Evaluation of emission reduction measures

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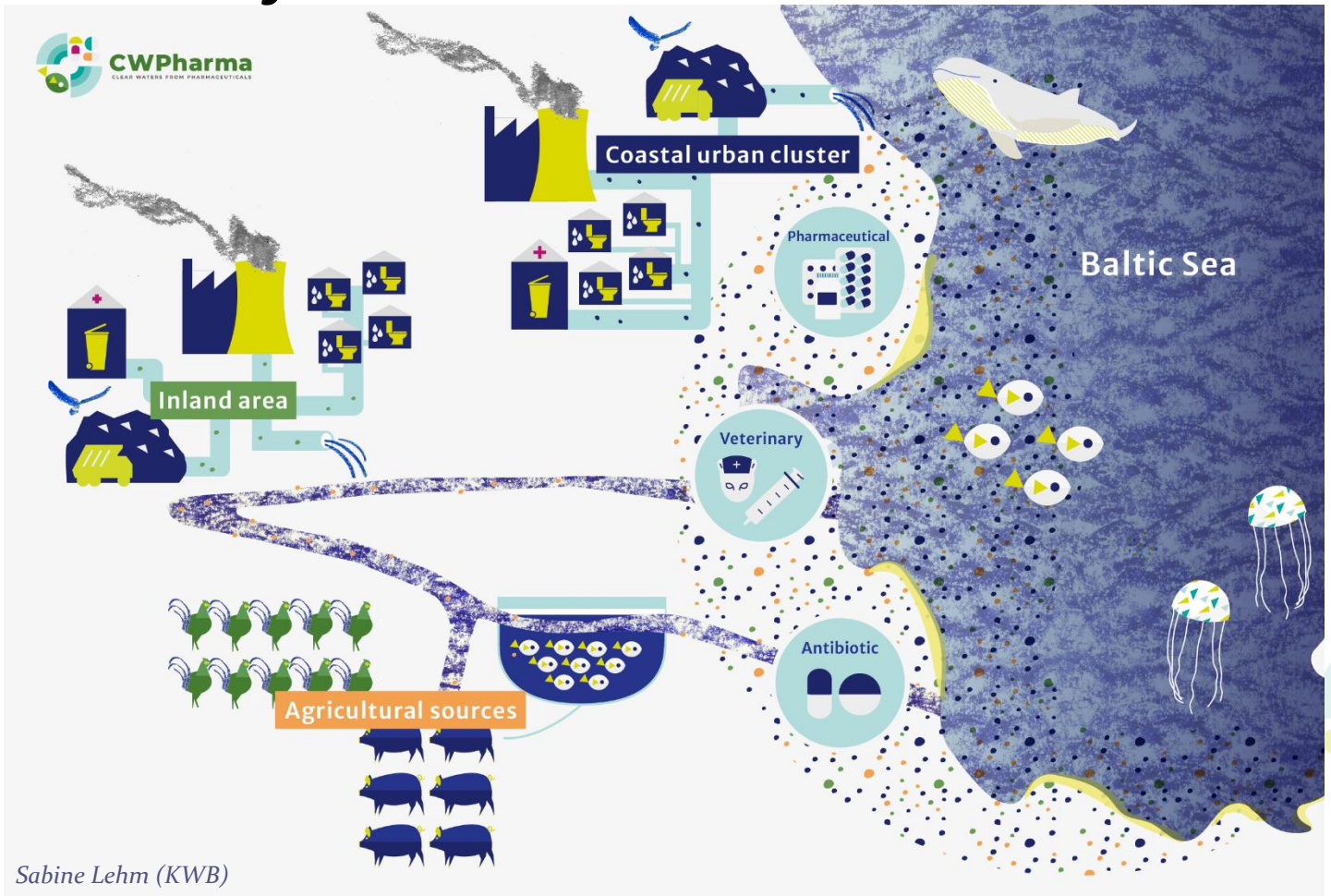
Sources of API contributions to the Baltic Sea



Sabine Lehm (KWB)

CWPharma recommendations

- Project work condensed into **20 recommendations**
- Organized into 3 areas needing improvement
  - Collection/disposal of unused pharmaceuticals and pharmaceutical waste
  - Wastewater treatment
  - Knowledge of API emissions, environmental concentrations and ecological effects
- Barriers to implementation identified & discussed

Improving collection and disposal of unused pharmaceuticals and pharmaceutical waste

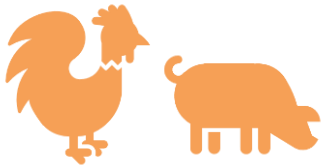
- **Citizens** should be able to **return all unused** human and veterinary **medicines free of charge** to **dedicated collection points** within all Baltic Sea countries

- **Increase the awareness** of **citizens, medical doctors, pharmacists, veterinarians and farmers** about the negative effects of pharmaceuticals in the environment through **targeted information campaigns**

Improving collection and disposal of unused pharmaceuticals and pharmaceutical waste

- **Hospitals and other healthcare institutions** should **collect their own pharmaceutical waste** and send it directly to the country appropriate waste treatment facilities.

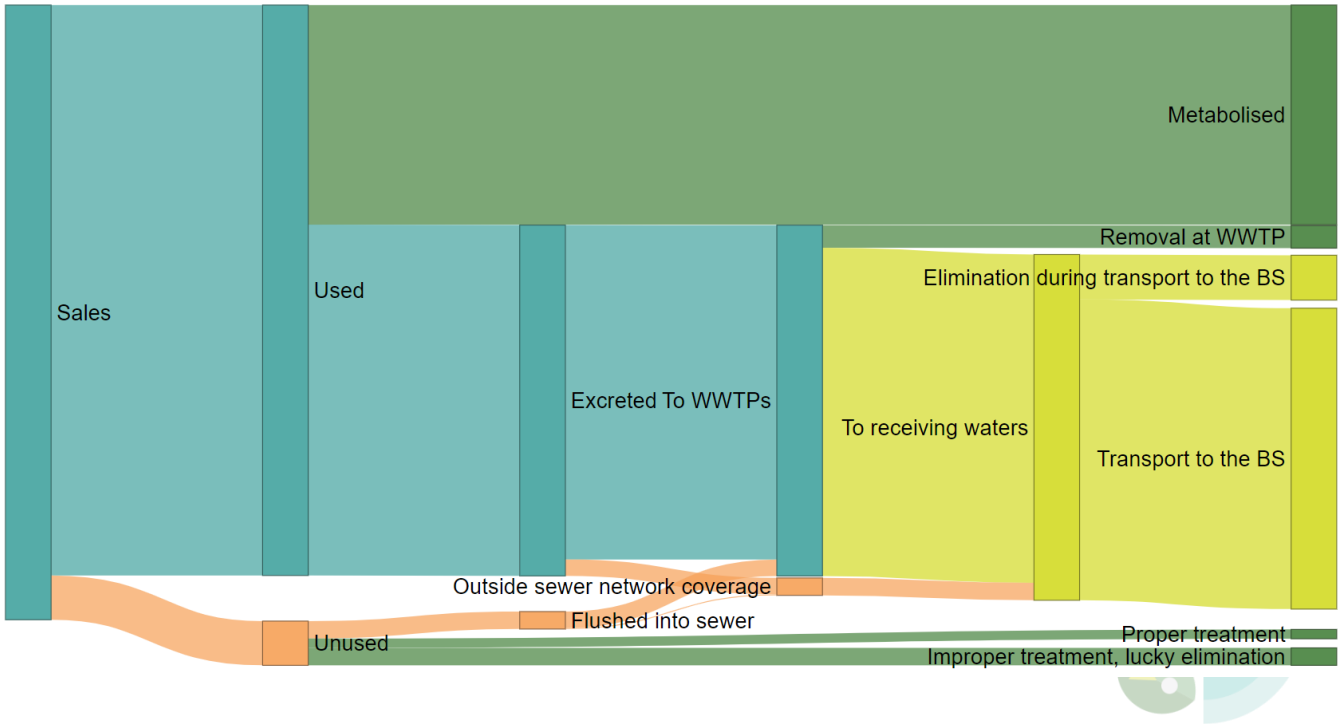
- **Farmers** should be responsible for organizing the **transport** of **commercial amounts of unused veterinary medicines** to the **appropriate** waste treatment **facilities** in their country.



- For **separately collected pharmaceutical waste**, **high temperature incineration** (~1100-1300°C) is the **recommended treatment** method.
  - Unused medicines collected with mixed household waste and incinerated at lower temperatures is the next best waste treatment option.

Improving wastewater treatment

- **Emissions** of environmentally risky APIs could be **reduced by**
  1. reducing indirect discharges of APIs
  2. upgrading WWTPs with AWT



Improving wastewater treatment

- The **suitability of AWT** technologies should be **determined** on a site-specific basis by monitoring **crucial water quality parameters** and **lab-scale testing**.

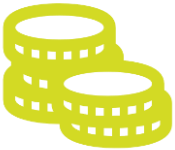
- The application of **ozonation should be followed by a biological post-treatment** step.

- Implementing a **national knowledge platform** to **share technical information on ozonation and activated carbon** will speed up and improve uptake of WWTP and AWT upgrades.

Improving wastewater treatment

- Depending on the local target API, loading rates, and method of consumption, significant **reduction in API emissions** will **require** a **combination of technical and non-technical reduction measures**.

- In terms of cost and technical efficiency, **API elimination via AWT** upgrading should be **implemented first at larger WWTPs** and then at smaller WWTPs.



- When evaluating AWT options, the **carbon footprint** of the different technologies should be **considered individually for each country**.

Improving knowledge of API emissions, environmental concentrations and ecological effects

- **Environmental permits** should **require pharmaceutical plants** to **estimate** their **API emissions** and **impacts** on **WWTPs** and **surface waters**.

- When necessary, environmental permit requirements for pharmaceutical plants should be **further supplemented** with **industrial wastewater contract requirements**.

- **Increase** the public **availability** of **API consumption statistics**.

Improving knowledge of API emissions, environmental concentrations and ecological effects

- **Knowledge on the environmental risks of APIs must be improved**.
- **More studies on** the use of **veterinary medicines** and their dispersal in the environment should be conducted.
- APIs should be included in **regular environmental monitoring programmes managed by national authorities**.
- **Analytical methods for API detection**, **including metabolites and hormones**, should be **further refined** to enable more comprehensive quantification of API concentrations in the environment.




Barriers to implementation

Lack of public/governmental awareness about environmental effects of APIs

Low public awareness and/or acceptance of take-back programmes

<u>Financial support for:</u>

1) AWT implementation
2) national knowledge platform
3) take-back prog.
4) monitoring prog.
5) analytical dev.

High temperature (1100–1300 °C) incineration not available in all countries

Differences in analytical results between laboratories

Lack of publicly available statistics on API consumption

Lack of enforcing reduction of API emission

Existing regulations might hinder the uptake of takeback programmes

Existing regulations might hinder the uptake of advanced treatment at local WWTP level

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