Mining wastes, pesticides and gasoline.
Effects on human health

Igor Hadjamberdiev, Rustam Tukhvatshin

Tables and photos made by authors are marked **

Chapter 1. Uranium tailings

- We are studying old uranium mining areas in Tien-Shen for last fifteen years [1;2].
- It has been determining high level of radioactivity (gamma irradiation, radon emanation, uranium income by food and water) in rivers costs Mailuu-Suu, Min-Kush, Sumsar, Shekaftar.
- There were assessment of child health - clinical diseases and basic health markers (protein immunity, c-chromosome test, etc) in the areas.

Picture 1. Cows in radioactive area, Min-Kush **

Table. Metals and Alfa activity in Mailuu-Suu area**

Toxicants in sedimentary of Mailuu-Suu area, 2015 (mg/kg) and Alfa-activity (Bk/kg)

Points	Cr	Mn	Co	Zn	As	Se	Mo	Cd	Pb	Th	U	Alfa-activ
r Mailuu-Suu[1]	58,7	1320,0	49,10	103,1	15,2	1,77	0,16	0,16	5,5	3,50	1,60	424
r Mailuu-Suu[2]	195,3	672,6	18,86	29,3	3,0	0,00	0,47	0,33	4,4	3,30	2,40	948
r Mailuu-Suu[3]	251,9	1004,9	24,46	58,3	7,9	6,34	1,58	0,19	19,3	4,82	19,8	832
r Mailuu-Suu[4]	269,5	942,8	25,64	94,5	13,5	6,68	1,57	0,36	20,1	8,19	4,00	683
r Sary-Bije	166,4	415,8	4,59	112,0	23,6	4,34	1,13	0,07	15,9	2,85	2,30	
r Kara-Jigach		330,5	6,53	11,2	5,5	0,00	0,21	0,17	4,1	3,82	0,50	807
r Kulmensay	94,2	449,1	8,23	40,6	10,1	7,20	0,79	0,48	21,0	7,51	4,50	684

Picture 2. Water filter installation in Mailuu-Suu school kitchen **

Table. Toxicants in sedimentary of Mailuu-Suu area (mg/kg) **

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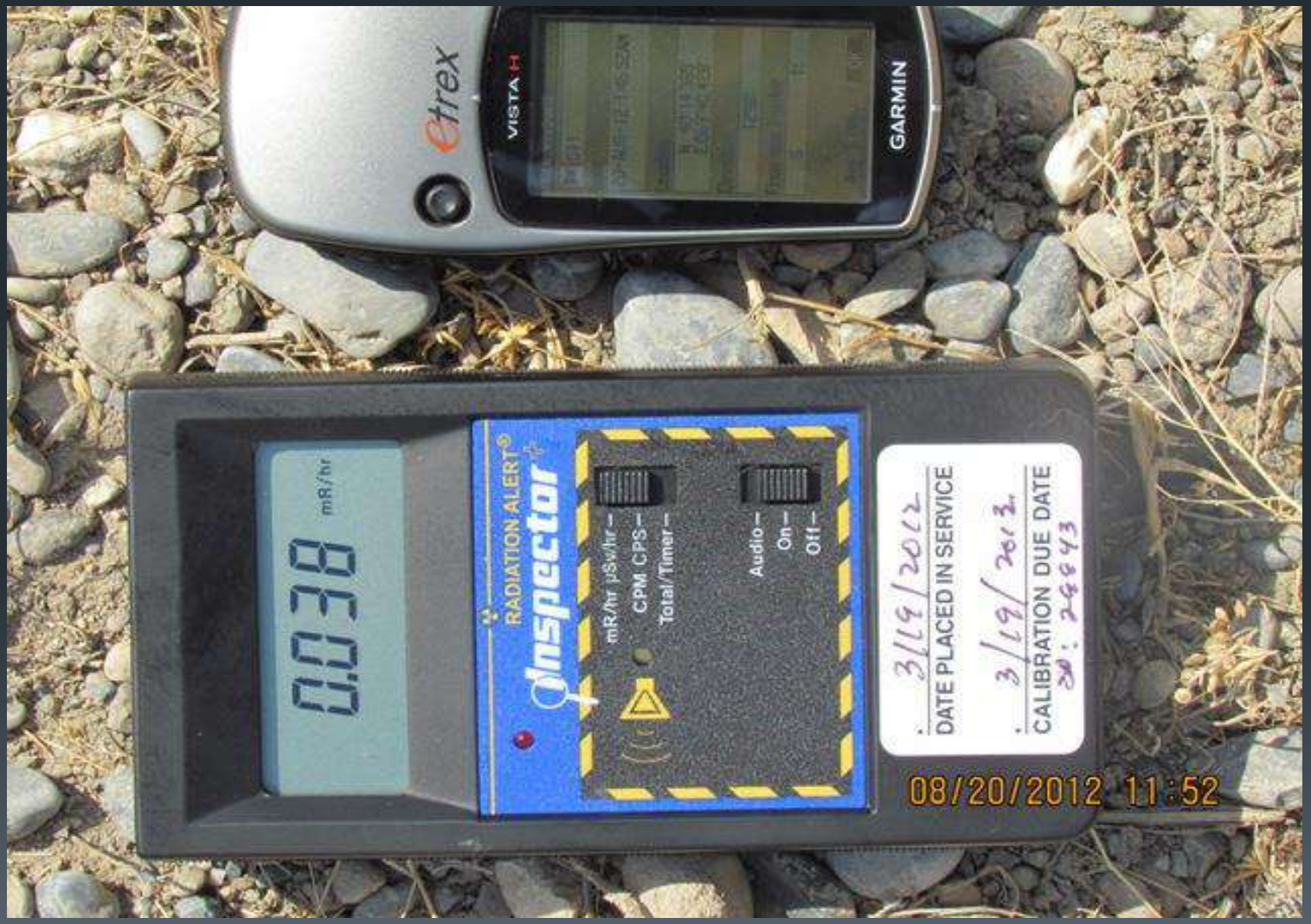
Methods **

- Radiological test devices: spectrophotometer DR 5000; radonometr RGA-01; radiometer SRP-68-01 with counter BTGI-01; ICP-MS (Perkin Elmer-Sciex ELAN-6000; Chrom-Mass-Spectrometer GC-MS.
- Bio-markers: T-lymphocytes (CD3+) , B-lymphocytes (CD19+), T-helpers/inductors (CD4+) and T-supressors/cytotoxic (CD8+) has done by cytotoxic test with monoclonal antibodies.

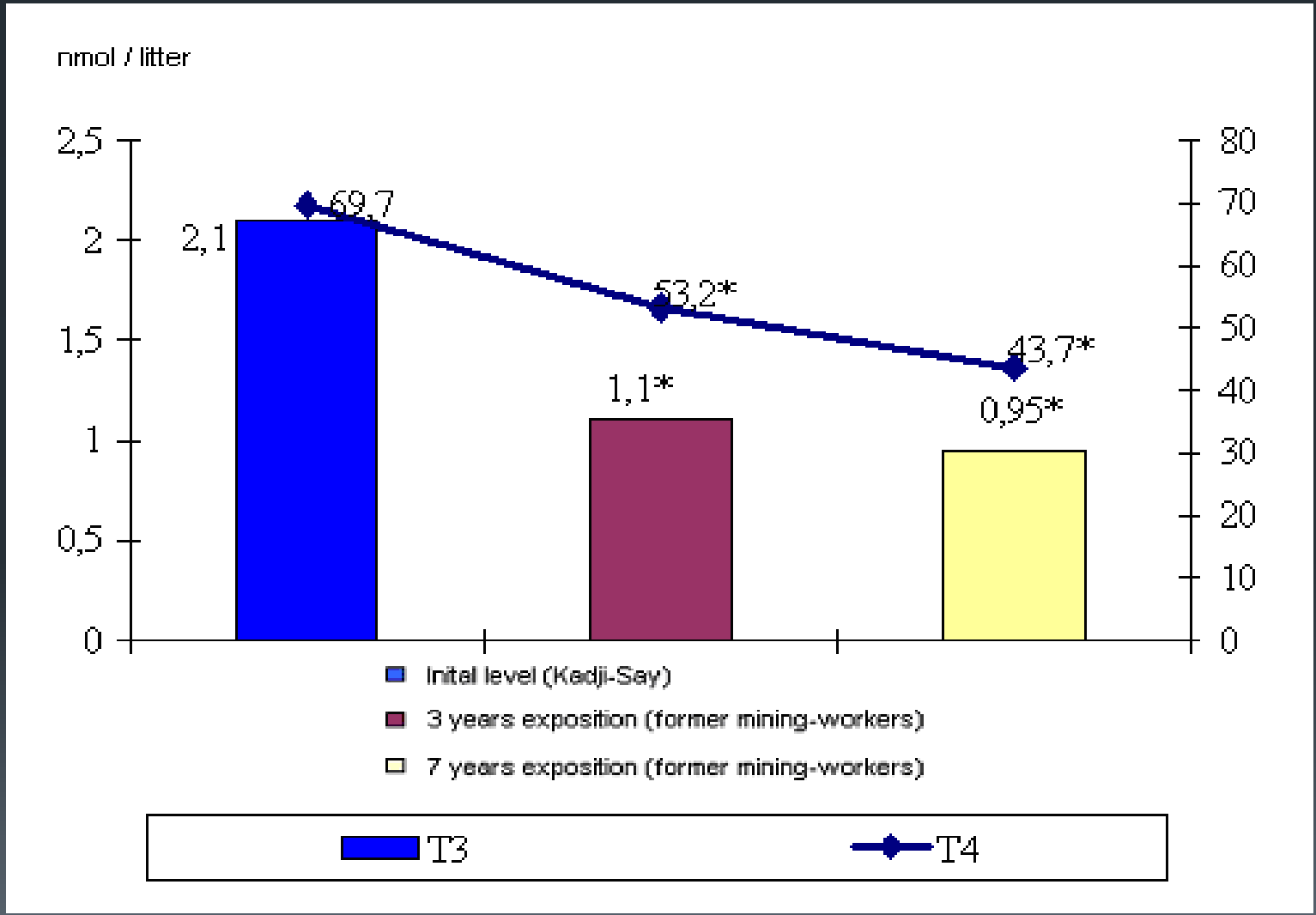
Picture 3. Mobile radiation measurement devices



- Radon in pastures near Mailuu-Suu tailings 14 - 90 Bk/m, but in several houses above mining (one year determination) from 82 to 900 Bk/m. Uranium concentration in the potato 0,03-0,17, carrots - 0,32 • 10-6 g / g . Min-Kush: cow milk and meat contain 2.27 and 0.107 mg/kg of wet weight.
- It has been determined children milk-teeth in Mailuu-Suu town 0,481 x 10^{-6} g/g. Contemporary immunity markers were determinate (CD3, 4,8,CD 19, and CD4/8 rate). There is close correlation between immunity and level of pollutants (in land and food) (r=0,82; r=0,76). There are clinic manifestation in the area: child growth moderating, higher level of diseases (chronic lung illness, skin and lung allergic syndromes, etc).

Picture 4. Blood sampling in Mailuu-Suu hospital for our study **

Picture 5. Impairment of thyroid function in uranium area Kadji-Say**



Picture 6. Biochemical analysis procedure in Swiss laboratory **

Picture 7. Radiological danger booklet (in Kyrgyz) **

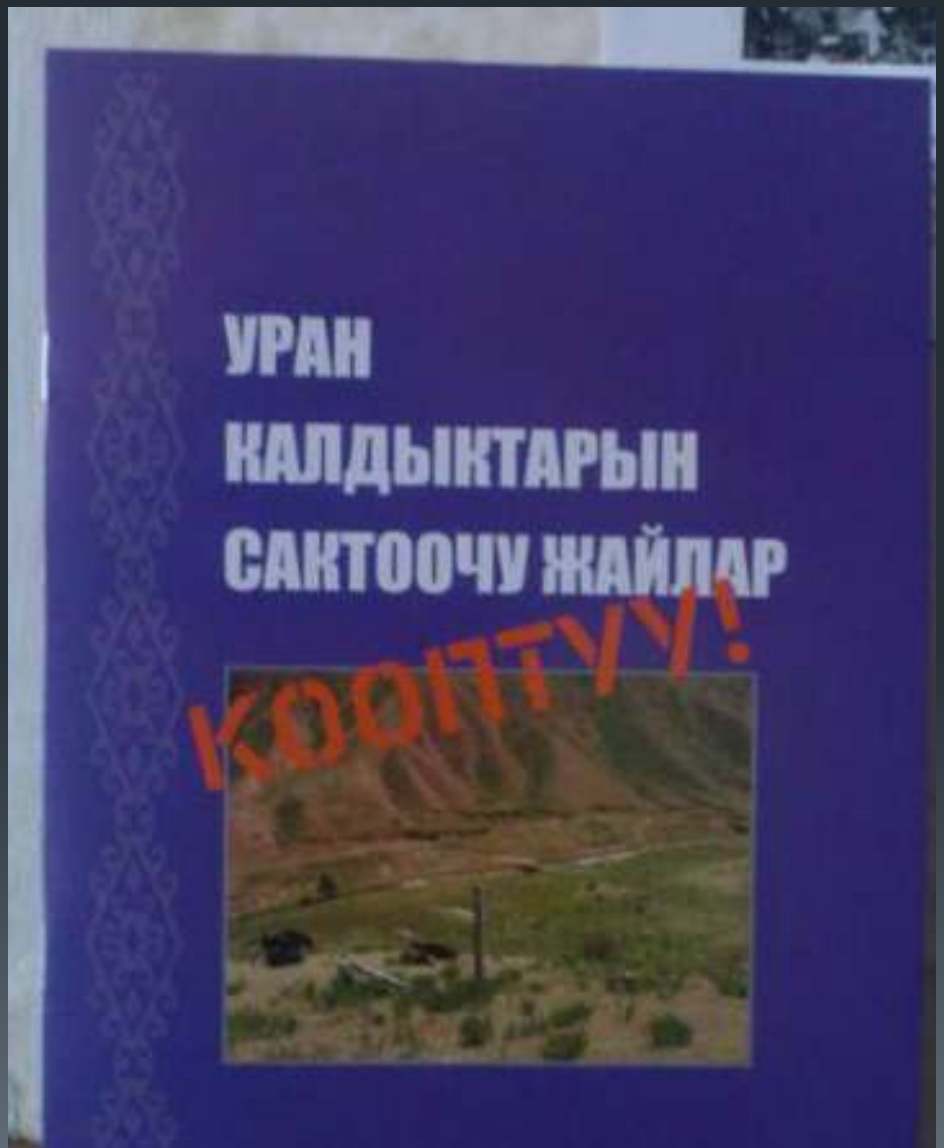


Table. Immunity status of people in former uranium mining or enterprise **

Показатель	Район обследования			
	п. Байтик (I группа) контрольная n=85	п. Ильич (II группа) n=35	п. Орловка (III группа) n=88	п. Актюз (IV группа) n=222
Т-лимфоциты,%	56,4 ± 0,92	48,4 ± 0,98*↓	40,2 ± 0,66*↓	40,9 ± 0,72*↓
В–лимфоциты,%	16,6 ± 0,36	15,76 ± 0,43	14,2 ± 0,33 *↓	13,3 ± 0,49*↓
Хелперные Т–лимфоциты, %	26,4 ± 0,74	24,9 ± 0,59	20,5 ± 0,45*↓	21,3 ± 0,48*↓
Цитотоксические Т-лимфоциты, %	15,0 ± 0,54	15,2 ± 0,29	15,6 ± 0,40	14,45 ± 0,39
Иммуноглобулины: Ig A г/л	1,82 ± 0,029	1,56 ± 0,052*↓	1,64 ± 0,04*↓	1,66 ± 0,03*↓
Ig M г/л	1,64 ± 0,028	1,30 ± 0,034*↓	1,52 ± 0,02*↓	1,49 ± 0,021*↓
Ig G г/л	11,46 ± 0,16	10,08 ± 0,24*↓	10,22 ± 0,12*↓	10,72 ± 0,12*↓
Циркулирующие иммунные комплексы, %	88,0 ± 2,2	112,8 ± 4,6*↑	118 ± 4,6*↑	111,5 ± 4,34*↑

Условные обозначения: *-достоверное различие по сравнению с контрольной группой ($p<0,05$)
↓-статистически значимое снижение параметра по сравнению с контролем;
↑- статистически значимое повышение параметров.

- We try protecting vulnerable population groups in uranium area - installing drinking water filters in schools, kinder gardens and hospitals. A radical solution should be resettling of pregnant and child.

- It has been using WB grant for Mailuu-Suu safty. Unfortunately, executors did not follow recommendation of I.Torgoev and other specialists (published in any sources, including our [2]).

- They should have transferred old radioactive pulps over dividing range, but executors group transferred pulps from one place of the cost to the other place of cost (see pictures 7,8 below).

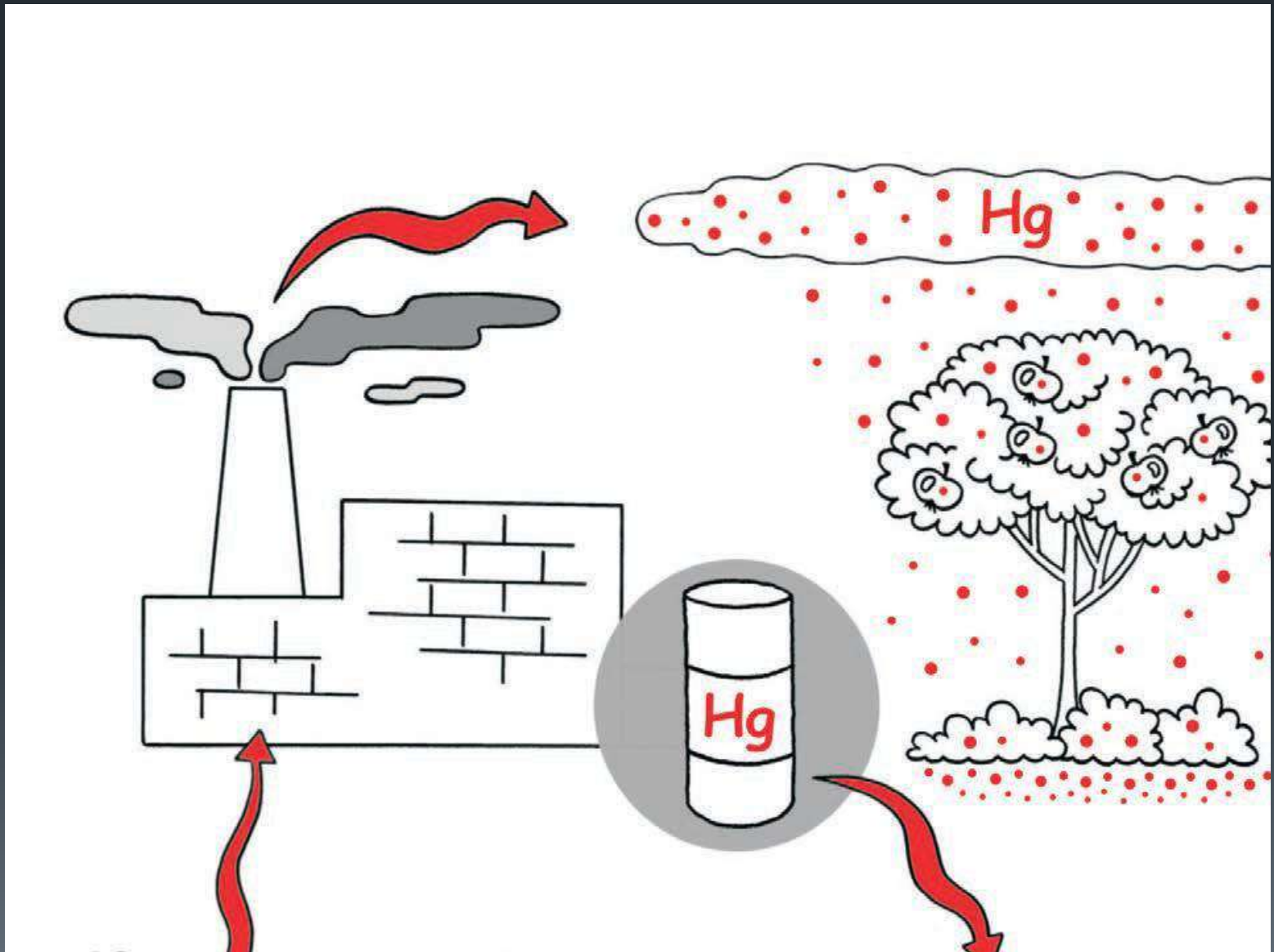
Picture 8. New dump from old uranium dumps in Mailuu cost by 7 mln Euro grant**

Picture 9. New dump, river cost obstructions (weak powers in landslide case) **

Chapter 2. Mercury and Lead

- According to the study in Aidarken area [3]: In the placental blood of all examined women, mercury was found in concentrations from 0.84 to 28.22 mg / ml with an average value of 5.88 mg / ml. In 80.4% of the examined individuals, mercury concentrations up to 10 mg / l were found, in 15.2% - from 10 to 18 mg / l, in 2.2% - more than 20 mg / ml.

Picture 10. Hg spreading ways



Picture 11. Khaidarken mercury area (from UNDP report)

Table. Mercury data in Khaidarken soil

Место отбора проб	Расстояние от мет. завода	Cd	Hg	Pb	Sb	Se
		(мг/кг)	(мг/кг)	(мг/кг)	(мг/кг)	(мг/кг)
Хайдаркан						
Сельскохозяйственная почва	0,5 км к югу	0,6	14,5*	18,9*	59,7**	6,4
Сельскохозяйственная почва	1 км к западу	1	9*	22*	52**	<1,5
Сельскохозяйственная почва	2 км к западу	0,4	25**	16*	20*	<1,5
Сельскохозяйственная почва	3 км к западу	0,3	10*	20*	32*	<1,5
Сельскохозяйственная почва	8 км к западу	0,6	14,5*	17,8*	40,4*	5,8
Отложения, р. Галуян	5 км к югу (вверх по течению)	<0,25	7,2*	<3,5	<2,5	5,2
Отложения, р. Галуян (у границы с Узб.)	8 км к северо-западу (вниз по течению)	0,3	43,9**	22,1*	98,1**	4,9
Почва	3 км к югу	0,4	6*	19*	4	<1,5
Почва на горном перевале	5 км к востоку	0,4	2	16*	<2,5	<1,5
Улуг-Тоо						
Сельскохозяйственная почва	2.5 км к юго-востоку	0,3	1	18	<2,5	6
Контрольная проба	80 км	1	1	24	3	<1,5

* превышение санитарных нормативов Кыргызстана менее, чем в 10 раз
** превышение санитарных нормативов Кыргызстана более, чем в 10 раз

Picture 12. Lead sand dump near village Sovetskoe

Project executors Kyrgyzbaev. I.Dzakipova, et all. 2017

Picture 13. Enlightment meeting for people of the village Sovetskoe

The settlement of Sovetskoye (Kan)

- The lead concentration in the sand is 1000-4000 mg / kg, and the lead concentration in the soil, which requires cleaning in the USA, is 400 mg / kg.
  The settlement of Sovetskoye (Kan) is located in the Kadamjay district of the Batken region. The settlement is located in the foothills of the Alai Range at an altitude of 1100-1200 m.
  There, from 1950 to 1971 the mine department of the Adrasman Lead-Zinc Combine carried out mining operations. Two cards situated in east of the village (about 2.8 million cubic meters).
  The most common symptom among residents, especially children, is anemia.
  A lead poisoning is the most dangerous illness of children.

Chapter 3. Obsolete pesticides

- Obsolete pesticides infiltrated from 214 warehouses and 85 old fly grounds for micro-planes (which had used for DDT pulverizing in 60th-70th). A lot of such warehouse has been ransacking of local population.There are polluted rise, crop, cotton lands in Tien-Shen valleys. Water pollution comes from upper layer mountains (Kyrgyzstan) to Uzbekistan.

- Massive scale of obsolete pestisides has been imported from China and India, illegally.

Picture 14. Sheep’s cemetery after obsolete pesticides poisoning

- On the fact of the mass case of sheep on May 13, 2013, the prosecutor's office of the Suzak district against a responsible employee of the tailing dumps agency at the Ministry of Emergency Situations of the Kyrgyz Republic initiated a criminal case. the tailing site, located on the At-Chabar site of the forestry of the Suzak district, was not provided with protection (special fencing). As a result, animals that grazed in the area died from poisoning. Total fell 133 heads of small cattle.

- **The main sources** of obsolete POP pollution are: old abandoned warehouse that has been ransacking by inhabitants, additionally POP (include DDT) imported illegally from India and China.
  Safety effort made for establishing guards for several abandoned old warehouses with obsolete pesticides 2013-2014 (by TAUW-Mileukontakt project).
  Most dander for oncology – dioxins [7]. It was appears by uncontrolled burning of wastage in villages. We study land/water/food pollution levels and made maps of pollution (ranking territory). There is a huge problem of finding correlation between the level of pollution and health status. Because: a) there are several different (not one) illnesses; b) the illnesses can come out in tenth years after body intake. So, we decided studying essential/basic health status by immunity levels (cells and CD proteins)**.

- Methods of studying**. We based on methods of health-area calculation and comparison [10]. Laboratory determination is based on Manual book [11], POP determination is done in accordance with recommendation of EPA US (devices: HP 5890 II Gas Chromatograph, Mass Spectrometer with HP MS Chemstation, etc). Selective determination was done for chromosomal-crash test [4]. Ordinary clinical data**:** clearance of urine; in serum goiter 4 hormones, ALT/AST liver-mark ferments.
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- Pesticides in waters**. North Tien-Shen Chui river have a sum of alfa-, beta-, gamma-, delta HCH $8,5x10^{-3}$ mg/litre, Aldrin $1,5x10^{-3}$, sum of DDT-DDE group $13,6x10^{-2}$ mg/l; Board South Tien-Shen and Pamir Vakhsh river, point intern to Amu-Darja - the sum of HCH $1,45x10^{-2}$ mg/l, Aldrin $9,0x10^{-3}$, DDT-DDE group $4,64x10^{-2}$ mg/l.

- **Acknowledgement**
  Our study on uranium, pesticides, mercury has been supporting by Swiss Green Cross and Blacksmith Institute (USA).

  The analysis of POP and uranium has been done with kindly support of independent laboratory Ilim (Director V.Prokhorenko).
- South Kyrgyzstan areas has been carefully studying by R,Toichuev [4;5;6].There are several publication on pesticides pollution and treatment by Kyrgyz traditional medicine. The study has been published data about breast milk DDE 0,0278±0,0,004 mg/l, and Hexa ChlorCyclHexan 0,006238±0,0042 mg/l .
- The enlighten booklet about persistent organic pollutants has been published in three national languages [7].

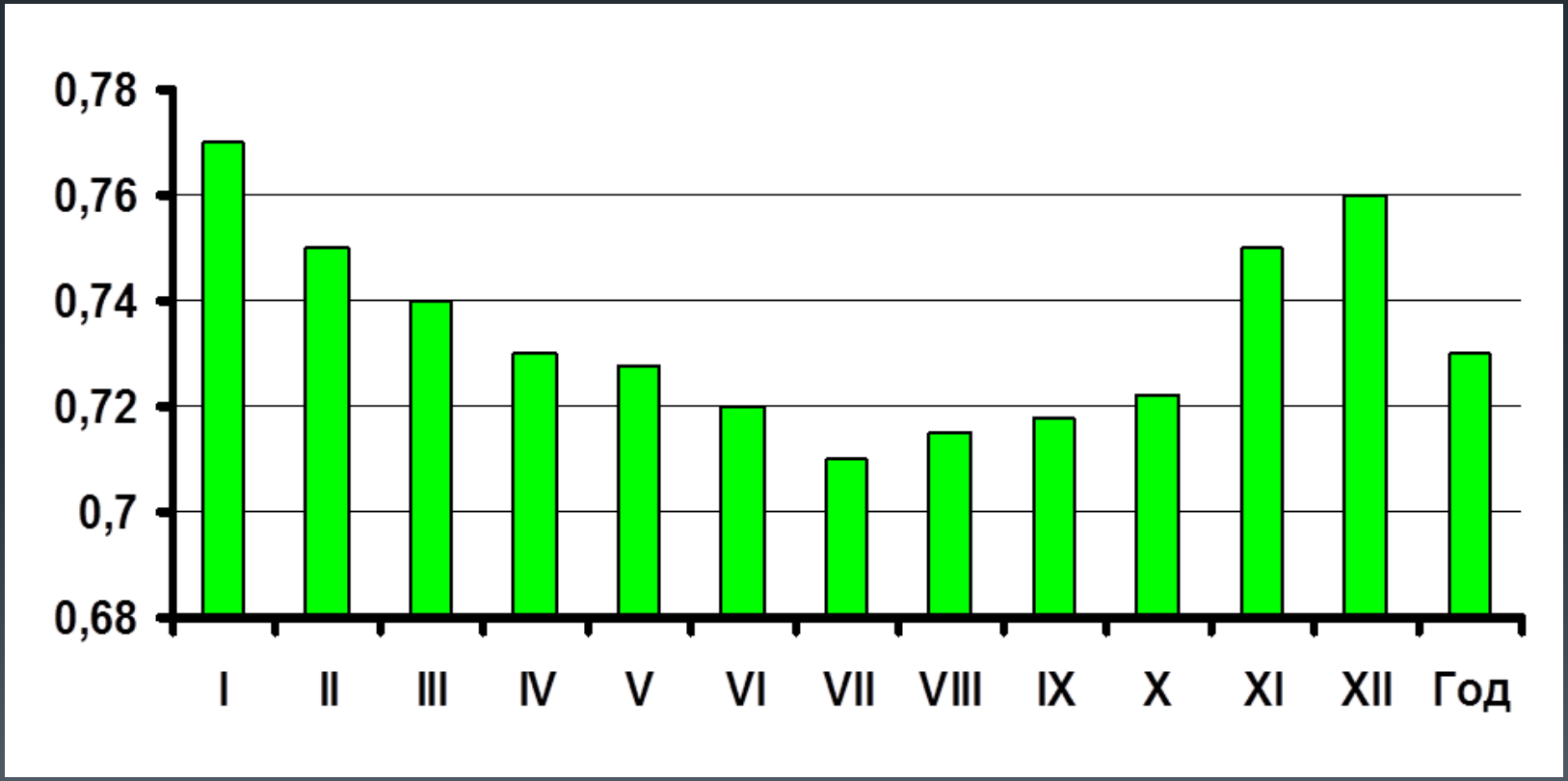
Chapter 4. Gasoline in Bishkek air

Picture 15. Crowd of cars

- The number of cars is 10 times higher than the norm 50 thousand, calculated for the Bishkek city structure [not counting visitors, that is, really 700 - 900 thousands]. The overwhelming majority of cars are old models from Europe, without an exhaust gas cleaning system.

- Even in Europe, where have been imposed strict restrictions on the quality of gasoline cars - air pollution leads to death every day about a thousand people. That is - ten times more than from transport accidents [8, 9]. Berkeley Earth (NGO), has calculated that in the most polluted regions of Europe, air quality is so bad that health damage is comparable to smoking seven cigarettes a day.

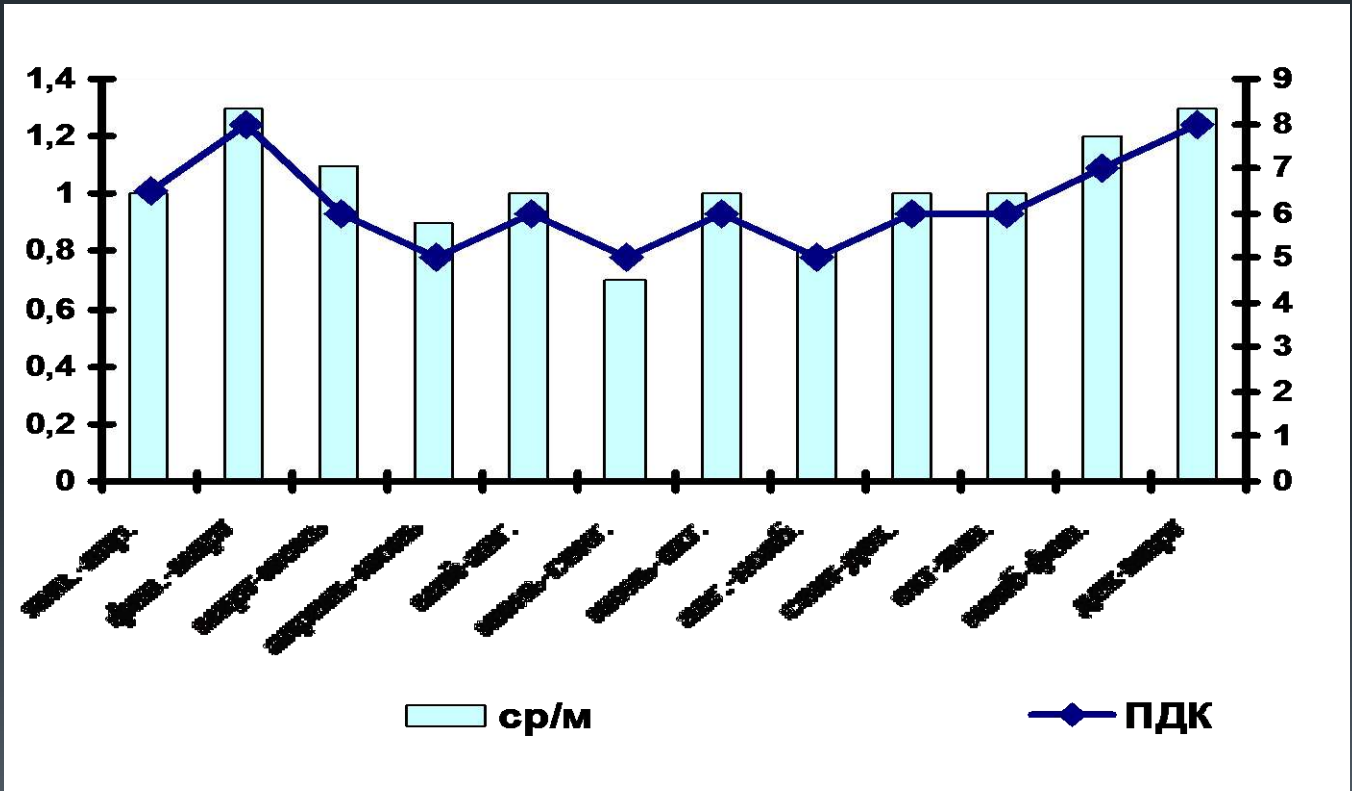
Picture 16. Transparency of air in Bishkek during seasons of the year **



- During the summer in the city center of 8.0 µg / m3 fine particulates were detected (group PM 2.0) according to the Green Movement Foundation. Air Beam (USA) sensor was used.
- In fall formaldehyde detected ** 0,05 between 0,22 mg/m ^{3}.

The concentration of harmful substances (nitrogen dioxide, formaldehyde) in the air of the capital exceeds the permition level by 2-4 times. Moreover, 3,4-benzapyrene contamination is higher in 20-45. Concentration ** in center of Bishkek 38,6 – 42,9 n gr/m ^{3} . This highly dangerous substance provokes endocrine and cancerous processes

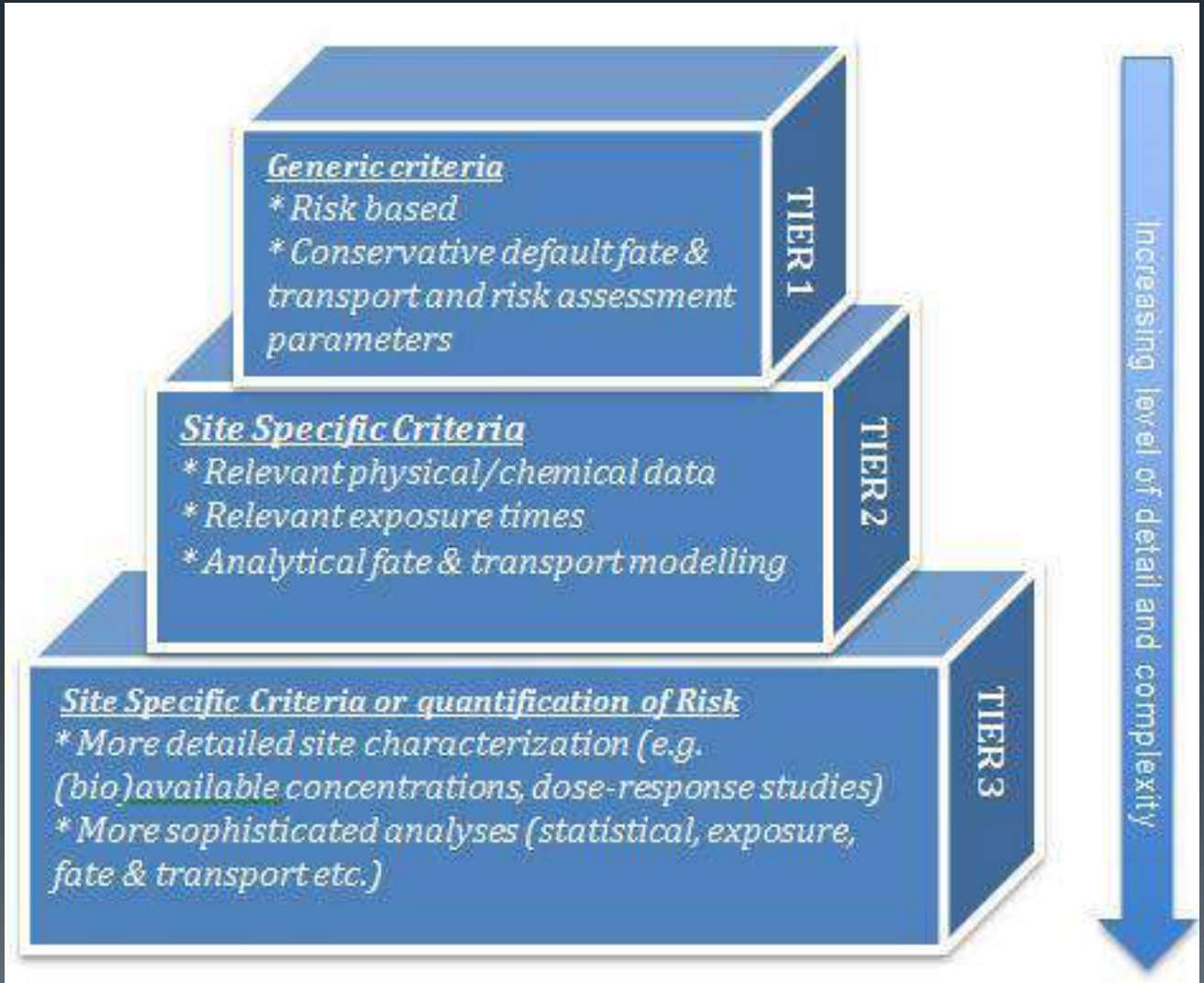
Picture 17. Content of dust in Bishkek air (seasons)



Discussion

- Risk assessment traditionally has been limited by toxicological data of single chemical compounds. But people in polluted area may be impacted by common toxicants. There are try calculating by rank`s scale results of two-three-four pollutants coincidence impact.
  Our suspicions are – these coincidence is worst resulting for immunity and genetic [13].

Picture 18.
Pollution study steps
(by Ohlssonental, 2014).



References

- 1) **Hadjamberdiev I., Tuhvatshin R. Bykhivchenko Yu.** Uranium pollution of meat in old tailing Tien-Shen area. *Nice inst Agriculture, Springer proceed 2009, p. 193-197.* http://link.springer.com/chapter/10.1007%2F978-1-4020-8359-4_21#page-1
- 2) Хаджамбердиев И., Тухватшин Р. Наиболее опасные урановые хранилища Центральной Азии (Мин-Куш и Майли-Суу) . *Мат-лы IV м-н конф Томск 2013 Радиоактивность и радиоакт элем-ты в среде обитания человека,* http://www.lib.tpu.ru/fulltext/c/2013/C33/146.pdf с.146-147.
- 3) Hadjamberdiev I., Kazieva I. Child Poisoning by Lead and Mercury in Kyrgyzstan. *9th INCHES conference, Children's Health and the Environment*
  Saving the Children at Risk, Seoul, Korea, June 27-28, 2018, http://inchesnetwork.net/conference-2018 and https://www.journals.elsevier.com/environmental-research
- 4) Тойчуев Р.М. Влияние содержания хлорорганических пестицидов в плаценте на течение беременности и роды у женщин. Гигиена и санитария-Том 94, № 6 (2015).
- 5) Toichuev R.M., D.S. Mirzakulov & T.R Payzildaev The effect of organochlorine pesticides residues on the incidence of primary male infertile - *13Th Int HCH & Pesticides Forum, Zaragoza Nov 2015, p.156-158. PDF 21,5 MB*

References

- 6) Toichuev R.M. The effect of organochlorine pesticide concentrations in placenta on pregnancy and labor – *The same volume, p.159-161.* Toichuev R.M., T.R. Payzildaev & D.S. Mirzakulov The problems of organochlorine pesticide pollution in obstetrics, pediatrics and andrology - *The same volume, p.162-164.*
- 7) **Hadjamberdiev I.,** S.Begaliev, A.Husainov Pesticides – danger! *Bishkek, booklet, 2006, 38 pp., (in Russ, Kyrgyz, Uzbek).*
- 8) Von Hans Bruyninck Unsere Liebe für Verbrennungsmotoren nimmt inakzeptable *Ausmaße an Veröffentlicht am 01.10.2018.* https://www.welt.de/debatte/kommentare/article181718472/Luftverschmutzung-Hans-Bruyninckx-fordert-Wechsel-zu-nachhaltigem-Verkehr.html
  9) WHO Air pollution causes 1 in 9 deaths worldwide http://www.who.int/airpollution/en/
  10) Disease Mapping and Risk Assessment for Public Health, *Chichester:Wiley 1999,482 pp.*
  11) A Laboratory Manual of Analytical Methods of Protein Chemistry (Eds: P. Alexander, H. P. Lundgren) *London: Pergamon Press, 2014, 244 pp.*
  12) Method chromosomal aberration as biological indicator environment impact on human. *Genetic Inst. Moscow, 1974, 42 pp. (in Russ).*
  13) Hadjamberdiev I., Prokhorenko V., Tukhvatshin R. Common Radioactivity and Pesticides Health Impact in Central Asia *Abstr Glasgow SETAC meeting, 2013, sect **3.***
  14) Hadjamberdiev I., Ryspekova A., et all., Central Asia pollution: Obsolete tailings, obsolete pesticides, obsolete gasoline and human. *Abstract, SETAC meeting, Rome, May 2018, In: section 4. Ecological risk assessment and human health risk assessment of chemicals, mixtures and stressors and risk mitigation strategies.*