NIGMI of Uzhydromet, Tashkent, Uzbekistan

Atmospheric Fall-outs as the Ecological Indicators of the Environmental Pollution

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Problems of organization of the unified monitoring system in the Republic of Uzbekistan

- Absence of the uniform principles of standardization and effective organization of the monitoring process at the national, sectoral and territorial levels, as well as the mechanisms of the financing the monitoring activities.
- The range of the parameters which should be observed is not optimized. Observations which are currently carried out for the rather voluminous amount of ecological indices hamper the decision making.
- The system of the information exchange works ineffectively among the parties included to this monitoring.
- There is no uniform methodological basis on the collection, processing and storage of information.

Ecological indicators

- Indicator is the parameter which gives the information about the important events and processes which have place in the environment and which facilitates to reveal the tendency.
- The indicators should be developed or selected on the base of the parameters with 5-10 year observation series.
- The technique of the calculation or measurement of indicators, frequency of observations and other parameters should be arranged in due order so that they could be used in comparative analysis.

Ecological indicators

The indicators can be subdivided to the following main groups:

- **(a) – the ones describing the impact on the environment;**
- **(в) – the ones characterizing the environment conditions;**
- **(c) - the ones describing the consequences for the environment;**
- **(d) - the ones describing the applied measures.**

The criteria of the selection of ecological indicators in Uzbekistan

- Linkage with the national ecological priorities
- Linkage with the international ecological policy
- Measurability
- Availability of the time data series
- Predictability of the effectiveness
- Possibility of the public awareness on the environment conditions
- Reliability

Ecological indicators for Uzbekistan

91 indicators has been selected

- 68 indicators from the international list of the countries of the Western Europe, Caucasus and Central Asia (WECCA)
- 23 indicators characterizing the specific conditions of Uzbekistan

Set of ecological indicators for WECCA countries and Uzbekistan by the priority problems of the environment and sectors of economics

Problem	Number of indicators		Sector	Number of indicators	
	WECCA	Uzb		WECCA	Uzb
Atmospheric air	25	20	Agriculture	3	
Water resources	35	25	Energy	7	4
Land resources	6	14	Transport	7	
Biodiversity	12	6			
Waste	12	9			
Climate change	11	6			
Aral Sea		2			
Health population state		4			

Dry atmospheric fall-outs

Dry Atmospheric fall-outs (DAF) – is the coarse-disperse fraction of the solid particles (>100 mm), which are released from the atmosphere with gravitation and fall on the underlying surface.

The main characteristics of DAF are as follows:

- **Total flux density of DAF (g/sq. m, kg/ha/year) which characterizes the total mass of the substance falling out per time unit on the unit of the surface area**
- **Flux density of water soluble DAF components per time unit on the unit of the surface area displaying the degree of the fall-outs' mineralization.**

Aim and purpose of DAF indicators

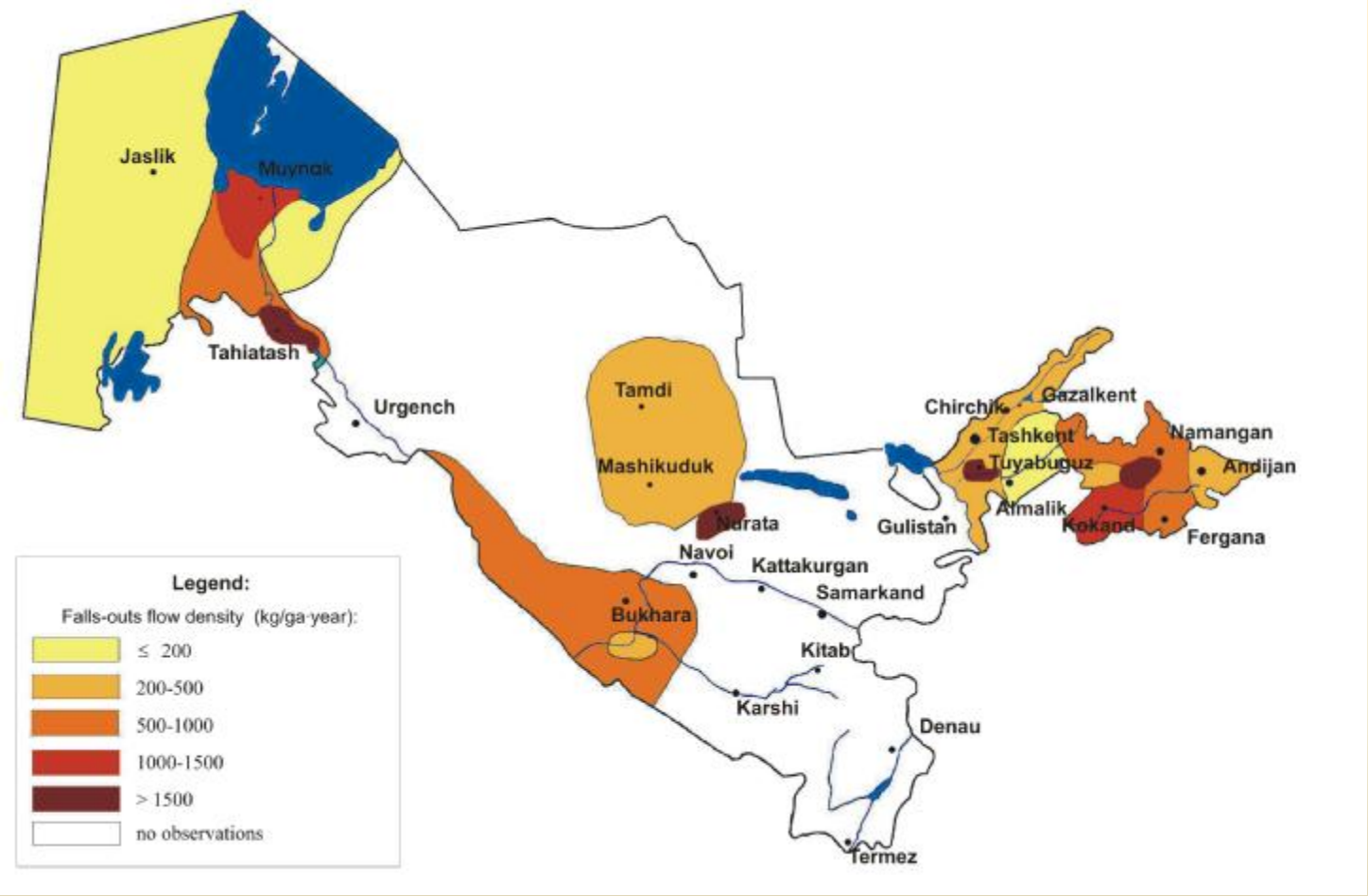
These indices can characterize the following:

- **Overall stress on the eco-systems caused both by anthropogenic and natural sources in the arid zones**
- **Role of separate sources in the formation of the atmospheric fall-outs composition, estimation of their contribution to the pollution of the underlying surface, surface vegetation, technological constructions, buildings**
- **To reveal peculiar features of the transfer of the polluted air masses from the emission sources**

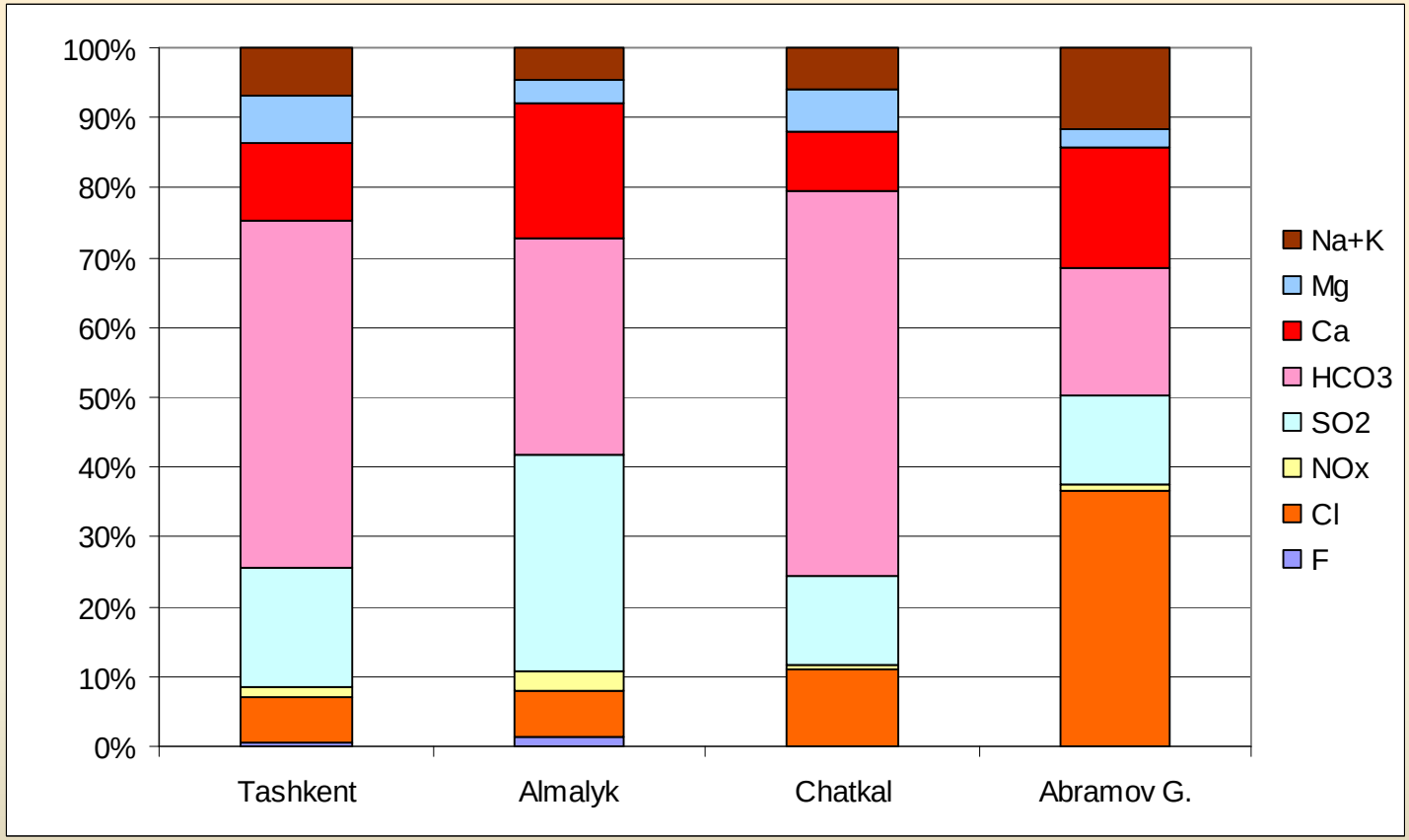
The indices are important:

- **For the authorities which control the environment conditions, for the assessment of situation and for ecological zoning of the territory**
- **For the analysis of the long-term data series provides for the estimation of air pollution with dust**

Map-scheme of the total DAF flux density in Uzbekistan



Differences of the water-soluble mineral components in DAF composition in the different sampling points

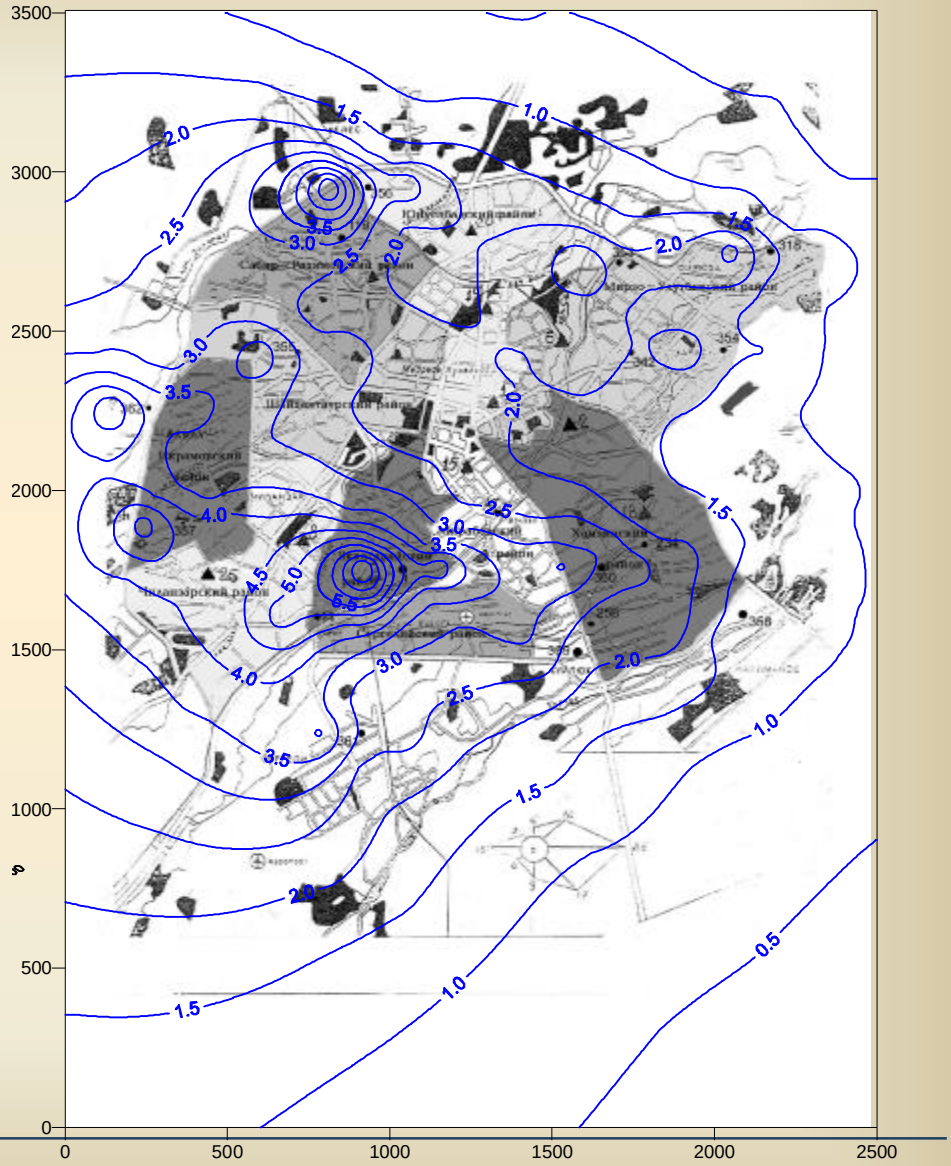


Comparative results of calculation of DAF flows density in the Priaralje region (model and experimental calculations)

R, km	Direction	Sampling points	DAF flows density (kg/ga/year)		
			Modeling	Nature experiments	
15	E	Uyali	1019,4	1272	(DAF)
25	S-W	Muynak	1212	2402	(å)
25	N	Aralsk	288	533	(Wet)
75	W	Jaslyik	635	961	(å)
80	S-W	Chimbay	1052	2702	(DAF)
130	S	Takhiatash	1038	1571	(å)
140	N	Chelkar	140	130	(OC)
290	S	Buzaybay	316	688	(DAF)
300	N	Terekhti	72	260	(Wet)
350	W	Chagyil	74	219	(Wet)

Note:
DAF – dry atmospheric fall-outs; FP – fall-outs with precipitation; Σ – sum of the dry and wet fall-outs.

Map-scheme of the nitrates flux density in Tashkent (industrial sources)



Measurements/ Calculation methods

DAF sampling

- Is carried out at the monitoring points of the National hydrometeorological service with one-month period in accordance to the “Temporal methodical guidelines on the sampling and analysis of samples of the dry atmospheric fall-outs” developed at NIGMI and adopted by Uzhydromet in 1991.
- Is carried out since 1982 at 15 stationary posts, at present the number of points is decreased to 7.
- Similar research methods are used in the countries with the arid climate (Turkmenistan, Israel, countries of EANET) for the investigation and assessment of the salt-and-dust transfer processes, dust storms and drifts. Artificial grass and other surrogate surfaces are used as underlying layer.

Measurements/ Calculation methods

Chemical analysis of samples

- Is carried out in the laboratory of ecological monitoring of DSFEP of NIGMI according to the guidelines for the estimation of 10 measured indices regarding their physical-and chemical characteristics (pH, electric conductivity, mineral composition of the water-soluble fraction) and series of the calculated indices. At present the updated version of the Methodical guidelines is developed.

Characteristics of the DAF flux density

- Are calculated by the results of the chemical analysis of the monthly samples.

DAF data base

- Created on the base of the long-term DAF observations in Uzbekistan territory and neighboring areas.

Requirements to the monitoring and data collection

- Carrying out systematic observations on DAF sampling by the uniform methods at all monitoring stations
- Timely chemical analysis
- Ensuring of the completeness, reliability and compatibility of results

Difficulties and limitations:

- insufficient number of observation points in the remote areas
- insufficient number of personnel and technical equipping of observation points and chemical laboratories

Precipitation Measurements/ Calculation methods

Precipitation sampling

monthly sampling

- is carried out at points of monitoring network of the National hydrometeorological network in accordance with Guidelines 52.04.186-89 by 12 indices at 20 stationary points.

one-time sampling

- are regularly sampled in Tashkent, Almalyk and Chirchik cities since 2003

Chemical analysis of precipitation samples

monthly samples

- are analyzed at the chemical laboratories of Uzhydromet

one-time samples

- are analyzed at the laboratory of ecological monitoring of DSFEP of NIGMI in according to Guidelines

Data Base "Precipitation"

Precipitation

Characteristics will be used as ecological indicators :

- **total mineralization (mg/l)**
- **number of cases with fall-outs less then pH 4,0**

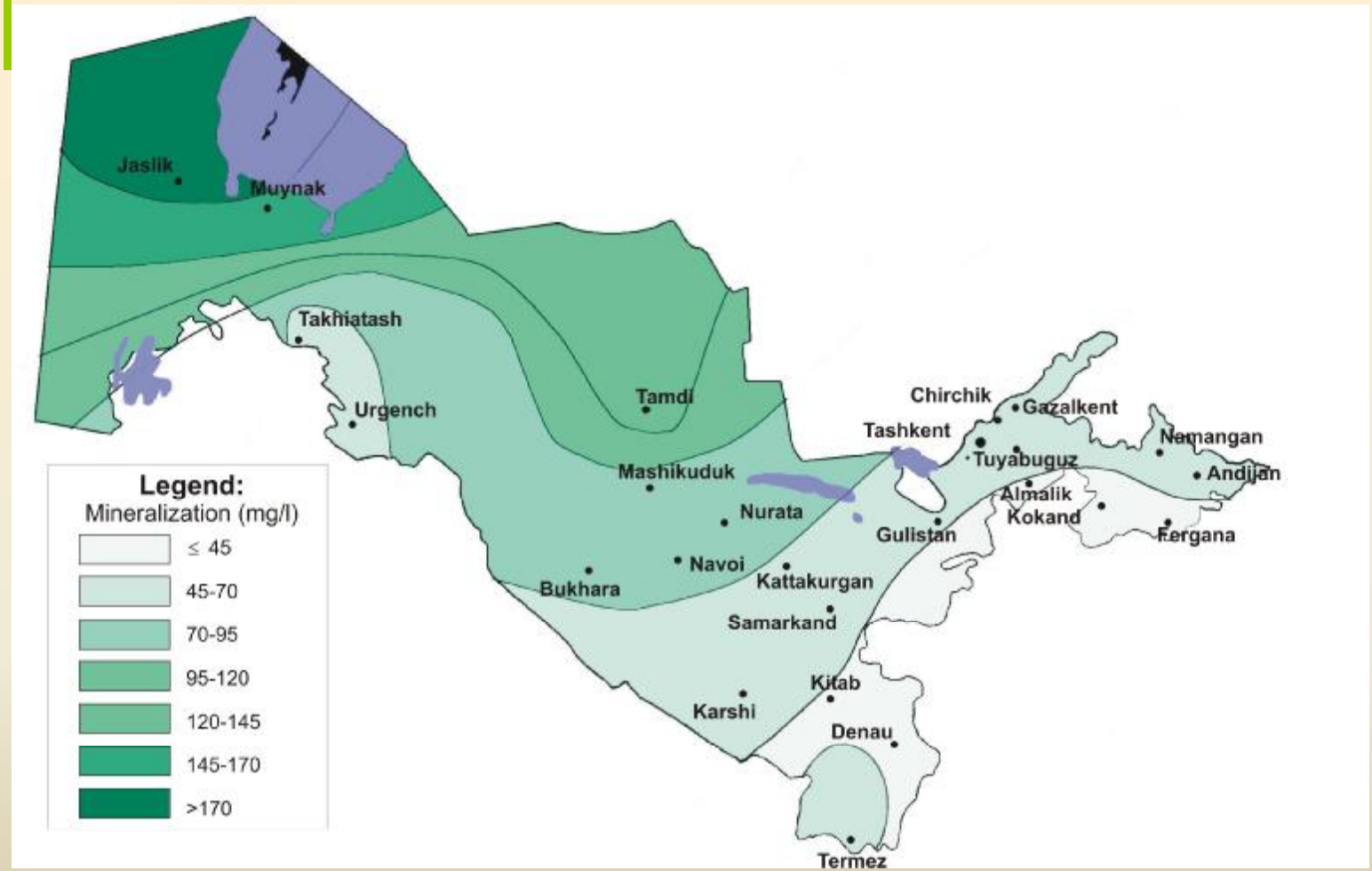
Aim and purpose of indicators

These indicators characterize the following:

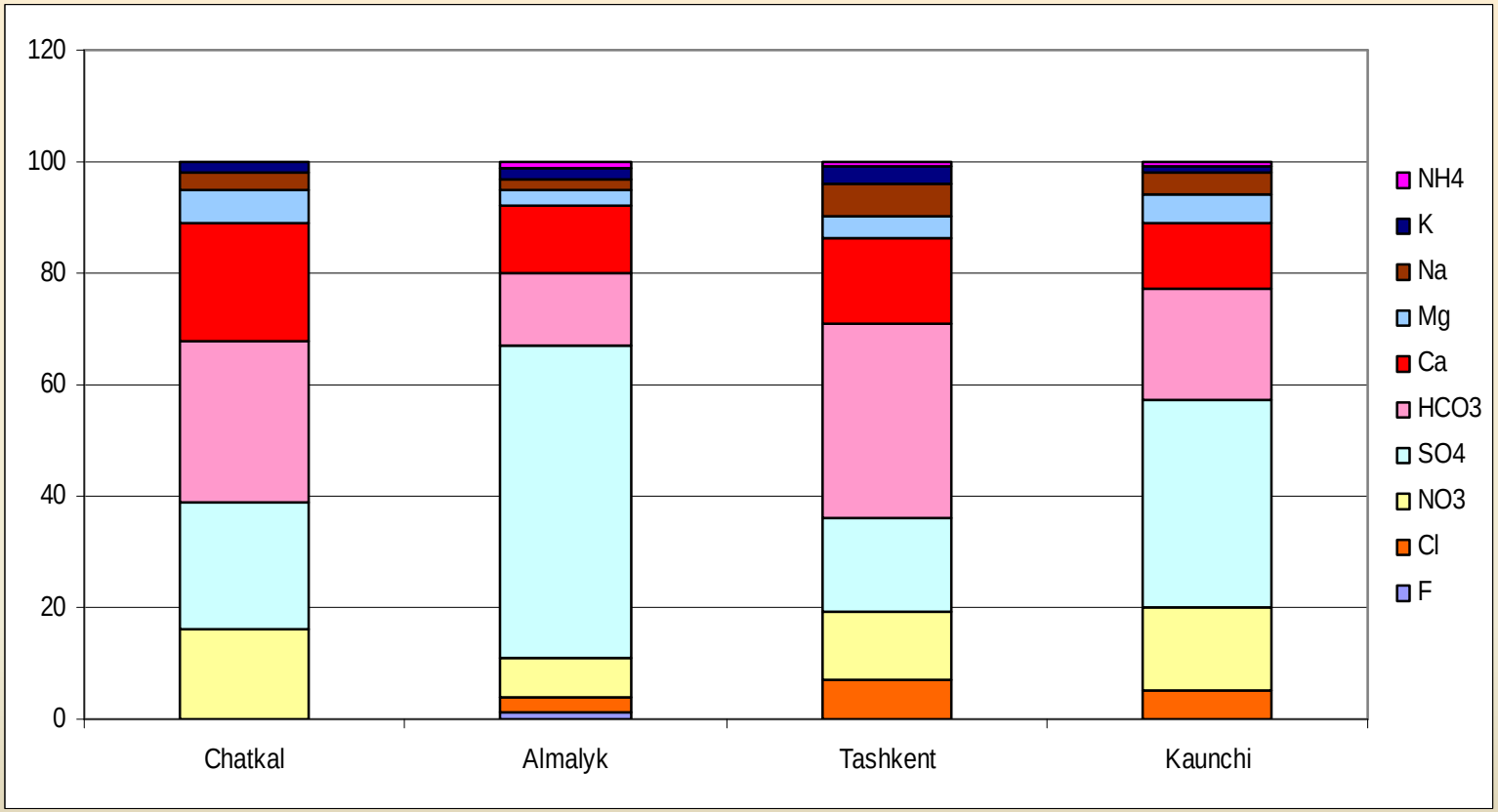
- **Overall stress on the eco-systems caused by anthropogenic sources**
- **Role of separate sources in the formation of the atmospheric fall-outs composition**

They can be used for assessment of economical and ecological damage.

Map-scheme of total mineralization (mg/l) in Uzbekistan



Differences of the water-soluble mineral components in precipitation composition in the different sampling points



Thank you

for attention!