

**Nutrient and energy recovery from
industrial and municipal WWTP:
Nordic and European perspectives on sludge
management in a circular economy**

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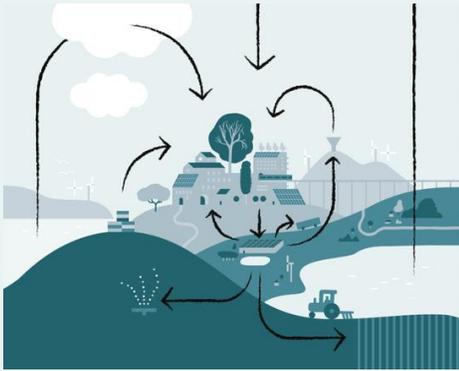
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Few other mass flows in the society are as big as the mass flow in the water and waste water sector

More than **1 billion tonnes of waste water** is collected, moved and treated in the Swedish waste water systems - from cities to the the receiving waters

The Sustainable Water Service of The Future

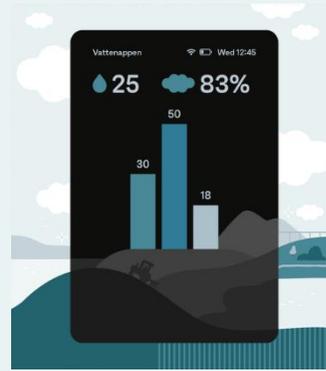
A Sustainable and Circular Society



This journey will lead us to:

- A sustainable circular economy and efficient use of resources
- Non-toxic chains of production
- Fossil-free energy sources.

A Smart and Functional Society



This journey will lead us to:

- A participatory and conscious customer
- A connected home
- An efficient flow control
- Smart water services in harmony with other community services.

A Resilient Society



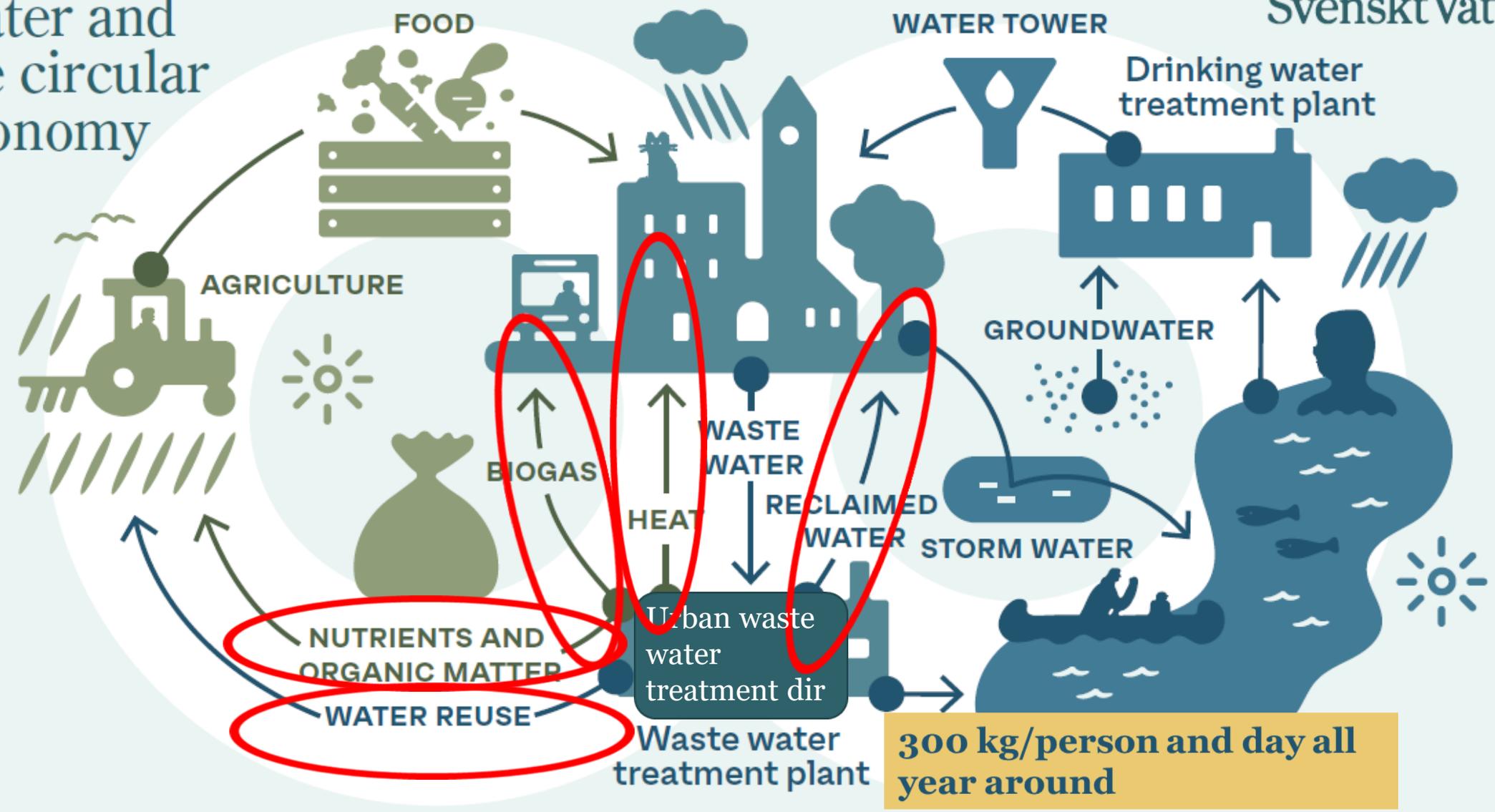
This journey will lead us to:

- A society that can effectively and efficiently manage crises
- A society with a secure food supply
- A climate-adapted society.

Water and the circular economy

120-140 kg/person and day all year around

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From Waste water treatment plant to Resource Recovery Plant

The European Green Deal



The EU as a global leader

A European Climate Pact

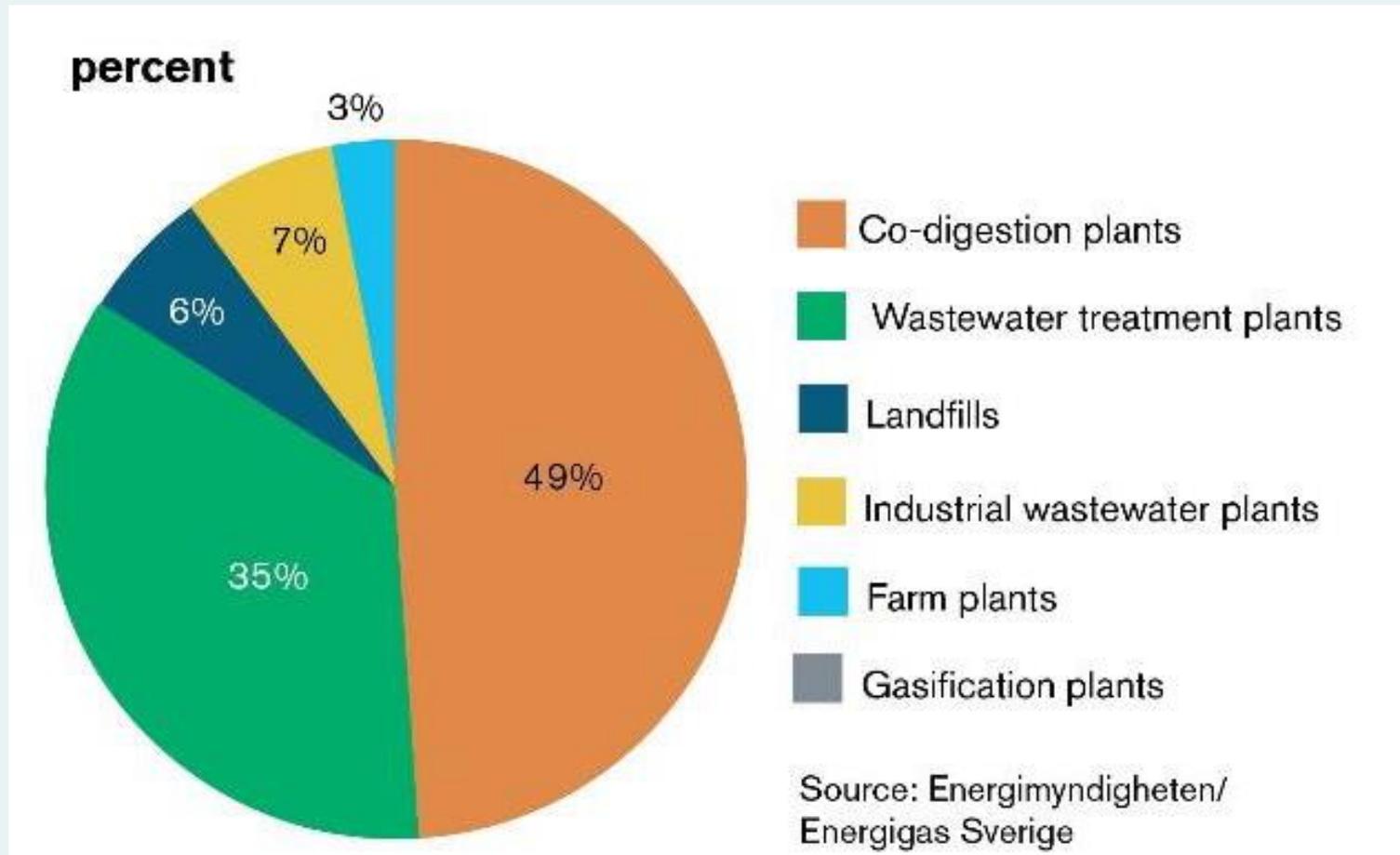


Biogas is a key to be part of a *climate neutral water and waste water sector 2030*

- **Maximise** the potential of biogas delivered to the market from your UWWTPs
 - and **minimise** your methane slip
- Fight for a sewage sludge quality so the sludge can be used in agriculture
 - If the sludge has to be incinerated - **produce biogas**
 - If the sludge has to be incinerated **minimise the use of biogas for drying the sludge**

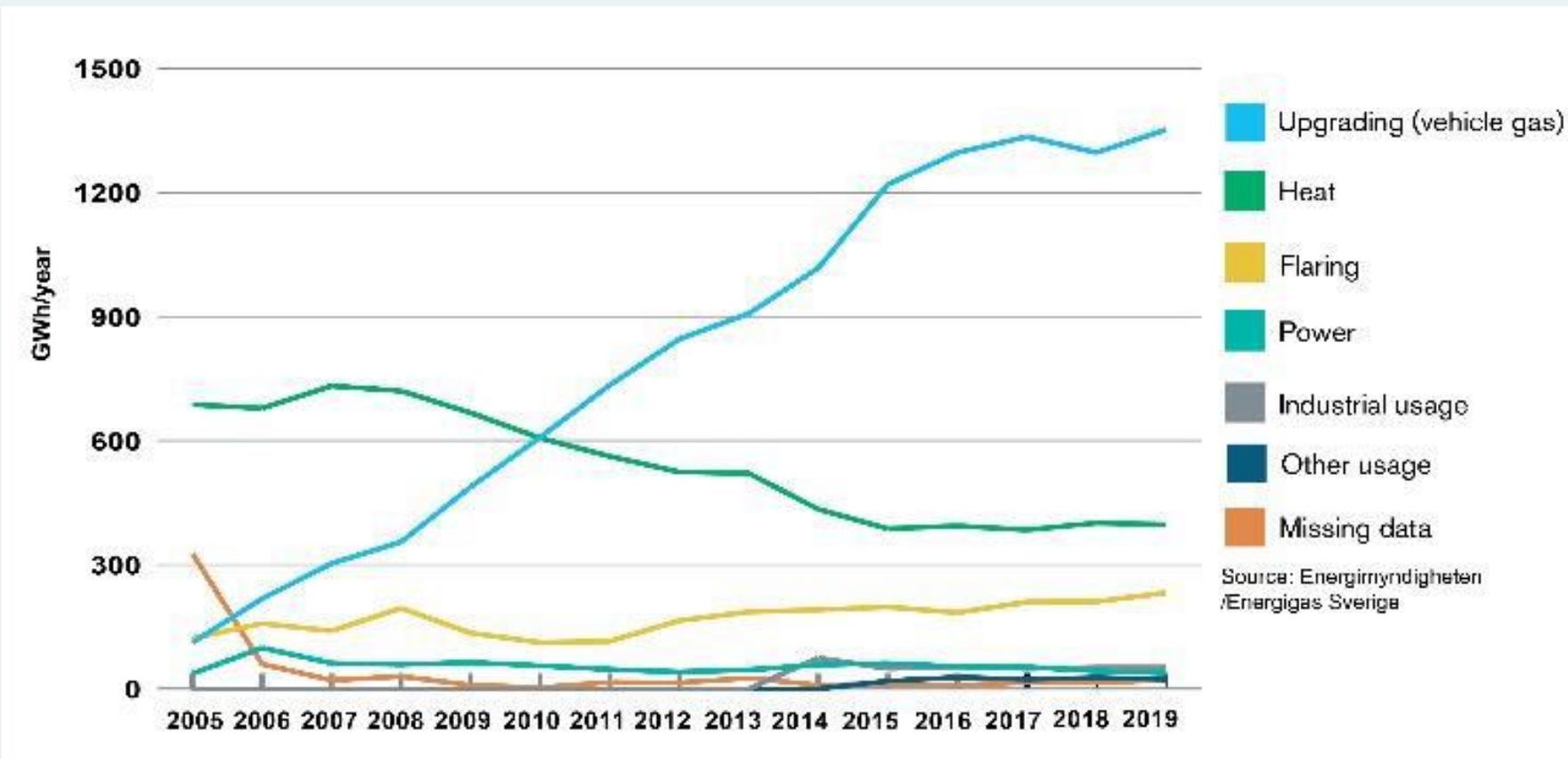
Share of biogas production for different plant types in Sweden 2019.

Source: Swedish Energy Agency/Swedish Gas Association



Use of produced biogas in Sweden 2019 and development since 2005.

Source: Swedish Energy Agency/Swedish Gas Association





A concept discussed at the Nordic P network

Use of resources in wastewater – use the EU waste hierarchy

Prevention: Control at source is the basis for circular economy

Prio 1 -Recycling of organic matter and nutrients on farmland through **Revaq** or sorting systems.

When that is not possible, no suitable farmland at reasonable distances or that the sludge does not meet **Revaq's** requirements:

Prio 2 - At least phosphorus is recovered and recycled (*Easy-mining: Ash2Phos and Aqua2Nitrogen, C-green, Ekobalans*)

Prio 3 –The sludge is used for landscaping

Prio 4 – Incineration only – energy recovered

Disposal (not allowed in Sweden)





Cleaner Water -
Better recycling

Revaq is operated by:

- Svenskt Vatten (Swedish Water & Wastewater Association)
- The Federation of Swedish Farmers (LRF)
- The Swedish Food Federation

and in close cooperation with the Swedish EPA.

- **5 million persons** (50% of Swedes) connected to a Revaq WWTP
- **39% of the Swedish sludge is used in agriculture** (3/4 from Revaq) and 60% land reclamation, 1% incineration (2018)

Revaq Certification system - Aims

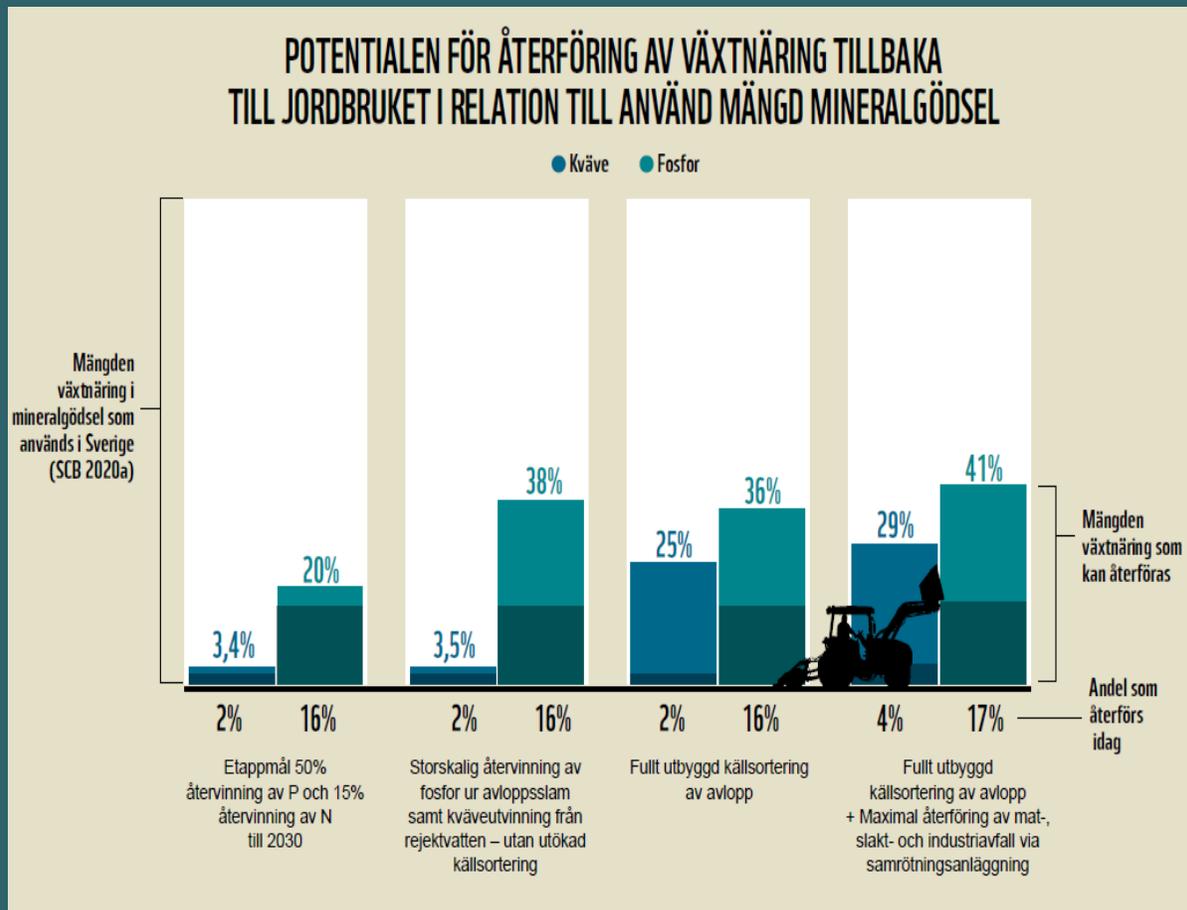
- **be a driving force to further improvement of the incoming wastewater**
 - the control at source or “upstream work” is in focus
- **an open and transparent information** about how sludge is being produced and it’s composition.
- **to secure that the sludge production is done in a responsible way** and the quality of sludge fulfil the requirements.



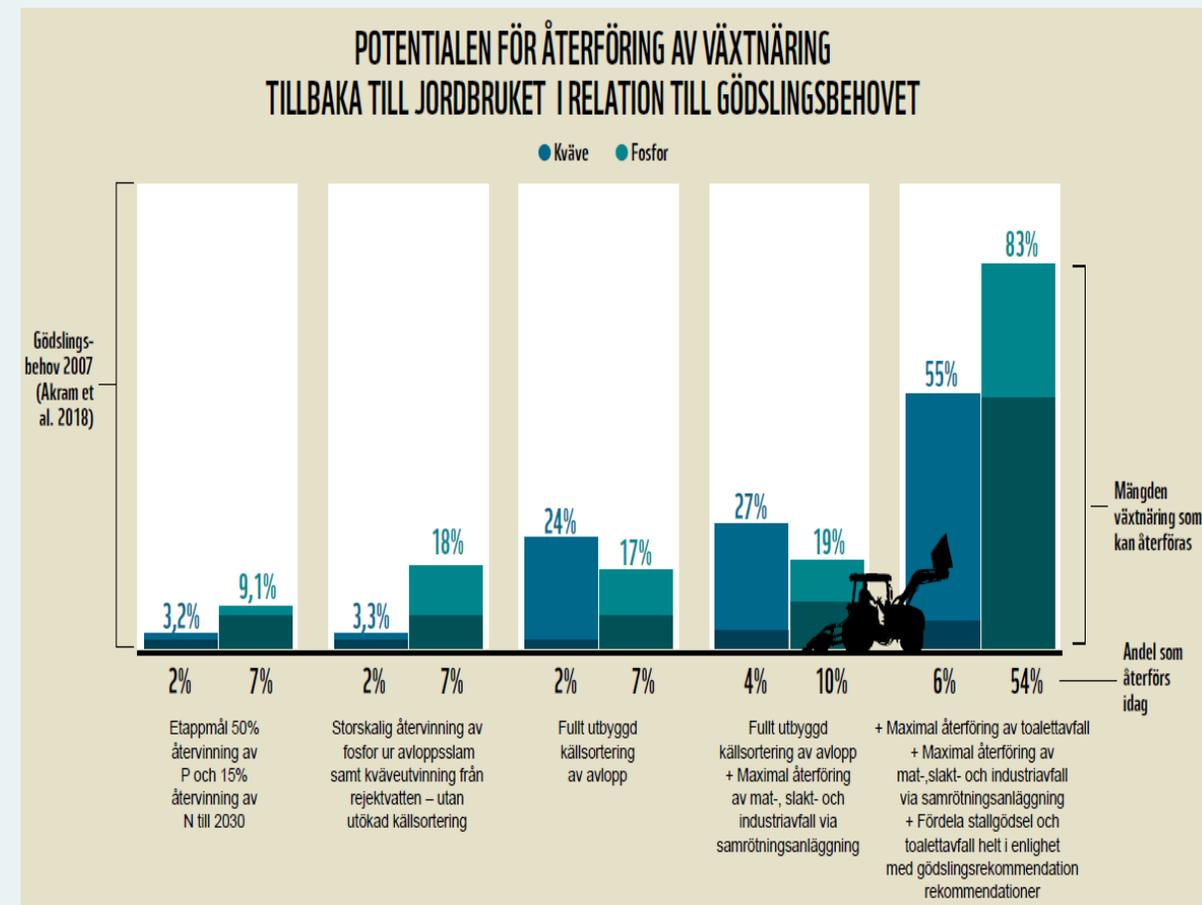
Science based reports for media and policy makers from Revaq and Svenskt Vatten: Which hazardous substances should be phased out from consumer products?



The potential for recycling nutrients back to agriculture compared to the used mineral fertiliser (ÖKAD CIRKULARITET OCH MINSKAD ÖVERGÖDNING, WWF 2021) Case Sweden



The potential for recycling nutrients back to agriculture compared to the real need for fertiliser (ÖKAD CIRKULARITET OCH MINSKAD ÖVERGÖDNING, WWF 2021), Case Sweden

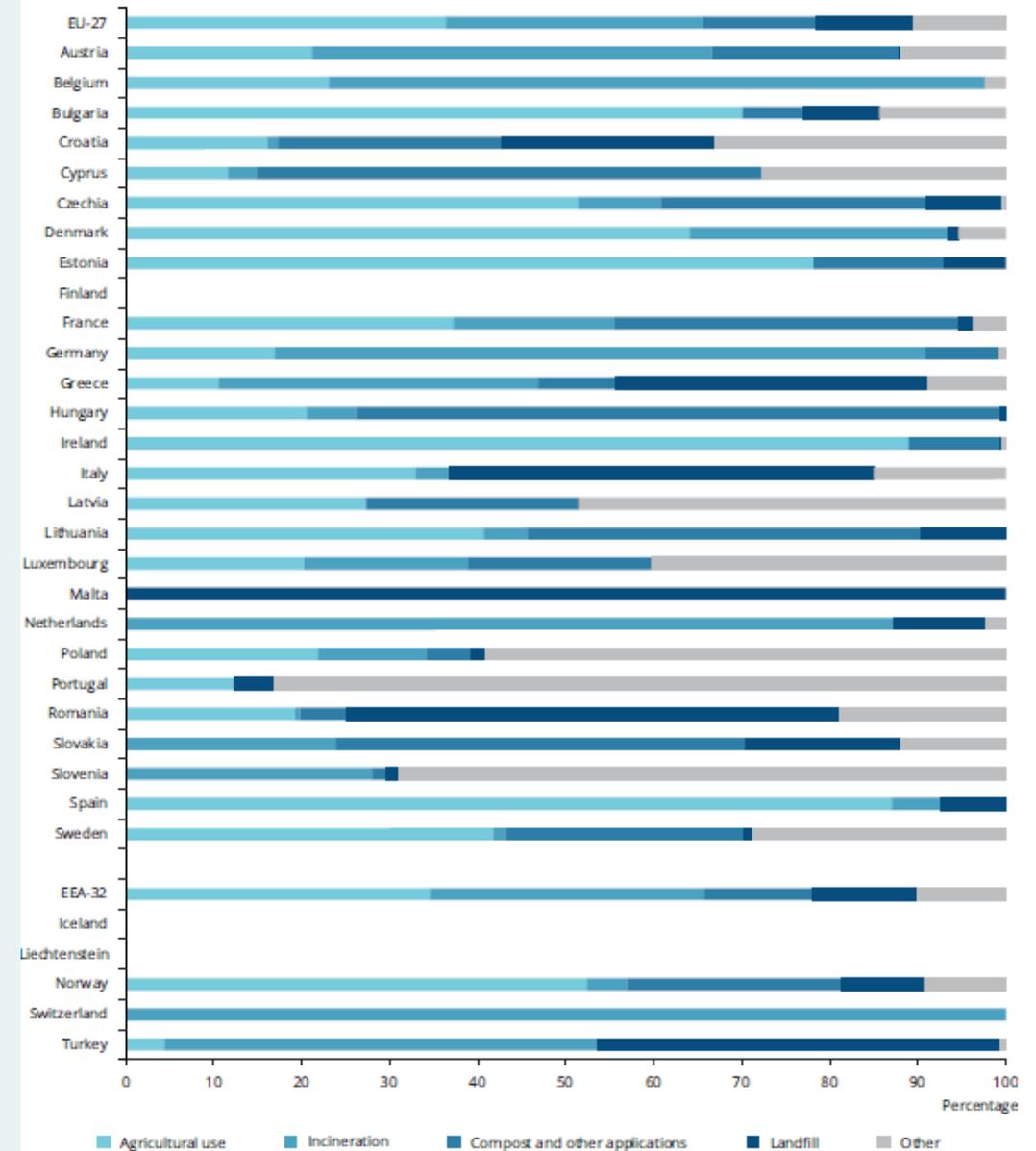


Sludge management in the EU

Wide variation in the destinations of sewage (EEA report No 05/2022)

- 34% in agriculture (DK, N, FIN, S)
- 31% incinerated, (DK, N, S, FIN)
- 12% compost and other applications,
- 12% went to landfill, and
- 10% was used in another way.

Figure 3.2 Sewage sludge management approaches in Europe



Notes: Reported data for each of the different uses was compared with the total disposed, according to various categories - agricultural use, compost and other applications, landfill, incineration, and other.

Data from 2018 and 2019, except for France and Switzerland (2017); Portugal (2016); Denmark and Italy (2010).

Source: Eurostat (2022).

Important proposals in Sweden 2021

The Government's delegation for circular economy & The Parliamentary delegation on environmental goals both suggested:

- The government should investigate the introduction of a **quota obligation** for recycled P and recycled N in **all mineral fertilizers put on the market** in Sweden/EU.

However – so far - no decisions from the Government

Take home message: **Biogas is a key to be part of a *climate neutral water and waste water sector 2030***

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