



NATIONAL INVENTORY OF POTENTIAL SOURCES OF SOIL CONTAMINATION IN CYPRUS

PART 1

COMPILATION OF THE INVENTORY OF SOIL POLLUTING ACTIVITIES

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NATIONAL INVENTORY OF POTENTIAL SOURCES OF SOIL CONTAMINATION IN CYPRUS

Partners:



- Institute of Geology and Mineral Exploration, Greece



- Institute for Ecology of Industrial Areas, Poland



- GeolInvest Ltd., Cyprus

In collaboration with the
Cyprus Geological Survey Department



OBJECTIVES

- to compile a *"National Inventory of Potential Sources of Soil Contamination in Cyprus"*;
 - to carry out soil geochemical surveys on different types of contamination to assess the human health risk depending on the end land use;
 - to determine site specific guideline values of inorganic and organic contaminants for different types of land use;
 - to develop guideline values for different chemical elements and compounds in soil, and
 - to classify potentially contaminated sites by placing them into categories (A, B, C and D),
- thus, setting up the Framework of a Contaminated Soil Management and Remediation Scheme.**



PROJECT EXECUTION

The project was carried out in
three phases from the

1st January 2004

To

31st December 2006

Although the draft final report was
submitted, we are still working on
some aspects, the geochemical
and Human health risk
assessment especially



Phase A:

Stage 1: Receipt of all existing data on soil pollution from the Geological Survey Department, Factory Inspectorate Department, the Environmental Service, etc.

Stage 2: Review and evaluation of all existing data and information, and extraction of the characteristics of soil pollution from the different types of polluting activities and their classification into categories.

Submission of Inception Report (Month 3).

Stage 3: Development of the database structure for the compilation of the National Inventory of Contaminated Sites, and start of digital entry of all the relevant characteristics.

Initial evaluation of potential sources of soil pollution.

Submission of Progress Report (Month 10).



Phase B:

Stage 1: Planning of fieldwork: Based on the classification of Contaminated Sites into categories, the most characteristic will be selected from each category for a detailed study.

Stage 2: Sampling and analysis of soil samples. Evaluation of results, determination of site specific guidelines for polluting elements and compounds according to land use, and risk assessment.

Description of the methodology for the investigation of contaminated sites.

Submission of Interim Report (Month 18).



Phase C:

Stage 1: Completion of the National Inventory of Contaminated Sites by the digital entry of all data and information into the database.

Classification of contaminated sites in categories (A, B, C, D) with respect to the developed site specific guidelines for the different chemical elements and compounds, and the level of risk in relation to the end land use.

Description of the methodology for the evaluation and management of risk of contaminated sites.

Submission of

*Draft Final Report (Month 23) and
Final Report (Month 24 - Delayed).*



Categorisation of potential soil contaminating activities in Cyprus, according to type and volume of hazardous wastes produced, and the probable organic and inorganic contaminants.

Note: The table below is flexible and more industries may be added or eliminated, if this is considered necessary.

GSD-Rating	GSD NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic contaminants	Inorganic contaminants
A	G27	105.12	Metal smelting, Metal treatment & Metal Works	BTEX, PAHs, PCBs, HCB, TPH, Phenols, Dioxins, Furans	As, Cd, Cl, Cr, Cu, F, Hg, Ni, Pb, V, Zn and inorganic compounds (Cl, HCN)
A	G27.44	105.12	<i>Metal smelting: Copper</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Ba, Cd, Co, Cr, Cu, Fe, Ni, Pb, U, V, Zn</i>
A	G27.45	105.12	<i>Metal smelting: Chromite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Cr, Ni, Fe, V</i>

NACE code: Standard nomenclature for economic activities

NOSE-P code: Standard nomenclature for sources of emissions

GSD-Rating	GSD NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic contaminants	Inorganic contaminants
A	G27.1	105.12	<i>Metal smelting: Cast iron</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Fe, Mn, P</i>
A	G28.51	105.01	Metal plating & aluminium anodising including galvanised pipes	<i>NMVOC, PAHs, PFCs, SF₆, Cyanide, Benzene, 1,1,1-Trichloroethane, Dioxins, Furans</i>	<i>As, Cd, Cr, Cu, F, Hg, Ni, Pb, Zn, Sulphuric acid, Hydrochloric acid, NH₃, NO_x, SO_x</i>
A	G13.2	-	Ore mining & Quarrying	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Cr, Cu, Ni, Zn</i>
A	G13.21	-	<i>Mining: Asbestos</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Co, Cr, Ni, asbestos fibres</i>
A	G13.22	-	<i>Mining: Chromite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Cr, Ni, Fe, V, Zn</i>
A	G13.23	-	<i>Mining: Copper</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Ba, Cd, Co, Cr, Cu, Fe, Ni, Pb, U, V, Zn</i>

GSD-Rating	GSD NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic contaminants	Inorganic contaminants
A	G13.24	-	<i>Mining: Pyrite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Ba, Cd, Co, Cr, Cu, Fe, Ni, Pb, U, V, Zn</i>
A	G14.5	-	<i>Mining: Umber</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Fe, Mn</i>
A	G14.222	-	<i>Mining: Bentonite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	-
A	G14.12	-	<i>Mining: Gypsum</i>	<i>BTEX, PAHs, PCBs, TPH</i>	-
A	G23	105.08	Petroleum refinery & Bulk storage	BTEX, MTBE, NWVOC, PAHs, PCBs, TPH, Phenols, Aliphatic hydrocarbons, Organolead compounds	As, Cd, Cl, Co, Cr, Cu, Hg, Ni, Pb, Sb, V, Zn, CN, NH ₃ , SO _x , (NH ₄) ₂ SO ₄

<i>GSD-Rating</i>	<i>GSD NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic contaminants</i>	<i>Inorganic contaminants</i>
A	G23.201	105.08	Petroleum refinery	BTEX, MTBE, NWVOC, PAHs, PCBs, TPH, Phenols, Aliphatic hydrocarbons, Organolead compounds	As, Cd, Cl, Co, Cr, Cu, Hg, Ni, Pb, Sb, V, Zn, CN, NH ₃ , SO _x , (NH ₄) ₂ SO ₄
A	G51.51	105.08	Petroleum bulk storage	BTEX, MTBE, NWVOC, PAHs, PCBs, TPH, Phenols, Aliphatic hydrocarbons, Organolead compounds	As, Cd, Cl, Co, Cr, Cu, Hg, Ni, Pb, Sb, V, Zn, CN, NH ₃ , SO _x , (NH ₄) ₂ SO ₄
A	G40.1	101.01	Electric power plant & distribution station	PAHs, PCBs	As, B, Ba, Cd, Cr, Cu, Hg, Mn, Mo, Pb, Sb, Se, Zn

<i>GSD-Rating</i>	<i>GSD NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic contaminants</i>	<i>Inorganic contaminants</i>
A	G90.01	109.03	Waste treatment plant	BTEX, MTBE, PAHs, PCBs, PCPs, TPH, VHH, Pesticides, Phenols, Chlorophenols, Dioxins, Furans, Aliphatic hydrocarbons, Chlorinated aromatic hydrocarbons, Organolead and Organotin compounds	As, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Se, Zn
A	G90	109.06	Landfill (including household wastes)	BTEX, MTBE, PAHs, PCBs, HFCs, PFCs, TCE, TCM, TPH, VHH, Pesticides, Phenols, Chlorophenols, Dioxins, Furans, Aliphatic hydrocarbons, CH ₄ , Chlorinated aromatic hydrocarbons, Organolead and Organotin compounds	As, B, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Zn and inorganic compounds (NO _x , SO _x , HCl, etc.)

GSD-Rating	NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic compounds	Inorganics
A	G50.5	-	Petrol station	BTEX, MTBE, TPH, Aliphatic hydrocarbons, Organolead compounds, Trichloroethylene	Ba, Cu, Cd, Pb, Ni, Zn
B	G21.1	105.07	Paper	PAHs, PCBs, NMVOC, TPH, VHH, Pesticides, Phenols, Chlorophenols, Dioxins, Furans, Aliphatic hydrocarbons	As, Cd, Cr, Cu, Hg, Mn, Ni, P, Pb, Sb, Zn, HCl, H ₂ SO ₄ , NO _x , SO _x , (NH ₄) ₂ SO ₄ , Cl, ClO ₂
B	G20.1	-	Wood treatment	BTEX, PAHs, PCBs, Phenols, Total chlorophenols, Phenols, Pesticides, Aliphatic hydrocarbons, Organotin compounds	As, Cu, Cr, Hg, Ni, P, Pb, Zn, NH ₃

GSD-Rating	NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic compounds	Inorganics
B	Other chemicals:-				
B	G24.2	105.09	<i>Chemicals: Pesticides/ herbicides/ Insecticides</i>	<i>BTEX, PAHs, TPH, VHH, Chlorophenols, Dioxins, Furans, Aliphatic hydrocarbons, Organotin compounds</i>	<i>As, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Zn and inorganic compounds</i>
B	G24.15	105.09	<i>Chemicals: Chemical fertilisers, including phosphate fertilisers</i>	<i>PAHs, TPH</i>	<i>As, Cd, Cr, Cu, Hg, Mn, Ni, P, Pb, Sb, Se, V, Zn and inorganic compounds</i>
B	G17.3	107.03	<i>Chemicals: Textile bleaching & dyeing</i>	<i>BTEX, NMVOC, PAHs, TPH, PCPs, Pesticides, Phenols, Chlorophenols</i>	<i>Al, B, Cd, Cr, Cu, Hg, Sn, Ti, Zn, H₂SO₄, NaOH, NaClO, (NH₄)₂SO₄, NH₃, H₃PO₄, NO_x, SO_x</i>

GSD-Rating	GSD NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic contaminants	Inorganic contaminants
A	G27	105.12	Metal smelting, Metal treatment & Metal Works	BTEX, PAHs, PCBs, HCB, TPH, Phenols, Dioxins, Furans	As, Cd, Cl, Cr, Cu, F, Hg, Ni, Pb, V, Zn and inorganic compounds (Cl, HCN)
A	G27.44	105.12	<i>Metal smelting: Copper</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Ba, Cd, Co, Cr, Cu, Fe, Ni, Pb, U, V, Zn</i>
A	G27.45	105.12	<i>Metal smelting: Chromite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Cr, Ni, Fe, V</i>
A	G27.1	105.12	<i>Metal smelting: Cast iron</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Fe, Mn, P</i>
A	G28.51	105.01	Metal plating & aluminium anodising including galvanised pipes	<i>NMVOC, PAHs, PFCs, SF₆, Cyanide, Benzene, 1,1,1-Trichloroethane, Dioxins, Furans</i>	<i>As, Cd, Cr, Cu, F, Hg, Ni, Pb, Zn, H₂SO₄, HCl, NH₃, NO_x, SO_x</i>

GSD-Rating	GSD NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic contaminants	Inorganic contaminants
A	G13.2	-	Ore mining & Quarrying	BTEX, PAHs, PCBs, TPH	As, Cr, Cu, Ni, Zn
A	G13.21	-	<i>Mining: Asbestos</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Co, Cr, Ni, Asbestos fibres</i>
A	G13.22	-	<i>Mining: Chromite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Cr, Ni, Fe, V, Zn</i>
A	G13.23	-	<i>Mining: Copper</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Ba, Cd, Co, Cr, Cu, Fe, Ni, Pb, U, V, Zn</i>
A	G13.24	-	<i>Mining: Pyrite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>As, Ba, Cd, Co, Cr, Cu, Fe, Ni, Pb, U, V, Zn</i>
A	G14.5	-	<i>Mining: Umber</i>	<i>BTEX, PAHs, PCBs, TPH</i>	<i>Fe, Mn</i>
A	G14.222	-	<i>Mining: Bentonite</i>	<i>BTEX, PAHs, PCBs, TPH</i>	-
A	G14.12	-	<i>Mining: Gypsum</i>	<i>BTEX, PAHs, PCBs, TPH</i>	-

<i>GSD-Rating</i>	<i>NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic compounds</i>	<i>Inorganics</i>
B	G24.3	-	<i>Chemicals: Paint and lacquer</i>	<i>BTEX, PAHs, PCBs, VHH, Phenols, Organotin compounds</i>	<i>Ba, Cd, Cr, Cu, Ni, Pb, Ti, Zn</i>
B	G24.4	107.03	<i>Chemicals: Pharmaceuticals</i>	<i>BTEX, DCM, NMVOC, PAHs, PER, TCM, TRI, VHH, Chlorophenols, Aliphatic hydrocarbons, Chlorinated aromatic hydrocarbons</i>	<i>As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, V, Zn and inorganic compounds (NH₃, NO_x, SO_x)</i>
B	G24.5	105.09	<i>Chemicals: Cosmetics, Toiletries & Disinfectants</i>	<i>BTEX, PAHs, PAE, PCBs, VHH, Phenols, Chlorophenols, Dioxins, Furans, Chlorinated aromatic hydrocarbons</i>	<i>As, B, Ba, Cr, Cu, Hg, Ni, Pb, Zn</i>
B	G29.6	105.09	<i>Chemicals: Cartridges and Shooting ranges</i>	-	<i>Cu, Pb, Zn and inorganic compounds</i> p10/21

GSD-Rating	NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic compounds	Inorganics
B	G25.1	-	Rubber products	BTEX, PAHs, TPH, VHH, Phenols, Chlorophenols, Aliphatic hydrocarbons, Chlorinated aromatic hydrocarbons	As, Cd, Cr, Cu, Ni, Pb, S, Zn, and inorganic compounds (Thiocarbonate, H ₂ SO ₄ , HCl)
B	G25.2	105.09	Plastic products	BTEX, PCBs, Acetone, Dichloromethane, Methyl ethyl ketone, Methanol, 1,1,1-Trichloroethane, Styrene, Phenols	Cd, Hg, Pb, Zn, CN, CS ₂
B	G29	-	Machinery including electrical	BTEX, PAHs, PCBs, TPH, VHH, Phenols, Chlorophenols, Dioxins, Furans, Aliphatic hydrocarbons, 1,1,1-Trichloroethane, Freon 113, Trichloroethylene, Methyl ethyl ketone, Dichloromethane	As, Cd, Cr, Cu, Hg, Ni, Pb, Zn and inorganic compounds [H ₂ SO ₄ , HNO ₃ , (NH ₄) ₂ SO ₄]

<i>GSD-Rating</i>	<i>GSD NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic contaminants</i>	<i>Inorganic contaminants</i>
B	G22	107.04	Printing/ Publishing	BTEX, PAHs, PCBs, VHH, Phenols, Organotin compounds	Ba, Cd, Cr, Cu, Ni, Pb, Se, Zn
B	G36.1	107.01	Furniture	BTEX, PAHs, Phenols, Total chlorophenols, Pesticides, Aliphatic hydrocarbons, Organotin compounds	As, Cu, Cr, Hg, Ni, Pb, Zn, NH ₃
B	G85	-	Hospital and medical clinics	BTEX, PCBs, TPH	Ag, As, Ba, Bi, Cd, Cr, Cu, Hg, Mo, Pb, Sb, Se, Sn, Pt, Zn
B	G1	110.04, 110.05 <i>[cross check]</i>	Agriculture (including chemical & livestock fertilisers)	Pesticides, Herbicides, Insecticides	As, B, Cd, Cr, Cu, Hg, Ni, P, Pb, Sb, Se, Zn, NH ₃ , Nitrates

GSD-Rating	GSD NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic contaminants	Inorganic contaminants
B	G1.2	-	Animal rearing (including pig, cow, sheep, goat & poultry)	Pesticides	As, B, Cd, Cr, Cu, Hg, Ni, P, Pb, Sb, Se, Zn, NH ₃ , Nitrates
C	G16	-	Tobacco	Propylene, Toluene, Acetone, Styrene, 2-Ethoxyethanol, Dibutyl phthalate, Methanol	As, Ba, Br, Cd, F, Hg, Pb, Sb & Zn compounds, NH ₃ , Cl
C	G19.1	107.03	Tannery	BTEX, MTBE, VHH, Aliphatic hydrocarbons, phenols	Cr ³⁺ , Cr ⁶⁺ , Cd, Pb and inorganic compounds (NO _x , HCl, Chlorides, Sulphides)

<i>GSD-Rating</i>	<i>GSD NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic contaminants</i>	<i>Inorganic contaminants</i>
C	G26	104.11	Non-metallic industries (including brick makers, stone makers & plaster)	BTEX, TPH, PAHs, PCBs, Aliphatic hydrocarbons	B, Cd, Cr, Cu, Hg, Ni, Pb, Zn
C	G26.4	104.11	Brick making industries	BTEX, TPH, PAHs, PCBs, Aliphatic hydrocarbons	B, Cd, Cr, Cu, Hg, Ni, Pb, Zn
C	G26.51	104.11	Cement manufacture	BTEX, HFCs, TPH, PAHs, PCBs, Aliphatic hydrocarbons, Dioxins, Furans	As, Be, Cd, Cl, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Sb, V, Zn, NH ₃ , NO _x , SO _x
C	G26.62	104.11	Plaster making industries	BTEX, TPH, PAHs, PCBs, Aliphatic hydrocarbons	B, Cd, Cr, Cu, Hg, Ni, Pb, Zn

<i>GSD-Rating</i>	<i>GSD NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic contaminants</i>	<i>Inorganic contaminants</i>
C	G26.7	104.11	Stone making industries	BTEX, TPH, PAHs, PCBs, Aliphatic hydrocarbons	B, Cd, Cr, Cu, Hg, Ni, Pb, Zn
C	G26.82	104.11	Umber, Bentonite & Gypsum manufacture	BTEX, HFCs, TPH, PAHs, PCBs, Aliphatic hydrocarbons, Dioxins, Furans	As, Be, Cd, Cl, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Sb, V, Zn, NH ₃ , NO _x , SO _x
C	G75.22	105.09	Military installations, including explosives	BTEX, NMVOC, PAHs, PCBs, TPH	As, B, Cd, Cr, Cu, Hg, Ni, Pb, Zn, NH ₃ , NO _x , Asbestos
C	G18.1	105.05	Leather products	PAHs, Toluene, Methyl ethyl ketone, Acetone, Glycol ethers, Xylene, Methyl isobutyl ketone	Cd, Cr, Mn, (NH ₄) ₂ SO ₄ , NH ₃

<i>GSD-Rating</i>	<i>NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic compounds</i>	<i>Inorganics</i>
C	G18.2	105.04	Wearing apparel	1,1,1-Trichloroethane, Methyl ethyl ketone, Toluene, Dichloromethane, Acetone, Xylene, Tetrachloroethylene	As, B, Cr, Cu, Mn, Sb, Zn, H ₂ SO ₄ , Cl
C	G19.3	105.05	Footwear	PAHs, Toluene, Methyl ethyl ketone, Acetone, Glycol ethers, Xylene, Methyl isobutyl ketone	Cd, Cr, Mn, (NH ₄) ₂ SO ₄ , NH ₃
C	G26.21	104.11	Pottery/ Ceramics	BTEX, HFCs, PAHs, PCBs, TPH, Aliphatic hydrocarbons, Dioxins, Furans	As, B, Cd, Cl, Co, Cr, Cu, F, Hg, Ni, Pb, Se, Ti, Tl, Zn, NH ₃ , NO _x , SO _x , and inorganic compounds

<i>GSD-Rating</i>	<i>NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic compounds</i>	<i>Inorganics</i>
C	G26.1	104.11	Glass	BTEX, HFCs, PAHs, TPH, VHH, Aliphatic hydrocarbons, Dioxins, Furans	As, B, Cd, Cl, Co, Cr, Cu, F, Hg, Ni, Pb, Sb, Se, Ti, Tl, Zn, NH ₃ , NO _x , SO _x , and inorganic compounds
C	G31.4	-	Battery	PCBs	Be, Cd, Hg, Mn, Ni, Pb, Se, Zn
C	G62	-	Airport	BTEX, PCBs, TPH, VHH	As, Cd, Hg, Pb
C	G35	-	Dockyards (including shipbuilding)	BTEX, PAHs, PCBs, TPH, VHH, Biocides, Pesticides, Phenols, Chlorophenols, Aliphatic hydrocarbons, Organotin compounds	As, Cd, Cr, Cu, Hg, Ni, Pb, Sn, Zn and inorganic compounds

<i>GSD-Rating</i>	<i>NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic compounds</i>	<i>Inorganics</i>
C	G35.1	-	Shipbuilding	BTEX, PAHs, PCBs, TPH, VHH, Biocides, Pesticides, Phenols, Chlorophenols, Aliphatic hydrocarbons, Organotin compounds	As, Cd, Cr, Cu, Hg, Ni, Pb, Sn, Zn and inorganic compounds
D	G15	105.03	Food (including all types of food manufacturing, e.g., dairy products, canned fruit, juice & vegetable)	Acetaldehyde, Acetone, Ethylene glycol, Methanol, Pesticides, HFCs, CH ₄	Cd, Hg, P, NH ₃ , (NH ₄) ₂ SO ₄ (solution), H ₃ PO ₄ , H ₂ SO ₄ , HNO ₃ , Cl, NO _x

GSD-Rating	NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic compounds	Inorganics
D	G15.1	105.03	<i>Food: Animal products processing</i>	<i>BTEX, HFCs, PAHs, VHH, Pesticides, Phenols</i>	<i>As, Cd, Cr, NH₃, NO_x</i>
D	G15.11 1	105.03	<i>Food: Slaughterhouses</i>	<i>BTEX, HFCs, PAHs, VHH, Pesticides, Phenols</i>	<i>As, Cd, Cr, NH₃, NO_x</i>
D	G15.4	105.03	<i>Food: Olive oil mill</i>	<i>Pectins, Tannins, Phenols and Organic acids</i>	<i>Cu, Fe, Mn, S, P, Chlorine & N compounds</i>
D	G15.71	105.03	Animal feedstuff for farm animals	BTEX, PAHs, VHH, Pesticides, Phenols	As, Cd, Cr, P
D	G15.72	105.03	Animal feedstuff for house pets	BTEX, PAHs, VHH, Pesticides, Phenols	As, Cd, Cr, P

<i>GSD-Rating</i>	<i>NACE-Code</i>	<i>NOSE-P code</i>	<i>Activity: Industry, Enterprise</i>	<i>Organic compounds</i>	<i>Inorganics</i>
D	G50.2	-	Automobile repair	BTEX, MTBE, PAHs, TPH, VHH, aliphatic hydrocarbons, Chlorinated hydrocarbons, Organolead compounds	Cd, Cr, Cu, Hg, Ni, Pb, Zn
D	G74.814	-	Photographic processing	BTEX, VHH	As, Cd, Cr, Cu, Hg, Pb, Zn and inorganic compounds
D	G93.01	107.02	Dry cleaner & Laundry	BTEX, TPH, VHH, Aliphatic hydrocarbons	P
D	G15.9	105.03	Beverage industries	BTEX, PAHs, PCBs	Cu, Cr, Pb, Zn, SO _x , Nitrates, Phosphates

GSD-Rating	NACE-Code	NOSE-P code	Activity: Industry, Enterprise	Organic compounds	Inorganics
D	G15.93	105.03	Wine industries	BTEX, PAHs, PCBs	Cu, Cr, Pb, Zn, SO _x , Nitrates, Phosphates
D	G93.032	-	Cemeteries	Formaldehyde, various organic pollutants	As, Cu, Fe, Hg, Pb, Zn, Phosphates, NH ₃ , Nitrates

Abbreviations:

DCM: Dichloromethane

HCB: Hexachlorobenzene

HFCs: Total mass of hydrogen fluorocarbons, *i.e.*, sum of HFC23, HFC32, HFC41, HFC4310mee, HFC125, HFC134, HFC134a, HFC152a, HFC143, HFC143a, HFC227ea, HFC236fa, HFC245ca

MTBE: Methyl-Tertiary-Butyl Ether

NMVOC: Total mass of Volatile Organic Compounds

PAE: Phthalatic Acid Esters (phthalates)

PAHs: Polycyclic aromatic hydrocarbons

PCBs: PolyChlorinated Biphenyls

PCPs: 1-(1-Phencyclohexyl) piperidine

PCPs: 1-(1-Phencyclohexyl) piperidine

PER: Tetrachloroethylene

PFCs: Total mass of perfluorocarbons, *i.e.*, sum of CF₄, C₂F₆, C₃F₈, C₄F₁₀, c-C₄F₈, C₅F₁₂, C₆F₁₄

SF₆: Total mass of sulphur hexafluoride

TCE: Trichloroethane-1,1,1

TCM: Tetrachloromethane

TPH: Total Petroleum Hydrocarbons

TRI: Trichloroethylene

VHH: Volatile Halogenated Hydrocarbons (Trichloromethane, *etc.*)

Questionnaire form for the Inventory of Soil Contaminating Activities

One of the key aspects of the Inventory was the "*Questionnaire*" to be used, and whether it should be in line with the "*European Pollutant Emission Register*" (EPER), according to Article 15 of European Council Directive 96/61/EC concerning "*Integrated Pollution Prevention and Control*" (IPPC). This Register includes also soil, and in any case, emissions from polluting industries are removed from the atmosphere by precipitation and fallout, and finally settle on soil and surface water. Hence, the register does cover indirectly potential soil contamination.

Following consultations with the Cyprus Geological Survey Department a simplified two page Questionnaire form was agreed.



Questionnaire form for the Inventory of Soil Contaminating Activities

Cons Unit No:	INVENTORY RECORD SHEET
1. General information	
Activity No: <input style="width: 100px;" type="text"/>	
Industry name (Greek and English name)	
Greek:	<input style="width: 100%;" type="text"/>
English:	<input style="width: 100%;" type="text"/>
2. Address / City / Village where the company is situated	
Address:	<input style="width: 100%; height: 40px;" type="text"/>
City/Village:	<input style="width: 100%;" type="text"/>
Place name:	<input style="width: 100%;" type="text"/>
District:	<input style="width: 100%;" type="text"/>
Postal code number:	<input style="width: 100%;" type="text"/>
3. Communication:	
Name	<input style="width: 100%;" type="text"/>
Tel.	<input style="width: 50%;" type="text"/> Mobile: <input style="width: 50%;" type="text"/>
Fax	<input style="width: 100%;" type="text"/>
E-mail	<input style="width: 100%;" type="text"/>
Web page	<input style="width: 100%;" type="text" value="http://"/>
4. Start and closure date of economic/industrial activity	
Start:	<input style="width: 100px;" type="text"/> Closure: <input style="width: 100px;" type="text"/>
5. Geographical position	
Geographical coordinates in WGS 84 with a GPS of the central point of the activity in at least 3 decimal of degree minutes or in metres UTM*:	
Easting (X):	<input style="width: 100px;" type="text"/> Northing (Y): <input style="width: 100px;" type="text"/>
6. Main and secondary economic activity	
Category of the Geological Survey Department*	<input style="width: 100%;" type="text"/>
Rating*	<input style="width: 100%;" type="text"/>
Main economic activity (1)	<input style="width: 100%;" type="text"/>
NACE code (1)*	<input style="width: 100%;" type="text"/>
Secondary economic activity (2)	<input style="width: 100%;" type="text"/>
NACE code (2)*	<input style="width: 100%;" type="text"/>
NOSE-P code*	<input style="width: 100%;" type="text"/>

- CAS-RN of primary raw materials*		<input style="width: 100%;" type="text"/>
- Chemical composition of primary raw materials		<input style="width: 100%;" type="text"/>
- Product & output/year		<input style="width: 100%;" type="text"/>
8. Emissions & quantity per year		
- Chemical composition of emissions		<input style="width: 100%;" type="text"/>
9. Liquid wastes (volume or wt/year) & Sampling (Yes=1, No=0)		Sampling*: <input style="width: 50px;" type="text"/>
- Chemical composition of liquid wastes		<input style="width: 100%;" type="text"/>
- Temporary disposal of liquid wastes (site or manner)		<input style="width: 100%;" type="text"/>
- Permanent disposal of liquid wastes (site or manner)		<input style="width: 100%;" type="text"/>
10. Solid wastes (volume or weight/year) & Sampling (Yes=1, No=0)		Sampling*: <input style="width: 50px;" type="text"/>
- Chemical composition of solid wastes		<input style="width: 100%;" type="text"/>
- Temporary disposal of solid wastes (site or manner)		<input style="width: 100%;" type="text"/>
- Permanent disposal of solid wastes (site or manner)		<input style="width: 100%;" type="text"/>
11. Recycling (description)		
12. Additional information		
- Persons employed		<input style="width: 100%;" type="text"/>
- Process flow chart (Yes=1, No=0)		<input style="width: 100%;" type="text"/>
- Industrial site plan (Yes=1, No=0)		<input style="width: 100%;" type="text"/>
- Area of industrial site in hectares (1 hectare = 10,000 m ²)		<input style="width: 100%;" type="text"/>
- Percentage area of bare soil (%)		%
- Sampling and analysis of soil* (Yes=1, No=0)		Number of samples*: <input style="width: 50px;" type="text"/>
- Stack (Yes=1, No=0)		<input style="width: 100%;" type="text"/>
- Land use of neighbouring area (industrial, residential, recreational)		<input style="width: 100%;" type="text"/>
- Photographs* (Yes=1, No=0)		Reference number*: <input style="width: 100px;" type="text"/>
Comments & other information:		
<input style="width: 100%; height: 20px;" type="text"/>		
<input style="width: 100%; height: 20px;" type="text"/>		
<input style="width: 100%; height: 20px;" type="text"/>		
<input style="width: 100%; height: 20px;" type="text"/>		
<input style="width: 100%; height: 20px;" type="text"/>		



..... Questionnaire form for the Inventory of Soil Contaminating Activities

Cons_No	X_coordinate	Chem_liq_wastes	Stack
Activity_No	Y_coordinate	Temp_disp_liqwastes	Landuse
Industry_Name	GSD_category	Perm_displ_liqwastes	Site_photo
Postal_address	Rating	Solid_wastes_Vol	Activity_hyperlink
City_Village	NACE_1	Sampl_solwastes	Activity_id
Place_name	NACE_2	Chem_solwastes	Comments
District	NOSE_P	Temp_disp_solwastes	
Postal_Code	Prim_raw_material	Perm_disp_solwastes	
Contact_person	CAS_RN	Recycling	
Telephone	Chem_raw_mat	Employees	
Mobile	Products	Flow_chart	
Fax	Emissions	Site_plan	
Email	Chem_emissions	Site_area	
Website	Liquid_wastes	Bare_soil_cover (%)	
Start_date	Sampl_liq_wastes	Soil_samp_analysis	
Closure_date			



SOIL FIELD OBSERVATION SHEET

Soil Field Observation Sheet

SOIL ID: **Date:** **Sampler ID:**

SAMPLE SITE LOCATION

REGION: **MAP SHEET:**

COORDINATES (Decimal degrees mandatory):

Projection: Universal Transverse Mercator Zone: 36N (+30 to +36) Datum: WGS 1984

National grid: **X-coordinate:** **Y-coordinate:**

Decimal degrees: **Longitude:** **Latitude:**

SITE DESCRIPTION

Landscape/Topography: Altitude (m):

Land use:

- | | | | |
|---|---|---------------------------------------|-------------------------------------|
| <input type="checkbox"/> Agriculture, specify crop: | <input type="checkbox"/> Grassland | <input type="checkbox"/> Fallow field | <input type="checkbox"/> Mixed |
| <input type="checkbox"/> Pasture | <input type="checkbox"/> Deciduous | <input type="checkbox"/> Coniferous | <input type="checkbox"/> Industrial |
| <input type="checkbox"/> Forest | <input type="checkbox"/> Non-cultivated | <input type="checkbox"/> Urban | |
| <input type="checkbox"/> Wetland | | | |
| <input type="checkbox"/> Other (Specify): | | | |

Bedrock lithology: Outcrops: Yes, specify

Formation: No outcrops

Type of overburden:

NUMBER OF SUBSITES:

SOIL TYPE (FAO classification or local name):

Ploughing depth (cm):

Sampling interval (cm):

Depth of ground water table (cm):

ABUNDANCE OF SOIL CLASTS % (>2mm):

0: 0-2: 2-5: 5-15: 15-40: 40-80: >80:

TEXTURE:

Sandy: Sandy-loam: Loamy: Clayey-loam: Clayey: Clay:

SAMPLE HUMIDITY: Dry: Moist: Wet:

ORGANIC CONTENT: Low: Medium: High:

POSSIBLE SOURCES OF CONTAMINATION (specify):

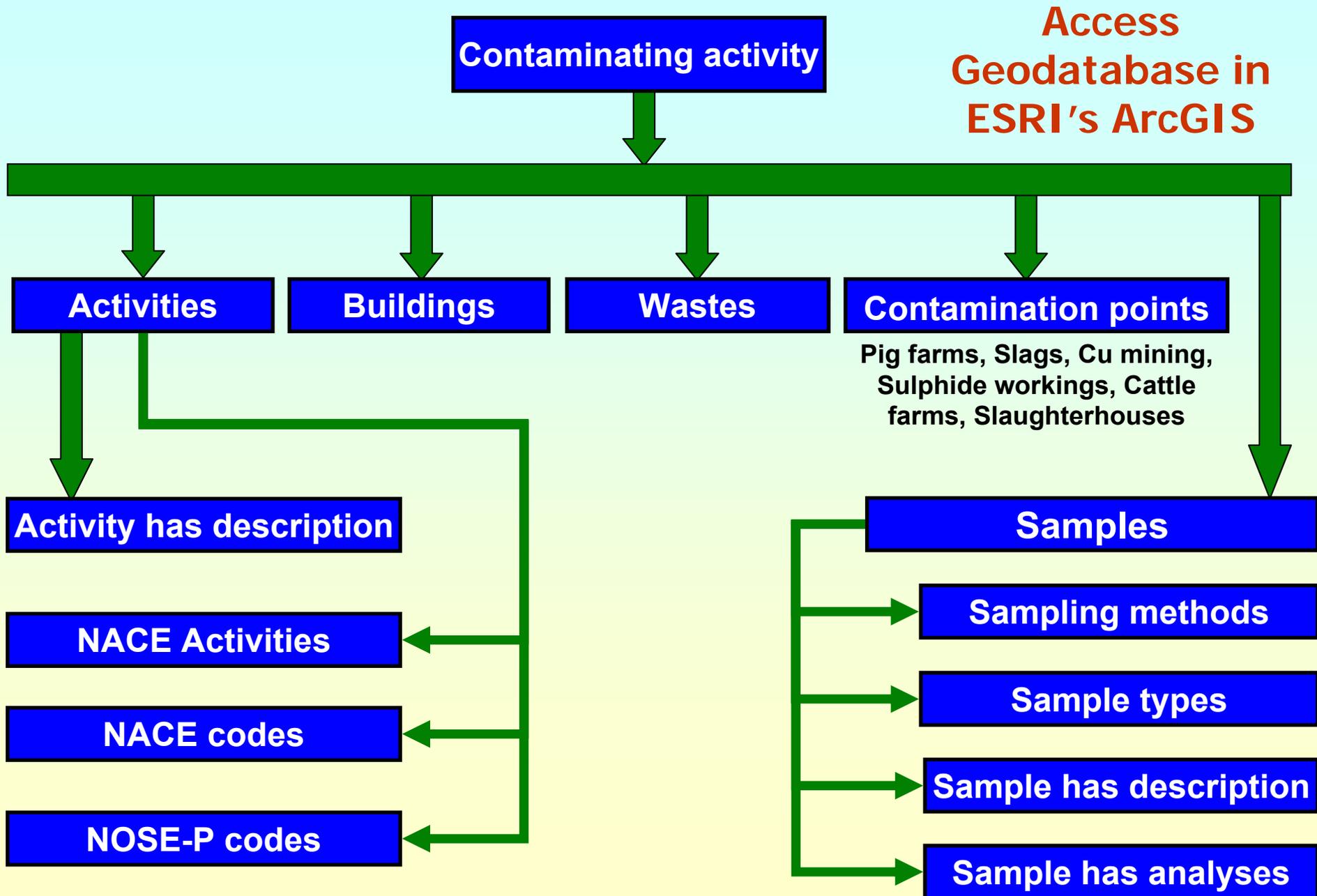
General photograph

Site photograph

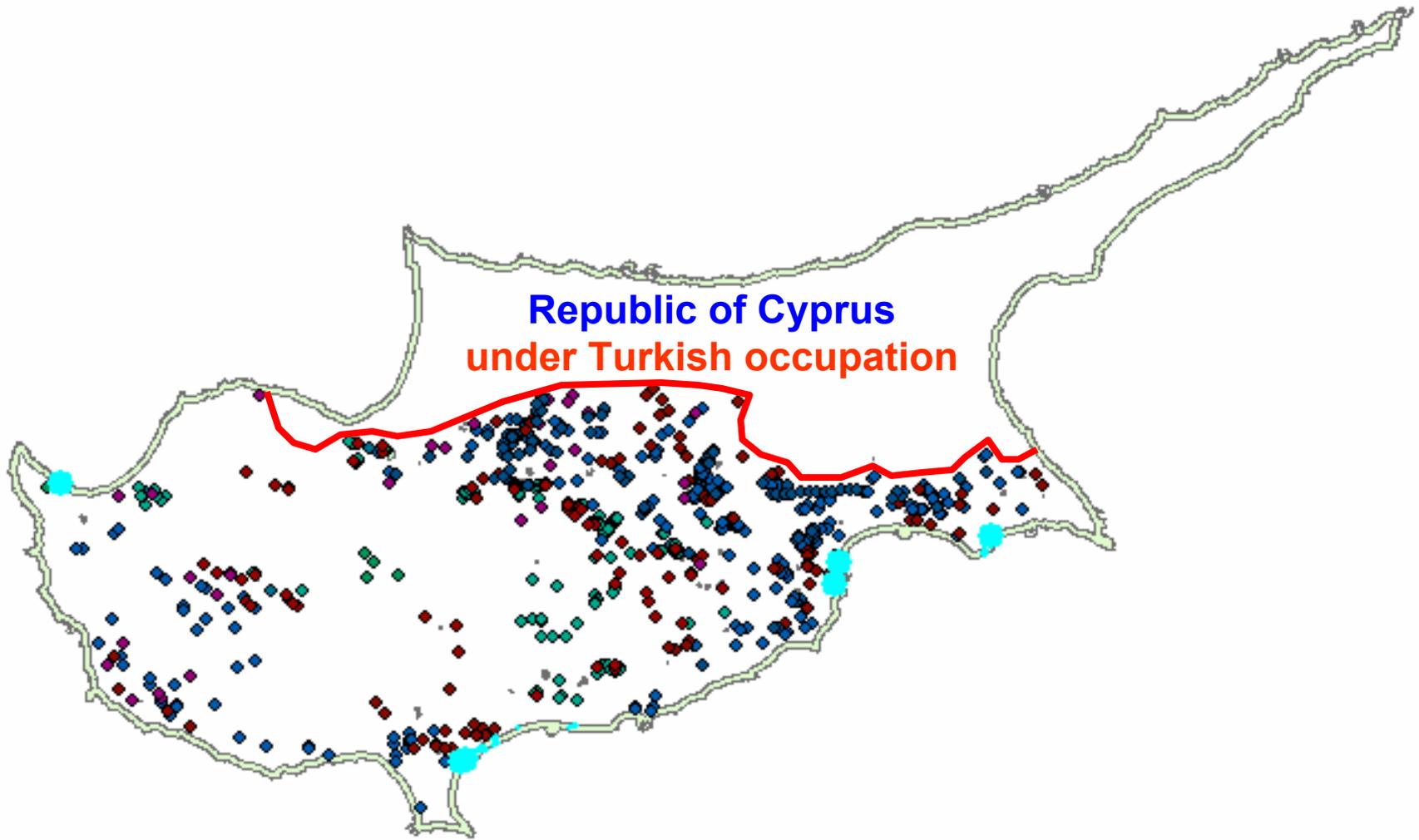




Model of a contaminating activity



Potential soil contaminating activities in Cyprus



Database Development

A very significant aspect of database development is the quality and integrity of data and information to be entered in the Inventory.

Since, the Inventory will become an important decision making tool, it must include high quality information and legally defensible chemical and geochemical analytical results.

Therefore, all information entered should be checked for its validity, and chemical analytical data for any sample type (soil, waste, *etc.*), submitted by companies should be accompanied by a validation certificate on the quality of the data.



..... Database Development

Geochemical data generated by the Cyprus Geological Survey Department should also be validated with quality control/quality assurance data.

Dubious information and chemical and geochemical analytical data, if stored in the Inventory, just for general information purposes, they should be **rated as of low quality** by storing a relevant document describing the data set (metadata).





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**NATIONAL INVENTORY OF POTENTIAL SOURCES OF
SOIL CONTAMINATION IN CYPRUS**

(Tender number 5/2004)

Alecos Demetriades, Nikos Androulakakis, Maria Kaminari, Katerina Vergou
Institute of Geology and Mineral Exploration, Athens, Hellas

Eleonora Wcislo, Marek Korcz, Jacek Dlugosz
Institute for Ecology of Industrial Areas, Katowice, Poland

Andreas Shiathas and Despo Papacharalambous
Geoinvest Ltd, Lefkosia, Kipros



Athena, December 2006



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PART 1

**REVIEW OF AVAILABLE INFORMATION WITH
COMMENTS AND RECOMMENDATIONS**

Alecos Demetriades, Maria Kaminari, Katerina Vergou,
Institute of Geology and Mineral Exploration, Athens, Hellas

Andreas Shiathas and Despo Papacharalambous
Geoinvest Ltd, Lefkosia, Kipros



Accompanied by CD-rom with report and
other useful information and
environmental software

Athena, November 2006



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PART 2

PERSONAL GEODATABASE OF POTENTIAL SOURCES OF SOIL CONTAMINATION IN CYPRUS

Nicos Androulakakis and Alecos Demetriades



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PART 3

A MANUAL FOR THE INVESTIGATION OF POTENTIALLY CONTAMINATED SOIL

EurGeol Alecos Demetriades

B.Sc.(Hons), M.Sc., F.G.S., F.A.A.G., M.I.M.M.M., C.Geol., C.Eng., C.Sci.
Geologist-Mining & Exploration Geologist-Applied Geochemist

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PART 4

QUALITY ASSURANCE AND QUALITY CONTROL, ESTIMATION OF MEASUREMENT UNCERTAINTY AND COMPILATION OF PROBABILITY RISK ASSESSMENT MAPS

EurGeol Alecos Demetriades
B.Sc.(Hons), M.Sc., F.G.S., F.A.A.G., M.I.M.M.M., C.Geol., C.Eng., C.Sci.
Geologist-Mining & Exploration Geologist-Applied Geochemist

Institute of Geology and Mineral Exploration, Athena, Hellas

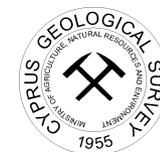


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NATIONAL INVENTORY OF POTENTIAL SOURCES OF SOIL CONTAMINATION IN CYPRUS

(Tender number 5/2004)

PART 5

GUIDANCE ON CONTAMINATED SITE RISK ASSESSMENT IN CYPRUS

1. SITE-SPECIFIC HUMAN HEALTH RISK ASSESSMENT (HRA)
2. RISK-BASED GUIDELINE VALUES FOR SOIL CONTAMINANTS (RBSGVs)

Eleonora Wcislo, Marek Korcz
Institute for Ecology of Industrial Areas, Katowice, Poland



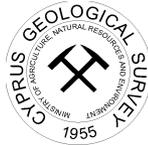
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**NATIONAL INVENTORY OF POTENTIAL SOURCES OF
 SOIL CONTAMINATION IN CYPRUS**

(Tender number 5/2004)

PART 6

**PRELIMINARY
 ENVIRONMENTAL GEOCHEMICAL RISK
 ASSESSMENT ON THE PREMISES OF THE
 HELLENIC CHEMICAL INDUSTRIES,
 VASSILIKO, CYPRUS**

Alecos Demetriades
Institute of Geology and Mineral Exploration

Antonis Charalambides
Cyprus Geological Survey



Accompanied by CD-rom with report and
 other useful information and
 environmental software

Athena, 2007

**NATIONAL INVENTORY OF POTENTIAL SOURCES OF
 SOIL CONTAMINATION IN CYPRUS**

(Tender number 5/2004)

PART 7

**HUMAN HEALTH RISK ASSESSMENT
 ON THE
 HELLENIC CHEMICAL INDUSTRIES LTD PROPERTY
 AT VASSILIKO, CYPRUS**

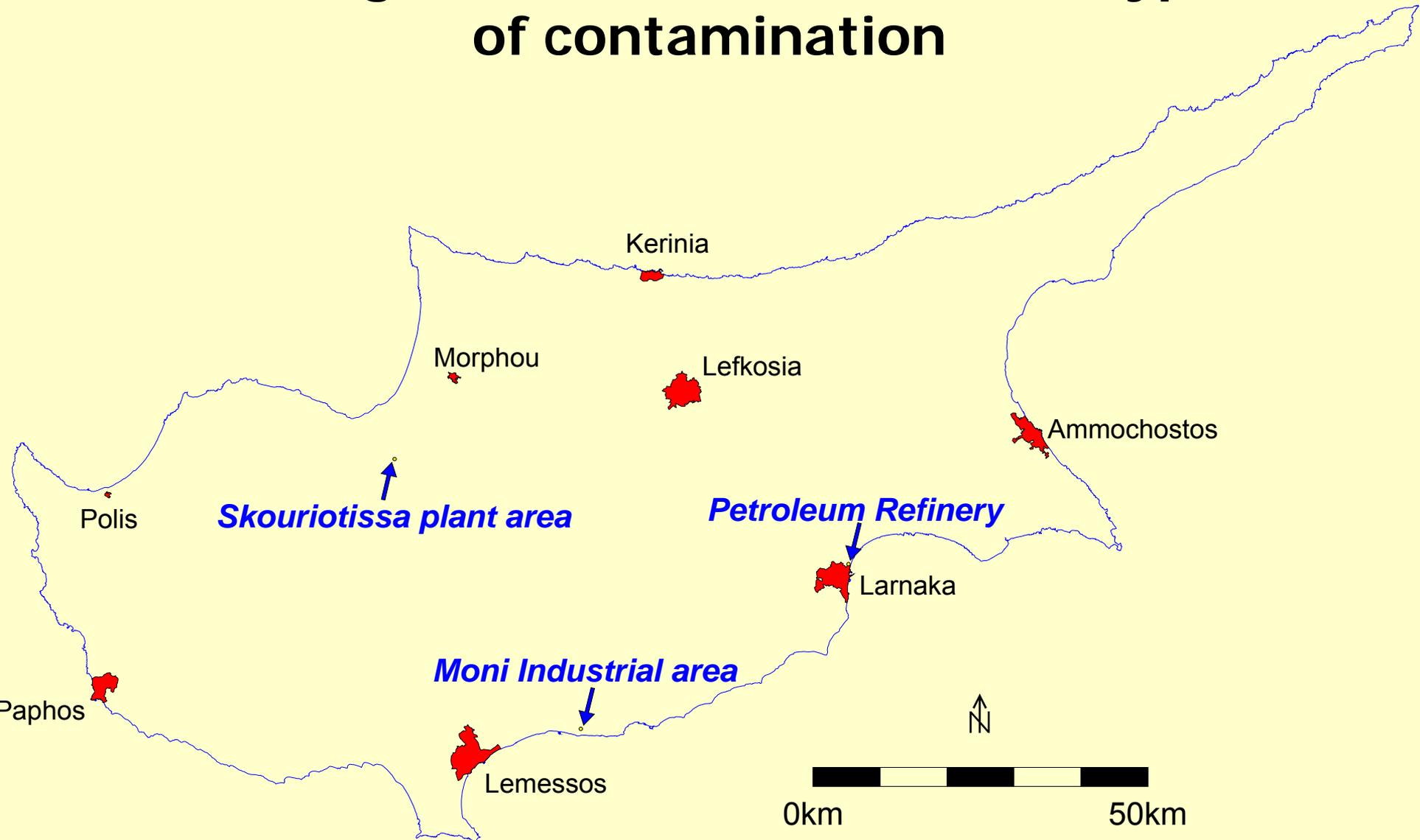
Eleonora Wcislo, Marek Korcz, Jacek Dlugosz
Institute for Ecology of Industrial Areas, Katowice, Poland



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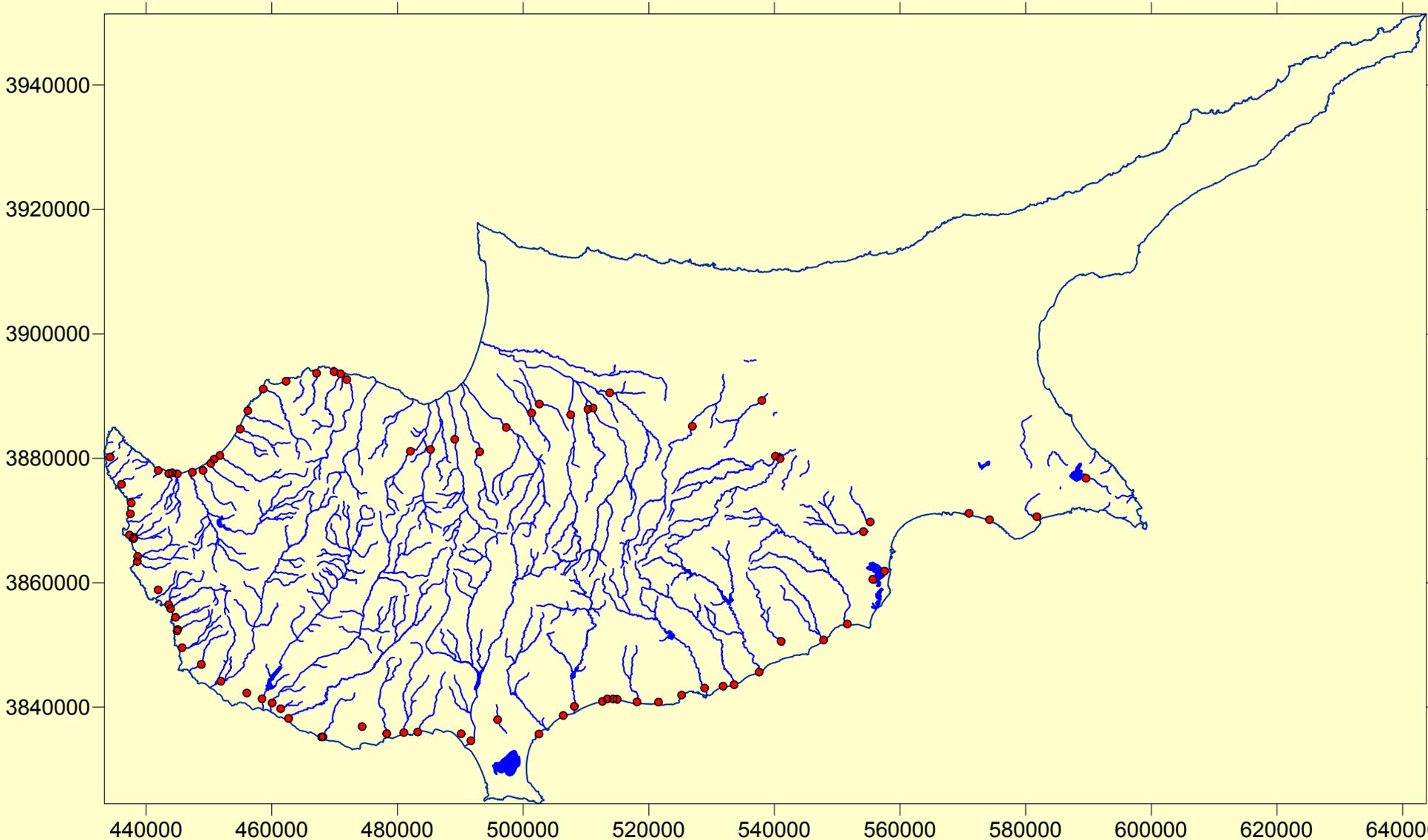
Investigated areas with different types of contamination





Geochemical baseline mapping

Floodplain sediment sampling





Thank you for your attention

