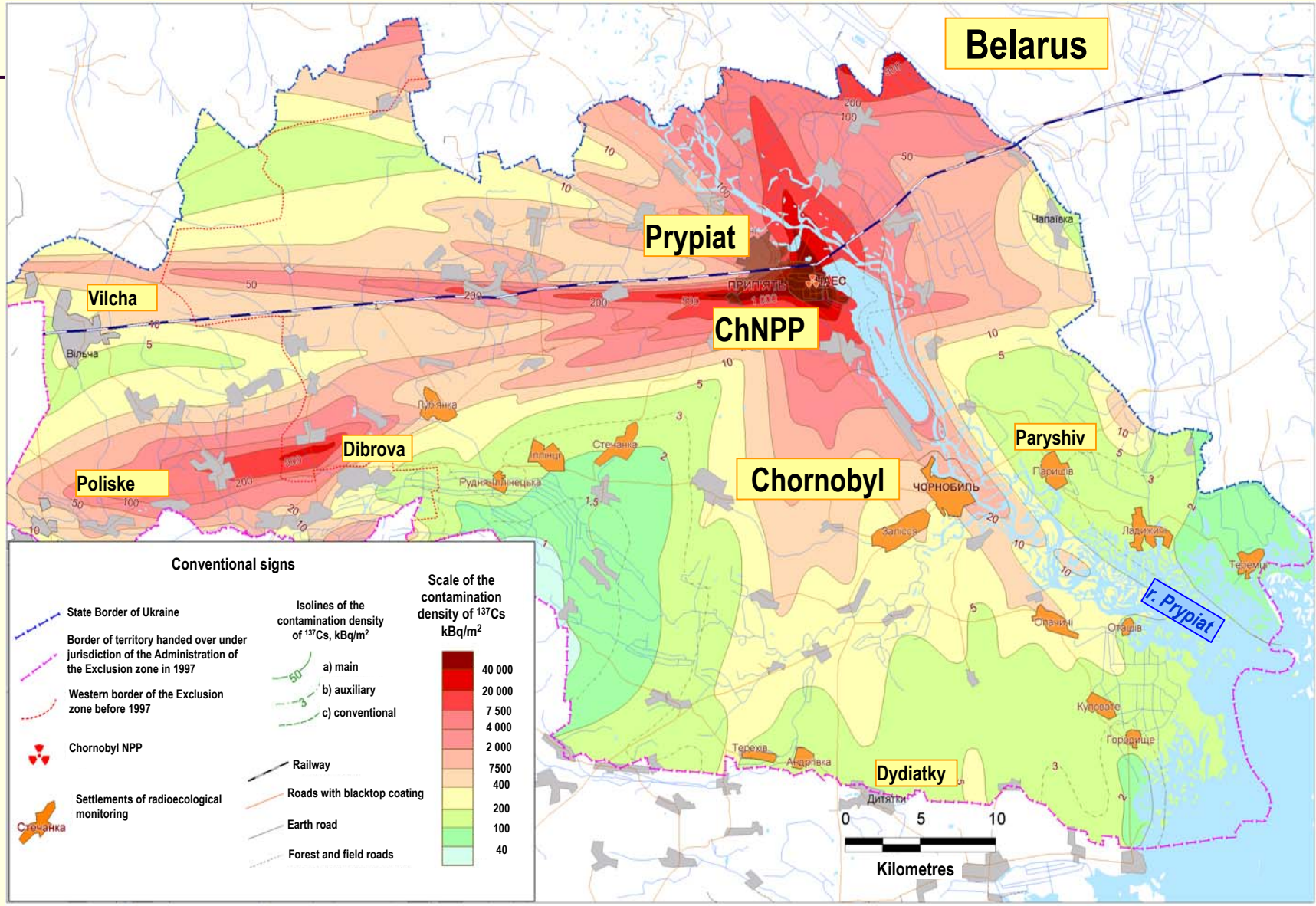
Modernisation of the automated system for monitoring of radiation situation in the Chornobyl exclusion zone within the EU TACIS project

- State Specialised Scientific and Industrial Enterprise “Chornobyl Radioecological Centre” (SSSIE “Ecocentre”)
- State Department – Administration of the exclusion zone and zone of absolute resettlement, Ministry of Ukraine for Emergencies

20th anniversary of the Chornobyl catastrophe conference, Heidelberg, March 15, 2006

Surface soil ^{137}Cs contamination of the Exclusion zone (for 01.12.2002)



Radioactivity stocks distributed in natural and technogenic objects at the Chornobyl exclusion zone (for 2001)

Object	Activity, PBq			
	Total	^{137}Cs	^{90}Sr	TRU
Territory of the exclusion zone	8.13	5.5	2.5	0.13
Cooling pond of the Chornobyl NPP	0.22	0.19	0.03	0.002
Near surface radwaste disposal facilities (RWDF)	5.49	3.6	1.8	0.09
Near surface points for temporary localization of radwaste (PTLRW)	2.14	1.4	0.7	0.04
TOTAL	16	10.7	5	0.26
Object "Shelter“ (damaged nuclear fuel)	740	480	260	10
Spent nuclear fuel of the Chornobyl NPP (reactor blocks Nos. 1,2 and 3, and SNFDF–1)	Spent fuel assembly – 21284, spent additional absorber – 1753			

Forest fire (May 8, 2003)

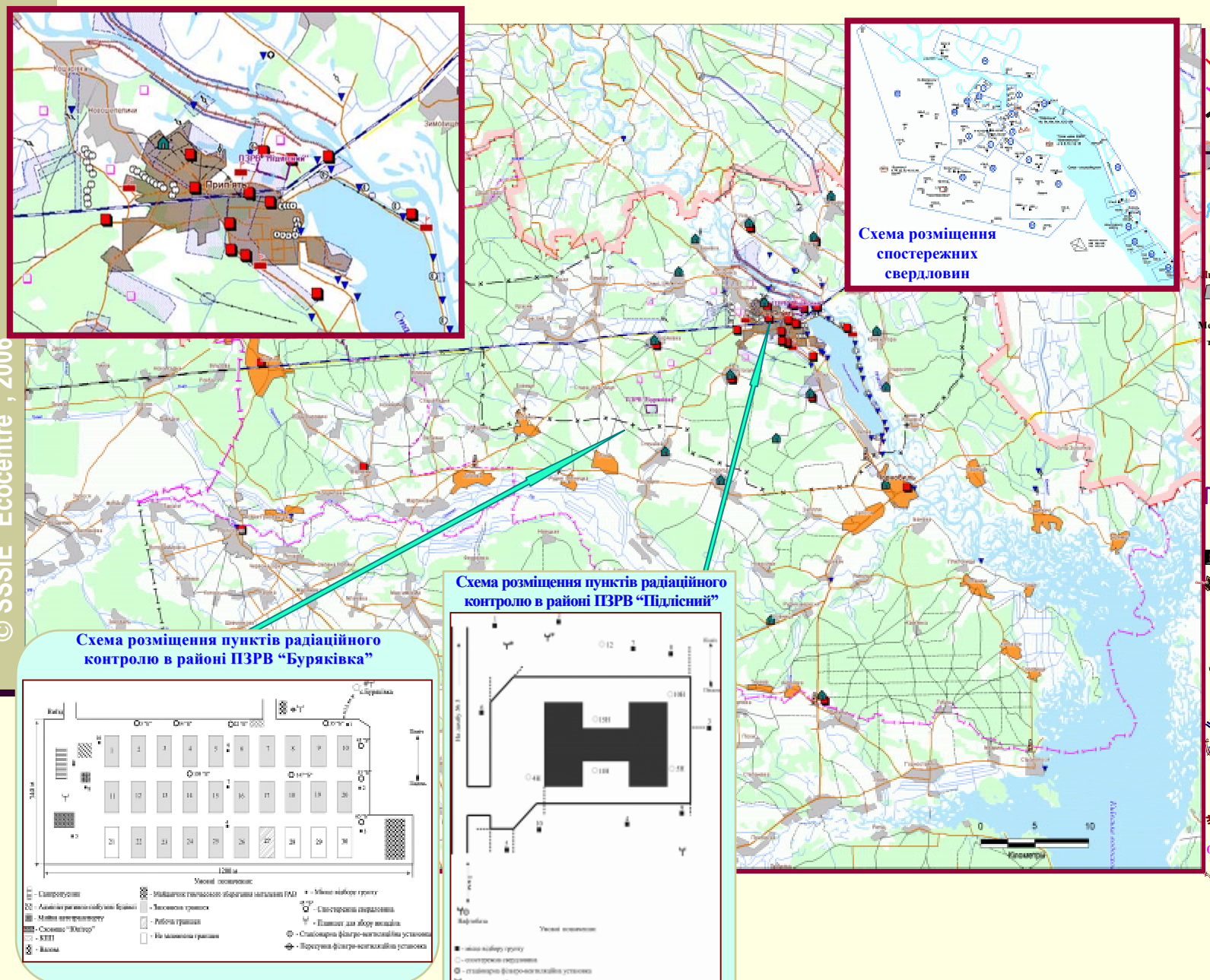
Distribution of soil surface layer contamination of ^{137}Cs for 2002 within the borders of the CEZ

Soil contamination, ^{137}Cs MBq·m^{-2}	Area, km^2	Relative area, %	Activity, PBq	Relative activity, %
0.074	200	7.7	0.01	0.3
0.185	700	26.9	0.13	2.2
0.37	510	19.6	0.19	3.3
0.74	410	15.8	0.30	5.3
1.85	340	13.1	0.63	10.9
3.7	210	8.1	0.78	13.5
7.4	130	5.0	0.96	16.7
18.5	70	2.7	1.30	22.4
37.0	20	0.8	0.73	12.7
> 37.0	10	0.4	0.74	12.8
TOTAL	2600	100.0	5.77	100.0

Parameters of the exclusion zone sensitive to radiation monitoring issues

Area	2600 km^2
Border	Length of the border of the exclusion zone – 441.2 km, including international border with Belarus – 154.5 km
Facilities	Chornobyl NPP, Object “Shelter”, RWDF (“Buriakivka”, “Pidlisny”, “Kompleksny”, “3rd line”, “Korogod”), PTLRW (about 800)
Forests	About 70% of the territory
Natural effluents	River Prypyat 4 – 18, wind resuspension 0.7 $TBq \cdot year^{-1}$

Sampling points of radioecological network of SSSIE Ecocentre



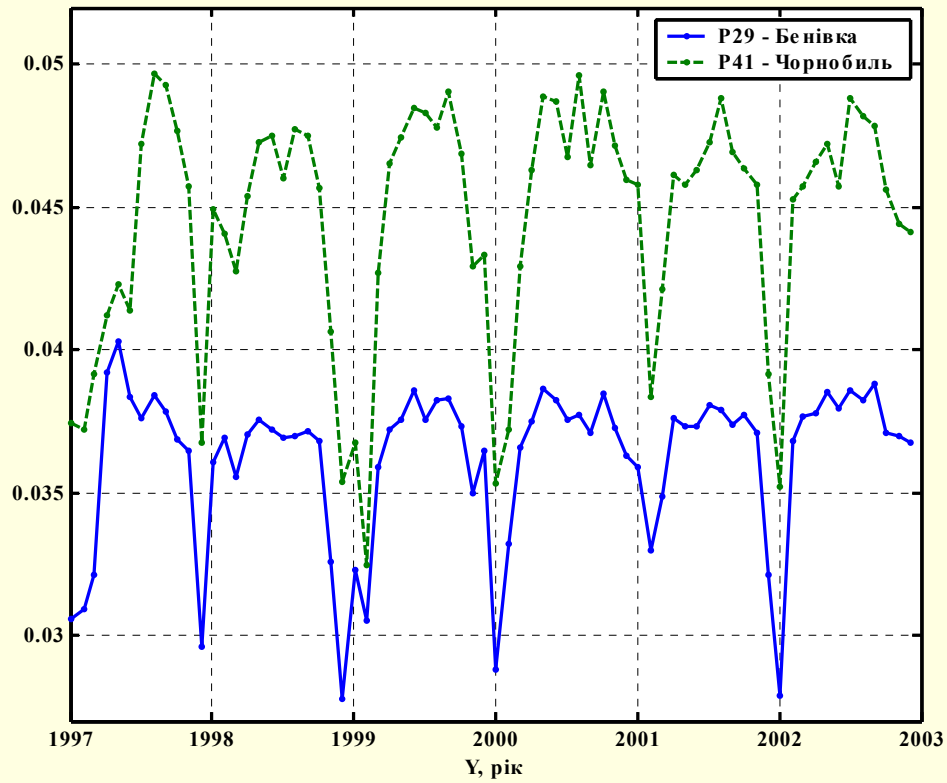
Temporal pattern of the dose rate

(Protocol SCRM-98) *attenuation function R(T)* for the equivalent dose rate from ^{134}Cs and ^{137}Cs as a result of vertical deepening in soil :

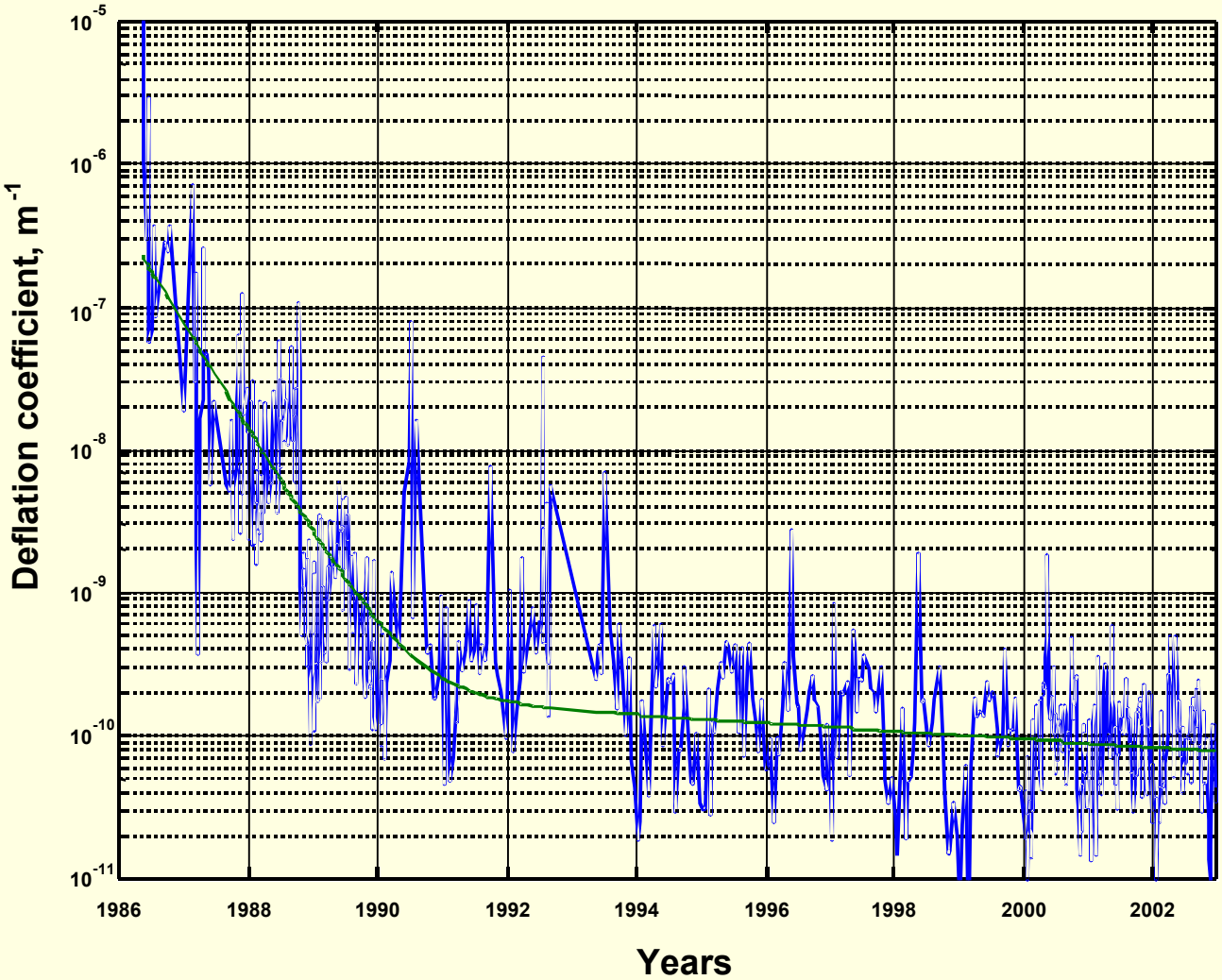
$$R(T) = 0.18 \cdot \exp(-T/0.5) + 0.65 \cdot \exp(-T/16.2), \ [T] = \text{year}.$$

$T_{1/2}$ of 16.2 year equals to the annual decrease of 4.1 %. That gives the overall reduction of the external dose rate for the period of time from 1997 to 2003 approximately of 22%.

The exposure dose rate (month-averaged) at points of the automated system of monitoring of radiation situation (ASMRS) of the Chornobyl exclusion zone in 1997 - 2003



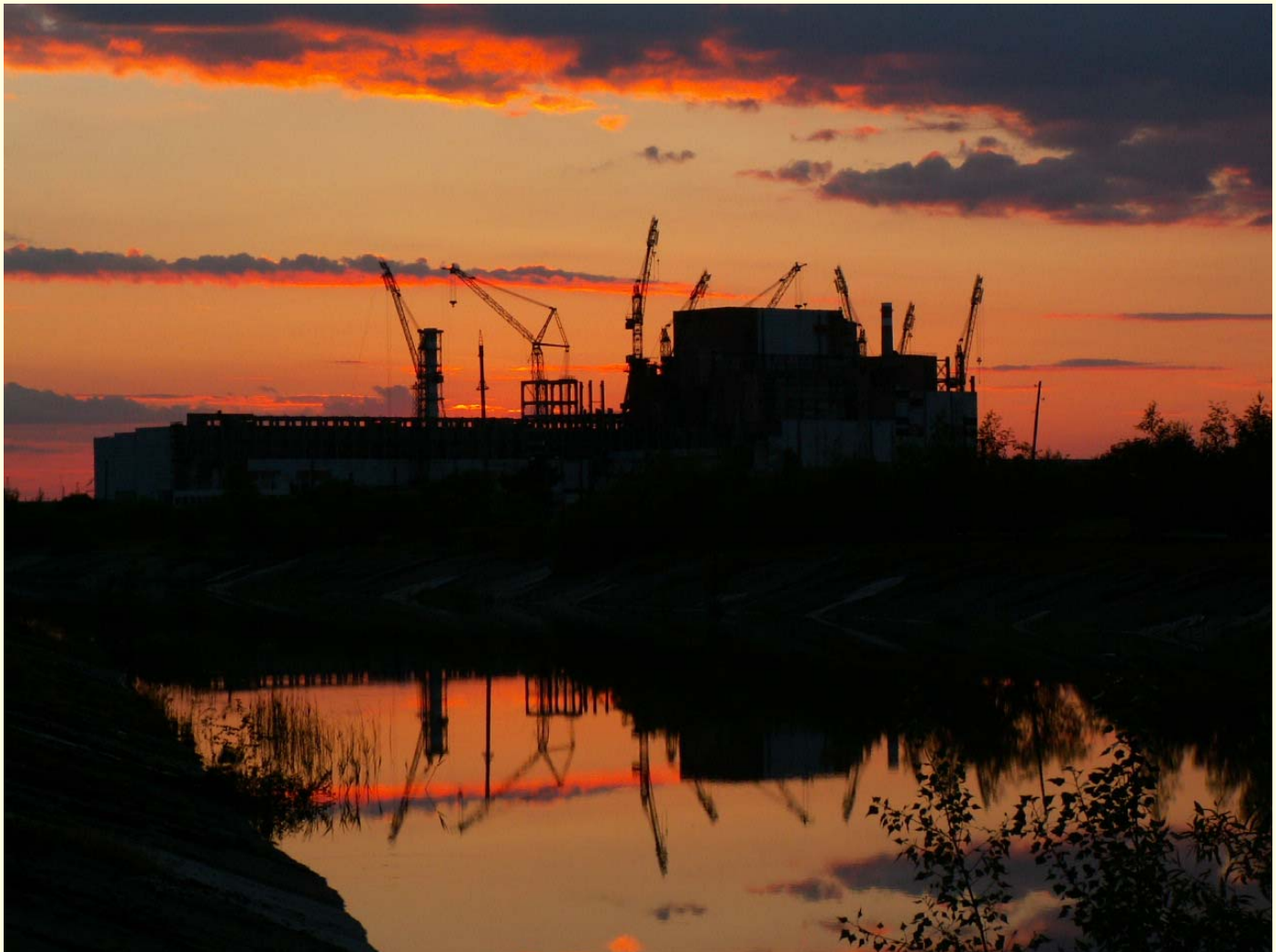
Deflation coefficient of ^{137}Cs observed at Chornobyl in 1986 - 2002



$K_D = 2.4 \cdot 10^{-7} \cdot e^{-T/0.6} + 2.3 \cdot 10^{-10} \cdot e^{-T/15.4}$, m^{-1}, $[T]$ = year

Elia preserve located in the north-west within the Exclusion Zone on the border to Belorussia

Reactor blocks 5 and 6 of Chornobyl NPP



Project details

Donor	EC (in framework of TACIS project U4.01/03 S)
Beneficiary	Ministry of Ukraine for Emergencies
Contractor	Consortium UkrAtomPrylad (Ukraine) – Genitron (Germany)
End – user	SSSIE “Ecocentre”
Contract	No. 76903, id. No. EuropeAid/ 119121/ D/S/UA, December 28, 2005
Terms	28.06.2007 (18 months)
Registration	No. ____ dated __.__.2006, by Ministry of Economy of Ukraine
Responsible person	Dr. O.Bondarenko, Director

Objective

- Modernisation of the existing ASMRS according to modern requirements to radiation monitoring systems and using suitable existing engineering and technical constructions, roads and communication lines

Targets to be achieved by the project

Current status

- 29 old DR sensors
- 4 old aerosol samplers
- Wire communication with a central unit
- Old central unit

Status to be achieved

- 39 new DR sensors
- 18 new aerosol samplers
- Radio communication with a central unit
- New central unit
- 1 aerosol monitor
- Meteorological station
- Modeling software

Work plan of the project

The name of works to be performed	Terms
Signing the Contract by all Parties	28.12.2005
Concluding the subcontract with Genitron for manufacture, delivery and montage of supplied equipment	D0+8
Development of Technical Specification, design documentation for technical means and software	D0+14
Works on pre-project survey and construction design works	D0+16
Approval of Technical Specification, design documentation for technical means and software	D0+17
Manufacturing and procurement of the equipment	D0+52
Delivery of the equipment for the final montage (assembly, installation) stage to the warehouse of the Contracting Authority	D0+58
Montage, preliminary adjusting	D0+61
Start-up and adjustment of ASMRS, software verification	D0+69
Provisional acceptance of the goods and release the pre-financing guarantee	D0+70
Metrological certification of all system	D0+72
Training of the Contracting Authority personnel	D0+74
Acceptance tests, commissioning of the system, final acceptance of the modernised ASMRS	D0+77
Drawing-up the reports under the project	= (D0+79) 28.06.2007