Estimation of risk factor bounded up with water ecosystem pollution

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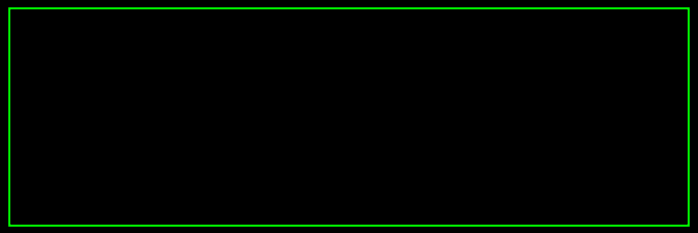
Risk

- Risk –possibility of hazard realization , or expected value of damage due to, for example, pollution of water.
- Risk can NOT be measurement by technical methods
- in a qualitative sense risk is characterized by adverse consequences nature
- in a quantitatively sense risk is characterized by probability of their beginnings

Risk - quantitatively

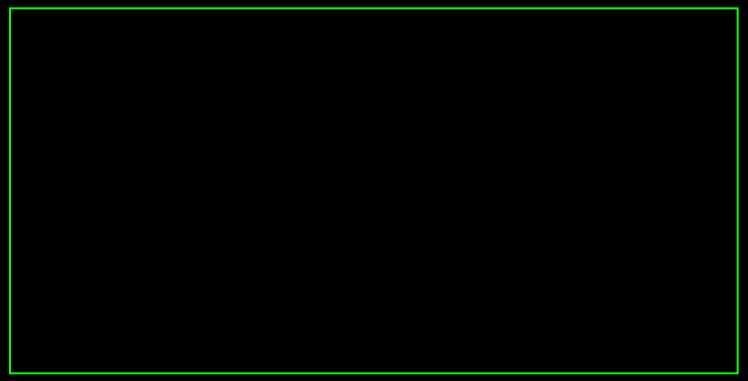


- in a quantitatively sense risk can be shown:
  - P, Pi – probability of adverse consequences Z, Zi , that can be put into money (sum damage) or publik permissible risk without money dimension.
  - As a publik permissible risk can be used MPL (maximum permissible load) of different toxic substances

Risk factor

- Risk factor – has dimension and can be show by:
- sk=Exposition * Toxic
- Exposition – volume of contaminant for one biological target
- Risk management - decision about contaminant using or putting a veto upon it, limitation its production, preparation of special corresponding documentation

Risk factor



- Pw – characteristic of hydrolyze volume (speed) (Pw=1 – for quick type an Pw=2 – for slow)
- BA – bioaccumulation factor, corresponds to contaminant bioconcentration Bcf in a hydrobiont
- Cf – contaminant concentration in hydrobiont
- Cw – contaminant concentration in water

- R – risk factor
- E – exposition factor, from 04 to 25Cw
- EFw – factor of effectiveness impact of contaminant
- Ew – factor of water exposition
- U – method of chemical using (U=5 for “close” - indoors and U=1 for “open”)

  - BA=2 for Bcf<100;
  - BA=4 for 100<Bcf<1000;
  - BA=8 for 1000<Bcf<10000;
  - BA=16 for Bcf>10000.

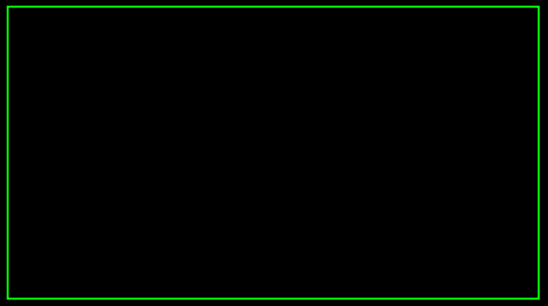
Toxic

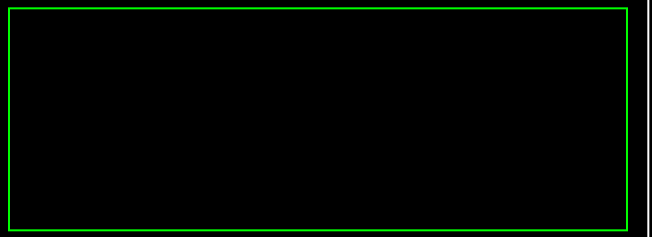
- Toxic – potential risk of contaminant, its possibility to damage.
- for toxic estimation there are some standard tests, for lethal (fatal) dose of 50% fish destruction.
- In Europe there are 9 tests and three of them - for water:
  - LC50 – during 96 hours – for fish;
  - LC50 – during 48 hours – for water flea;
  - EC50 - inhibition of algea growth
  - LC50 depend on water conductivity and species diversity
- Sum of tests results – EFw.
- R →Sy, maxR=1, minR=0 (Isidorov, 1997).

- LC50 for:
  - Cu – 0,02-1,0;
  - Zn – 0,5-5,0;
  - Pb – 0,5-10,0;
  - Cd – 0,5-105,0;
  - Cr – 3,5-118,0;
  - Ni – 5.0-100,0;
  - Fe – 1,4-133,0 mg/l
- Conclution about risk by risk factor volume:
  - Sy≥0,55 – high risk
  - 0,3≤Sy <0,55 - potencial
  - Sy<0,3 –without risk

Your work

- Calculate risk correspond to contaminant “X” in water availability
- Calculate risk correspond to contaminant “Y” in water availability
- Normalized a risk factor (R) by the equation if risk increases account of “X” increasing
- Calculate risk factor for natural water object (LC50 for fish – as was above noticed)





Data. What are the “X”and “Y” contaminant?

	"X" contaminant		"Y" contaminant	
Cw concentration	30	mkg/l	50	mkg/l
Cw min concentration	0,1	mkg/l	10	mkg/l
Cw max concentration	100	mkg/l	100	mkg/l
U method		open		open
Pw hydrolize speed		slow		very slow
Cf		Cf=Cw*20 times		Cf=Cw*100 times
Bcf=Cf/Cw	20	in 20 times	100	in 100 times
LC50 for fish	4	mg/l	2	mg/l
LC50 for flea	50	mkg/l	40	mkg/l
EC50 of algea inhibition	20	mkg/l	20	mkg/l