MONITORING OF EXPOSED ARAL SEA BED

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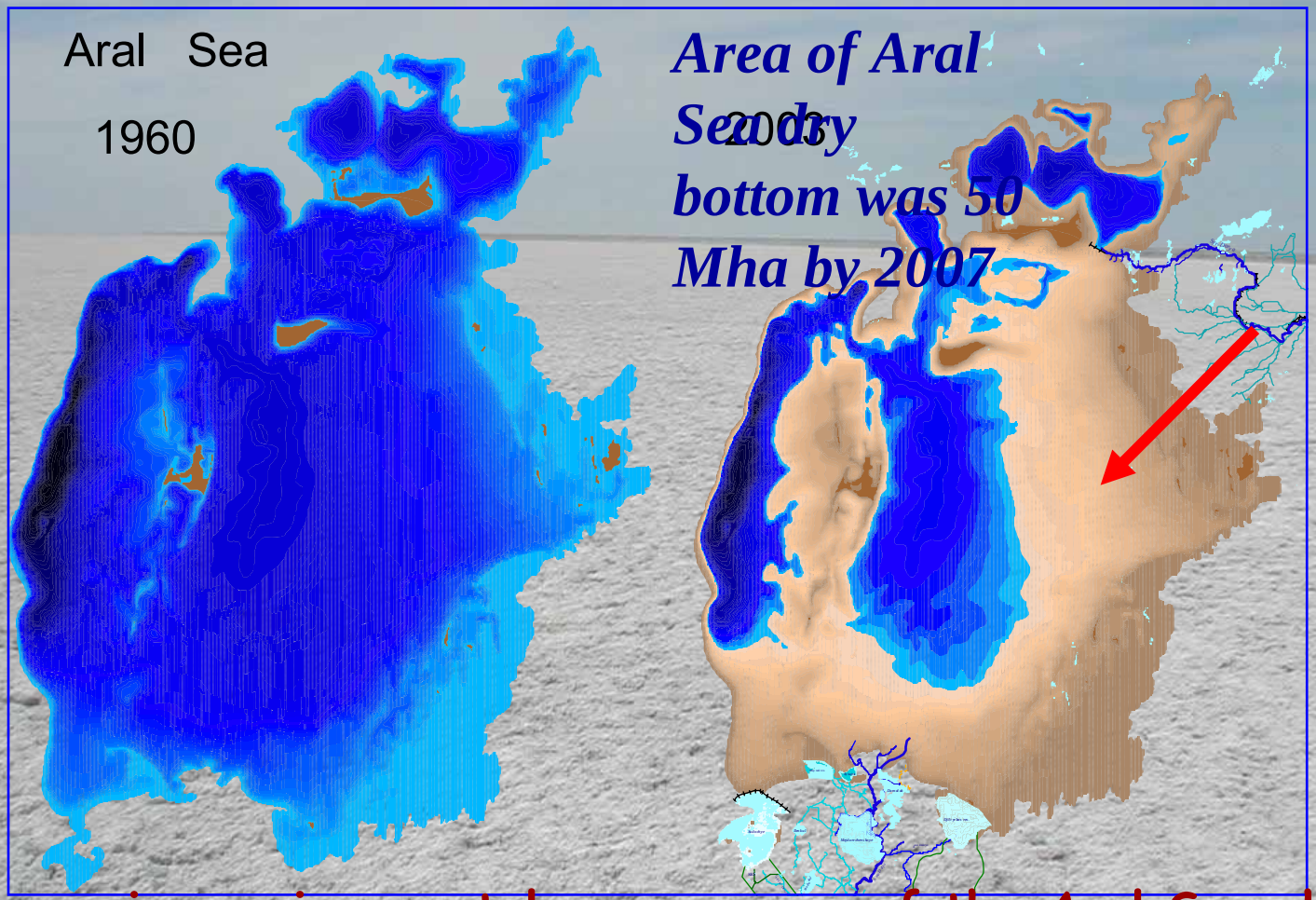
Changes of landscape



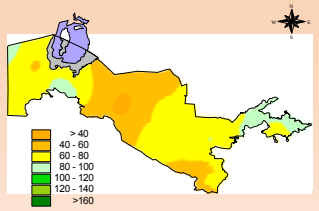
The major environmental consequence of the Aral Sea shrinkage is an intensive development of desertification processes in Prearalie (coastal zone), occurrence of new desert ARAL-KUM

Why it has happened?

Drying of the Aral Sea was connected with the two factors:

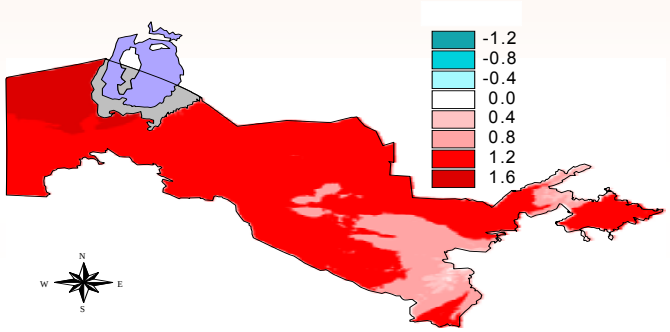
- natural – climate change, its aridization; and
- anthropogenic – water diversion for irrigation

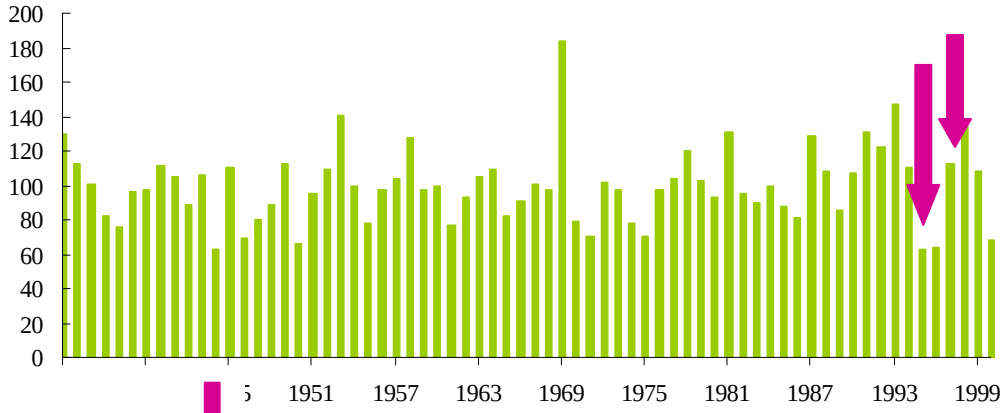
Climate change (Uzglavhidromet)

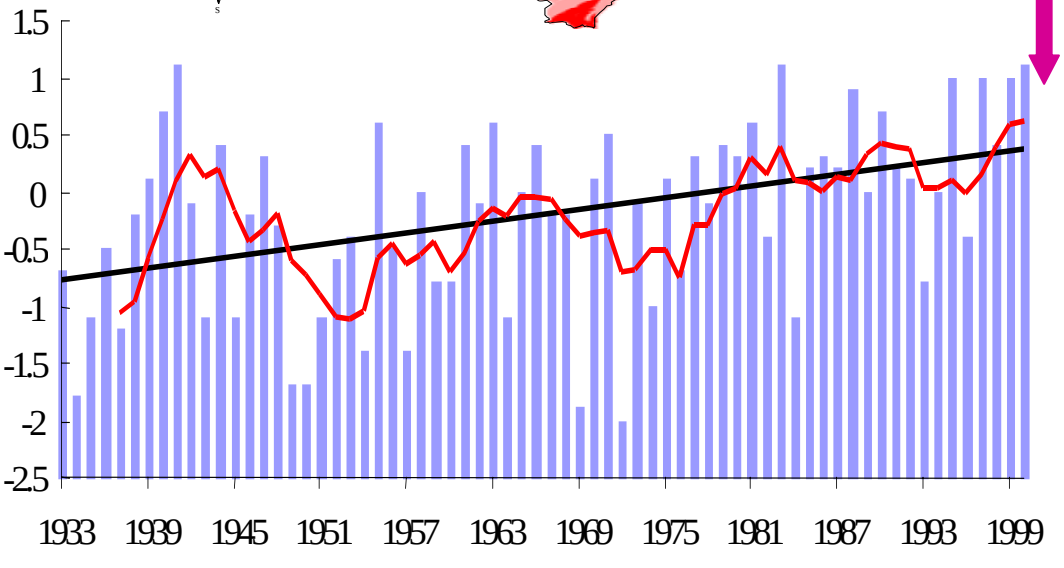


Long-term changes of the annual sums of precipitations

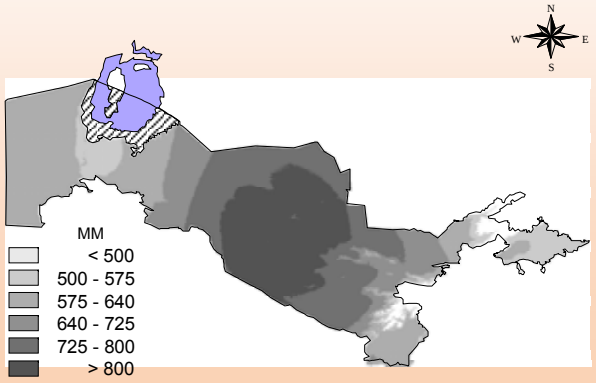
Regional indicators of change of a climate







evaporation



Ecosystem changes in the coastal area are caused by two following processes:

- - expanding area of new land in place of recessed sea;
- - desertification of delta zone in Prearalie.

Change in landscape on the exposed bed of the Aral Sea

Amudarya channel

Populus Asiana

Tamarix

Change in vegetation. Withered trees and bushes

According to rough estimates, direct losses in the Aral Sea area amount to (USD million per year):

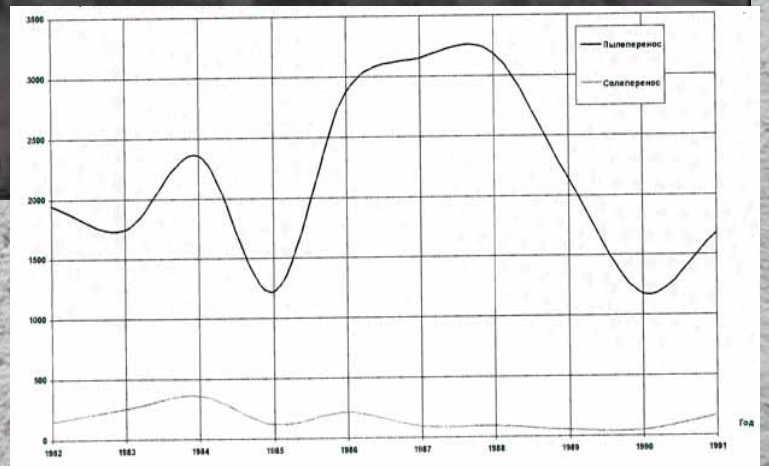
- Irrigation farming - 6,55
- Fisheries and fish breeding - 28.57
- Muskrat hunting - 4.0
- Cattle breeding - 8.4
- Recreation and tourism - 11.16
- Agriculture, total – 58,68
- Fish industry – 9.0
- Muskrat pelt processing – 18.0
- Cane processing – 12.6
- Transportation losses – 1.0
- Industry, total - 40.6
- Production, total – 99,28
- Indirect losses - USD 16.74 million
- Social losses - USD 28.81 million

- Thus total direct and indirect socio-economic losses as a result of environmental disaster in the Aral Sea region are estimated at USD 144,83 million.

Contribution of dry atmospheric precipitation

to general balance of wind transferred salt aerosols is from 30 to 70% for Prearalie.

- The first zone extended to 100 km from the emission source, with flux density of sandy-salt aerosol of 150-250 g/m2/year.
- The second zone extended to 400 km, with flux density of sandy-salt aerosol from 100,0 to 50,0 g/m2/year.
- The third zone extended to 500 km from the water area, flux density of sandy-salt aerosol of 10,0 g/m2/year and less.



Salt accounts for from 30 to 50% in the total balance of precipitation

- 1 – salt migration with precipitation;
- 2 – salt transfer with wind during steady state of atmosphere;

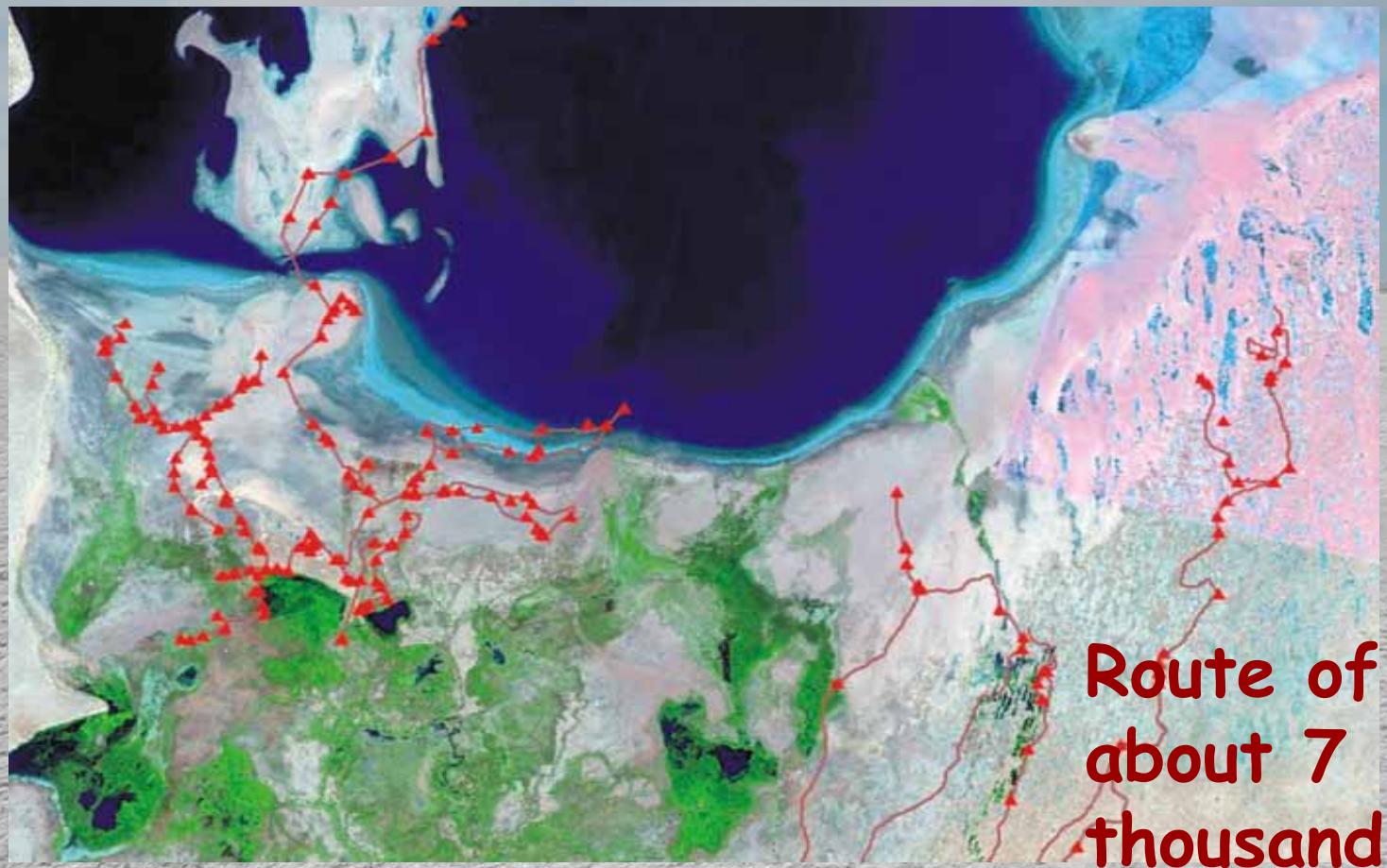
•3 – salt and dust transfer during dust storms and snowdrift.

Comparison of health status indexes in different part of the Aral Sea basin

Indexes	Life span, years		Infant mortality per 1000 infants below 1 year		Hepatitis per 100 thousand residents
	1980	1995	1980	1995	1995
Central Asia	67.9	68.1	20.4	19.6	360
Uzbekistan	69.0	70.1	37.7	30.3	235
Karakalpakstan	67.6	68.0	46.0	45.2	258
The Aral Sea zone	64.2	64.8	59.4	61.0	1980
Turkmenistan	65.0	66.7	54.7	46.1	264
Tashauz	64.0	64.1	n/a	75.2	547

Stabilization and use of the exposed bed of the Aral Sea

Expedition routes



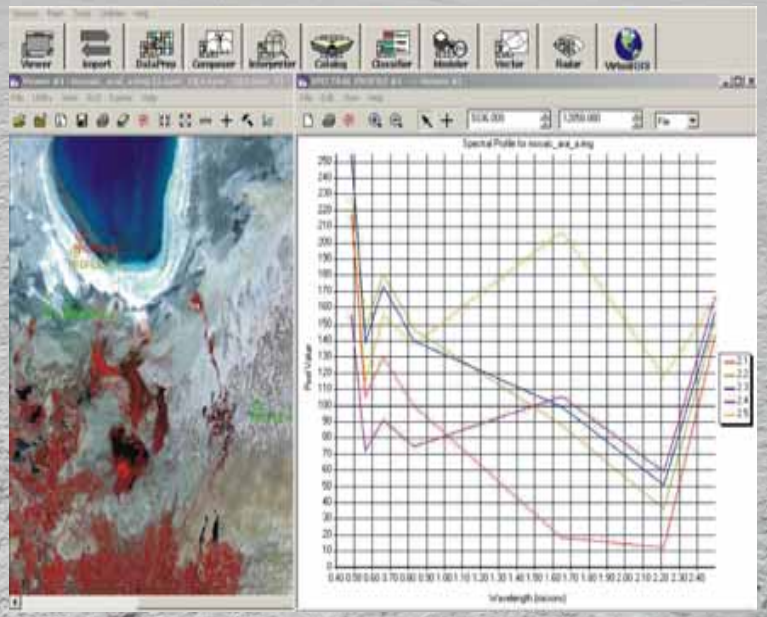
Route of about 7 thousand km

Periods of 5 expeditions: Autumn, Spring 2005-2007,

430 test sites, 133 soil profiles

IRS and Landsat data were used in monitoring

Apparatus	Spectral Range, (μm)	Spatial Resolution	Zone coverage width, (km)
PAN	0.50-0.75	5.8	70
LISS-3	0.52-0.59	23	142
	0.62-0.68		
	0.77-0.86		
WIFFS	0.62-0.68	188	800
	0.77-0.86		



16 oct, 44°03'29'', 58°36'02'' profile 3, crusted takyr-like solonchak

Gently dipping pit-and-mount sandy loam and loamy solonchak plain, covered by shell in places

Tamarisk family orbuscula Pall - Phragmites australis, with ephemeral vegetation and dead reed spots

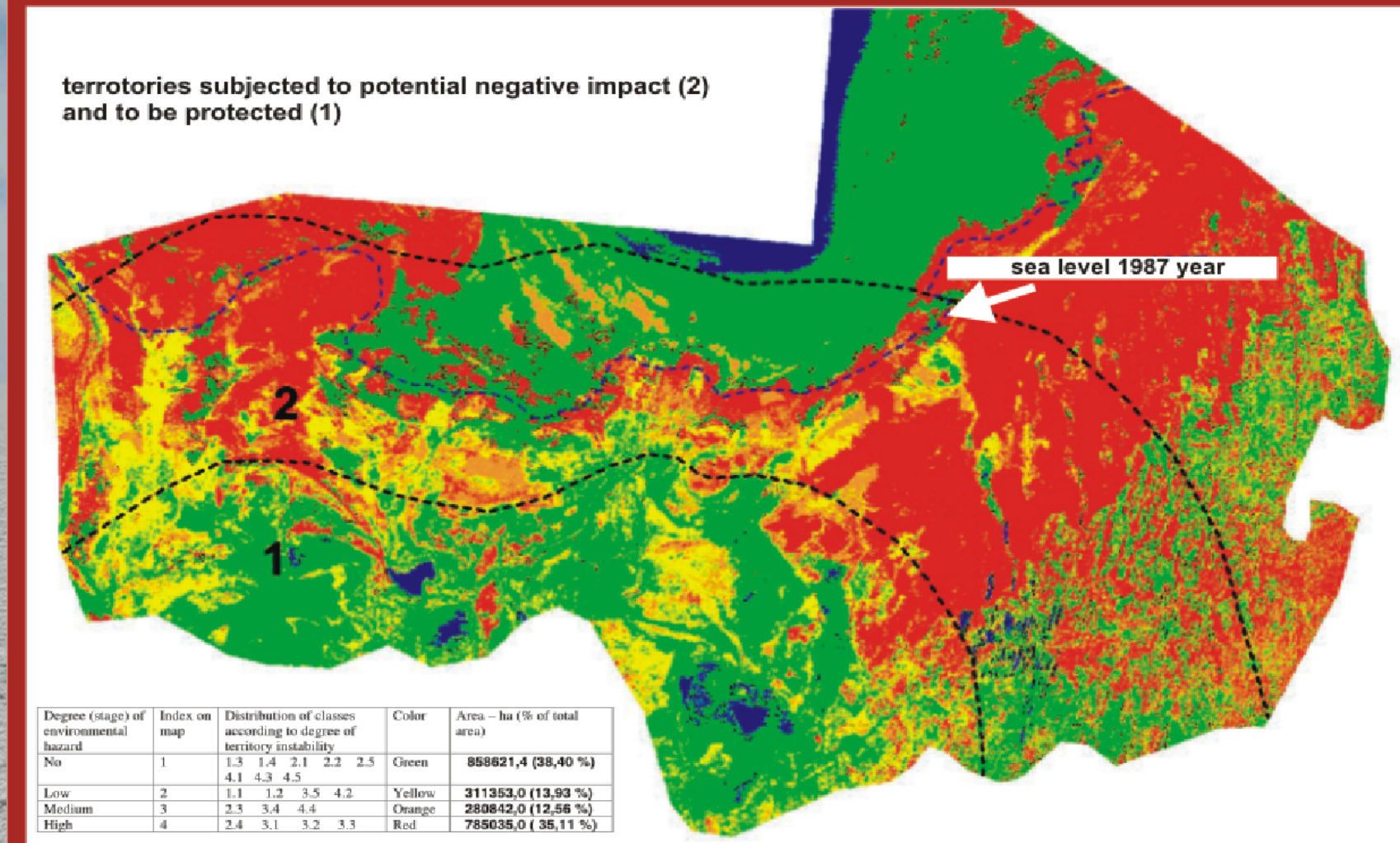
Beginning of growing season

Projective cover 10-15%

Environmental hazard – medium

Erosion risk management

Risk degree	NN	Name of class
	1	WATER
2	1.1	Drying up bays
2	1.2	Aral Sea
1	1.3	Reservoirs and rivers with freshwater
1	1.4	Shallow water with reed
	2	SOLONCHAK
1	2.1	Marsh solonchak
1	2.2	Salt marsh-coastal
3	2.3	Crust-puffed and crusted
4	2.4	Solonchak with blown sandy cover
1	2.5	Shor solonchak of closed sinks
	3	SANDS
4	3.1	Plain sand (with shell rock)
4	3.2	Dune sand, without vegetation
3	3.3	Pit-and-mount sand (poor fixed)
4	3.4	Hilly and hilly-ridgy, poor fixed sands, without vegetation
2	3.5	Hilly, hilly-ridgy fixed sands
	4	DELTAL AND ACCUMULATIVE PLAINS
1	4.1	Meadows on alluvial plains (reed, herb, cereals on alluvial-meadow, swamp-meadow and meadow-swamp soils)
2	4.2	Hydromorphic soil subjected to desertification
1	4.3	Scrub (halophytic vegetation: tamarix, karabarak)
3	4.4	Shrubs
1	4.5	Shrubby-haloxylon



Degree (stage) of environmental hazard	Index on map	Distribution of classes according to degree of territory instability	Color	Area – ha (% of total area)
No	1	1.3 1.4 2.1 2.2 2.5 4.1 4.3 4.5	Green	**858621,4 (38,40 %)**
Low	2	1.1 1.2 3.5 4.2	Yellow	**311353,0 (13,93 %)**
Medium	3	2.3 3.4 4.4	Orange	**280842,0 (12,56 %)**
High	4	2.4 3.1 3.2 3.3	Red	**785035,0 (35,11 %)**

Regarding environmental hazard degree, i.e. belonging to unstable areas, the classes are united into four groups from 1 to 4. Here, group 1 bears no risk, and group 1 is an extremely unstable area

The group of extremely unstable areas consisting of three sand and solonchak types occupies a large territory and accounts for 35,11 %

Plantation of haloxylon (30 th.ha)

Planting during year	Wind speed (м/s)	Change of wind speed (%)
Control , without plant)	12,7	0,0
1	10,1	20,5
2	8,3	34,6
3	5,7	55,1
4	3,3	74,0
5	2,6	79,5
6	1,1	91,3
7	0	100,0

Environmental hazard zones and cultivable zones