



COST

European Network on New Sensing Technologies for Air Pollution Control and Environmental Sustainability - *EuNetAir*

COST Action TD1105

Special Session: *Environmental Case Studies from Mediterranean, Central and Eastern Europe*

Air Quality in Ukraine: Measurement Methods and Applied Technologies

Duisburg, Germany, 4 - 6 March 2013

Action Start date: 01/07/2012 - Action End date: 30/06/2016

Year: 2012-2013 (*Starting Action*)



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Scientific context and objectives

Ukraine



S = 603 700 km²

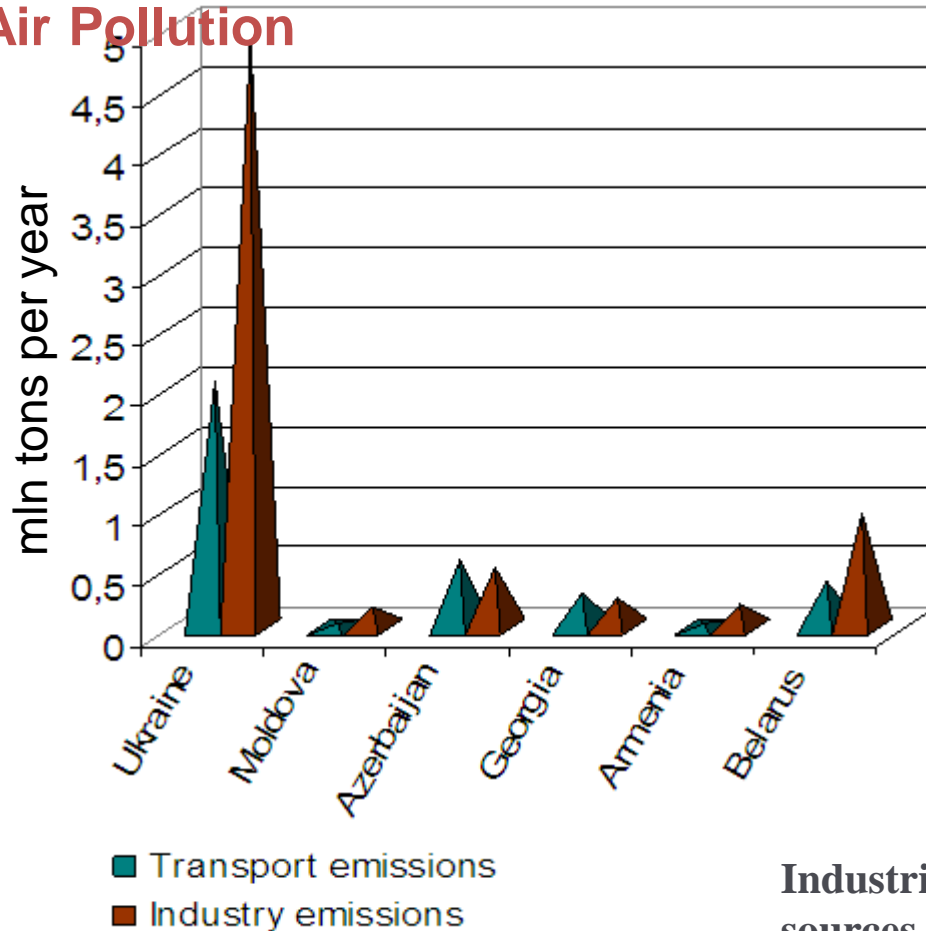
Population: 45,553,000 people

Regions: 24 + AR of Crimea,
2 municipalities – Kyiv, Sevastopol

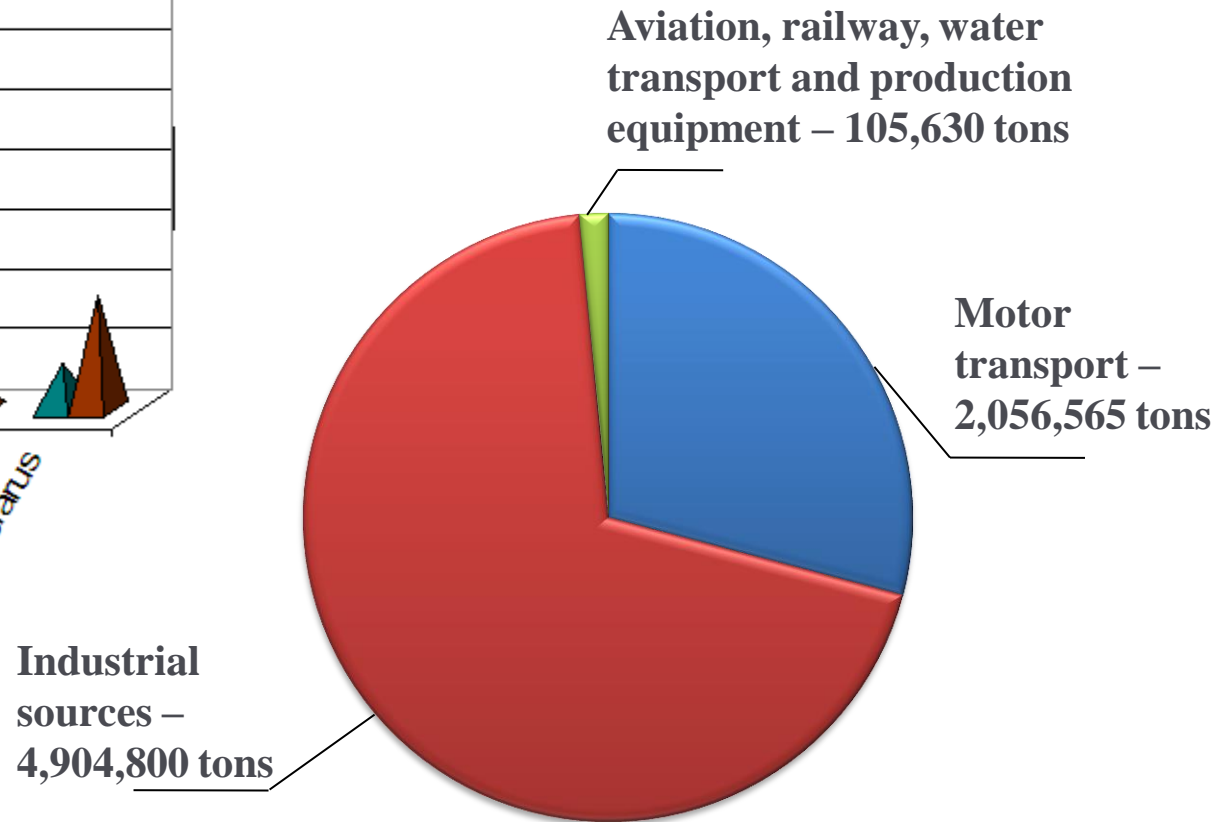
Number of cities: 1 341

Scientific context and objectives

Project ENVINT Expert Evaluation of Air Pollution

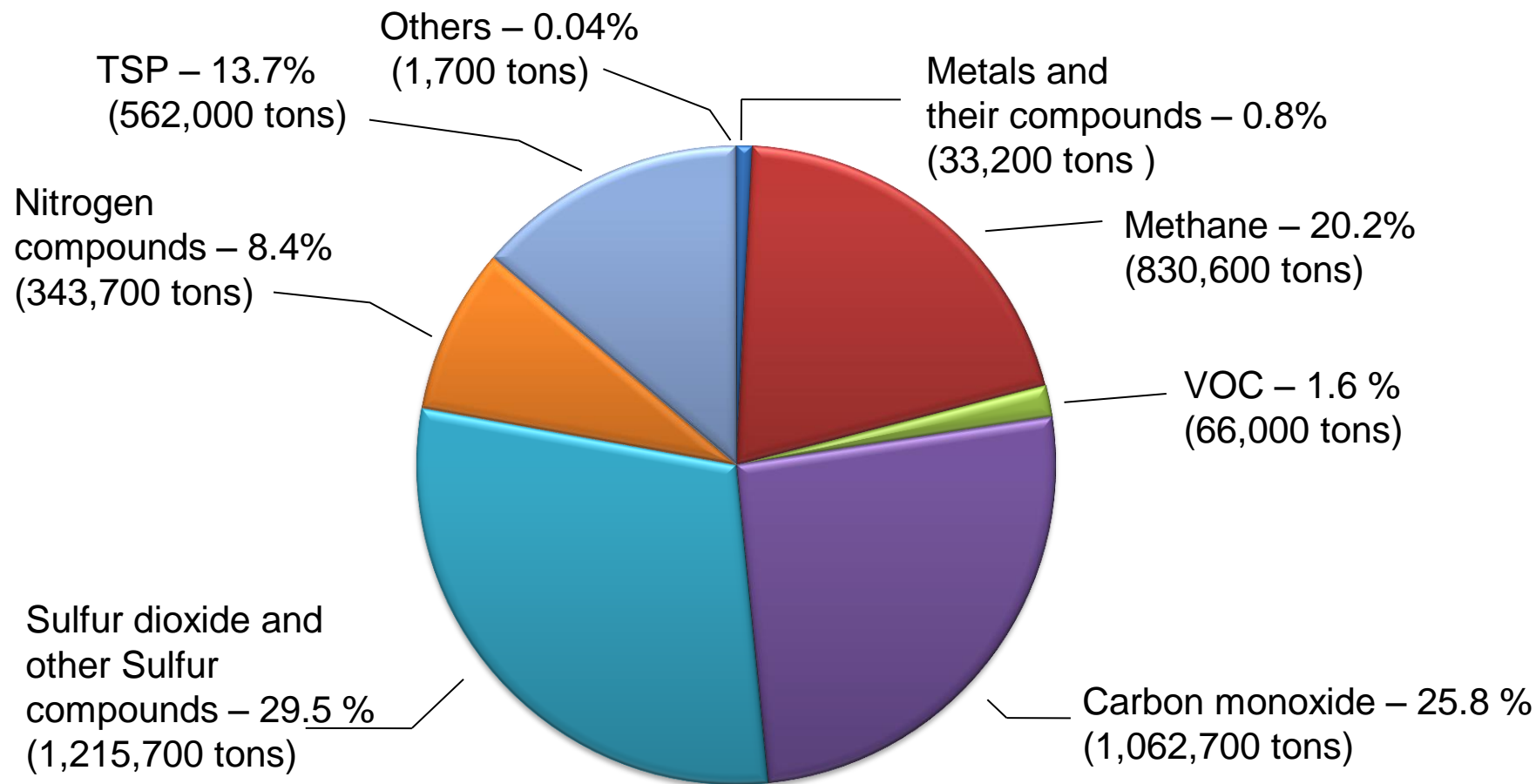


Emissions from industrial and mobile sources into the ambient air*



Scientific context and objectives

Emissions from industrial and mobile sources into the ambient air*



Scientific context and objectives

**Air quality monitoring by
Ukrainian Hydrometeorological Agency
(monitoring in ambient air)**



<http://cgo.kiev.ua/>

Stations of monitoring: 163 in 53 cities

Transfer stations: 2

Monitored pollutants – 31

Methods – routine data



Scientific context and objectives

**Sanitary and Epidemiologic Departments
(monitoring in ambient air in the settlement
zones and recreational areas)**



www.ses.gov.ua

Monitored substances:

- ✓ TOP pollutants
- ✓ Heavy metals in aerosols:
 - Cadmium
 - Manganese
 - Cuprum
 - Zink
 - Lead
 - Chromium
 - Iron



Scientific context and objectives

Current Challenges

- ❑ Difficulties in harmonization of regulatory documentation and methodical guidelines for the ambient air pollution assessment in accordance with EU:
 - different approaches to regulation and definition of the criteria of air pollutants assessment
 - no standardized methods for the determination of ambient air pollutants.
- ❑ Absence of PM₁₀ and PM_{2.5} monitoring:
 - no national regulations for PM₁₀ and PM_{2.5} assessment
 - lack of equipment for determining air pollutants concentrations at monitoring stations
- ❑ New equipment for monitoring and analysis of the air pollution is not used effectively due to:
 - insufficient specialized technical assistance and personnel;
 - necessity of techniques for calibration and standardization of equipment and its service maintenance



Scientific context and objectives

Current Challenges

- ❑ Absence of the unified land-use, meteorological data, emission inventories and population characteristics databases
- ❑ Lack of the qualified personnel for conducting exposure and health risk studies
- ❑ Lack of cooperation between Ukrainian Hydrometeorological, Ecological and Sanitary Epidemiological Agencies
- ❑ No single approach to health impact and human health risk assessment

Current activities

Air Pollution and Risk Assessment Laboratory

- Development of regulatory documents, standards, measurement methods
- Hygienic assessment of chemical air pollution
- Detection of toxic air pollutants in indoor environment
- Human health risk assessment studies in terms of air pollution
- Development of emission inventories and permits for enterprises
- Development and practical application of information technologies into practical hygiene and medical ecology
- Working out recommendations and preventive risk reduction programs for the local authorities
- Monitoring of outdoor aerobiological pollution

Current activities

Air Pollution and Risk Assessment Laboratory

Ongoing Research Projects

- Analysis of Disease Burden Determined by Increased Health Risk Levels from Exposure to Air Pollution in Ukraine (2012-2014)
- Scientific Principles of Assessment of Health Risks Resulting from Traffic-Related Air Pollution (2012-2014)

Available Facilities

Research Methods

- Analytical methods of chemical analysis for toxicity assessments of polluting substances
- Instrumental methods of chemical analysis
- Human health risk assessment methodological instruments
- Mathematical methods for exposure and risk assessments (air pollution dispersion models (ISC-Aermod View, CALRoads View, land-use regression models)
- Cartographic methods for visualization and analysis of spatial, air pollution, exposure and population data for the purposes of human health studies (GIS tools)
- Methods of statistical analysis for improvement of exposure assessment methods (statistical packages)

Available Facilities

Gas Analyzers



Available Facilities

Gas Chromatographs



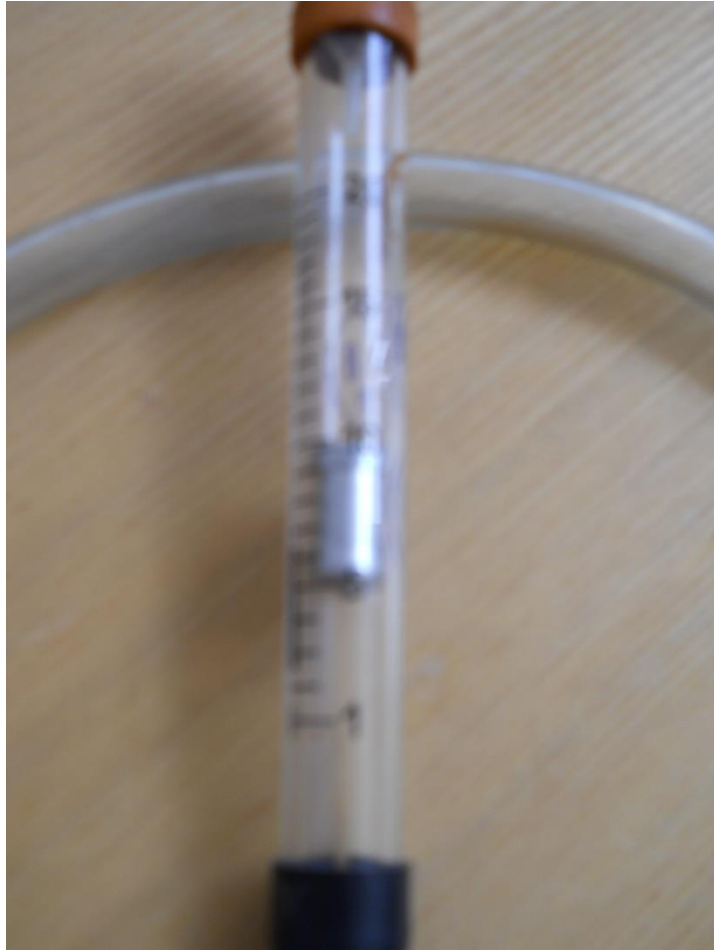
Available Facilities

Mobile Laboratory



Available Facilities

Burkard Pollen Trap



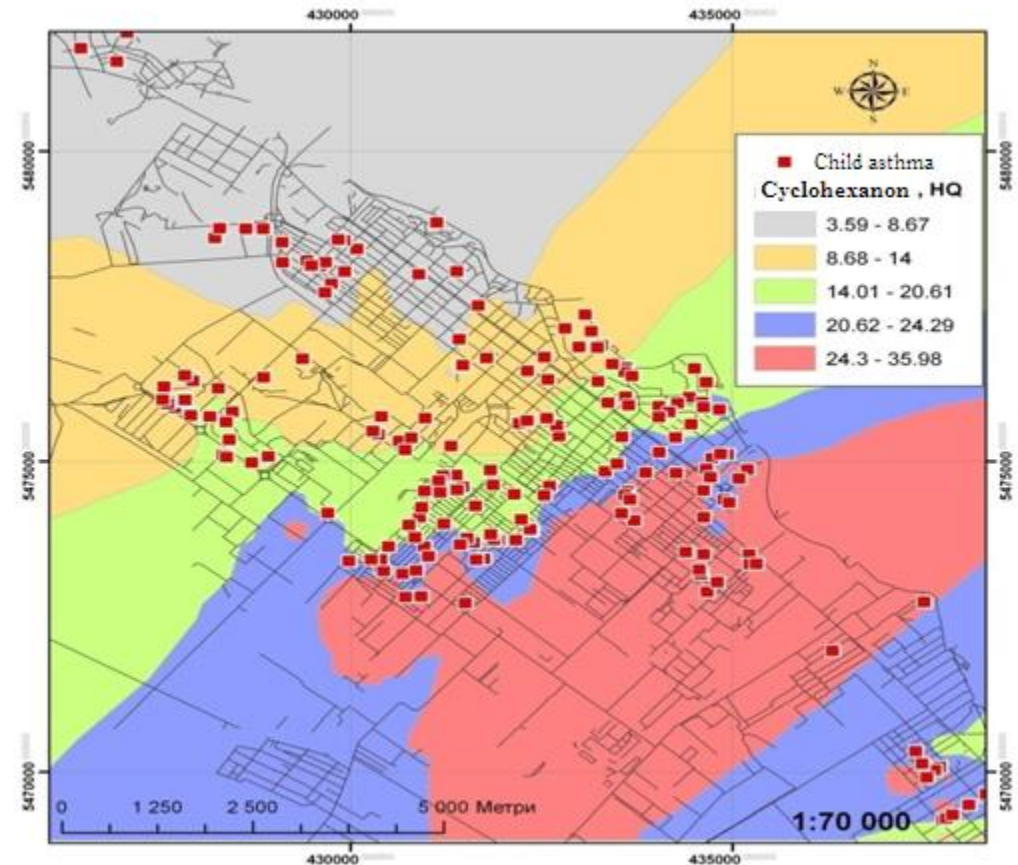
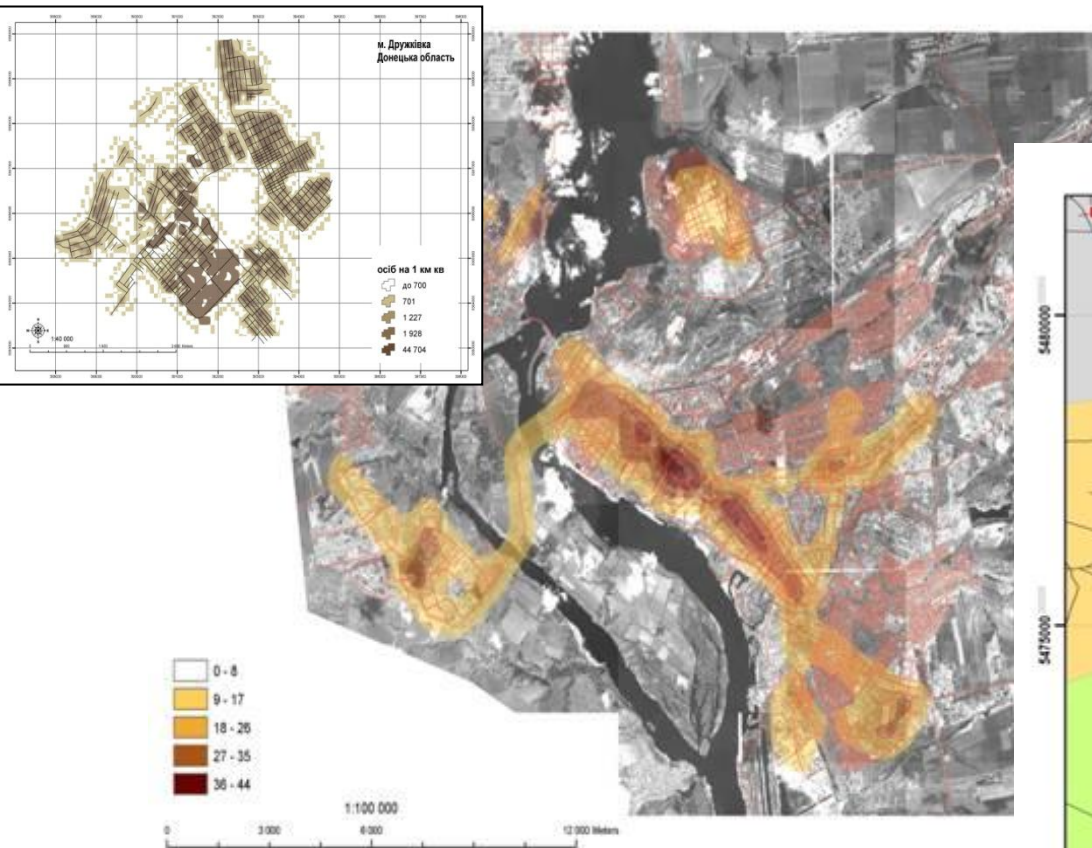
Results Achieved

Human Health Risk Assessment Studies

- Human health risk assessment projects reflecting the hazardous impact of industrial air pollutants on human health were conducted in 16 cities (3 international collaborative projects)
- Priority pollutants were identified for every studied location
- Health risk levels and additional mortality cases were estimated for the population of the studied cities
- Traffic-related air pollution studies were conducted in 2 cities
- Environmental interventions aimed at reduction of risk levels along with health preventive programs were developed

Results Achieved

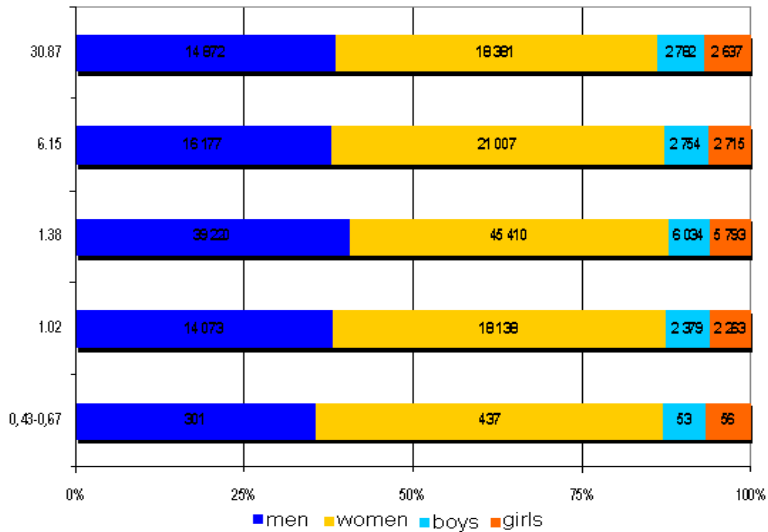
Identification of Receptor Points



Results Achieved

Identification of Risk Zones Formed by Industrial Air Pollution

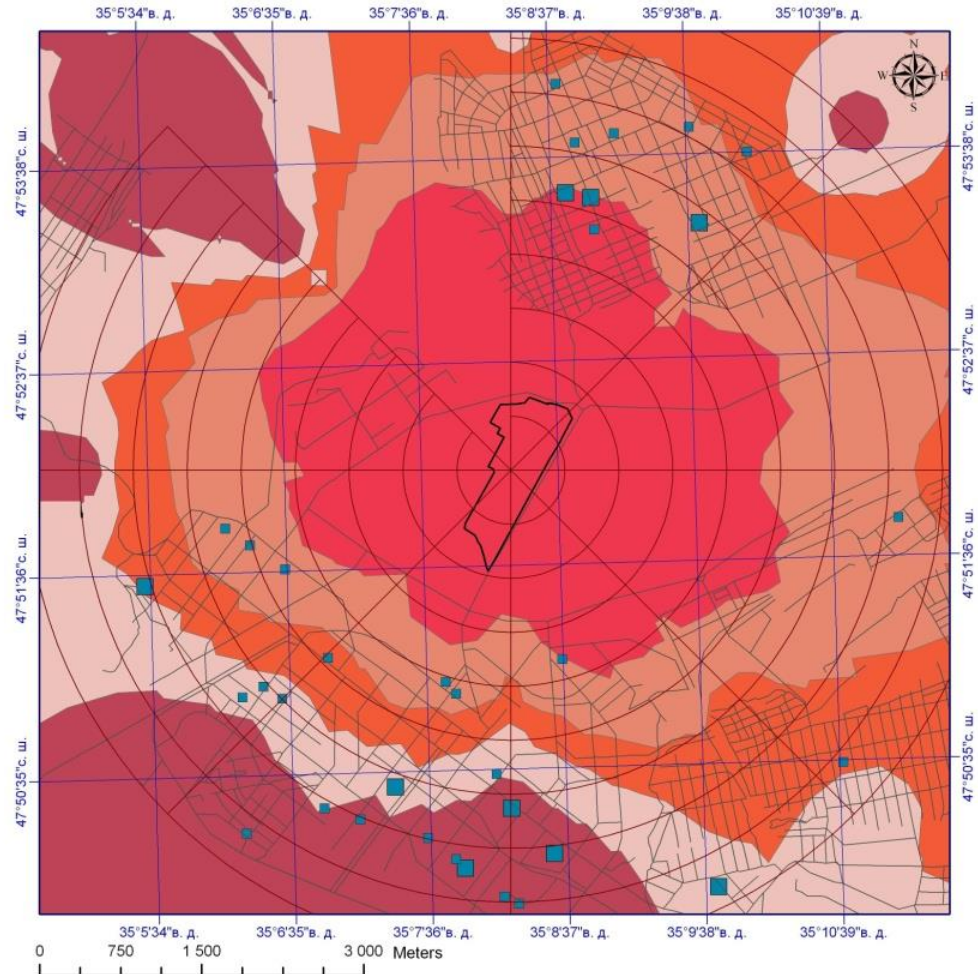
Number of people exposed to NO₂



Legend

- Plant boundary
- kindergartens (number of children)
 - 20 - 154
 - 155 - 290
 - 291 - 690
- Risk zones
 - 1 - 14
 - 15 - 17
 - 18 - 21
 - 22 - 30
 - 31 - 138

1:45 000



Results Achieved

Indoor Air Pollution Research

- Methodological basis of quantitative and qualitative criteria for assessment of indoor air pollution were improved in terms of harmonization of the national regulations with EU
- Indoor air sampling procedure was improved taking into account features and peculiarities of the residential and office buildings in Ukraine
- Recommendations regarding indoor air sampling methods were developed
- The list of criteria indoor pollutants relevant for Ukraine was worked out

Results Achieved

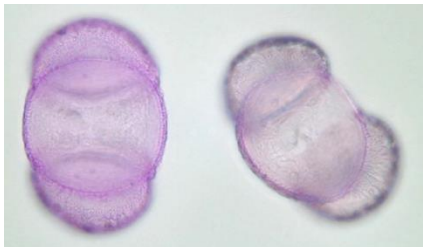
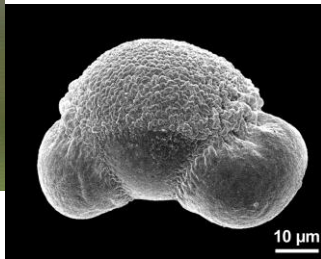
Pollen Monitoring Studies

✓ Collaboration with World Allergy Organization since 2006

- Pollen monitoring in 3 cities of Ukraine
- Development of the database of the micro objects of biological contamination



Foto: Ame Anderberg



Future Planned Activities

- ❑ Estimation of the burden of disease attributed to air pollution in Ukraine (project on Analysis of Disease Burden Determined by Increased Health Risk Levels from Exposure to Air Pollution in Ukraine, duration 2012-2014)
- ❑ Improvement of exposure assessment methods in traffic-related air pollution health studies (project on Scientific Principles of Assessment of Health Risks Resulting from Traffic-Related Air Pollution, duration 2012-2014)
- ❑ Indoor air quality and respiratory health studies in schools (international project on School Environment and Respiratory Health of Children – SEARCH II)
- ❑ Development of the national guidelines for particular matter
- ❑ Harmonization of Ukrainian regulations on particular matter with EU
- ❑ Improvement of the methods of assessment of indoor and outdoor PM pollution
- ❑ Improvement of the air quality monitoring network through revision of the location of monitoring stations and advance in technical and methodological support

Conclusions

Main Achievements

- Methodological basis of probabilistic assessment of the impact of chemical and biological air pollutants were improved;
- Human Health Risk Assessment Methodology (U.S. EPA) was adapted for application in health studies in Ukraine;
- Exposure assessment methods in terms of different time periods were improved;
- Methodological framework of ambient and indoor air quality studies was harmonized with EU legislation;
- Pollen monitoring network was established;
- Risk assessment procedure was implemented into environmental management system at local scale;
- Health risk management algorithm was worked out for development of environmental and health interventions;
- 10 methodological and normative documents were worked out.

Conclusions

Open Problems

- Reorganization of the Sanitary and Epidemiological Agency of Ukraine
- Inefficient air quality monitoring network
- Absence of PM₁₀/PM_{2.5} monitoring
- Lack of specialized technical assistance and qualified personnel
- Necessity of techniques for calibration and standardization procedures and equipment service maintenance
- No free access to the software for Human Health Risk Assessment studies
- Poor reporting of results in international publications

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