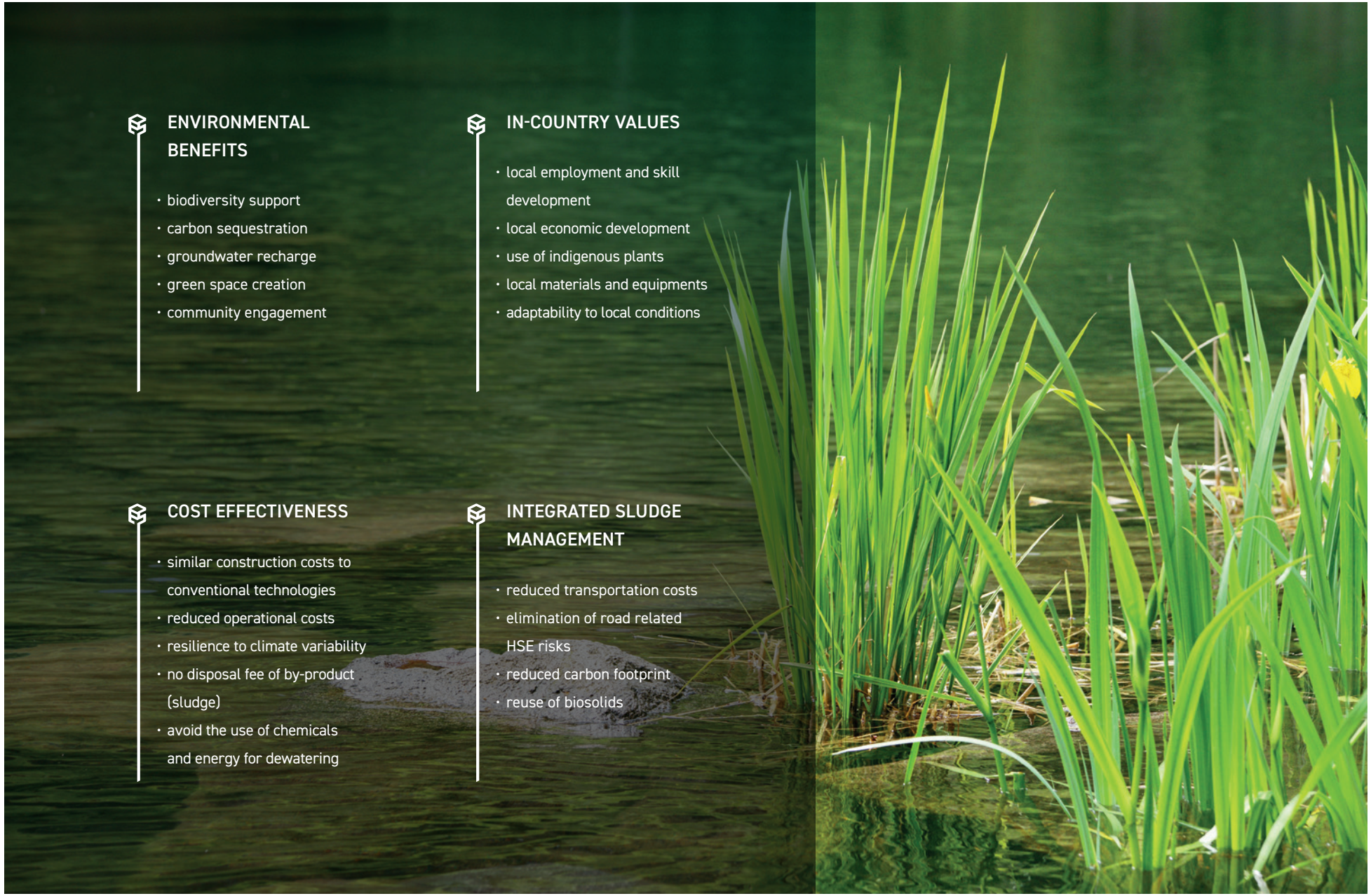

ecosys
WETLAND ECOSYSTEMS
FAQ – your questions, our answers
INSPIRED BY NATURE
Ecological Wastewater Treatment

Our Solution, your Benefits.

Our complete package for constructed wetlands.

Constructed wetlands can be particularly beneficial for treating wastewater, offering numerous advantages tailored to the country's specific environmental, economic, and social objectives. Our capabilities include masterplanning, feasibility studies, conceptual and detailed engineering design, construction and operation of constructed wetlands.



ENVIRONMENTAL BENEFITS

- biodiversity support
- carbon sequestration
- groundwater recharge
- green space creation
- community engagement

IN-COUNTRY VALUES

- local employment and skill development
- local economic development
- use of indigenous plants
- local materials and equipments
- adaptability to local conditions

COST EFFECTIVENESS

- similar construction costs to conventional technologies
- reduced operational costs
- resilience to climate variability
- no disposal fee of by-product (sludge)
- avoid the use of chemicals and energy for dewatering

INTEGRATED SLUDGE MANAGEMENT

- reduced transportation costs
- elimination of road related HSE risks
- reduced carbon footprint
- reuse of biosolids


Important Questions,
helpful Answers.

Do reed plants align with the local flora and fauna?

Yes, a large number of wetland plant species are native in the region including phragmites australis widely used in constructed wetlands. Wherever brackish or freshwater saturates the soil or is appearing at the surface (wadis, oasis, sewage and irrigation water spills), wetland plants will grow naturally and provide habitat for small native birds and other fauna.

What is the footprint of the constructed wetland system?

Depending on the land availability and treatment intensification the total area is ranged **between 2 and 5 m² per person**. This area can be integrated into the landscaping and can have any shape. Small and large-scale wetland projects can be developed – it all depends on client requirements.

What is the lifetime of the system?

Constructed wetlands are robust, self-sustaining systems that typically operate efficiently for **more than 20 years with minimal maintenance.** Wetland plants work in synergy with naturally occurring microorganisms to break down sewage solids into stable mineral forms, eliminating mechanical wear on the system. While stabilized organic matter may gradually accumulate at the surface, it does not impair treatment performance. With very few mechanical parts, the system offers straightforward operation, significantly reducing maintenance demands and the risk of operational failure over time.

What about mosquitoes?

Mosquitoes have a larval stage, which lives in water. Compared to wastewater lagoons, constructed wetlands do not have stagnant open water areas, and thus **mosquitoes are unable to breed**. Other insects (e.g. flies) are reduced by the high biodiversity of the system.

What operation and maintenance is required?

Depending on the size of the system a **weekly visual inspection of pipes, pumps and general conditions, and switching of valves** is all that is required. If desired, sensors can be installed and connected to a central control centre for remote monitoring.

What about rodents?

Rodents do not find any food in the pre-treated or macerated sewage which is loaded into the constructed wetlands. Therefore **rodents are not attracted to the wetland** for food. Because the filter bed is temporary charged with water from time to time, and there is always water level close to the surface rats, mice or rabbits cannot burrow in the wetland sub-soil.

Does the system need a constant inflow of sewage in the low season?

No, it is important to have a minimum inflow of water during the plants establishment to prevent the young plants from dying in the first half year. Once the wetland plants are established and have developed their rootzone they will survive short to medium term periods without inflow. A longer period without sewage inflow (3 – 4 month) will lead to a hibernation of the reeds; the above ground biomass will dry off, but the below ground stems (Rhizomes) will immediately sprout new shoots when water becomes available again. The dried biomass can be harvested before new sewage is filled into the system. A start-up period (like with a technical treatment plant) is not required.

Is a pre-treatment of sewage required?

That **depends on the design and application**. Some of the offered constructed wetland systems make use of pre-treatment in form of a screen, anaerobic baffled reactors or sometimes an aerobic biological process (e.g. SBR, trickling filter, fixed bed reactor). Systems can also be charged with raw sewage which avoids sludge production. These systems have a special wetland filtration stage (Stage A) which removes, dewaters and mineralizes the suspended solids prior to a second biological wetland treatment stage (Stage B). The specific technology to use depends on the project and client. Grey water reed beds do not require any pre-treatment, except a grinder pump.

What about the sewage sludge?

If a wetland system with a pre-treatment in the form of sedimentation or septic tank is chosen, the accumulated sludge in the sedimentation stage can either be **disposed off-site by tankers or converted into humus** in a special sludge composting reed bed. The produced volume of sewage sludge, if any, depending on the chosen wetland system, is always less than in a conventional activated sludge system. The sewage treatment does not rely on activated floating sludge, but on the microbiological processes in a rooted substrate layer which does not produce any surplus activated sludge. In a raw sewage treatment wetland, the mineralized sludge in the first filtration stage (Stage A) should be removed after 8–10 years. The stabilised organic matter that is removed, is a beneficial landscaping amendment for improving the quality of soil, which tends to be lacking organic matter in the region.

What about sewage smell?

The treatment process in the upper layers is aerobic, which prevents the generation of bad smelling gases. The wastewater remains below the surface of the gravel media which minimises any odours. Oxygen is supplied by the Reeds through the spongy aerenchyma tissue. The foul sewage odour is only created by anaerobic processes and thus **sewage smell is not a problem** faced in constructed wetland sewage treatment systems.

What effect has the local temperature on the system?

The higher the better. In contrast to technical sewage treatment plants, wetland technology has its **optimum performance in a hot climate** as the physiology of Phragmites is tuned to photosynthesis operating at these temperatures and the activity of the biological processes in the rooted filter layers are at an optimum under the local climate conditions.

Is there water lost through the reed plants?

Water is not lost, as it is used to create greenery with the wetland plants. If the wetland is integrated into the landscaping its foot-print substitutes area of the normal soft landscaping which would otherwise consume water for irrigation. **Water is removed from the system by transpiration**, a process by which the plant loses water through its stomata (breathing pores). Depending on the project objectives, we can implement specific design measures to either minimise or maximise the water that is transpired from the system.

Sustainable.
Effective.
Cost-saving.

With our extensive technical experience, we aim to support you by delivering a sustainable and reliable wastewater treatment solution that actively promotes the adoption of green innovation. Furthermore, our wetland technology offers significant advantages over conventional sewage treatment plants.

Over 90% of the equipment and materials required for constructing wetlands can be sourced domestically.

PROJECT PHASE	CONSTRUCTED WETLAND	CONVENTIONAL SEWAGE TREATMENT PLANT (STP)
Construction	• lower demand for materials compared to conventional sewage treatment plants (STP) • requires excavation, planting of vegetation and construction of inlet and outlet structures • less carbon-intensive construction process compared to conventional STPs	• high demand for concrete and steel • significant carbon footprint due to the production and transportation of equipment and materials
Operation	• minimal to no energy consumption, as constructed wetlands rely on natural processes • no chemicals required (depends on discharge standards) • act as carbon sink through plant biomass accumulation • promotes biodiversity and green initiatives • simple operation and within the capability of locally trained staff	• high energy requirements for pumping and aeration • regular use of chemicals like polymers • GHG from energy consumption • complex and challenging operation and process control, especially under variable inflow conditions
Maintenance	• involves vegetation management, occasional organic matter removal • regular inspections but less frequent interventions compared to conventional STPs • integrated sludge management and reuse	• mechanical parts require regular maintenance and replacement • continued use of chemicals and energy • waste sludge management and disposal

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The small and compact solution.

Over 70 references including Qiddiya, Ma'aden and Neom.
Used in Saudi Arabia, Oman, United Arab Emirates, Jordan, Bahrain, Qatar and Kuwait.

KEY PROJECT DATA

- Capacity in persons: 65
- Flow-rate: 12 m^3/d
- Treatment Footprint: 34 m^2

COST COMPARISON OVER 25 YEARS

- Wetland: 10,000 USD
- Conventional technology: Activated Sludge Treatment, 13,000 USD
- Savings: 30 %

Wetland Ecosystems

Thinking big and bigger.

Sewage treatments for selected projects in Oman and Saudi Arabia.

Farha, Oman

KEY PROJECT DATA

- Capacity in persons: 600
- Flow-rate: 120 m³/d
- Treatment Footprint: 1,400 m²

COST COMPARISON OVER 25 YEARS*

- Wetland: 650,000 USD
- Conventional technology: 850,000 USD
- Savings: 25 %

Yibal, Oman

KEY PROJECT DATA

- Capacity in persons: 1,750
- Flow-rate: 350 m³/d
- Treatment Footprint: 2,900 m²

COST COMPARISON OVER 25 YEARS*

- Wetland: 1,440,000 USD
- Conventional technology: 1,900,000 USD
- Savings: 20 %

Riyas NGL, Saudi Arabia

KEY PROJECT DATA

- Capacity in persons: 6,700
- Flow-rate: 2,000 m³/d
- Treatment Footprint: 16,500 m²

COST COMPARISON OVER 25 YEARS*

- Wetland: 16 Mio USD
- Conventional technology: 18,4 Mio USD
- Savings: 13 %

* Cost comparison (CAPEX + OPEX) between the constructed wetland and the conventional technology for the treatment of raw sewage

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905.347.2 11/2024 . Photos: Adobe Stock . BAUER Resources GmbH