relevant emissions
→ Operating materials

# Resource and material cycle

We design our plants so that wastewater and sewage sludge are utilised as an **energy resource**, **material** or **water source** and are thus integrated back into the resource cycle.

## Sustainable cycle systems

For many years, the WTE Group has actively promoted the idea of using the resources available on our planet as effectively and as sustainably as possible. This covers both minimal use and professional treatment and recovery of valuable resources.

By designing our plants to enable substances to be recovered from wastewater and sewage sludge and then returned to nature, we are doing our bit to establish a true resource cycle.

**Umm Al Hayman, Kuwait**
In our new plant in Umm Al Hayman, we have laid the foundation for reusing multiple resources in the region once they have been treated:

**’**
**”Closing the water cycle”, i.e. creating and maintaining a real cycle of water, is of fundamental importance for us and the entire ecosystem. We are proud that so many of our plants are setting new standards in this field.’**

**Torsten Hentschel,**
WTE Wassertechnik GmbH,
Head of Process Engineering

→ **Purified wastewater:**
The quality of the treated wastewater (treated sewage effluent – TSE) is perfect for use for the irrigation of gardens, nurseries and public parks, on golf courses, for agriculture and for industrial processes. The wastewater treated in the plant (generated by 1.7 million people, and rising) is saved in specially designed main and auxiliary reservoirs. These reservoirs have a total capacity of roughly 320,000 m³.

A monitoring centre with lab located by the main reservoir guarantees the safety and cleanliness of the water. A new pipeline network, roughly 450 km in total length, can supply process water to end customers’ premises where it will then be used, closing the cycle.

→ **Biogas**
The gas obtained as a by-product of the fermentation process is used in high-efficiency combined heat and power (CHP) plants to cover the majority of the electrical and thermal energy that the plant needs for operation.

→ **Sludge**
At the local plant, sludge is treated for re-use. Established procedures like microflotation followed by digestion are applied. Following this treatment, the sludge is composted.

At the end of this treatment, which is almost fully automated, the composted sludge can be used as class A fertiliser for agriculture. As a result, valuable resources are produced instead of waste, and thanks to WTE they can be brought back into the resource cycle.

In UAH, both the water line and the sludge line are designed to produce a usable resource at the end of treatment. We are convinced that we will be able to use the experience we have gained from this project in future projects.

Umm Al Hayman is currently one of the largest projects in the world for treating wastewater and supplying the sectors of agriculture and industry with process water that has been treated to the highest standards.

**39** strategic and secondary reservoirs

More than **50,000 m³** digestion tower volume

Processing of roughly **120,000 tonnes** of wet sludge per year

Production of **70,000 tonnes** of fertiliser per year

# Green energy in Skopje, North Macedonia

Our wastewater treatment and sewage sludge incineration plant in Skopje, the capital of North Macedonia, is based on an green energy model developed in-house. Building on this concept, the plant was designed to allow all resources available locally to be utilised as efficiently as possible: biogas, steam and sunlight – in volumes that not only fully cover the plant's energy needs but also leave a surplus. This means that any surplus energy can be fed into the public power grid, and the wastewater treatment plant produces more energy per year than it needs for its own purposes – making the wastewater treatment plant Skopje a truly green power station.

**Sustainability made to measure**
By developing plant concepts that are precisely tailored to meet our customers' needs, our customers benefit in multiple ways:

→ **Better profitability**
The entire plant is designed to meet the requirements and ideally will run with full energy self-sufficiency. This means that the operating costs – especially in the long term – will be much lower than for comparable projects.

→ **Safeguarding against crisis**
As plants can largely or even fully supply their own energy, plants and operators are less affected by external influences (for example increasing market prices for energy). This provides planning reliability and considerably reduces vulnerability to crisis situations.

→ **Conscious environmental protection**
Our energy concepts are primarily designed for the use of renewable energy. By focusing on renewable energy sources throughout the entire process, we integrate environmental protection into our projects from the outset, always in close coordination with our customers.

For more information about the project
see page 14.



# Use of flue gas waste heat in Berlin-Waßmannsdorf

We are currently setting up a new sewage sludge utilisation plant at the site of the wastewater treatment plant Waßmannsdorf for Berliner Wasserbetriebe (BWB). The aim of this new plant is for it to utilise all sewage sludge produced in this urban area self-sufficiently. To date, large residual amounts of sludge still have to be incinerated externally, as there is insufficient incineration capacity.
The thermal sewage sludge utilisation plant Berlin-Waßmannsdorf also has an energy self-sufficient design: the hot gases generated by the incineration of sewage sludge are vital for producing a modern water-steam cycle within the plant. This is of special importance for the processes on site.

→ Optimised drying of the sewage sludge
→ More efficient use of the energy potential
→ Electric energy generated in turbine systems
→ Coverage of (most of) the plant's energy requirements
→ Excess energy used in plant operation
→ Energy fed into the local district heating network

Once work has been completed, Berlin will have a large-scale and above all future-proof plant for disposing of sewage sludge that is largely energy self-sufficient and that makes a significant contribution to the local district heating network.

## Provision of process water for agriculture in Cyprus

On the island of Cyprus, four wastewater treatment plants are currently in operation that the WTE Group played a leading role in or is still involved to this day. This includes the design, construction and (future) operational management, depending on the plant. The Anthoupolis, Limassol-Moni and New Nicosia plants are already operated by WTE. In addition to the general aim of designing a powerful and efficient plant, using water resources responsibly was a priority on the island.

**'With German wastewater technology and long-term operational management, we are making a significant contribution to the development of the island's infrastructure as the basis for a resource-conserving emerging economy.'**

**Stefan Geurts,**
WTE Wassertechnik GmbH,
Head of Wastewater/Water Services

| Sites | Plant capacity (in PE) | Wastewater treated per day (m³) |
|---|---|---|
| Anthoupolis | 100.000 | 13.000 |
| Larnaca | 100.000 | 18.000 |
| New Nicosia | 269.115 | 30.000 |
| Limassol-Moni | 272.000 | 40.000 |

The plants are designed to not only use the latest wastewater treatment methods but also to be expanded repeatedly in the future with little effort. This ensures that it will be possible to treat consistently larger amounts of wastewater to the highest standards in future in the individual regions.

**Solution for local water shortages**
Once it has been treated, a large percentage of the wastewater goes on to be used for agricultural irrigation. All three plants combined provide sufficient water to irrigate over 1,000 hectares (depending on the type of cultivation and crop rotation). Treating several million litres of water per day helps to make efficient use of the limited water resources on the island and to prevent excessive exploitation of groundwater. This makes a major contribution to protecting water locally.
At the same time, the plants generate several thousand tonnes of dry matter every year that can be used as a natural fertiliser in agriculture.

More than **30 billion** litres of wastewater treated per year

## Professional utilisation of sewage sludge

Professional utilisation of sewage sludge is becoming increasingly important: As stricter limits now apply for nitrogens and heavy metals following the amendment of Germany's Sewage Sludge and Fertiliser Ordinance in 2017, sewage sludge can no longer simply be used for agricultural purposes.

**High rates for energy utilisation**
The sewage sludge incineration plant Halle-Lochau, which was completed in 2022, is able to utilise 33,000 tonnes of dewatered sewage sludge (TS content 25%) and 2,750 tonnes of externally dried sewage sludge (TS content 90%) for energy every year. All processes on site are in accordance with the latest standards and strict efficiency criteria.
At the same time, the sludge treatment / flue gas cleaning generates an ammonium sulphate solution (ASS). This solution can be used in concentrated form as a nitrogen fertiliser.

## Thermal and electrical energy self-sufficiency in Hannover-Lahe

Near Hanover, we designed and built a cutting-edge sewage sludge mono-incineration plant on behalf of Enercity Contracting GmbH, put it into operation and handed it over to the customer. The special feature of this plant is that it is fully thermally and electrically self-sufficient – and it also supplies households in the surrounding area.

The design of the plant focused on the overall energy efficiency. This is achieved by efficiently combining multiple processes:

- → Superheated steam is converted to electricity in turbine generators
- → Waste heat is used to dry the sewage sludge
- → Recovered energy is fed into the district heating network

The sustainably planned and energy self-sufficient plant therefore not only boasts excellent energy efficiency – across all processes. Thanks to maximum district heat extraction, the sewage sludge incineration plant also supplies some 5,000 households in the region with heat generated in an environmentally compatible way via the district heating network.

We support municipalities and associations with the safe and efficient **thermal utilisation** of **sewage sludge**. In this way, we form the foundation for future **phosphorus recovery.**

## Recovering phosphorus from sewage sludge

Following the amendment of Germany's Sewage Sludge Ordinance in 2017, wastewater treatment plants in Germany with population equivalents of over 100,000 will have to start recovering the vital raw material phosphorus from sewage sludge in 2029, and plants with smaller capacities will have to follow suit in 2032. Thanks to phosphorus recycling, this raw material will be retained in the resource cycle.
To ensure that this will be possible in the future, we design and build plants with mono-incineration, providing the basis for phosphorus recovery, and thus enabling the plants to fulfil this important task.

**Future procedures integrated today**
If recycling is to be performed successfully at a later stage, it is important for the municipal sewage sludge to be incinerated professionally. At multiple plant sites in Germany, such as Berlin-Waßmannsdorf and Halle-Lochau, or in Lithuania (Utena), the sewage sludge is therefore professionally dried on site and then incinerated. The resulting ash, which contains the phosphorus, is stored separately. This makes it possible for phosphorus to be recovered from the ash at a later point in time.

We help to reduce the anthropogenic impact on water bodies by minimising the pollutants in treated wastewater

**'Phosphorus is crucial to the survival of humans and nature – for this reason our projects set the foundations for future phosphorus recovery.'**

**Fabian Lappé,**
WTE Wassertechnik GmbH,
Head of Business Division
Technology / Design

## Removal of pollutants

The thermal utilisation (mono-incineration) of sewage sludge is a tried-and-tested method for safely disposing of the sludge produced in wastewater treatment plant operation. At the same time, mono-incineration also plays a major role in removing organic and inorganic pollutants from the water cycle.

### Pollutants in sewage sludge

- Heavy metals (lead, cadmium, mercury, arsenic)
- Pharmaceutical residues
- Dioxins
- Polychlorinated biphenyls (PCB)
- Perfluorinated surfactants (PFS)
- Germs/pathogens
- Plastic residues/microplastics

Because of the high temperatures that are achieved during the thermal utilisation process, the majority of the pollutants are oxidised. The volatile incineration products that are produced then undergo flue gas cleaning to permanently remove them from the cycle. Individual residues that remain in the sewage sludge ash can be separated from valuable raw materials like phosphorus at the end of the process.

In this way, the WTE Group contributes to removing pollutants from the water cycle as effectively as possible and on top of that to help conserve important resources.





## Membrane technology for safe process water

Advanced technologies and procedures can make a big difference when it comes to continuously improving the cleaning performance of wastewater treatment plants. Now more than ever, methods are needed that can remove minute microorganisms and particles from the water cycle – to protect humans, nature and animals.

Our wastewater treatment plants in Cyprus are a good example of the value provided by such advanced technologies. Anthoupolis, Larnaca and Mia Milia are the sites of some of the largest membrane bioreactors (MBRs) in Europe.

These cutting-edge membrane filtration systems comply with strict technical standards and can therefore clean domestic and industrial wastewater with extreme efficiency and filter organic substances very reliably. As a result, they provide consistently high water quality while requiring little maintenance.

The advantages of membrane technology:
- High level of automation
- Easy handling and maintenance
- Compact design / little space needed
- Safe operation
- High system availability
- Short start-up and shut-down cycles

Thanks to the use of ultrafine membranes (ultrafiltration), particulate impurities, bacteria and viruses can be filtered out of the wastewater. The pathogen-free wastewater then meets international requirements in relation to cleanliness and absence of germs and can be directly re-used as process water. Above all, this means it can be safely used in agriculture for irrigation purposes.

**'Wastewater treatment plants with membrane technology deliver the best water quality currently available – this benefits agriculture and the environment.'**

**Dr. Ekaterina Vasyukova,**
WTE Wassertechnik GmbH,
Head of Research and Development

## Additional treatment stages

The local requirements for a plant for wastewater treatment can vary significantly from one region to the next. In some places, the water may have much higher levels of contamination with parasites, for example. We take risks like these into account early on and incorporate corresponding solutions.

**Tailored solutions for local challenges**
One example of this is our plant in Tubli (Bahrain), which we equipped with more extensive wastewater treatment. The process includes not only N- and P-elimination but also two-stage ozonisation and subsequent chlorine treatment of the wastewater.

Worm eggs (helminth eggs) also pose a great risk. Two-stage filtration and thermal treatment of the rinsing water averts this risk effectively. This elaborate purification and disinfection effectively prevents parasite infections in the treated wastewater.

> ‘We want to permanently increase the proportion of people worldwide who have access to clean drinking water.’

**Torsten Hentschel,**
WTE Wassertechnik GmbH,
Head of Process Engineering

For more information about the project:
wte.de/en/references/

**Modernising without downtime**
One key feature here is that the plant could not be taken out of operation for the modernisation work, as this would jeopardise supply reliability. With very detailed planning and professional implementation, we were able to prevent this scenario and extend the plant’s capacities without any major impact on operations.

## Supply reliability in Romania

Today, there are many regions worldwide where consistently supplying the population with clean drinking water is still a major challenge, rather than a matter of course. At the WTE Group, we support towns and municipalities in maintaining this central pillar of public services.

Romania provides some examples of our commitment in this regard: we are currently connecting the districts Cluj and Sălaj to a modern network of drinking water supply lines. We are laying 165 kilometres of piping for safe transport of drinking water, connected to the existing drinking water distribution grid, to safeguard and improve the supply of households and commercial consumers with drinking water. Furthermore, we are setting up the required technical infrastructure on site, a pump station, a reservoir including chlorination plant and the required valve shafts. We have taken the local conditions into account to ensure that we can create a modern, powerful and efficient supply network for the population together with our local partners.

Another key project in the region is the modernisation of the drinking water treatment plant Gilau. The aim here is to optimise the water treatment process and to improve the treatment methods used on site. In future, the plant will be able to process an average of 9,540 m3 water per hour to the strictest quality standards so that it can be supplied to the region’s population as drinking water.

> ‘Being able to access clean water is a human right – this is something we firmly believe in. For this reason, we appreciate the opportunity to work with dedicated partners to find practicable solutions to ensure supply reliability for the people that live in the region.’

**Johannes Egbert,**
WTE Wassertechnik GmbH,
Head of Networks

# Energy efficiency

Our aim is to **design** new plants in such a way that they are particularly **energy-efficient** in **operation** and that can use **renewable energy sources**.

## Generating energy in wastewater treatment

**Wastewater treatment and sewage sludge incineration plant Skopje, North Macedonia**
In Skopje, WTE will be realising the construction of a new wastewater treatment plant for 650,000 PE with advanced sewage sludge treatment – based on an overall ‘green power plant’ concept.

The concept of generating energy beyond the plant’s own requirements impressed our client in terms of profitability and climate protection.

**The key element of the green energy model: solar power plants**
To cover the plant’s own energy needs directly, solar power plants will be built with a combined capacity of 2 MWp. Overall, the photovoltaic systems will contribute to the energy budget with an annual production of 3,168,000 kWh a year on average – regardless of how much of the treatment plant’s capacity is utilised.

The gas obtained from the plant will also be used in high-efficiency CHP plants to cover the majority of the plant’s electrical and thermal energy needs. A steam turbine integrated on site will additionally provide energy for the processes. Thanks to the combination of these three energy sources, the plant can produce more energy in total than it consumes. The feeding of surplus energy into the grid has already been confirmed in a contract with the local energy supplier.

For more information about the project:
wte.de/en/references/

**Wastewater treatment plant Umm Al Hayman, Kuwait**
Thanks to the use of low-energy aeration equipment and the overall system’s convenient hydraulic design, we have been able to reduce energy consumption. The gas obtained as a by-product of the fermentation process is used in high-efficiency combined heat and power (CHP) plants to cover the majority of the electrical and thermal energy that the plant needs for operation.

| | | |
|---|---|---|
| **Umm Al Hayman** | 40 % | coverage of energy requirements |
| **Skopje** | 150 % | |

## Autothermal sewage sludge incineration

All of the sewage sludge incineration plants that we have designed or realised work with autothermal technology. This means that no additional fuel is needed for ongoing operation in order to thermally utilise the sewage sludge. In addition, selected plants are fully energy self-sufficient.

**Using thermal utilisation for drying sewage sludge**
To generate electricity, we use the thermal energy released when sludge is incinerated. Some of the heat is also fed back into the sludge drying process – this way we put the energy potential of autothermal incineration to optimal use.

**Energy generated from sewage sludge incineration**
In our sewage sludge mono-incineration plants, high temperatures from roughly 850 to 950 °C ensure safe and low-pollutant burn-out of the fuel. The steam that is produced in the waste heat boiler is then used to generate electricity. Excess heat generated in the process can be fed into a public heat grid or used to heat up the digestion towers in the wastewater treatment plant.

- → Calorific value adjustment in sewage sludge for energy-self-sufficient incineration
- → Plant boasts high energy efficiency
- → Verified compliance with all emission limits
- → Optional start-up process using biogas

‘All of our plants are designed to generate all the electricity they need themselves, with optional incorporation of excess heat into a district heating grid.’

**Franz-Josef Kramer,**
WTE Wassertechnik GmbH,
Head of plant planning sewage sludge

Once the process is complete, the remaining ash and residue corresponds to only about **10%** of the original sludge mass.

## Interlinking of material - and energy flows

Sewage sludge incineration plants work on the basis of various processes that can be combined to increase efficiency. In our assignments for planning, construction and operation of plants, we look to interlink material and energy flows.

**Wastewater treatment and sewage sludge incineration plant Skopje, North Macedonia**
The future plant for wastewater treatment and sewage sludge incineration will be combined with an optimised primary treatment concept aimed at reducing the oxygen requirements of the biological aeration tanks and to increase the biogas yield and the subsequent electricity production. Furthermore, the thermal energy from the incineration is not only used to generate electrical energy but also fed to a back pressure steam turbine for further process steps, such as the preheating and drying of sludge. This significantly reduces chemical requirements and eliminates the need to use energy from fossil fuels for drying.

**Sewage sludge incineration plant Gut Großlappen Munich, Germany**
Diverse interlinking of thermal energy flows is also planned for this plant, with the aim of increasing efficiency. This starts with the partial drying of the sludge, which generates exhaust vapour:

For additional electricity generation, there are plans to design a photovoltaic system that will be set up on unused areas of the sewage sludge incineration plant's roof, if this proves feasible.

For more information about the project:
**wte.de/en/references/**

## Sustainable solutions for harnessing energy

To supply our plants with energy reliably and as sustainably as possible, we use a mixture of different systems. Wherever possible and financially feasible, we incorporate systems such as turbines, **combined heat and power (CHP)** plants or **photovoltaic plants** into our designs.

These technologies are often able to cover the majority of a plant's energy requirements. Using these systems consistently can significantly reduce the amount of energy needed from the public mains power supply and increase the plant's energy independence, ultimately resulting in lower operating costs. This also makes a considerable contribution to climate protection.

## Award for Kočani Wastewater Treatment Plant

The wastewater treatment plant realised by WTE in Kočani, North Macedonia, received the energy award 'Médaille d'eau' at the AQUA Suisse trade fair in 2023. This medal recognises wastewater treatment plants that feature special energy efficiency, the generation of renewable energy and the reduction of greenhouse gases.

**Award-winning dedication to energy efficiency and climate friendliness**
Since 2003, the 'Médaille d'eau' has been awarded to wastewater treatment plants in Switzerland every five years by InfraWatt (the association for the use of energy from wastewater, waste, waste heat and drinking water) and the Swiss Water Pollution Control Association (VSA).
Twenty Swiss plants were honoured for their sustainable wastewater treatment at the award ceremony in Zurich. On top of this, a medal of honour was awarded at international level. This medal went to the Kočani Wastewater Treatment Plant.

**Renewable energy generation as criterion**
At the plant, the biogas produced during the cleaning process is used to produce electricity in a combined heat and power plant. In addition, WTE worked with its affiliate company EVN Macedonia to construct a solar plant with an installed capacity of 450 kWp and a planned annual output of 590,000 kWh, in order to make use of the region's plentiful sunshine. Together, the biogas and solar plants cover roughly 55% of the treatment plant's power requirements. In a region that obtains almost 70% of its electricity from fossil fuels, this energy efficiency and local energy generation makes a significant contribution to reducing greenhouse gas emissions.

**Pioneering work for the region**
The wastewater treatment plant uses mesophilic sludge treatment (sludge digestion) followed by sludge composting to process 65,000 PE. As the first wastewater treatment plant in the region of Kočani, it uses solar energy to cover its electricity needs. WTE implemented the planning and construction of the plant from 2017 to 2019, including four contract extensions. The plant was officially opened in early 2019.

The success of our strategy for renewable energy generation has been confirmed by continuous measurements. In 2022, for example, the electricity production of the photovoltaics plant was 680,948 kWh.

## Certification of selected plants

Thanks to the certification of selected plants in accordance with the energy management system ISO 50001, we have been able to achieve energy improvement goals in recent years.

Our currently largest wastewater treatment plant in Zagreb is an example of how specific energy consumption has improved in recent years. Also with the help of targeted investments: in 2023, for example, in measures to reduce the consumption of biological purification as the largest consumer block of the wastewater treatment plant.

'We invest on the basis of both economic and energy perspectives. This enables profitable and sustainable operation of our plants.'

**Nina Hustadt,**
WTE Wassertechnik GmbH,
Responsible for environmental and energy management

# Climate-relevant emissions

We reduce **climate-relevant emissions** in the construction and operation of our plants. We achieve this by using efficiently planned workflows, optimising processes and increasingly using renewable energy and corresponding procedures.

## Group-wide environmental guidelines

In accordance with the public IMS guidelines, WTE is committed to observing binding obligations and creates the framework for targets and measures for improving WTE's environmental performance. Furthermore, an environment key indicator system is used to calculate the carbon footprint for all WTE and WTEB sites.

**IMS =** integrated management system

With the environmental guidelines, internal codes of conduct have been adopted for all WTE and WTEB sites in order to reduce the carbon footprint and make each individual employee aware that they can make a contribution to protecting the environment.

## Integrated approaches to climate protection

Reducing climate-related emissions – at both individual and corporate level – is one of the goals that WTE has set itself. To achieve this as a company group, we need to use a mixture of approaches that together will lead to a better CO2 balance.

### Design

Even early on, in the planning stage of a plant, we opt for the procedures, construction methods and materials with the least impact on climate. A large part of this is cutting back on our use of construction materials with an especially bad carbon footprint. Wherever practical, we opt for sustainable and greener alternatives.

As part of a project in Skopje, we made the digestion towers for the wastewater treatment plant from steel rather than using a classic concrete structure. This helped us to significantly improve the plant's carbon footprint.

### Operation

Plant operation offers enormous potential for saving CO2 emissions. Measures that can be employed to achieve this include the following:

- Selecting appropriate process stages
- Modernising process technologies
- Reducing the use of fossil fuels (oil, coal, natural gas)
- Transitioning to renewable energy

For more information about the project:
**wte.de/en/references/**

At our plants in **Skopje** and **Munich**, we have reduced our use of conventional natural gas as a medium for the start-up burners for sewage sludge incineration to zero. Instead, we use biogas from the sewage sludge digestion process - which is integrated into the plant's energy mixture in Skopje - helping to make it energy self-sufficient. At other plants (for example Zagreb) we have already started implementing the conversion of biogas into electricity in combined heat and power plants (CHP plants) with great success.

To reduce the environmental impact of exhaust gases to a minimum, we use an especially efficient form of multi-stage flue gas cleaning at our plants in **Berlin, Munich, Hannover-Lahe** and **Skopje**. The systems used at these plants are in harmony with the current BAT conclusions for waste incineration (December 2019). This means that compliance is ensured with the limits set down by the IED Directive 2010/75/EU (Industrial Emissions) and by BImSchV (Federal Emission Control Ordinance) number 17.

**Supporting measures**
To supplement our efforts in plant construction and operation, we also implement a number of smaller measures to reduce emissions. These measures are always put into practice in accordance with the options available locally.

Examples:
- → Optional mobile working
- → Bike leasing or public transport ticket offers
- → Support of e-mobility (charging stations)
- → Procurement of electric vehicles for the vehicle fleet

At our Essen site, we also compensate for all our emissions resulting from our use of gas in the form of climate certificates. These certificates support carbon offset projects or Renewable Energy Sources Act projects with the quality label 'ÖkoPLUS' from TÜV Rheinland. These carbon offsets form only a small part of our overall efforts, however.


# Operating materials

Our aim is to reduce the use of chemicals.

## Reducing chemical use

Wastewater treatment and sewage sludge utilisation both frequently involve the use of chemicals. We are fully committed to the objective of reducing the use of chemicals in these processes to a necessary minimum. In many of our plants, we have already started putting this principle into practice.

- → Wastewater treatment in Kočani (biological waste air treatment)
- → Wastewater treatment and sewage sludge incineration plant in Skopje (biological waste air treatment and sludge pre-heating)
- → Sewage sludge incineration plant in Munich (sludge pre-heating)

In the treatment of sewage sludge, using cutting-edge biofilters instead of chemical scrubbers ensures that the plant's waste air does not constitute an odour nuisance for the surrounding area. In sewage sludge incineration, we use energy harnessed from the process to pre-heat the sludge in order to improve the dewatering performance. This means that the use of chemicals can be optimised to a minimum here as well.





Focus area **social affairs**

# Social affairs – Our focus on health, safety and development

With the work they do, our employees make a significant contribution to society. We want to make sure that this dedication is given the recognition it deserves. To do this, we have established a range of health protection measures that deliberately go beyond the minimum legal requirements. At the same time, we take multiple approaches to promote the satisfaction of our employees and their individual development – inside and outside the company. In this way, we create an integrative, supporting work environment where both long-term employees and new recruits can feel they are in good hands and where they are able to show their strengths.

Main topics

→ Health and safety
→ Support and development
→ Working conditions and corporate culture
→ Social responsibility

# Employee health and safety

Our aim is to provide **safe working conditions** at all workstations. We take specific **work health and safety measures** to raise awareness of risks, prevent accidents and avoid injuries.

## Safe working conditions

We are committed to ensure safe working conditions for all our employees. The requirements for occupational safety can vary considerably depending on the workplace – for instance at the desk, during plant operation, or on the construction site. For this reason, we regularly perform interdepartmental risk assessments that explicitly take into account each of our projects and any special conditions on site.

- Regular inspections of workplaces/construction sites
- Compilation of instructions
- Analysis of accidents / accident causes
- Evaluations of occupational health and safety reports
- Internal training on the topic of safety
- Extensive instructions for (new) employees
- Regular in-house medical check-ups

Our employees can rely on being provided with appropriate work materials, safety clothing etc. Alongside our commitment to safe workplaces, we make a point of raising our employees' awareness of potential workplace risks. In this, we also involve our suppliers and subcontractors.

This makes it possible for any risks or dangers to be identified, addressed and rectified. As a result, occupational safety at WTE is a joint effort, and it helps us to continuously work towards our goal of eliminating 100% of accidents.

## Occupational health examinations

Our employees work in a variety of countries all over the world. As our sector is highly international, our teams often find themselves working under unusual conditions. This can range from very hot and cold conditions to increased risks of infections, for example due to the local sanitary conditions and because local insects are potential vectors of disease.

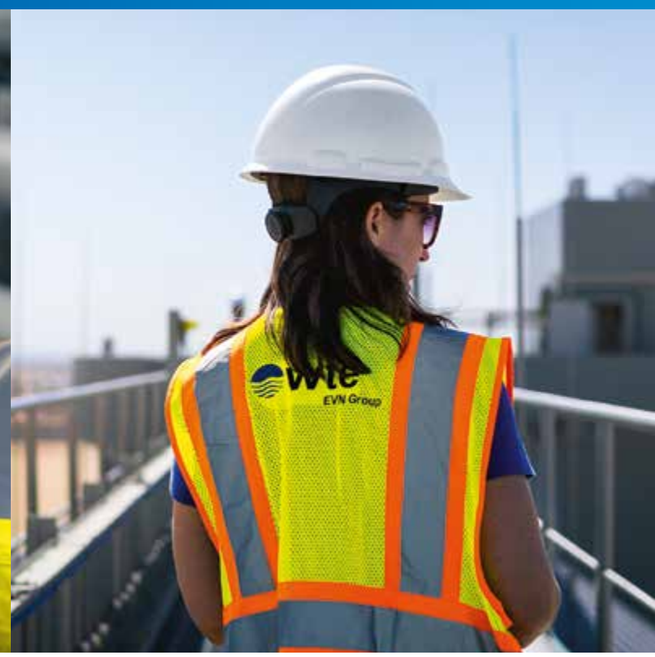
To give our employees optimal protection from these risks, we offer all the required health examinations and after-care examinations as a matter of course. This includes examinations such as the following:

- Health examination 'working abroad in combination with special climatic conditions or health challenges' (**G35 examination**)
- Health examination 'activities with risk of infection' (**G42 examination**)
- Eye test (for computer workstations / **G37 examination**)
- Vaccination offers (depending on area of activity/application area)

Our consistent occupational health examinations act as an important component of preventive healthcare, which benefits our employees above all. These examinations are performed by our experienced company doctors in strict compliance with legal regulations and ensure that the health of our globally active teams is protected reliably.

**'We want to realise spectacular projects together with our employees. For this reason, the health and safety of our employees is always our top priority.'**

**Carolin Korfmann,**
WTE Wassertechnik GmbH,
Company health management

## Certified systems for occupational health and safety

We take our responsibility for our employees very seriously. For this reason, all measures relating to occupational health and safety are certified to the specifications of ISO 45001 (occupational health and safety management systems). This allows us to provide a provably good and healthy working environment for all our employees.

At the same time, we ensure that new legal regulations or updated directives are communicated throughout our group quickly and thoroughly. Our internal training on the applicable regulations serves as a regular reminder of how important occupational health and safety is for the WTE Group.

We aim to protect the **health of our employees** and make lasting improvements to their **working environment**. We strive to consistently achieve **health rates** among employees of at least 95%.

## Workplace health management

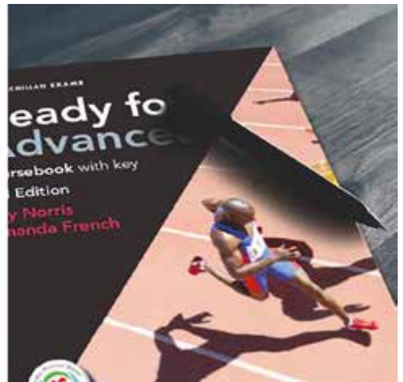
Health is our most valuable asset. With this in mind, we have set up a workplace health management (WHM) system and defined clear goals that we aim to achieve over the short, medium and long term. Our aim here is to raise awareness of the topic, increase interest in these measures among the workforce and make long-lasting improvements to the health of our employees.

To achieve this, we have implemented a comprehensive package made up of four pillars:

- → Occupational health examinations/check-ups
- → Workplace health promotion (WHP)
- → Workplace integration management (WIM)
- → Regular surveys/evaluations

With measures such as inspecting all workstations once a year to check that they meet the ergonomic needs of the people that use them, encouraging people to sign up for events like the Essen company run, offering discounts on gym memberships, providing presentations on various health-related topics and much more, we hope to reduce illness-related absence and enhance the well-being of our staff. This lays the foundation for a healthy and happy workforce.

**Professional health courses**
Our employees have the opportunity to participate in various courses on topics such as preventing back pain and increasing their resilience to illness. The WTE site in Essen, for example, provides a weekly back/Pilates course. In 2023 an expert in trauma therapy and resilience development held two half-day workshops on how to build a durable shield against stress and a healthy approach to using mental resources. This was followed by a workshop on **New Perspectives through Mindful Communication**.




## Healthy foods from within the region

A healthy and balanced diet plays a major role in the health and performance capacity of our employees. This is why our Workcafé offers lunch from a regional supplier from Monday to Thursday. We make a point of providing a seasonal selection of foods from the region as far as possible.

The range of dishes available is diverse and free from flavour enhancers and preservatives. The dishes provided at the Workcafé are also subsidised by us, so that all employees can enjoy a healthy range of meals at affordable prices.

# Support and development of employees

We continuously support the **personal development** of employees and provide them with opportunities for **tailored advanced training**.

## Support and development measures

**Regular development/target agreement talks**
We have one-to-one meetings with our employees on a regular basis. This provides an opportunity to address individual developments and agree on targets for the coming business year. These talks are held at least once a year. Any agreements that are made can be modified where needed in subsequent talks, however.

**Additional feedback talks for employees**
We are always willing to listen to the concerns of our employees. Feedback talks can be requested on an optional basis at any time, giving employees the opportunity to give and receive feedback. In this way, we ensure in-depth communication between employees, supervisors and management.

**Internal and external training + advanced training**
Our employees are entitled to take part in various types of training to advance their professional development. This training is provided both internally and in collaboration with external partners. In the past business year, the amount of training provided by WTE was almost 2,000 hours at the Essen site alone, and more than 1,000 hours for the WTE Betriebsgesellschaft.

**Tailored advanced training for local employees**
For international projects in particular, we offer special training for local employees. As their involvement begins during the construction phase, they will be able to share what they have learnt later on and provide expert support for plant operation. With this type of training, we strengthen skills and secure local jobs.

**Support of academic qualifications (master's/doctorate)**
We are always pleased when our employees pursue academic qualifications, including doctorates. We therefore support our employees by allowing them time to devote to their personal academic development. Several employees from our company group have already been given this type of support, particularly in technical and commercial disciplines.

**In-house English courses**
Our company is active on a global scale. We are therefore aware of the importance of having employees with sound English skills relevant to the industry. To enable this, we offer in-house English courses for various skill levels. This gives employees the opportunity to refresh or improve their language skills.

# Working conditions and corporate culture

We want to make lasting improvements to **employee satisfaction**. Our aim is to implement effective measures to achieve a consistently low employee turnover of no more than 5 per cent per year.

## Flexible working hour models

For some years, we have implemented flexible working hour models that give our employees significantly more freedom in how they shape their workday.

Within the WTE Group, we offer the following models:
- → Flexitime
- → Part time
- → Mobile time

Wherever these models are feasible within our company group, we aim to give our employees the option of choosing a model that suits their needs.

## Employee surveys for evaluation

We carry out surveys of our employees when they join the company and then on a regular basis. This gives employees the chance to give us critical and constructive feedback. The collected feedback is then evaluated and the issues raised are worked through.

If problems can be rectified quickly, we address them as promptly as possible. Structural criticism is taken seriously and we look into what can be improved. We give our all to offer employees a good work environment.

**’It is important to us that our employees see that their feedback has an impact. Where appropriate and feasible, we implement measures based on our surveys. This makes it clear to everyone that things can improve when they are addressed.’**

**Tim Steffen,**
WTE Wassertechnik GmbH,
HR

## Company social benefits

To promote the satisfaction of our employees, we proactively offer a range of company social benefits. Our employees are free to make use of them – depending on their needs and interests.

Company social benefits of the WTE Group at the Essen site

**Day-care collaboration**
Thanks to our collaboration with the day-care centre operator Kinderhut, we have access to an entire network of day-care centres, so we can offer our employees professional care for small children.

**Gym discounts**
We collaborate with the gym chain FitX to give all employees who work out there a discount on their membership fee.

**Public transport ticket**
Relevant for commuters: we provide our employees with public transport tickets. For car drivers, we provide free parking directly on site.

**Job bicycle**
Employees interested in having a bicycle for work can lease a job bicycle from us.

**Free fruit**
For a healthy snack: we supply a selection of free fruit on site. At the work café, a kitchenette and Seeberger coffee are also provided for free.

## Onboarding process with mentor system

Throughout the WTE Group, we recognise the importance of cohesion, community and togetherness. At the same time, we appreciate that finding your feet in a new workplace is something that people can find difficult. To help with this, we have developed a clearly structured onboarding process that introduces new employees to our company step by step in their first days and weeks.

Our mentors play a key role here. In our mentor system, all new employees are assigned a mentor. The mentors perform the following tasks:

- Technical and organisational support of new employees throughout their entire induction period
- Joint presentation of new employees to the teams/specialist departments
- Integration of new employees into their specific team
- Tours of premises and surrounding area
- Induction and working methods, processes and workflows

Our mentors have practical checklists they can use as a reference so that it is always clear what items still need to be worked through in the first work week, for example. Induction plans are also currently being prepared.

In this process, the mentors are points of contact for professional and personal matters. They give new employees security and orientation as they gradually become familiar with day-to-day work at the WTE Group. This is how we ensure that all employees are given the best prospects for success when they start work with us.

## Content employees for low turnover

Our employees play a significant role in the success of the WTE Group. For this reason, we implement a whole package of measures aimed at making lasting improvements to employee satisfaction. This includes:

- Flexible working hour models (see page 76)
- Regular employee events, summer parties / participation in sports events
- Various social benefits and offers (see page 77)
- Benefits such as company pension and contributions to capital formation
- Structured and guided onboarding processes (see page 78)

With measures like these, we have been able to increase employee satisfaction and team spirit over recent years. As a result, the employee turnover rate at WTE's headquarters in Essen has remained consistently below 7% since 2021; in the long term, we are aiming for a consistently low rate of no more than 5% per year.

We cultivate an inclusive workplace culture and set an example with our diverse and accepting corporate climate.

## Diversity

As an international company, diversity is of crucial importance for us. All WTE employees should have the same opportunities regardless of their gender, age or background.

We are proud that we have become a multinational and multicultural company. Employees from a diverse mixture of countries and cultures work for the WTE Group. We work with students on work experience placements looking to learn about the industry as well as long-standing employees who have been helping us to make the world a better place for many years.

The WTE Group is a large community where everyone should have the chance to grow and develop together with our company. If we ever face any obstacles, we work together to eliminate them – this ranges from wheelchair-accessible entrances to matters that reach deep into the structures of our company group.

We always look for ways to accommodate individual needs. In this way, we create a healthy and inclusive workplace culture where all employees are a small but vital part of a diverse community and workforce.

**'From the welcome email, fact sheet or personal introduction in the specialist departments – it is important for us to involve new employees on equal terms from the outset. In this way, we form the foundation for long-term employee satisfaction.'**

**Markus Pollmann,**
WTE Wassertechnik GmbH,
Head of HR

## Feedback system during induction

Employees' expectations typically change over time. To ensure that these changes are taken into account in our onboarding process, we ask for feedback from our new employees regularly throughout their first weeks. This helps us to keep our onboarding up to date and give new team members everything they need for their career at WTE.

# Corporate social responsibility

We fulfil our corporate social responsibility by providing support specifically for **newcomers to the industry** and creating opportunities for young talent.

## Regulars' table of Junge DWA

The WTE Group supports motivated professionals from the industry – for example by arranging individual meetings of relevant networks in which know-how can be exchanged. One of these networks is the Essen regulars' table of the 'Junge DWA' (Young DWA), which aims to enable regional networking between young and established professionals in Essen and the surrounding area, so they can share information and experience and discuss current topics together.

In addition to being given a presentation of the association and its activities by the Junge DWA, past attendees have been given insight into the projects of the WTE Group – including specialist presentations on the research project 'Microbial Fuel Cells' and some impressions of the design progress of a Berlin sewage sludge incineration plant viewed through VR headsets. The format of the event provides many ways for people to talk about technical topics, share knowledge and ideas and gain new perspectives.

**'Events like this, with their clear topic focus and highly motivated attendees, play a major role in the development of young specialists in our industry.'**

**Tabea Deysenroth,**
WTE Wassertechnik GmbH,
Process Engineering

## Taking on trainees

We give young talent thorough training, ensuring that all our trainees are given appropriate work to do within well-defined frameworks. Our aim is to provide challenging tasks that promote the development of our employees.

With our ongoing training of industrial and office clerks, we are actively addressing the shortage of skilled personnel. Thanks to our forward-looking personnel planning, we also ensure that we will be able to maintain our current trainee hiring rate of 100% in the future.

We are committed to being able to offer a job to every skilled worker who has received training within the WTE Group. With this highly tailored training, we make it possible for our trainees to start a career at WTE – immediately after completing their training. Naturally we continue to support our former trainees in pursuing additional qualifications / advanced training.

We aim to meet our responsibility by supporting **social projects.**

## Supporting sick children in the Middle East

As part of our corporate social responsibility (CSR) we like to support specific projects that do good for people in many different countries. This includes Kuwait Association for the Care of Children in Hospital (**KACCH**) and the Bayt Abdullah Children's Hospice (**BACCH**).

These two charities are active in the Middle East and offer psychosocial and palliative care for sick children and their families. The services provided by KACCH help children to learn in a playful way why they are in hospital, what is wrong with them and how they can best deal with this situation, which can be quite daunting for a child.

**Improving quality of life**
BACCH's services, on the other hand, are aimed at children with (potentially) life-threatening illnesses: children are nursed and cared for by an interdisciplinary paediatric palliative care team – both at home and in hospital, no matter where they are based. The main focus is on improving the children's quality of life by giving their families dedicated support. These services are provided at no cost to the affected families.

**'The organisations are doing enormously important work in their local regions. All the services make a major difference in the day-to-day lives of children and families. We are delighted to be able to help this excellent work to continue in the future.'**

**Stefan Nalbach,**
WTE Wassertechnik GmbH,
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We have prepared this sustainability report with the greatest possible care and have reviewed the data. Nevertheless, rounding, typesetting or printing errors cannot be ruled out. This sustainability report also contains forward-looking estimates and statements that we have made on the basis of all information available to us up to the editorial deadline. These forward-looking statements are usually described as “expect”, “estimate”, “plan”, “calculate”, etc. We would like to point out that the actual circumstances, and thus also the actual results, may differ from the expectations presented in this report due to various factors.

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