

How to select the least-cost solution for arsenic removal

Regulatory and practical principles of water infrastructure development

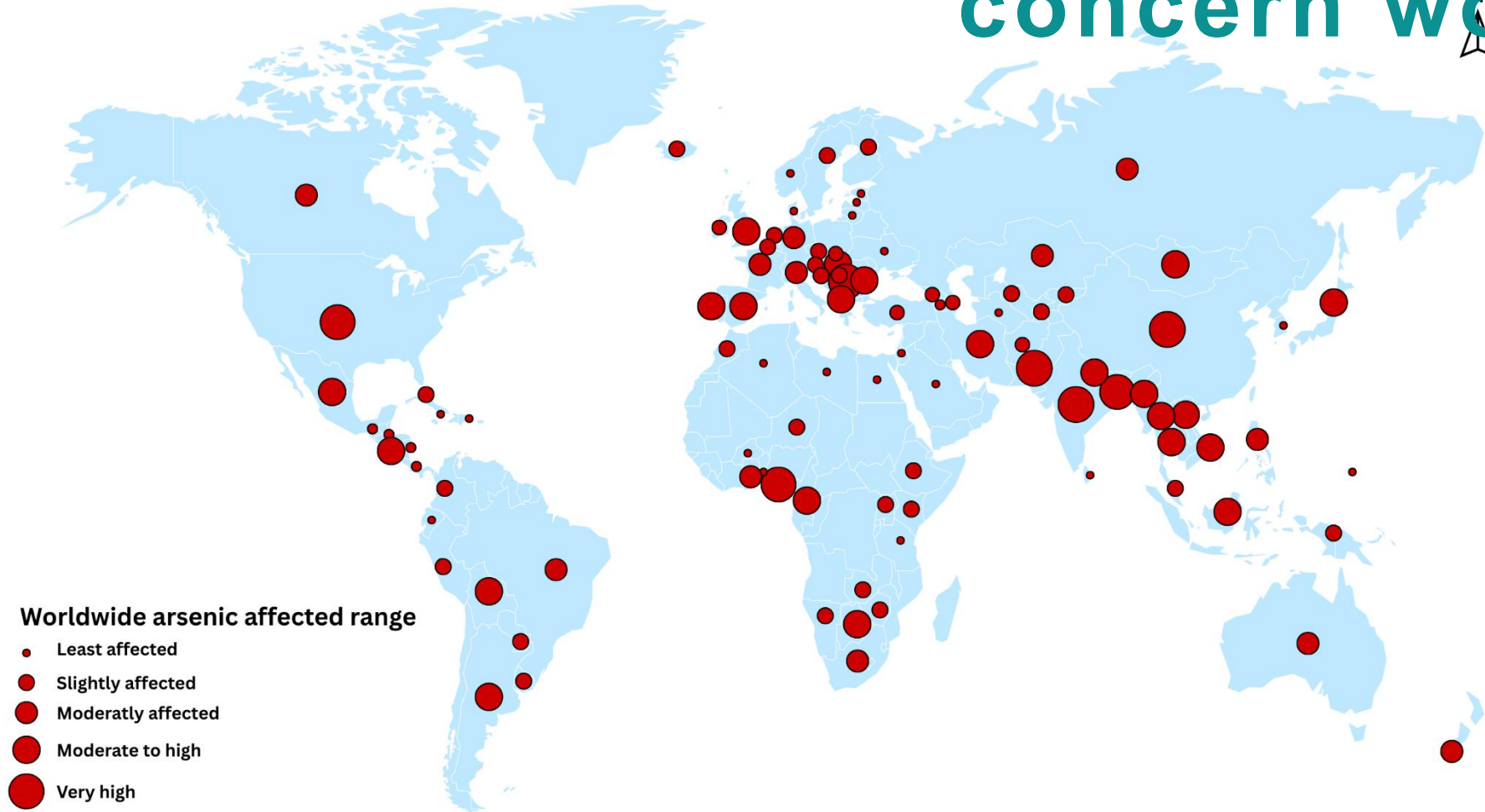


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Arsenic contamination in groundwater is a significant concern worldwide



Created based on the map by [E. Shaji , M. Santosh , K.V. Sarath ,Arsenic contamination of groundwater: A global synopsis with focus on the Indian Peninsula](#) (2021)

Arsenic removal technologies comparison

Conventional technologies

- Coagulation
- Filtration

Adsorption

- Uses media like activated alumina, iron oxide/hydroxide or proprietary resins
- Cerium-hydroxide-based, regenerable adsorbents



Main Regulatory Principles

1. **Fundings provide financial support only for the investments, not for the operation,**
2. **least-cost solutions (feasibility studies, option analysis, public procurement) must be considered when determining support,**
3. the projects must be sustainable in technical and financial terms as well
4. the tariffs resulting after the investment must be affordable for the citizens.



Main Regulatory Principles

There is a fifth principle supported by the common sense and the European Union as well:

We are not rich enough to buy cheap!



≠



professional technical, financial and economic planning and evaluation is required



Dynamic Cost Comparison Calculation (DCC)

Proper project preparation is needed for **long-life, sustainable water infrastructure solutions** that deliver favourable operating costs

Public procurements also need **transparency** in terms of cost-effectiveness by considering life-cycle costs

Best practice for project preparation and planning



Dynamic Cost Comparison Calculation (DCC)

- Life-Cycle costing (LCC)
- Option analysis



2026 Cost efficiency Option analysis - infrastructure developments

CHOOSING THE OVER-ALL LEAST COST SOLUTIONS

Assess cost-effectiveness by considering **life-cycle costs** and comparing them at present value

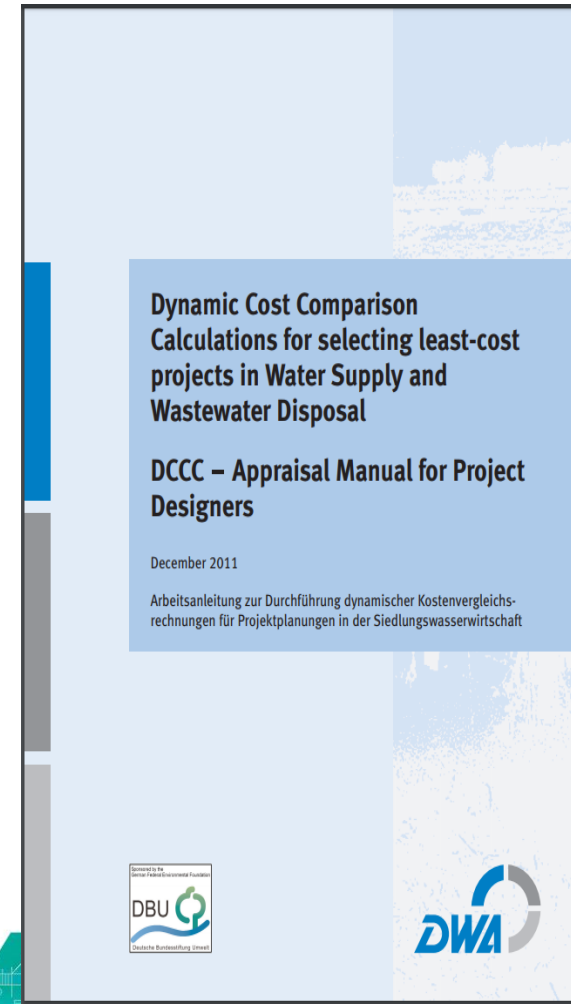
- ➔ Enable cost-efficient implementation
- ➔ Promote resilient, long-term performance
- ➔ Ensure economic and operational sustainability
- ➔ Provides transparency during Public Procurement processes



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the proper tool for „selecting least-cost projects in Water Supply and Wastewater Disposal” is EWA DCC guide¹

Available in 7 languages



¹ [http://www.dwa.de/dwa/shop/produkte.nsf/1A34AF1A8F92595DC12579A4001ECE52/\\$file/vorschau_DCCC-Guidelines.pdf](http://www.dwa.de/dwa/shop/produkte.nsf/1A34AF1A8F92595DC12579A4001ECE52/$file/vorschau_DCCC-Guidelines.pdf)

Importance of Lifecycle-Based Planning in water development Projects



With DCC & LCC approaches

- Enable cost-efficient implementation
- Promote resilient, long-term performance
- Ensure economic and operational sustainability and transparency



Arsenic removal technologies comparison

	Coagulation, sand filtration	Granular ferric hydroxide	Regenerable adsorbent
Contaminated water As concentration (ug/l)	28	28	28
Water treatment capacity (m ³ /day)	800	800	800
Purified water As concentration (ug/l)	8	8	8



How to choose?

Based on investment cost?

Investment cost (EUR)

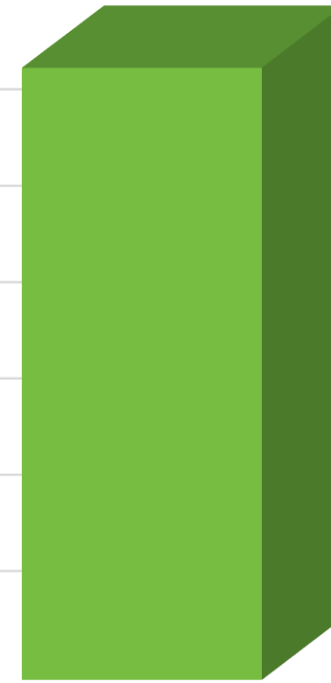
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0



Coagulation



Granular ferric hydroxide



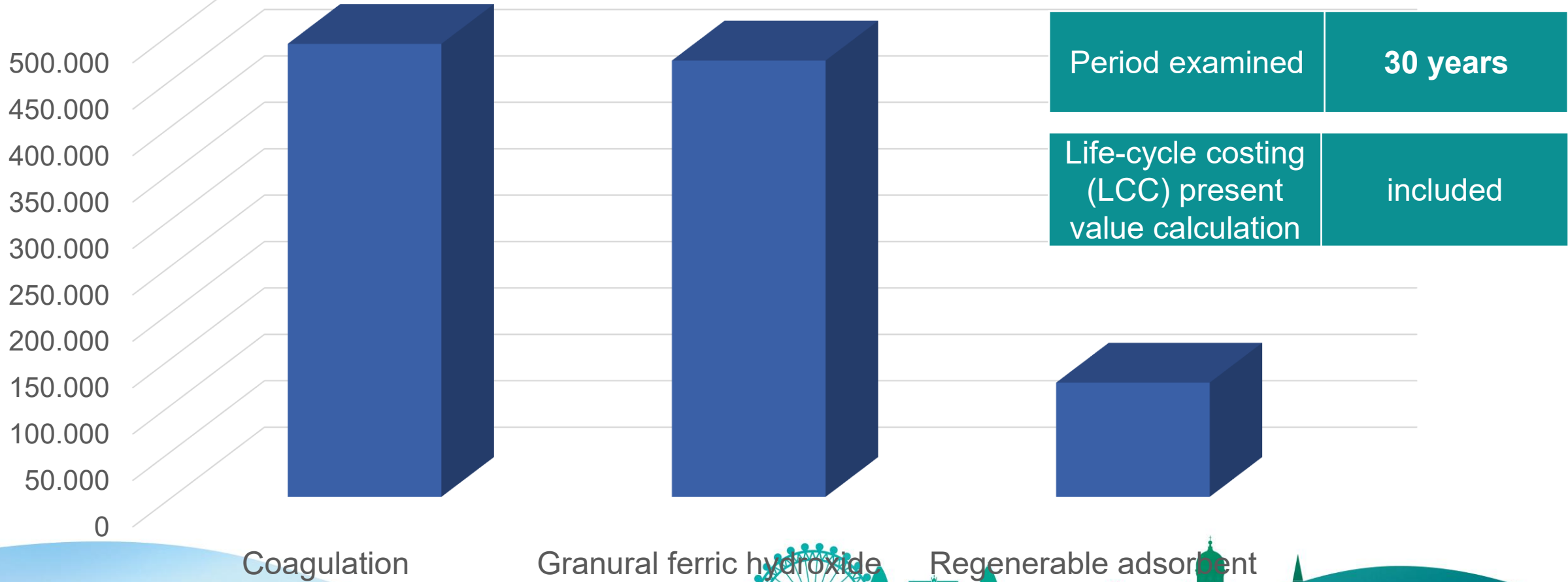
Regenerable adsorbent



How to choose?

Based on running expenses?

■ Running expenses (O-M-R)

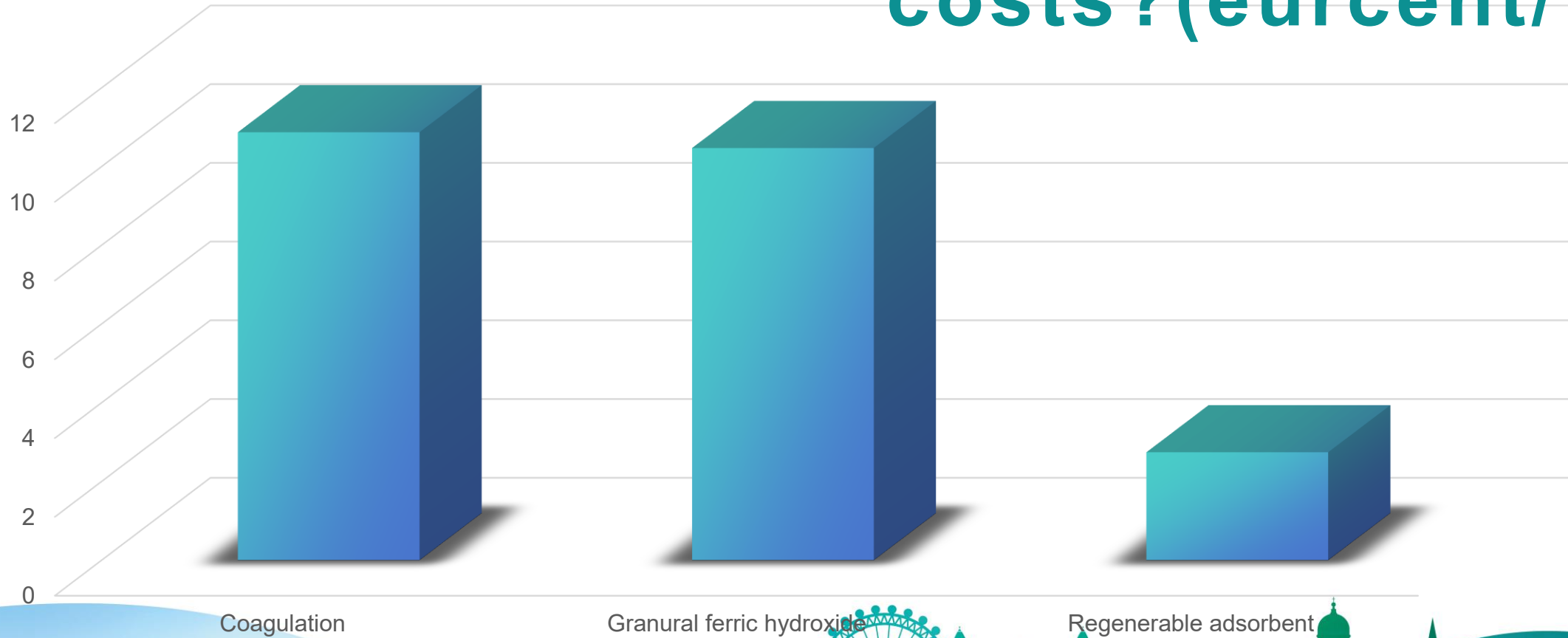


with 5% discount rate on the running expenses

O: operation M: maintenance R: replacement

How to choose?

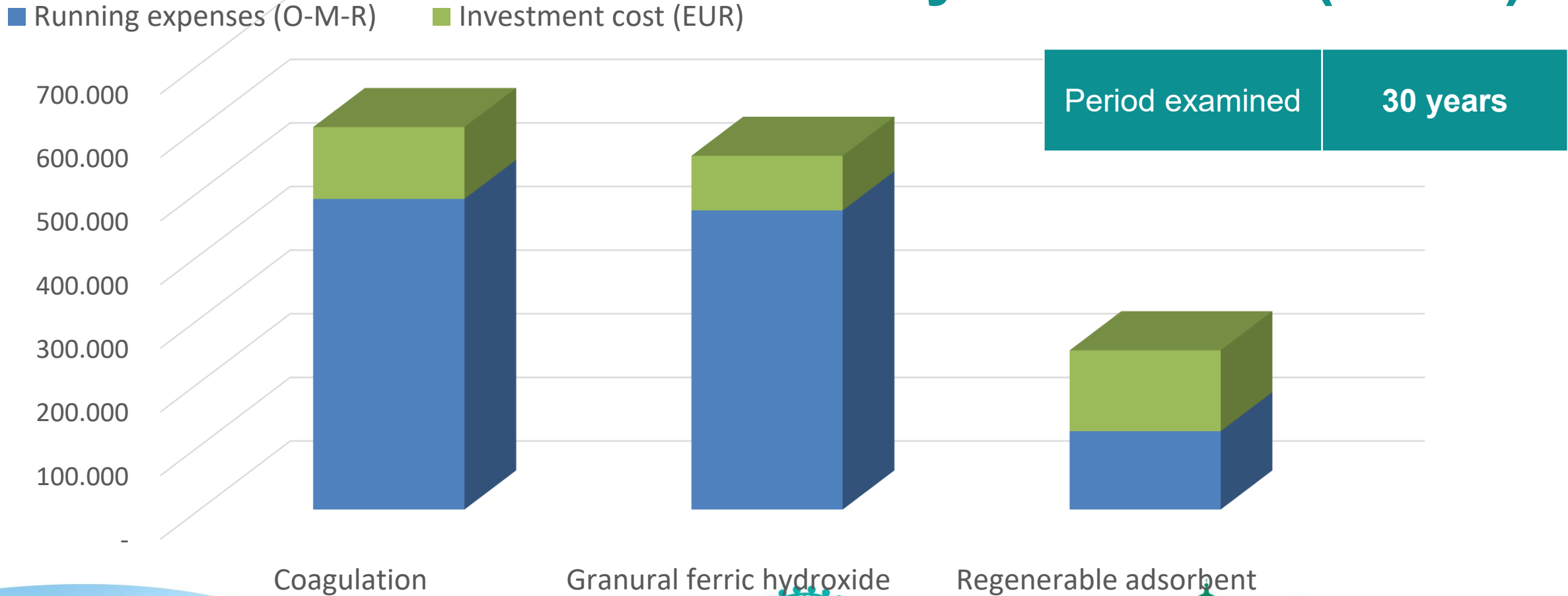
Based on OMR running expenses unit costs?(eurcent/ m3)



with 5% discount rate on the running expenses

O: operation M: maintenance R: replacement

How to choose? Based on Life-Cycle Cost (EUR)?



Based on total life-cycle costs!!



How to choose? Based on Life-Cycle Cost (EUR)?

Period examined

30 years



Purification (O-M-R) with AsMET costs less than
3 €cent/m³ = 0.003 €cent/liter
over a 30 year operational period

Based on total life-cycle costs!!



Benefits of DCC and LCC

Approaches in arsenic removal

- **DCC (Dynamic Cost Comparison) & LCC (Life-Cycle Costing):**
 - Identify cost-efficient, and economically viable solutions.
 - Enable selection of affordable solutions
- **Outcome:**
 - Keep operational costs low – cost recovery in operation
 - Provide operational sustainability





7th ASEM SEMINAR
ON URBAN
WATER MANAGEMENT

THANK YOU FOR YOUR ATTENTION!

A series of blue and green silhouettes of city landmarks, including a Ferris wheel, a building with a dome, a statue on a pedestal, and a church with a steeple.

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