

# Estimation of risk factor bounded up with water ecosystem pollution

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Dr. Fedorova Irina Viktorovna  
Hydrology Department

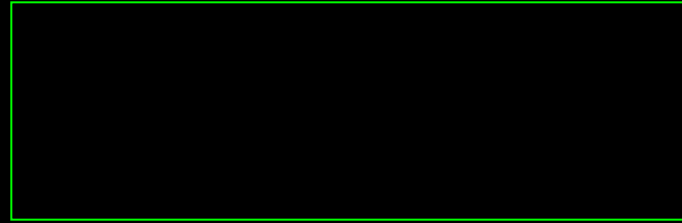
# Risk

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- 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

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

# Risk factor

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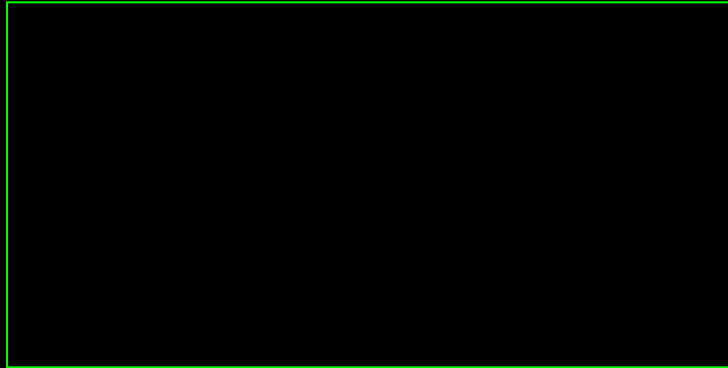
- Risk factor – has dimension and can be show by:

- $Risk = Exposure * Toxic$

- Exposure – 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

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- $P_w$  – characteristic of hydrolyze volume (speed) ( $P_w=1$  – for quick type an  $P_w=2$  – for slow)
- $BA$  – bioaccumulation factor, corresponds to contaminant bioconcentration  $B_{cf}$  in a hydrobiont
- $C_f$  – contaminant concentration in hydrobiont
- $C_w$  – contaminant concentration in water
- $R$  – risk factor
- $E$  – exposition factor, from 04 to  $25C_w$
- $EF_w$  – factor of effectiveness impact of contaminant
- $E_w$  – factor of water exposition
- $U$  – method of chemical using ( $U=5$  for “close” - indoors and  $U=1$  for “open”)
  - $BA=2$  for  $B_{cf}<100$ ;
  - $BA=4$  for  $100<B_{cf}<1000$ ;
  - $BA=8$  for  $1000<B_{cf}<10000$ ;
  - $BA=16$  for  $B_{cf}>10000$ .

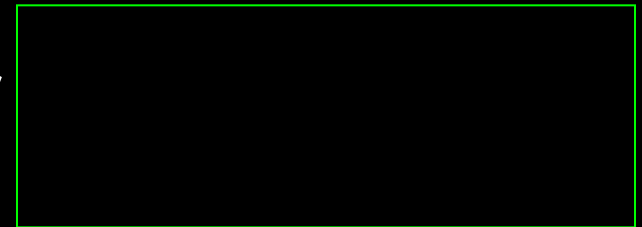
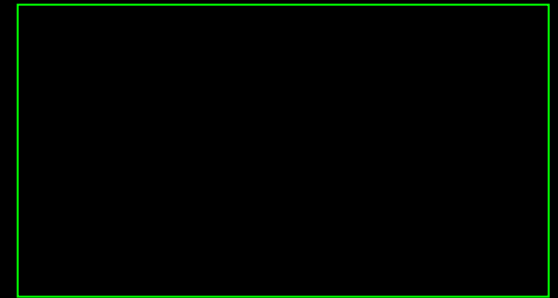
# Toxic

- 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.
  - $R \rightarrow S_y$ ,  $\max R=1$ ,  $\min R=0$  (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:
    - $S_y \geq 0,55$  – high risk
    - $0,3 \leq S_y < 0,55$  - potential
    - $S_y < 0,3$  –without risk

# Your work

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- 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?

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	<b>"X" contaminant</b>	<b>"Y" contaminant</b>
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 algae inhibition	20 mkg/l	20 mkg/l