



WWTP RAVDA: BLUE ENERGY, TOURISM, AND ENVIRONMENTAL PROTECTION

BIOLOGICAL FACULTY AT SU "ST.KLIMENT OHRIDSKI"
Centre of Competence Clean&Circle
VIK BURGAS

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Blue Economy Training Day – 23 October 2025



About Magdalena Bogdanova

Team/Scientific Supervisors:

Prof., D.Sc. Yana Topalova

Assoc. Prof., Ph.D. Ivaylo Yotinov

Education:

- PhD Program: Biotechnology of Treatment Processes
- Master: Management in Tourism
- Bachelor: Biomanagement and Sustainable Development
- Erasmus in Strasbourg, France

Work Experience:

- Online media
- Marketing and Sales, Guest Relation in Tourism
- EU Funds
- World Expo Milan 2015
- NGOs





Our Team's Work

- **Extreme load swings:** Tourist seasons cause sharp spikes in BOD5, COD, and nutrients that push WWTPs to their limits.
- **Real-world evidence:** Eight years of data reveal how tourism, migration, and even COVID-19 shape wastewater patterns.
- **Integrated insight:** Combining microbial, chemical, and operational data uncovers the system's hidden weak points.
- **Environmental urgency:** Every improvement directly protects coastal ecosystems and tourism economies.
- **New technologies :** We work on creating inovative methods for wastewater treatment using cold atmospheric plasma



Why Blue Economy Matters?

- The Blue Economy integrates ocean health with economic growth.
- Coastal regions like Burgas depend on clean seas for tourism and livelihoods.
- Wastewater management is key to sustainable coastal development.





WWTP Ravda: Key Facts

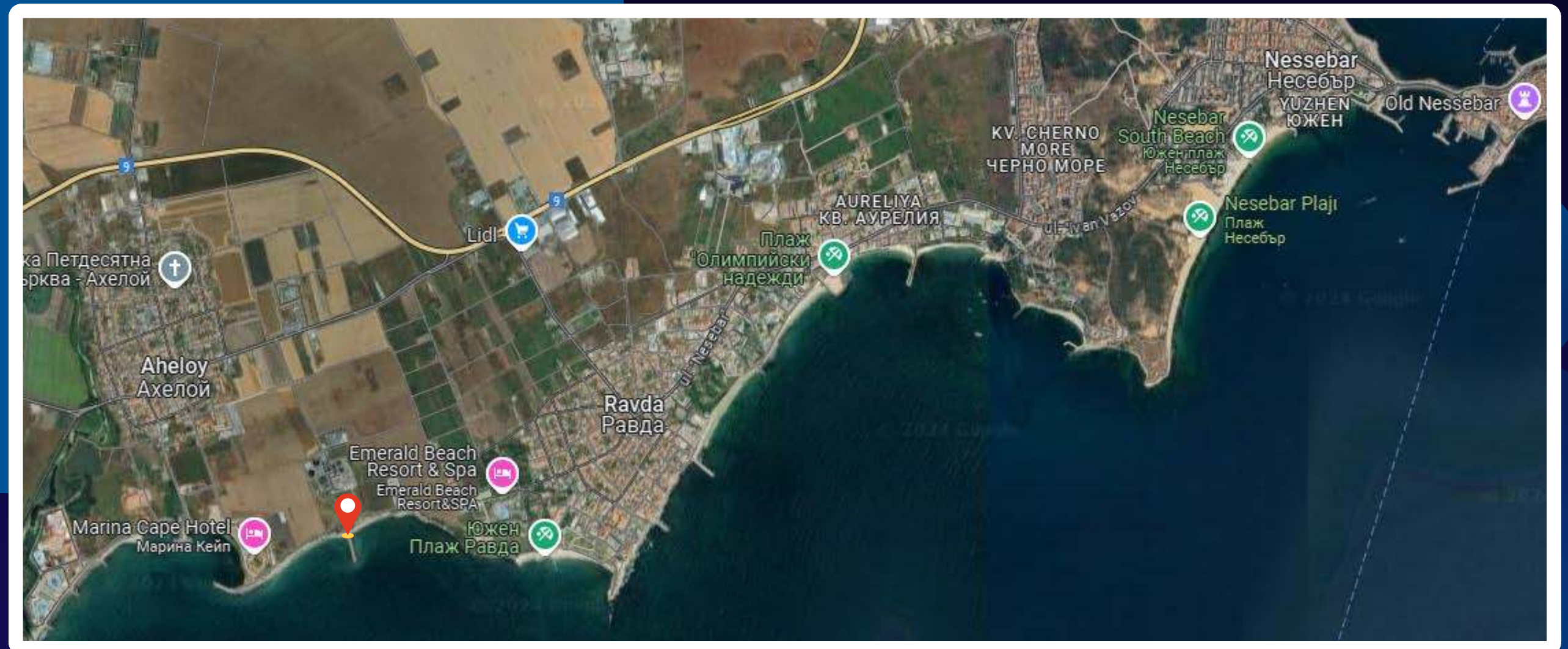
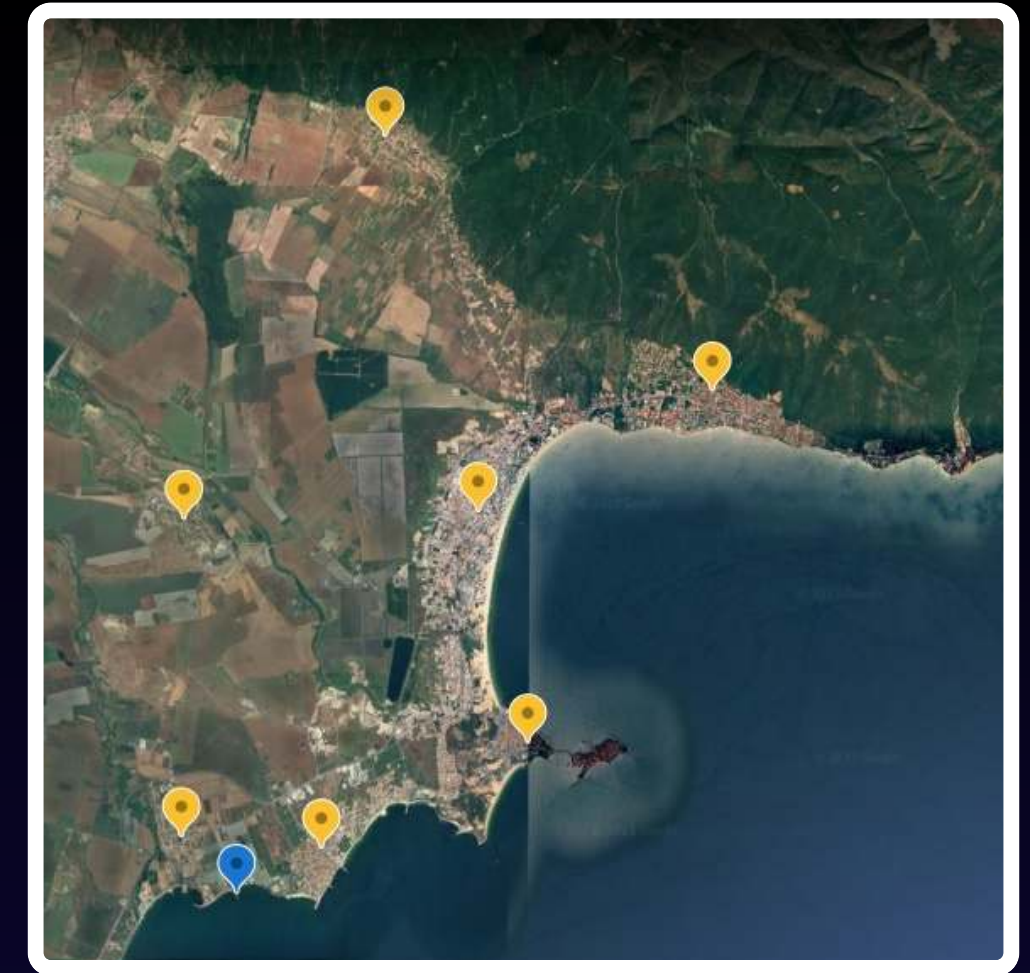
- Constructed in 1970, renovated in 2004, 2013, and 2015.
- Capacity: 47,850 m³/day.
- Serves approx. 222,000 population equivalent (Nesebar, Ravda, Sunny Beach, Aheloy, Kosharitsa, Tankovo, St.Vlas).
- Strategic infrastructure supporting tourism and environment.





Location and Importance

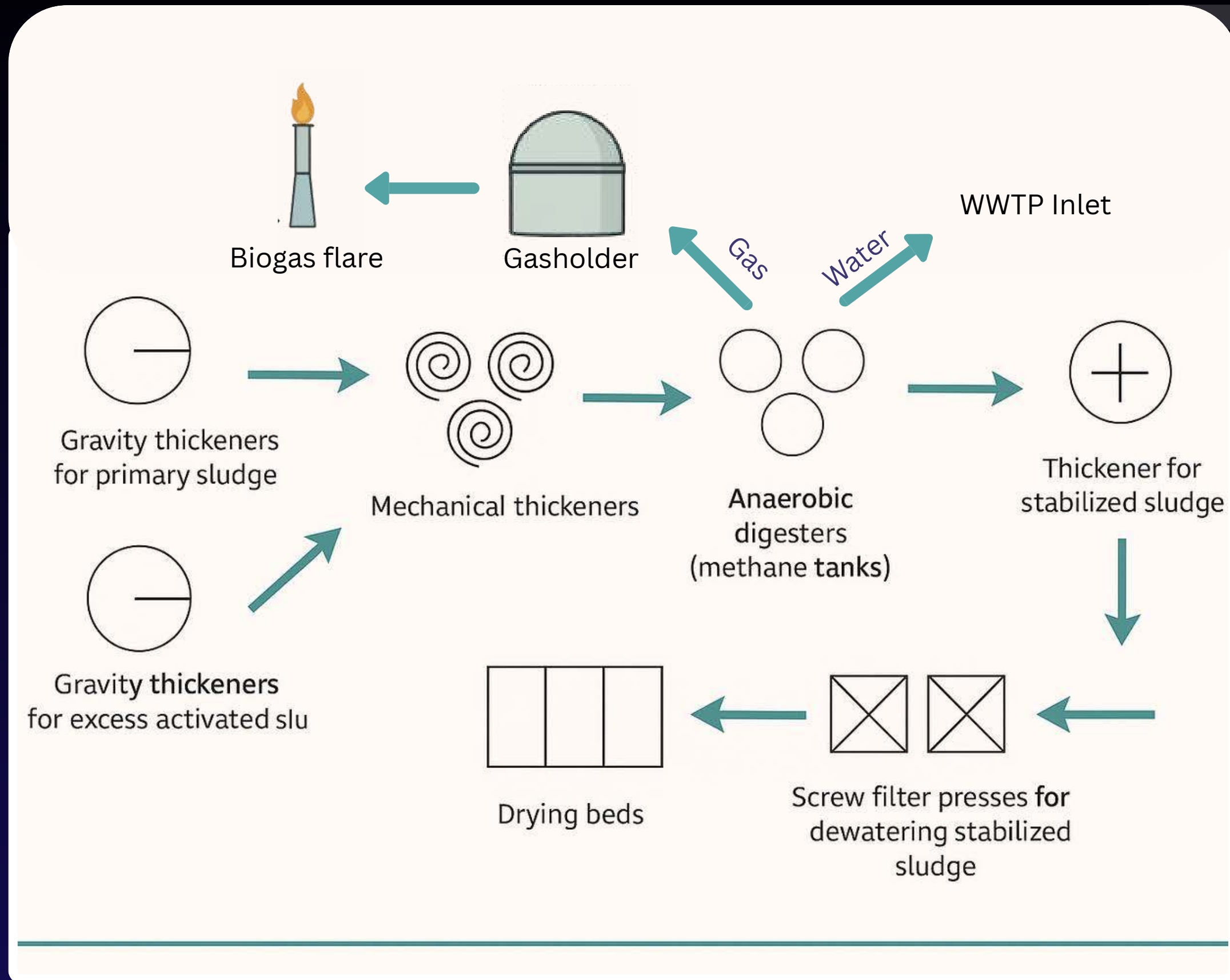
- Situated near major Black Sea resorts – a critical link between tourism and environment.
- Protects bathing water quality along one of Bulgaria's busiest coasts.
- Compliance with EU Urban Wastewater Directive and Blue Flag beach standards.





Treatment Process Overview

- Primary, secondary, and tertiary treatment stages.
- Biological nutrient removal (N, P).
- UV disinfection before discharge into the sea.
- Continuous monitoring and automation ensure high standards.
- Thickening of primary and excess sludge (gravity & mechanical).
- Anaerobic digestion in methane tanks – biogas production.
- Biogas used for heat and power; excess burned in flare.
- Dewatering with screw presses and drying on beds.
- Stabilized biosolids reused for energy or agriculture.





Treatment Process Overview

Primary Treatment — “Physical Cleaning”

- Removes large solids, sand, oils, and floating materials.
- Settling tanks separate heavier particles from the water.

Secondary Treatment — “Biological Cleaning”

- Microorganisms break down organic matter (BOD5, COD).
- Activated sludge systems convert waste into stable biomass.

Tertiary Treatment — “Advanced Purification”

- Removes nutrients (nitrogen, phosphorus), pathogens, and fine particles.
- Ensures safe water quality before discharge into the sea.

Discharge and Reuse Potential

- Treated water is usually released into coastal waters.
- With additional treatment (e.g., filtration, UV, plasma), it can be reused for irrigation, industry, or groundwater recharge — supporting a **circular water economy**.





Environmental Impact

- Prevents eutrophication and algal blooms.
- Reduces microplastics and chemical pollutants entering the Black Sea.
- Protects biodiversity and supports sustainable fisheries.





Connection to Tourism

Clean waters = strong tourism economy

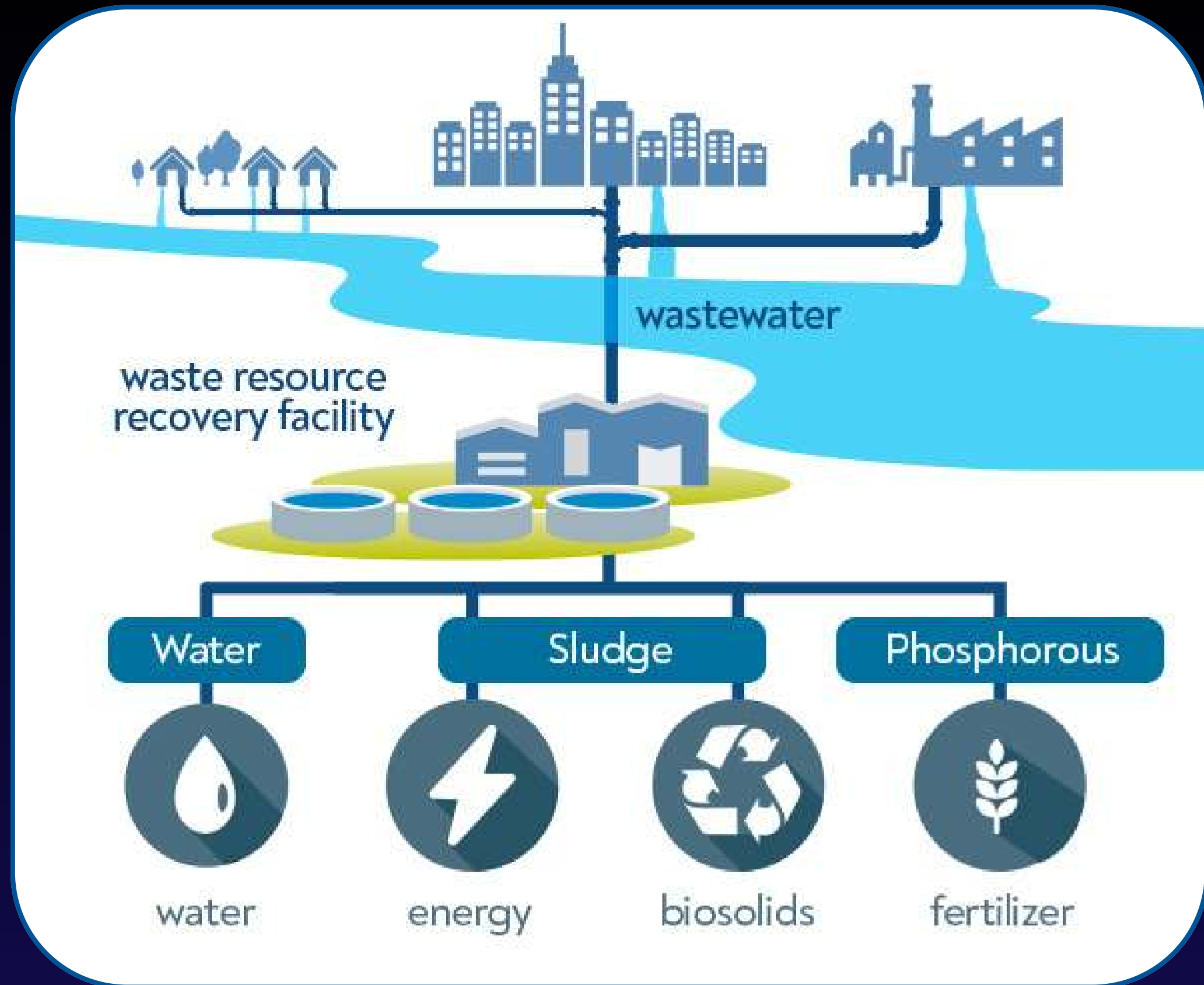
- Supports eco-labels, beach certifications, and green destination branding.
- Reliable wastewater management increases investor confidence in coastal regions.



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Blue Energy and Green Transition

- Wastewater = energy resource, not just waste.
- Biogas recovery from sludge: covers $\approx 30\%$ of plant's energy needs.
- ⚡ Potential to add photovoltaic systems \rightarrow toward energy-neutral operation.



Source: worldbank





Climate Change and Coastal Resilience

- Rising temperatures and sea levels affect wastewater infrastructure.
- WWTPs play a role in climate adaptation and resilient urban planning.
- Reducing emissions through renewable integration.





Marine Pollution and Monitoring

- Contribution to reducing marine litter and pollution hotspots.
- Cooperation with Black Sea monitoring programs.
- Data sharing with local universities and environmental agencies.
- Platform for testing new technologies in wastewater and marine monitoring.



Policy and Governance



- Example of public–private cooperation in environmental infrastructure.
- Aligns with EU Green Deal and UN SDGs (Sustainable Development Goals) (6, 7, 13, 14).
- Importance of local leadership in sustainable coastal management.





Conclusions

- WWTP Ravda = cornerstone of sustainable coastal tourism.
- Demonstrates how clean water, renewable energy, and innovation can coexist.
- Model for blue and circular economy integration in Bulgaria's coastal regions.





Learn more about our work



The cover of the journal 'processes' features a red and white logo on the left. In the top right corner, there are two circular icons: a yellow one with 'IMPACT FACTOR 2.8' and a blue one with 'CITESCORE 5.5'. The article title is centered, and the authors' names are listed below it. At the bottom, there is a red bar containing the MDPI logo, a QR code, and the DOI link.

processes


IMPACT FACTOR 2.8 CITESCORE 5.5

Article

Comparison of the Work of Wastewater Treatment Plant “Ravda” in Summer and Winter Influenced by the Seasonal Mass Tourism Industry and COVID-19

Magdalena Bogdanova, Ivaylo Yotinov and Yana Topalova

Special Issue
Integrated Approaches to Eco-Friendly Processes for Persistent Pollutants Contamination
Edited by
Dr. Raluca Maria Hlihor, Dr. Isabela Maria Simion and Dr. Mihaela Rosca

MDPI 
<https://doi.org/10.3390/pr12010192>

The cover of the journal 'water' features a blue and white logo on the left. In the top right corner, there are two circular icons: a yellow one with 'IMPACT FACTOR 3.0' and a blue one with 'CITESCORE 6.0'. The article title is centered, and the authors' names are listed below it. At the bottom, there is a blue bar containing the MDPI logo, a QR code, and the DOI link.

water


IMPACT FACTOR 3.0 CITESCORE 6.0

Article

Wastewater Treatment Technology for Sustainable Tourism: Sunny Beach, Ravda WWTP Case Study

Magdalena Bogdanova, Ivaylo Yotinov, Yana Topalova and Valentina Lyubomirova

Special Issue
Sustainable Water and Wastewater Treatment: Theory, Methods, and Applications
Edited by
Dr. Wei Wei

MDPI 
<https://doi.org/10.3390/w17010007>





Thank You!

