Tere tulemast

Välkommen

Witamy

Welcome

laipni lūdzam

CommitClimate

Learning Platform
Training Module Street *Lighting,*
Water & Wastewater

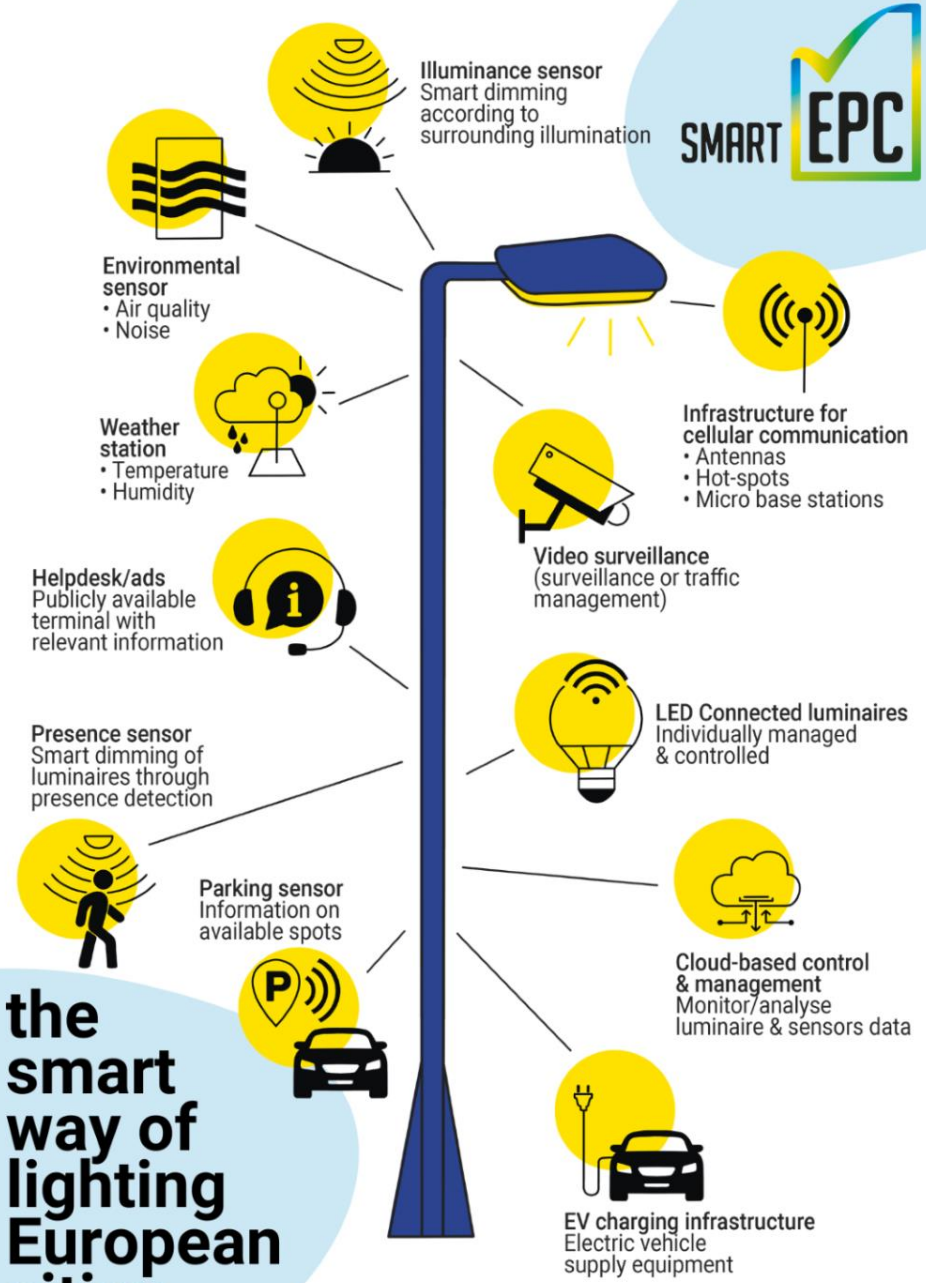
Outlines

- Energy efficient and smart public lighting
- Why is the climate-water-energy nexus important?
- Wastewater treatment (WWT): energy needs and energy production
- WWT Energy efficiency measures and lifecycle cost approach
- How to improve energy efficiency
- How to avoid heat losses
- Good example Denmark

Energy efficient and smart public lighting

Street lighting accounts for 1-2% of electricity demand in the European Union. However, on municipal level street lighting can be as much as 40-50% of public electricity consumption. Steps towards efficient smart lighting:

- Step 1: Inventory of public lighting and assessment, which needs should be met.
- Step 2: Switch to LED street lighting, where this has not happened yet. LED is highly energy-efficient, reducing energy consumption by up to 70%.
- Step 3: Integrating smart technologies to improve public safety, monitor air quality, and provide other services. For example, in the city of London there are more than 6.000 EV chargers installed on lampposts



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Smart public lighting systems can deliver

- High energy efficiency,
- minimum environmental load,
- high level of connectivity and embedded intelligence.

Source: https://energy-cities.eu/the-evolution-of-public-lighting-from-torches-to-smart-services/

Financing energy efficient street lighting

- Calculate life-cycle-costs: While the investment to change street lights is significant, LED street lighting saves energy and need less maintenance during operation.
- Example: In Spain, a city of 40,000 inhabitant saved €1,240,000 per year in changing street lights to LED, reduced CO2 emissions by 2,000 tonnes and free up the electricity grid to use this energy for other purposes, such as charging 2,000 electric vehicles per year or 30,700 electric bicycles (Source: https://www.endesa.com)
- If local authorities can not afford investment costs , Energy Performance Contracting (EPC) can be a solution: energy efficiency investments are pre-financed and implemented by an energy service company (ESCO). The annual energy and maintenance cost savings then cover the investment and capital costs.

Why is the climate-water-energy nexus important?

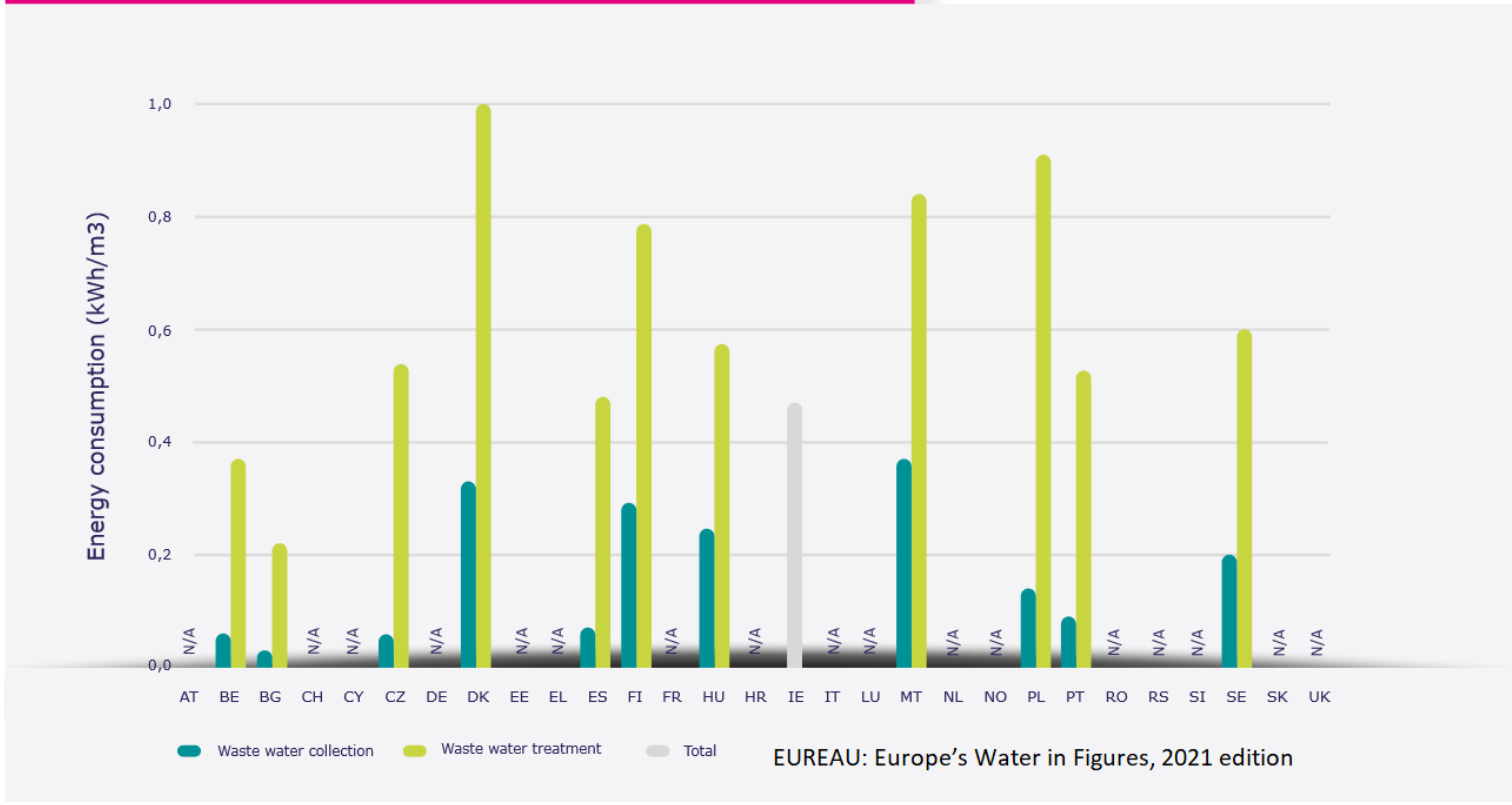
Climate change puts an additional stress on water availability and quality. Actions to mitigate and adapt to climate change can have strong implications for water systems and its users. Changes in energy usage and types of energy production, e.g. hydropower or biofuels, affect water usage (and impact agricultural production).

In the EU, large amounts of energy are needed to treat wastewater for reuse and disposal into the environment.

Wastewater treatment

- Treating wastewater properly is necessary to ensure good water quality.
- Electricity consumption for wastewater treatment is significant with about 25 000 GWh/year, which is about 0.8 – 1% % of the electricity consumption in the EU.

Figure 32
Energy consumption for the collection and treatment of waste water



Wastewater treatment and the European Green Deal

- The 2023 proposal to review the urban wastewater treatment directive introduce an energy neutrality target, meaning that by 2045 urban wastewater treatment plants will have to produce energy from renewable sources, based on regular energy audits. This energy can be produced on or off-site, and up to 35% of non-fossil energy can be purchased from external sources.

Measures for energy efficient waste water treatment

Energy use in waste water treatment plants is a significant cost for local authorities in Europe. Some key measures for reducing energy use are among others:

- Reducing the amount of water collected by sewer systems, e.g. through enhancing the infiltration of storm water in soils and promoting natural water retention systems
- Regular energy audits followed by energy saving measures as optimal pump design incl. maintenance (saving about 5-25% of energy use in sewer system).
- Optimisation/replacement of aeration infrastructure (possible savings up to 25-60%).
- Using instruments at their optimum performance level and implementing more energy efficient equipment (screw blowers, high speed turbos, air header valves)
- Staff buy in: Engaging staffs in the process by asking for input results in efficiency measures is key! After all, it’s the staff dealing with the processes every day!

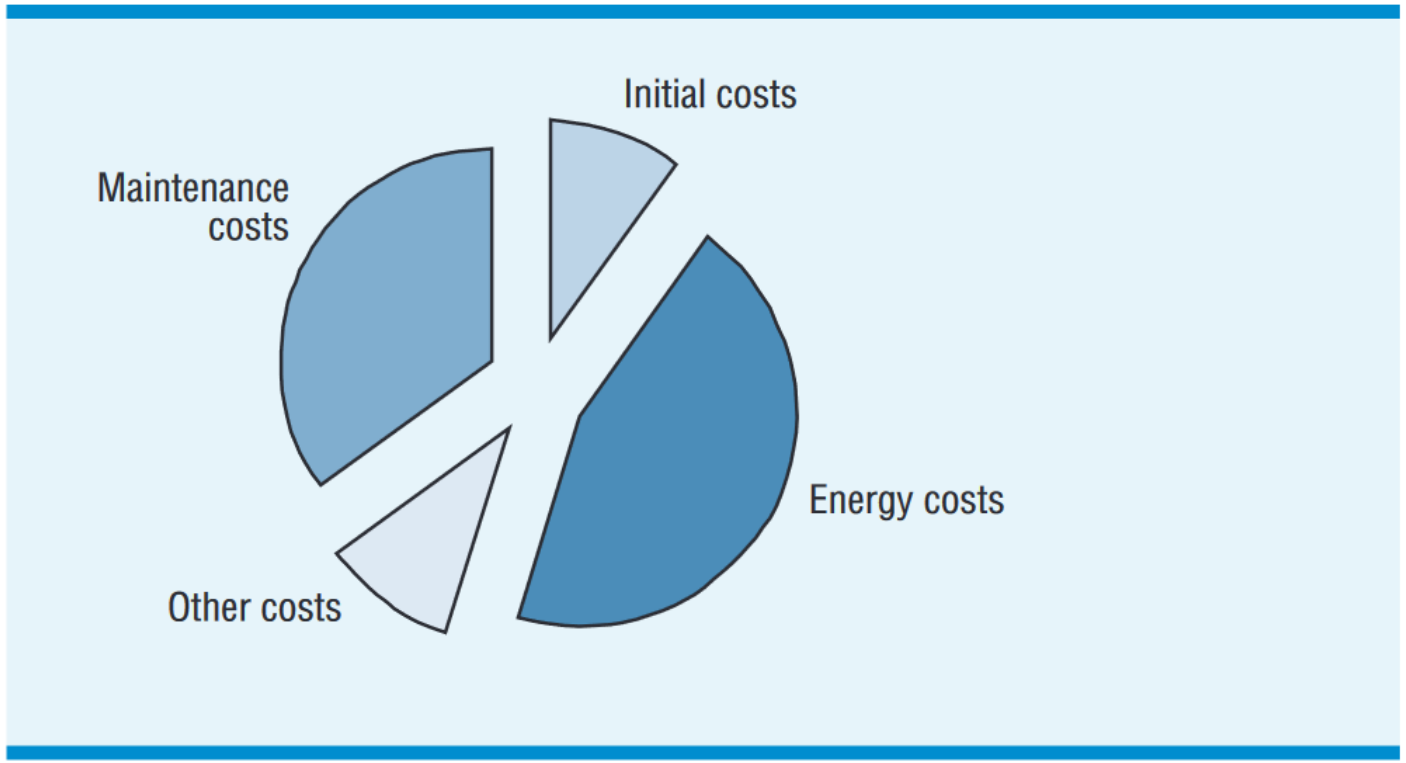
Wastewater used for renewable energy production

- Wasterwater treatment plants can use sludge to produce biogas for energy purposes.
- Purified wastewater can also be used through heat pumps, e.g. Hammarbyverket in Stockholm/Sweden. It has seven heat pumps with a total power of 225 MW, which is enough to heat 95,000 two-room apartments during a normal cold winter. The purified wastewater comes from Henriksdal's wastewater treatment plant to the Hammarby plant heat pumps, that utilise the energy contained in the received purified wastewater. The heat produced goes into Stockholm's district heating network. At the same time, the process generates cold water, which in the next step is used to produce cooling in the district cooling network.

Reduce water losses

Water losses carry both economic and environmental repercussions. On the economic front, these losses translate to a direct operational cost to water utilities, on the ecological front, water losses contribute to depleting water tables and exacerbate water scarcity, particularly in regions already under water stress. Keep an eye on:

- Pressure management and reducing leakages. Less pressure will use less electricity and less water volume will be lost.
- Reducing water consumption in homes and industries leads to energy savings in the production, supply, collection and treatment of water.



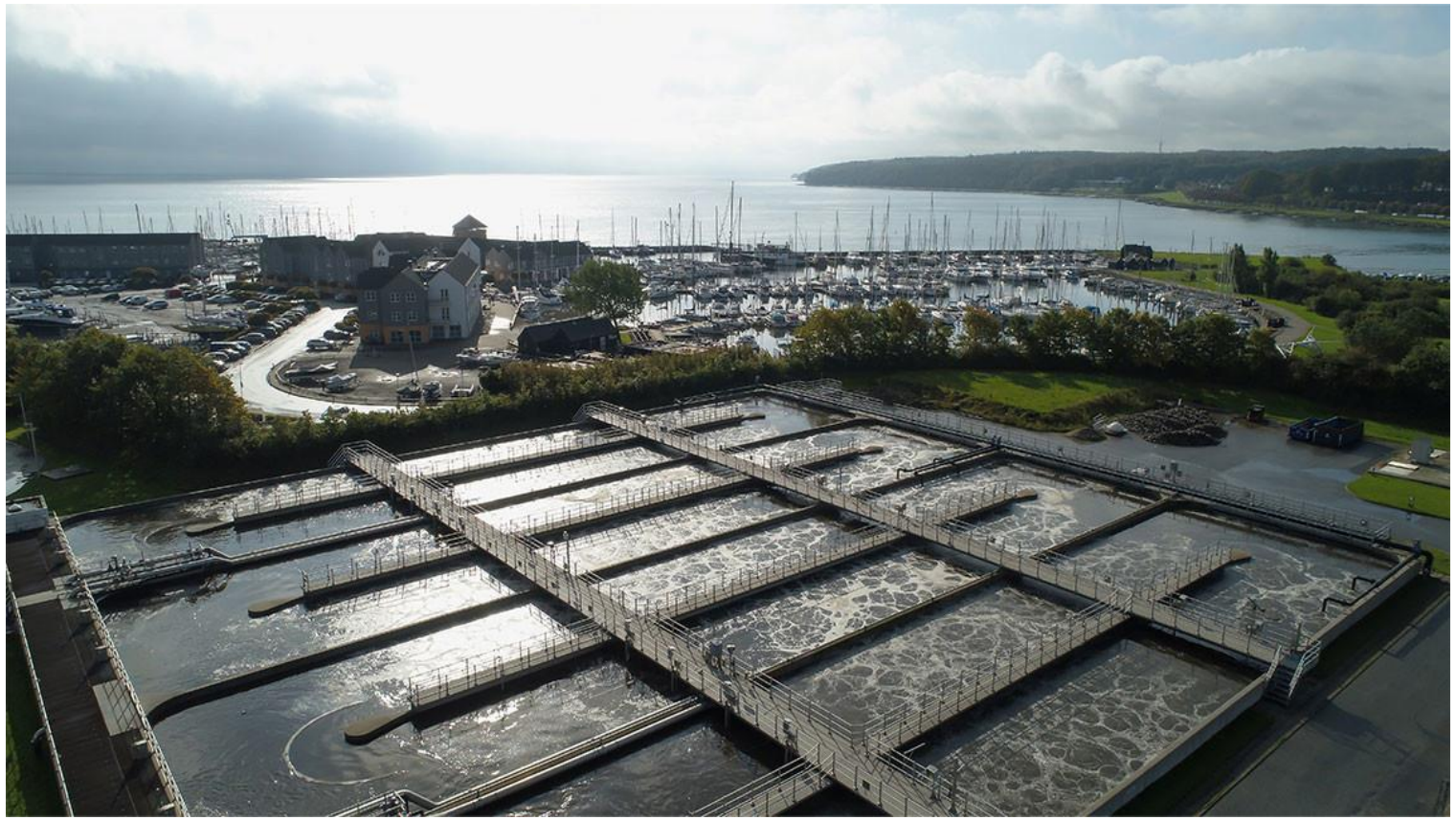
The Insignificance of the Initial Purchase Price

The initial purchase price is only a fraction of the pump's total life-cycle-cost (LCC).

A more energy-efficient pump system can keep costs low for many years.

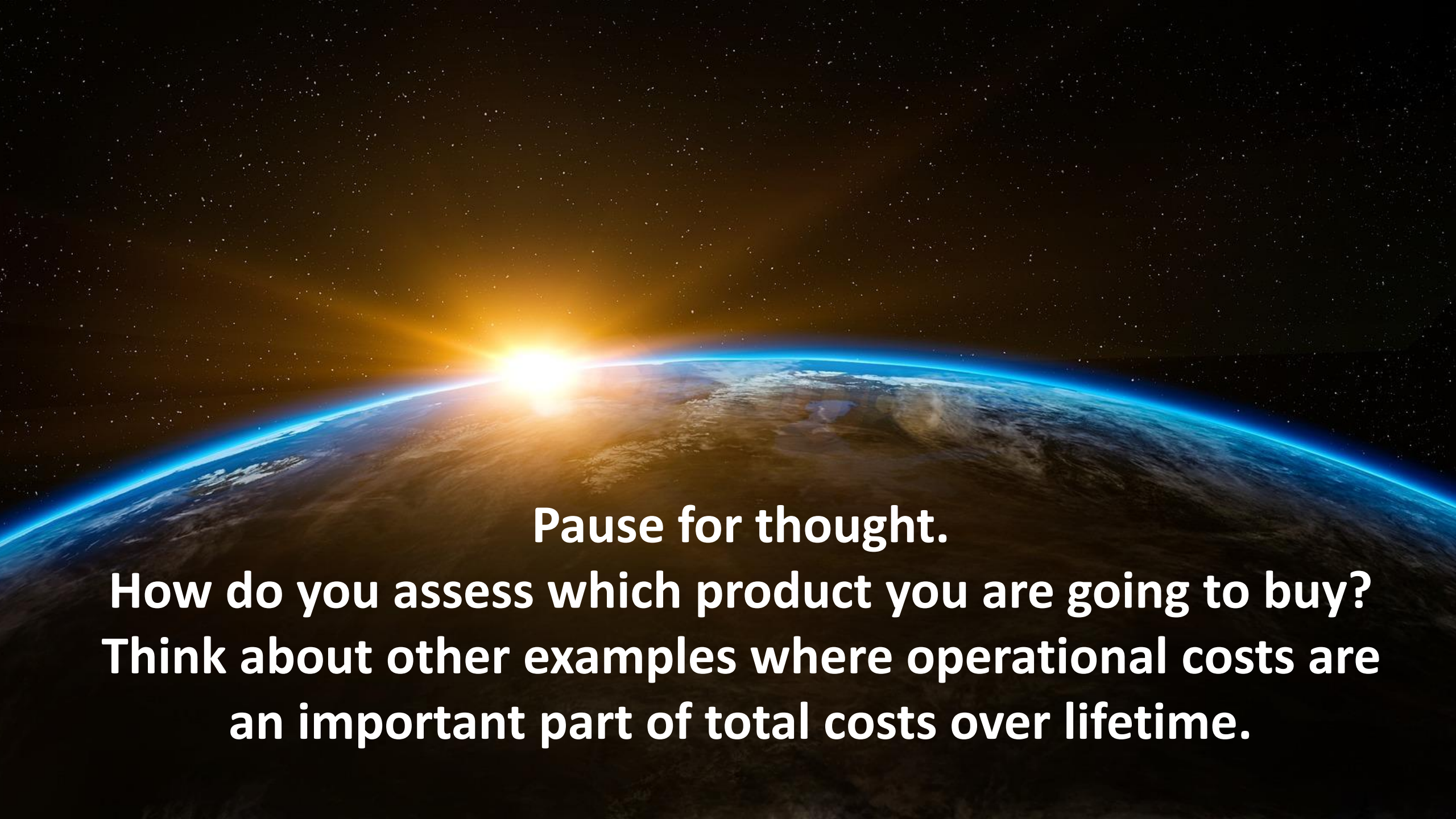
Source: https://www.energy.gov/eere/amo/articles/pump-life-cycle-costs-guide-lcc-analysis-pumping-systems-executive-summary

Denmark: from wastewater plant to power plant



Marselisborg Wastewater Treatment Plant produces 50 percent more electricity than it needs and 2.9 GW of heat for the district heating system. The surplus is enough to serve the needs of the drinking water supply and wastewater treatment facilities for the whole water cycle in the catchment area.

Source:
Picture from https://www.aarhusvand.com/showcases/energy-optimization/marselisborg-wwtp/
https://stateofgreen.com/en/solutions/marselisborg-wwtp-energy-neutral-water-management/


Pause for thought.
How do you assess which product you are going to buy?
Think about other examples where operational costs are an important part of total costs over lifetime.

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Thank You for your attention!

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