



Management of toxic metals as a guidance for mitigation of NORM?



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Outline

- The new regulations of NORM in Switzerland
(revised radioprotection ordinance, applicable as from 1.1.2018)
- Swiss legislations treating toxic metals (As, Cd, Pb, ...)
- Adding Uranium to the list of toxic metals:
 - what levels to choose?
 - would it help for NORM?



NORM in the Swiss radioprotection ordinance as from January 1st, 2018

Art. 168: **NORM industries** include:

- Ground water filtration facilities
- Gasproduction
- Deep geothermal energy production
- Zircon and zirconium industry
- Cement production, maintenance of clinker ovens
- Maintenance and disposal of refractory materials
- Tunnelconstruction in U- and Th-rich bedrock

Annexe 2 :

Exemption level: 1 Bq/g

Those industries evaluate, **based on representative measurements**,

- whether NORM (>1 Bq/g) are produced as products or waste.
- whether workers or the public are exposed to elevated doses.

Art. 169: With the approval of the authority NORM may be released into the environment, while the dose for the public remains < 0.3 mSv/year

Art. 170: For construction materials, that are of concern from a radiation protection point of view, **the authority determines** the activity concentration index and assesses the dose if I>1. The authority informs the public about the results.

For full text www.strahlenschutzrecht.ch (in german, french, and italian)



NORM in the Swiss radioprotection ordinance: Industries with authorisation

building materials
blasting sands
fertilizer
refractory materials



< 1 mSv for the public
< 0.1 mSv from drinking water
< 0.3 mSv from the air

Ground water filtration facilities

Gasproduction

Geothermal energy production

Zircon and zirconium industry

Cement production - maintenance of clinker ovens

Maintenance and disposal of refractory materials

Tunnelconstruction in and Th-rich bedrock

Industries



dosimetry for workers >1 mSv/y

products & reuse
> 1 Bq/kg ?

waste & recycling
> 1 Bq/kg ?

to the environment

- incineration
- (waste water)
- land fill



< 0.3 mSv
< 0.1 mSv from drinking water
landfills
(radioactive waste)



Swiss ordinances imposing maximum levels for toxic metals

VVEA* reuse and disposal of waste

- maximum levels for materials to be deposited on different (5) types of landfills
- for materials to be used in cement clinker production

TBDV* drinking and bathing water

GSchV* water protection ordinance

LRV* clean air ordinance

ChemRRV* chemical risk

AltIV* contaminated sites

VBBö* soil protection

* For full text search the abbreviation under <https://www.admin.ch/gov/en/start/federal-law/search.html>



Treating Uranium as a toxic metal?

- Radioactivity is excluded from the (Swiss) the Environmental Protection Act
→ no maximum levels for U and Th defined
- But: the chemical toxicity of Uranium dominates over its radiotoxicity
- From an analytical point of view it would be easy to add U (and Th) to the list of analytes, e.g. in an ICP-MS protocol
- Hypothesis 1: maximum levels for U together with other toxic metals would simplify procedures and would help to identify NORM practices.
- (Hypothesis 2: Due to its low solubility Thorium - except for some well known products - is less of an issue and might be covered by looking at Uranium.)



Maximum levels for toxic metals and Uranium

Radio

ok

ok!

3 Bq/l

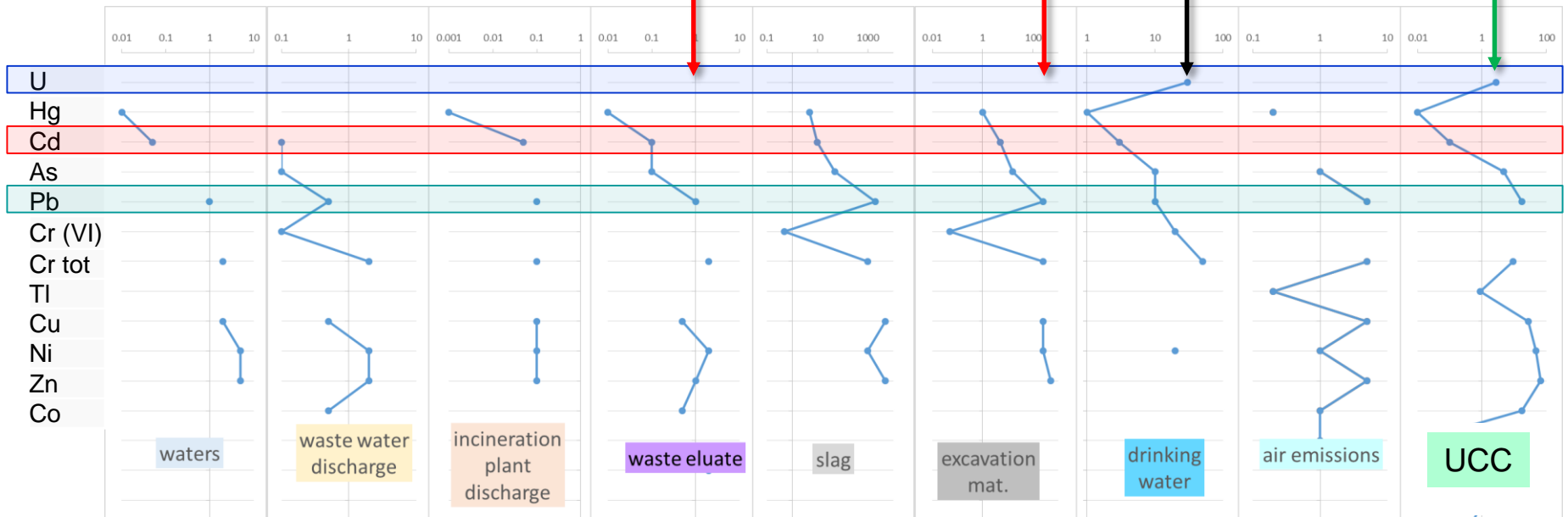
33 Bq/kg

Chem.

12 Bq/l

3 Bq/g

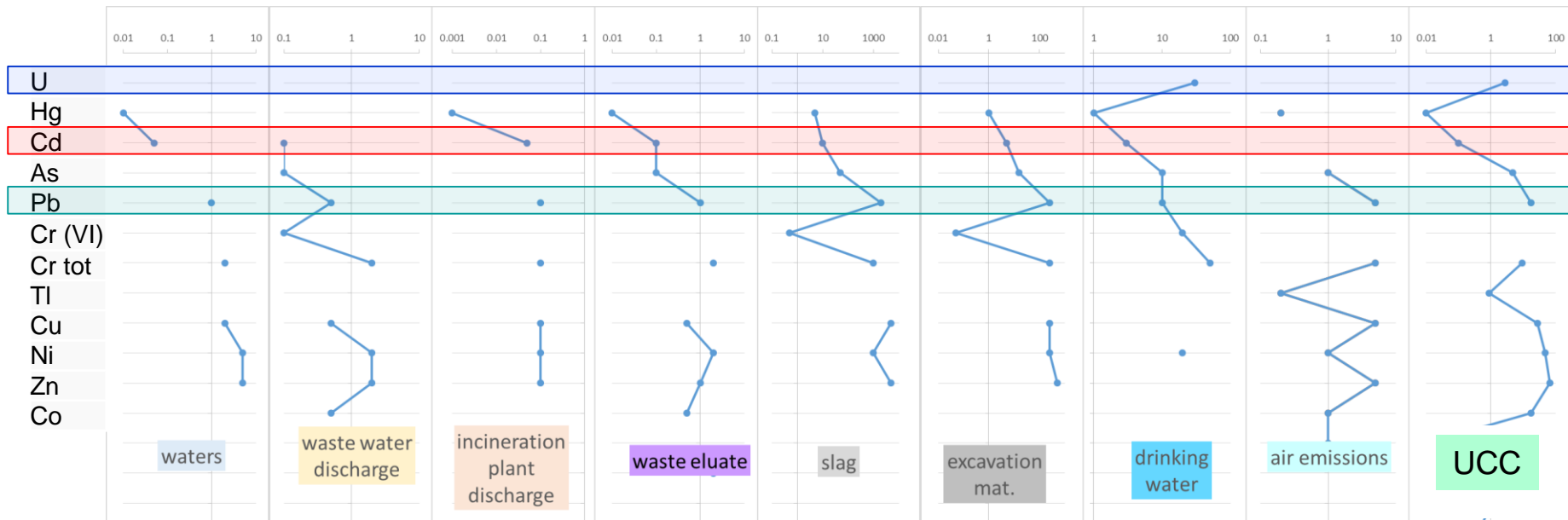
0.3 Bq/l





Introducing Uranium maximum levels?

- Yes, from a health protection perspective!
- Levels taking into account the chemical toxicity might work well for radiotoxicity ...
- Blending is prohibited for toxic metals but often reasonable for NORM ...





Thank you!

