Tehnoloogiad ja nende efektiivsus ravimijääkide eemaldamiseks reoveest

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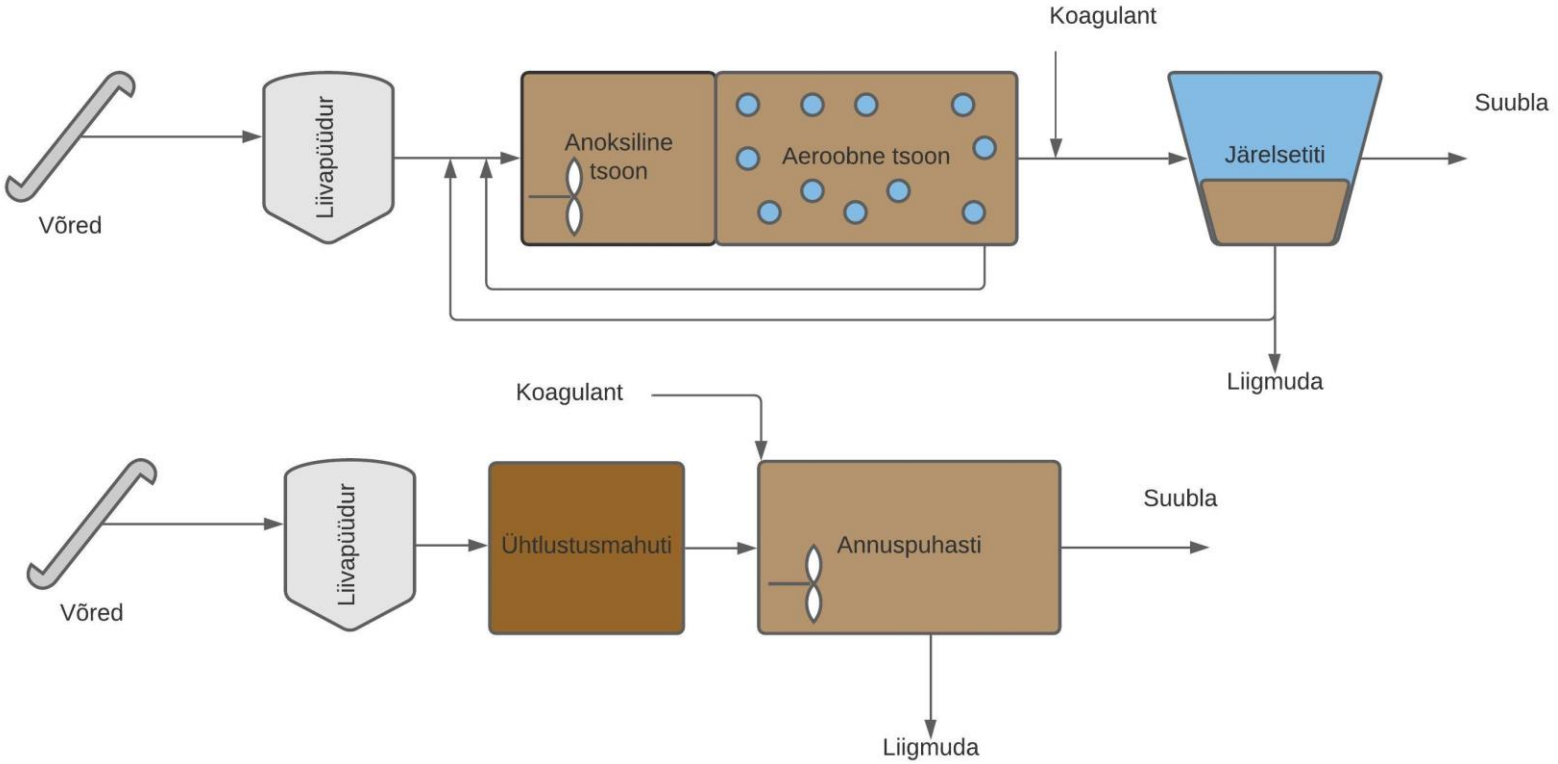
Hetkeolukord

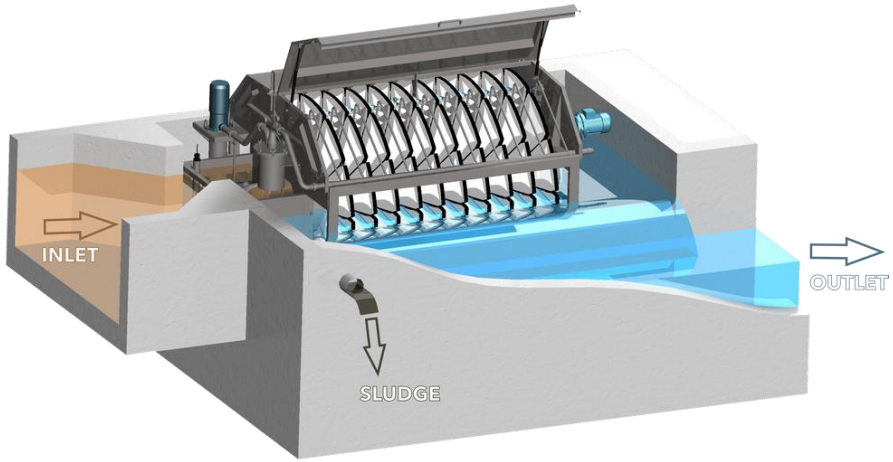


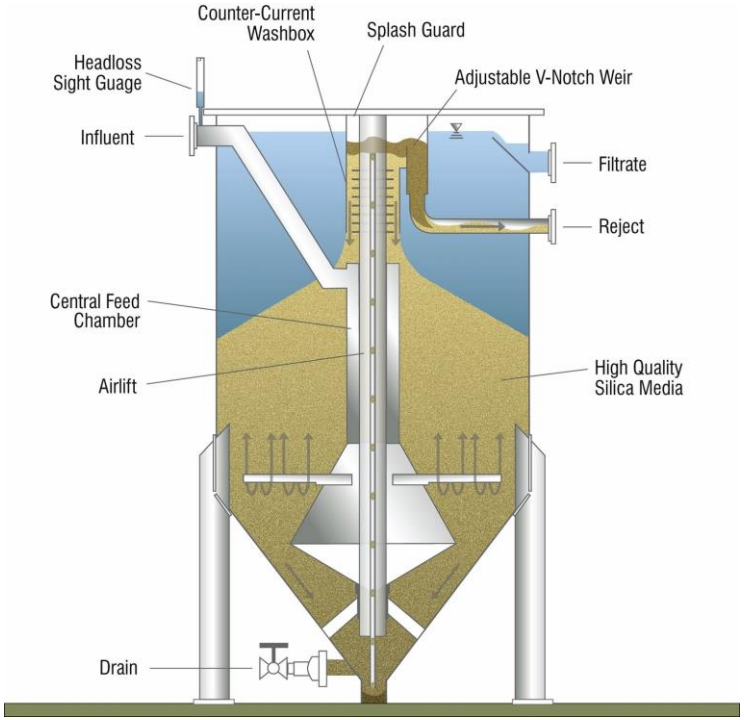
Järelpuhastuse motivaatorid täna

- Fosfori piirmäär ehk heljumiärastus;
- Hüdrauliline ülekoormus;
- Aktiivmuda pundumine.

Järelpuhastus Eestis

- Ketasfiltrid;
- Liivafiltrid.

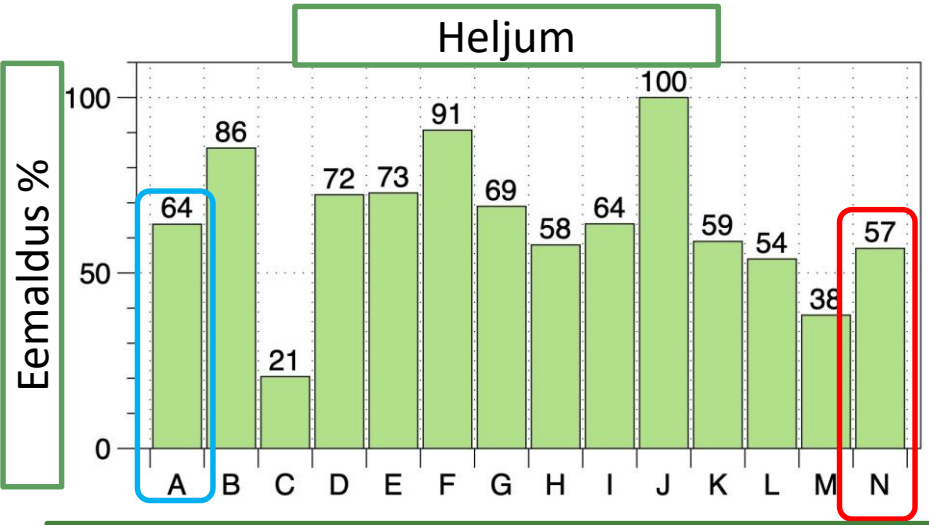


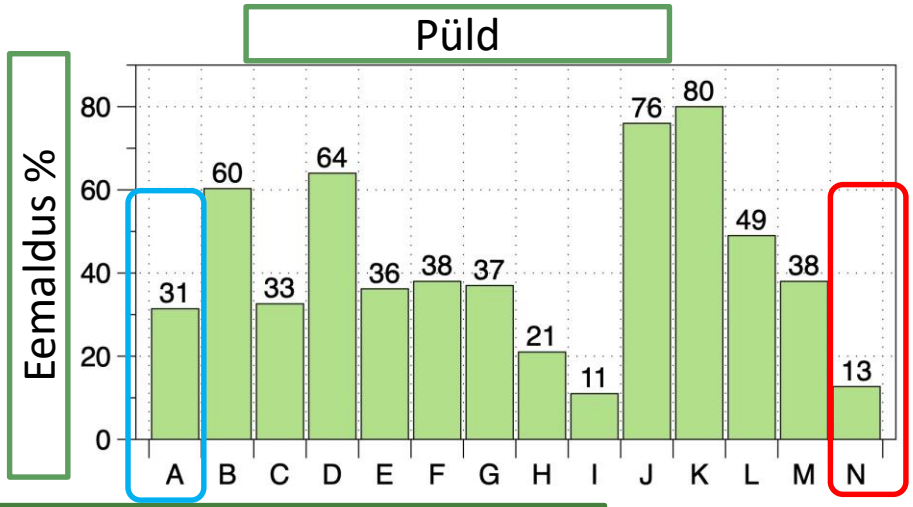


Järelpuhastuse eeldused

- Efektiivne lämmastikuärastus;
- Annuspuhastite puhul järelühtlustusmahuti;
- Madal heljumi koormus.

Järelpuhastuse uuring BEST





Phosphorus removal and removal efficiency of other pollutants with various post-treatment methods.
A – sand filter and anthracite, B – coagulation with ferric, C – manipulating pH to 8.5, D – manipulating pH to 10,
E – adsorption with GAC, F – coagulation and flocculation, G – green sand AFM,
H – green sand AFM with potassium permanganate dosing,
I – green sand AFM with reduced potassium permanganate dose,
J – green sand AFM with coagulation and flocculation,
K – green sand AFM and aluminium coagulant and flocculation,
L – green sand and pH manipulation to 11, M – zeolite ion exchange**, N – disc filtration.**

Kasutatud tehnoloogiad-CWPharma

- Osoneerimine;
- Aktiivsüsi;
- Aktiivmudal –ning biokilel põhinev bioloogiline puhastus.

Pilootkatsed viidi läbi (lisaks Helsingi)

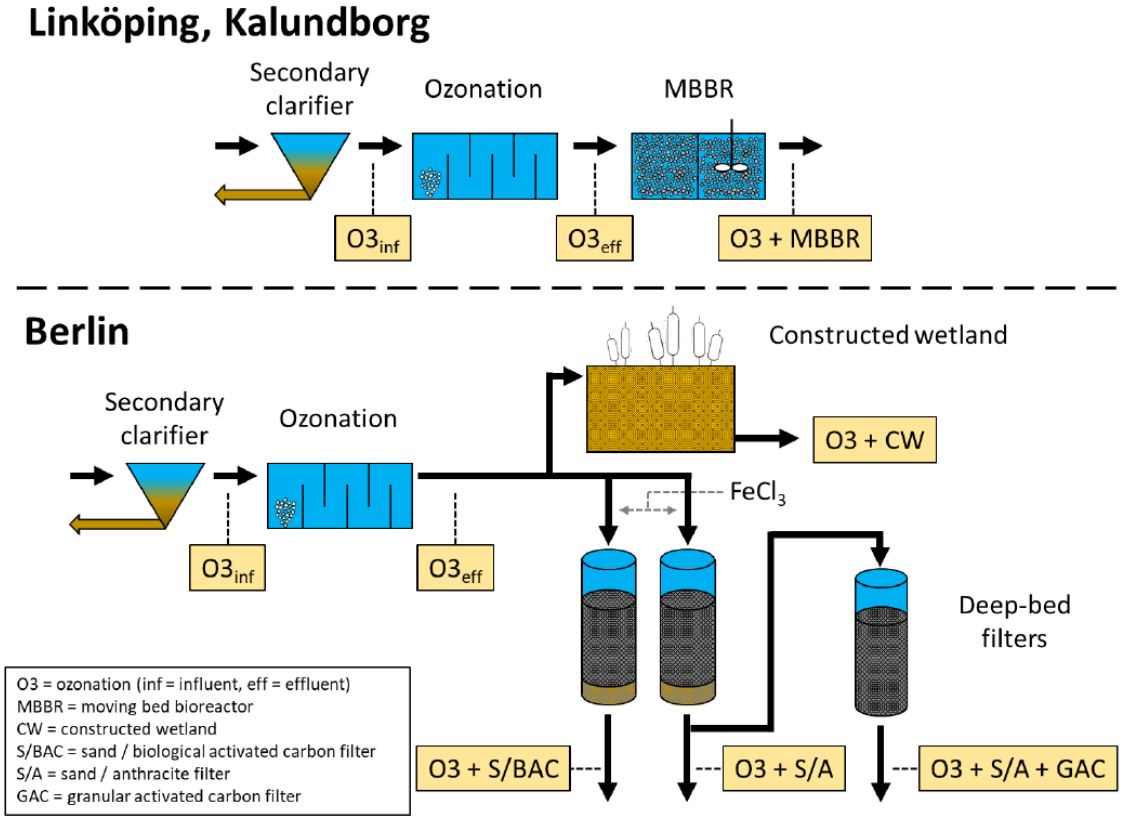


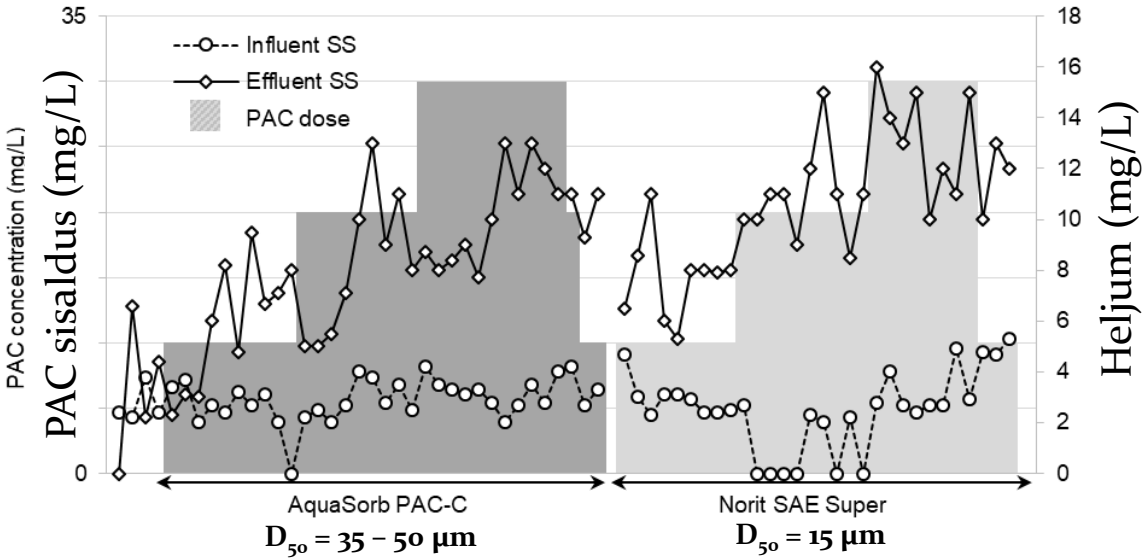
Figure 1: Schematic overview of sampling points at WWTPs Linköping (SE), Kalundborg (DK) and Berlin (DE).

Viikinmäki (Helsingi) katsetas mikrofiltrite ning pulbrilise aktiivsöe kombineerimist (PAC)

Microsieve

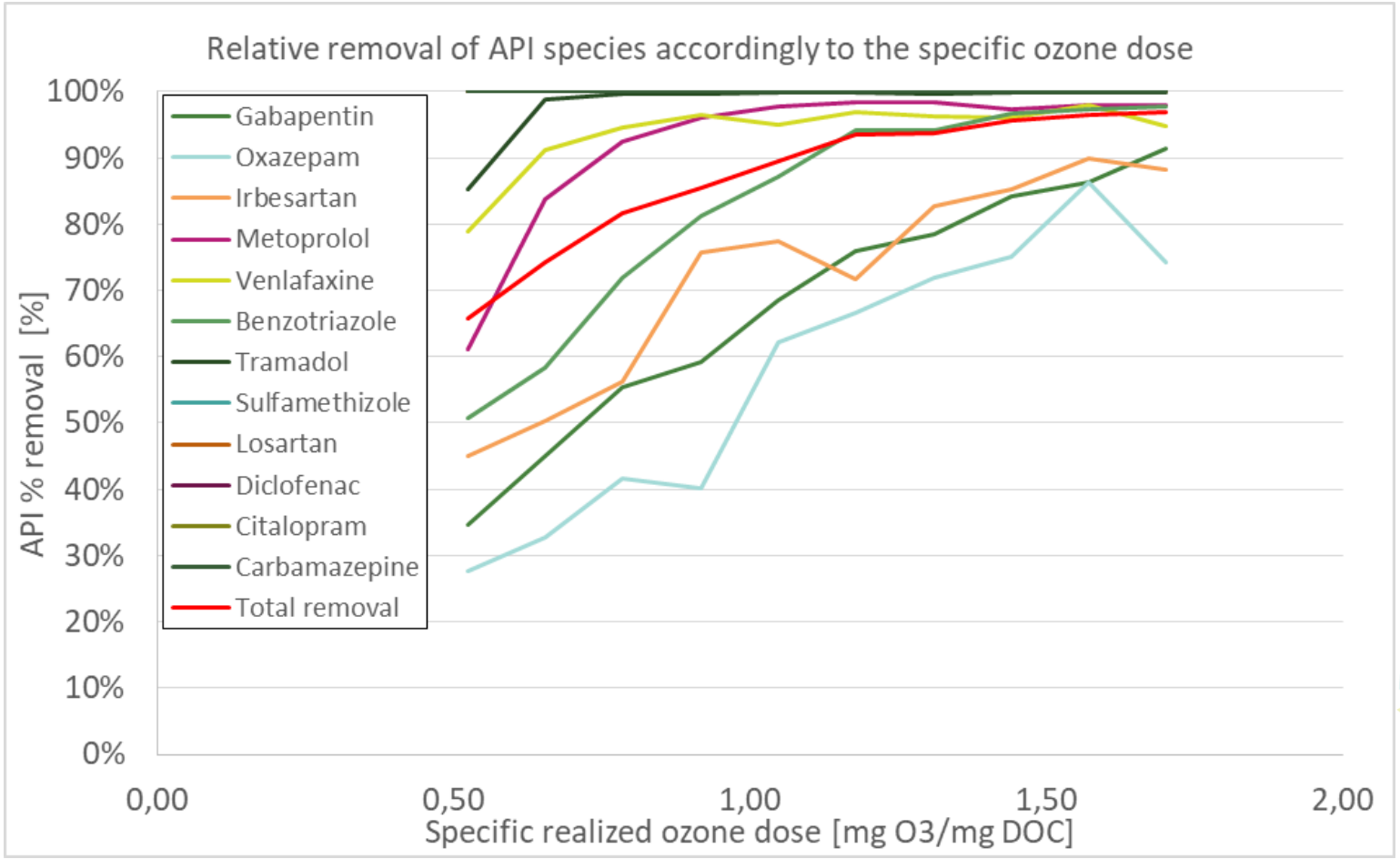
Cloth filter

ACTIFLO® CARB

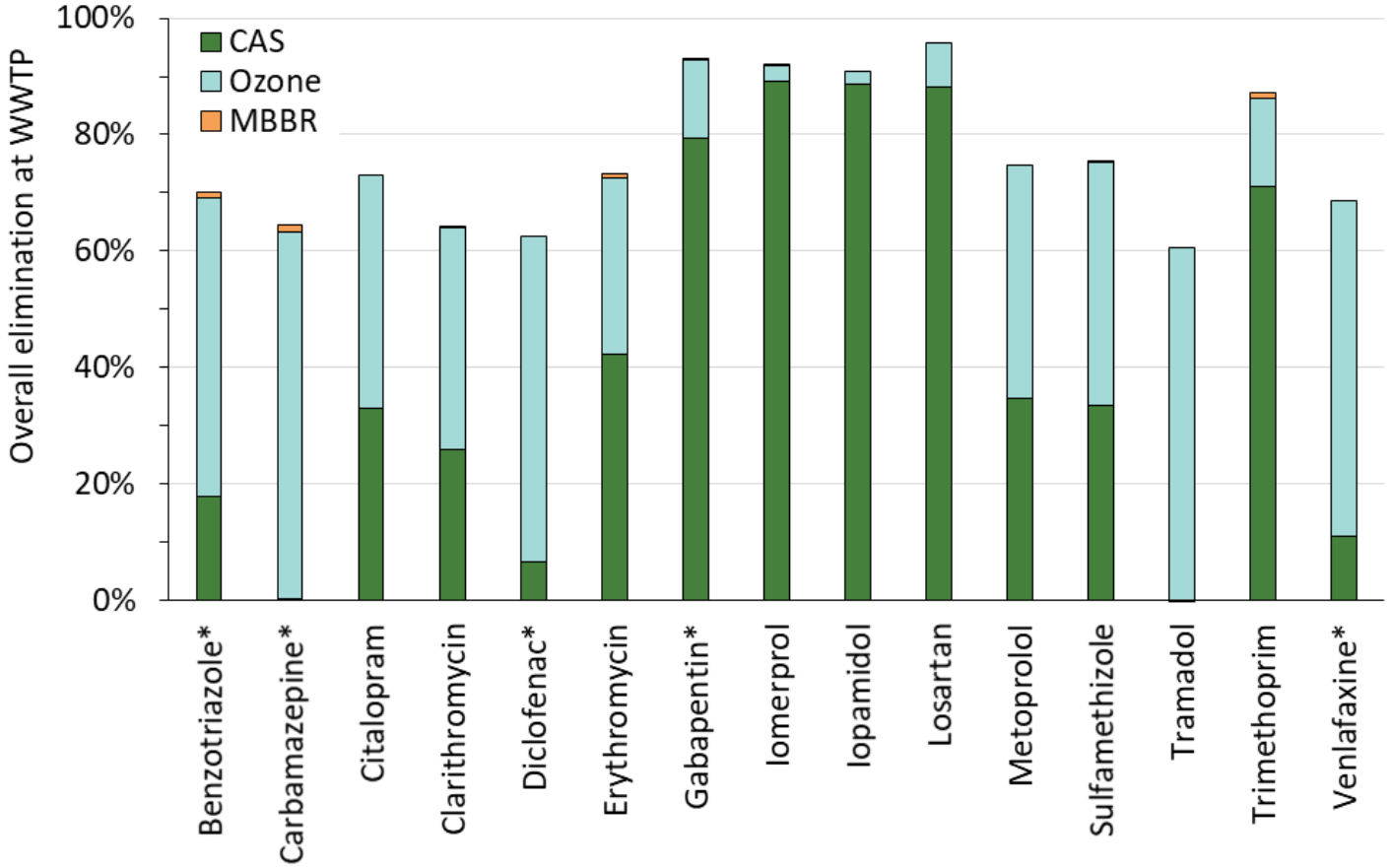


Ebapiisav PAC eemaldus, mistõttu on oht selle sattumiseks keskkonda.

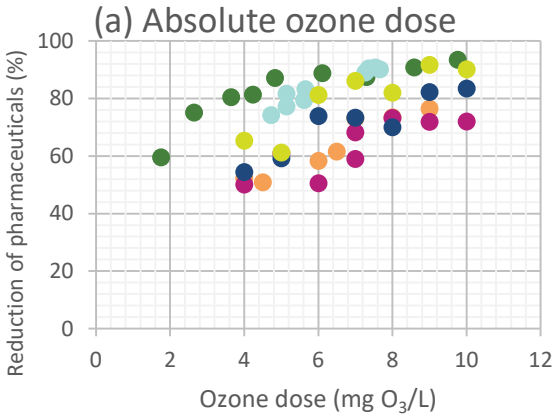
Osooni puhastusefektiivsus ravimijääkide eemaldamisel

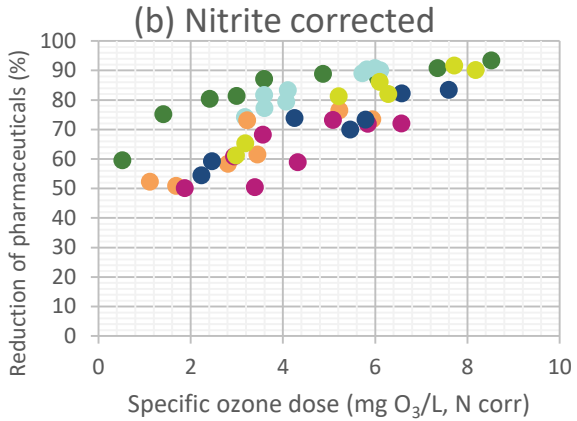


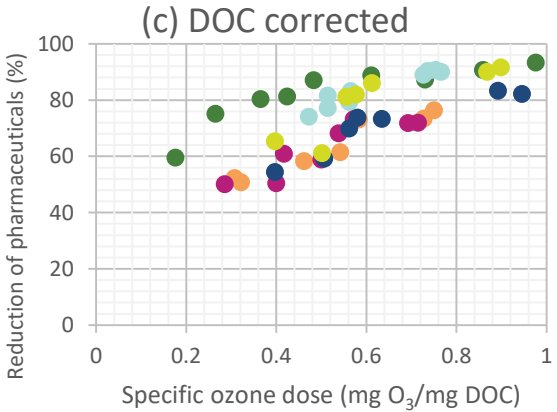
Aktiivmudaprotsessi-, osooni- ja biokiletehnoloogia puhastusefektiivsus ravimijääkide eemaldamisel

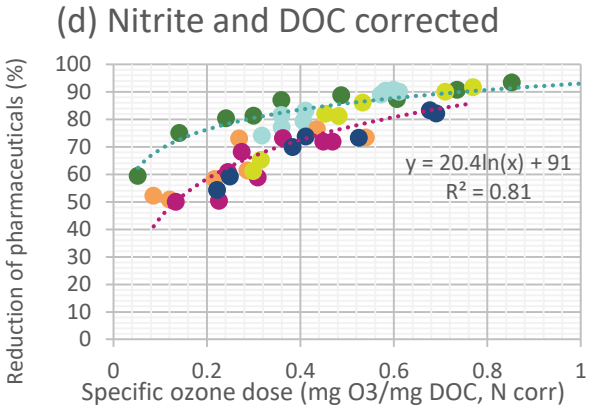


Nitrifikatsioon vs osoneerimine







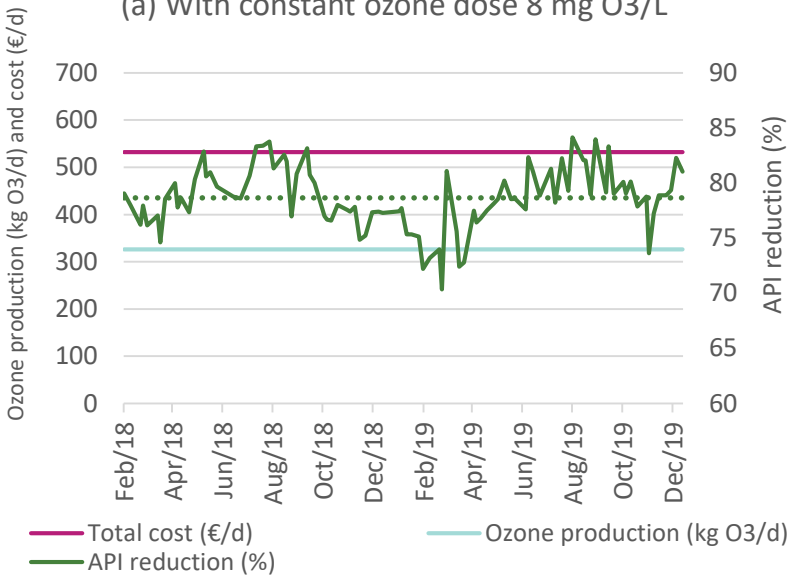


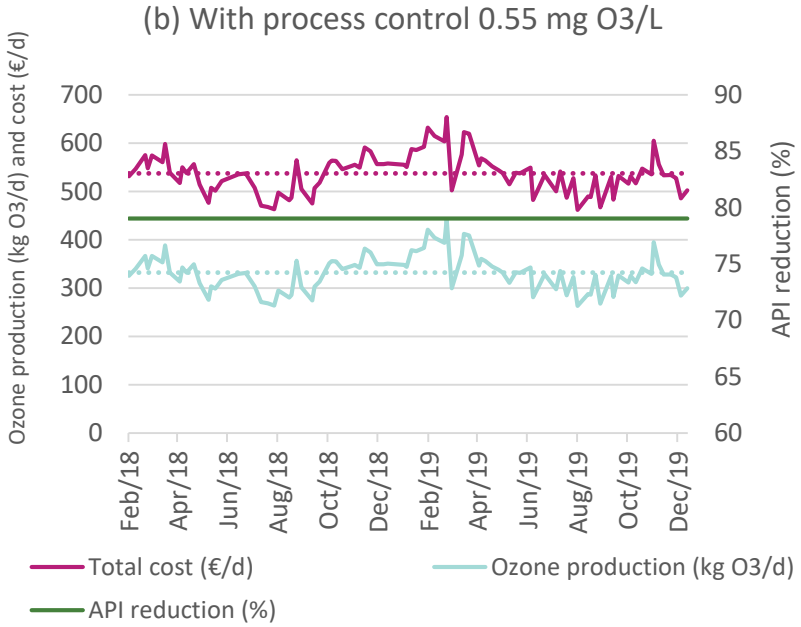
Average API reduction for:

- atenolol
- citalopram
- diclofenac
- metoprolol
- sulfamethoxazole
- oxazepam
- trimethoprim
- propranolol

- A specific ozone dose of 0.55 mgO3/mgDOC,N corr is required for an average of 80 % API reduction.
- 18 % of the produced ozone is consumed by nitrite alone

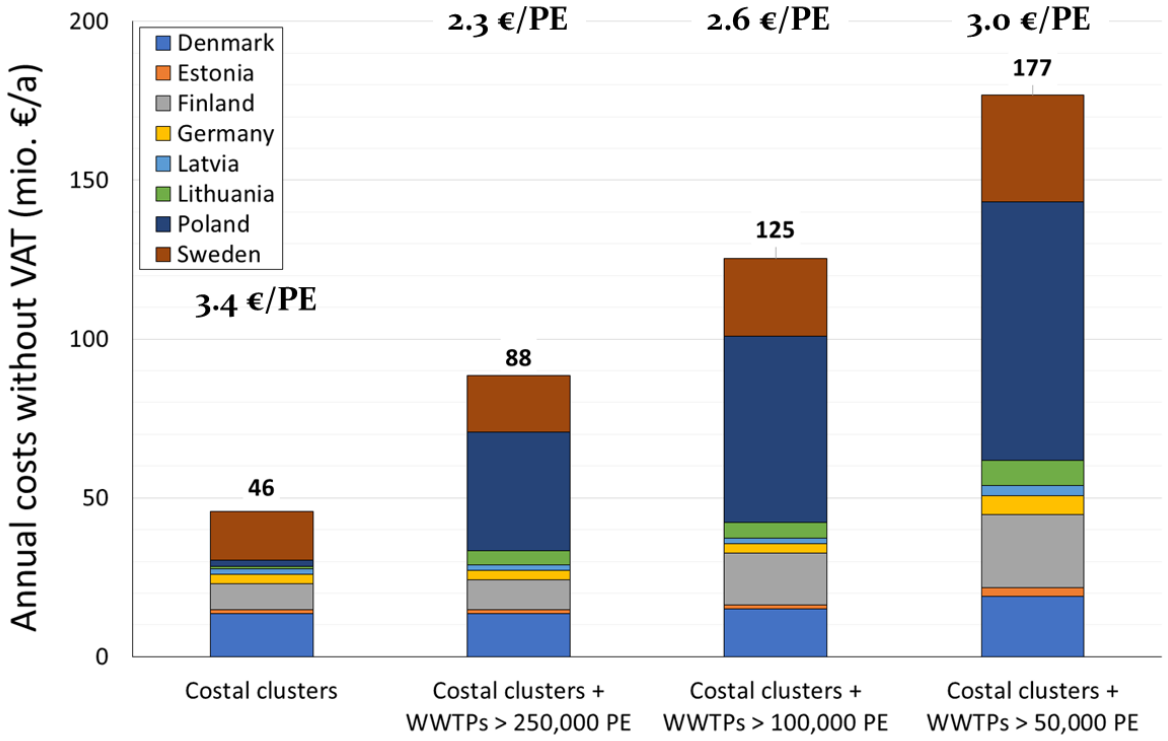
Osoneerimise automatiseerimine, näiteks UVA$_{254}$





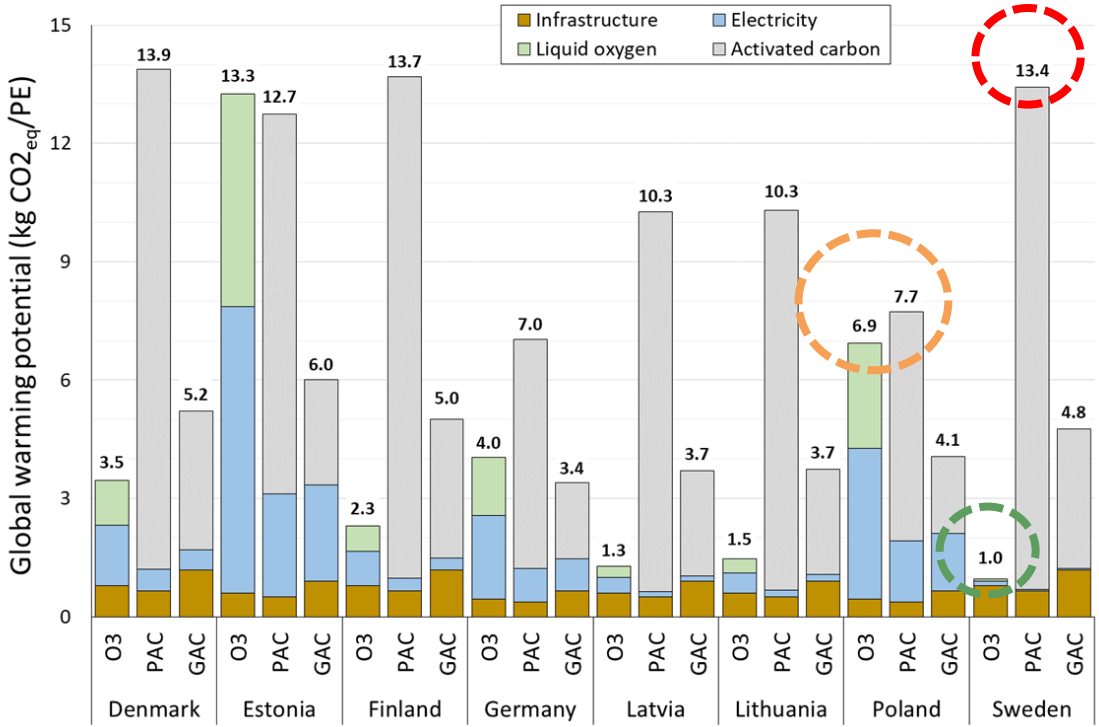
Opereerimiskulud ravimijääkide eemaldamiseks

- Opereerimiskulud (inimekvivalendi kohta aastas), kulude arvutamisel lähtuti täismõõtmetes järelpuhastusega reoveepuhastitest.



Kasvuhoonegaaside emissioon olenevalt kasutatavast järelpuhastustehnoloogiast kg CO_2 ie kohta aastas

➔ a) O3 (0.5 gO_3/gDOC) & liivafilter (SF), b) PAC (1.0 gPAC/gDOC) & SF, c) SF & GAC



Osoon eelistatud:
Skandinaavia, Läti ja Leedu

GAC eelistatud:
- Poola, Eesti

Soovitused tehnoloogia rakendamiseks

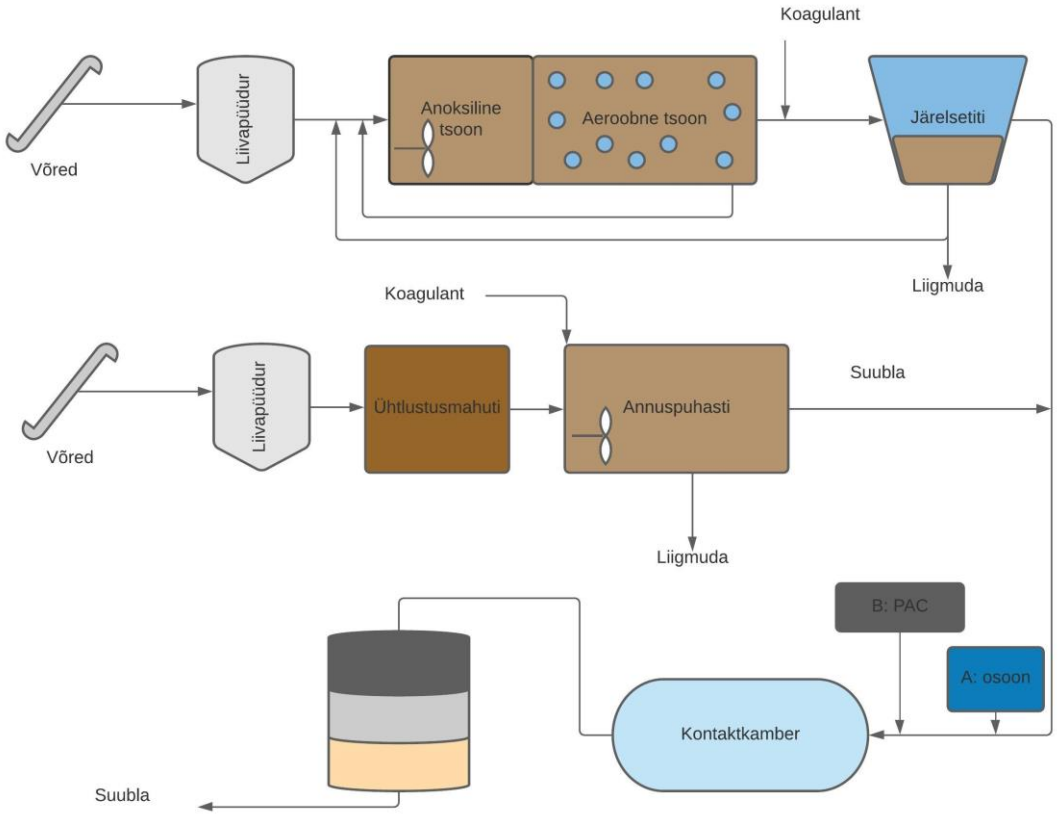
2025-2030 .a. üle 250 000 ie

2035-2040 .a. üle 50 000 ie

Osoneerimisele peab järgnema bioloogiline puhastus;

Kasutusele võetav tehnoloogia oleneb riigiti kasvuhoonegaaside emissioonist.

Järelpuhastus, mitte ainult ravimijääkide eemaldamiseks



Korraga tuleb lahendada võimalikult palju probleeme: nagu:

- partikulaarse fosfori eemaldamine;
- bioloogiliselt raskesti lagundatava orgaanilise aine eemaldamine (sh ravimijäägid);
- ravimijäägid;
- metaboliidid;
- raskmetallid jm

Projekti partnerid

EUROPEAN
REGIONAL
DEVELOPMENT
FUND