



NATIONAL RESEARCH AND DEVELOPMENT INSTITUTE
FOR INDUSTRIAL ECOLOGY

ECOIND

EXCELLENCE IN RESEARCH AND ENVIRONMENTAL SERVICES



EXPERTISE CATALOG 2023

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INCD ECOIND - the only institute at the national level with a global approach to environmental issues and industrial ecology, the main action directions being a cycle of research, development, technical assistance and consulting activities.

The activity profile of the institute, permanently adapted to the internal and external environmental market requirements, includes advanced and applied research, mainly experimental, intended especially for the control, evaluation, prevention, reduction and combating of industrial pollution. INCD ECOIND currently carries out:

- basic fundamental research activities aimed at increasing the level of knowledge in environmental chemistry and biology, biodiversity conservation and sustainable development;
- applied research activities of a pre-competitive type in the field of identification, quantification and evaluation of pollution, as well as the prevention and combating of pollution, especially that generated by industrial activities and other branches of the national economy.

Currently, INCD ECOIND operates under the coordination of the Ministry of Research, Innovation and Digitalization.

The activity is carried out in accordance with the Integrated Management System for Quality-Environment, Health and Safety at Work, and Innovation Management, according to SR EN ISO 9001:2015, SR EN ISO 14001:2015, SR ISO 45001:2018, SR 13572:2016 and QSCert certificates.

The laboratories are RENAR accredited on various environmental matrices (over 120 accredited tests) according to the SR EN ISO/IEC 17025:2018 reference requirements.

INCD ECOIND is certified for drinking water quality control monitoring (Ministry of Health, Health Strategies and Policies Directorate), for the preparation of studies and environmental documentation (Romanian Environmental Association 1998) and documentations for obtaining water management approvals and authorizations (Ministry of Environment, Waters and Forests).

POLLUTION CONTROL DEPARTMENT

02

The department is involved in applied research activities and services in the field of environmental quality control and monitoring, respectively of the environmental components water, air, soil, sediments and waste.

The activity carried out within the department aims at the following directions:

- research activities and monitoring of environmental parameters to solve specific problems arising in the technological processes carried out by economic agents;
- the development and implementation of new effective methods/methodologies for evaluating the quality of the environment, reducing the level of pollution in order to improve the health of the population;
- assessment of the quality of the environmental components water, air, soil within research projects with national / international funding or through documentation requested from economic agents by the environmental authorities.

WATER, SOIL, WASTE POLLUTION CONTROL
LABORATORY

AIR POLLUTION CONTROL LABORATORY

BIOTESTS-BIOLOGICAL ANALYSES LABORATORY

Main research directions:

- Development and validation of advanced methods using chromatographic techniques (HPLC-DAD, LC-MS/MS, GC-ECD/FID, GC-ECD/FPD, GC-MS/MS, GC-HRMS, HS-GC-MS/MS) for the detection of different classes of emerging contaminants: drugs (antibiotics, antipyretics, diuretics, antiseptics, analgesics, anti-inflammatory, cytostatics, estrogen hormones), pesticides (organochlorine compounds, organophosphorus, herbicides), endocrine disruptors (Bisphenol A and derivatives, organic UV filters, diastereoisomers of hexabromocyclododecane, perfluorinated derivatives), dioxins and furans and (bio)degradation products in environmental samples (surface water, wastewater, sewage sludge, soil) and biota;
- Quantification methods of some new chemical parameters, recently introduced in the Romanian and European legislation for the quality control of drinking water intended for human consumption (PFAS, haloacetic acids, microcystin)
- Bioaccumulation and biodegradation of emerging contaminants (xenobiotic substances included in the priority or substances list or in the watch lists related to EU directives) with potential endocrine disruptor and carcinogen from abiotic environmental factors in aquatic organisms and plants;
- Assessment of the level of contamination of aquatic and terrestrial ecosystems with drugs, pesticides, endocrine disruptors, metals and their degradation products;
- Assessment of metal content in surface waters (inland and coastal) and sediments using sensitive and specific spectrometric methods for detection at trace levels (ppb, ppt) using techniques: : ICP-OES-HG, ICP-EOS-USN, AFS, LC- ICP-MS;
- Assessment of contamination of surface water and wastewater with microplastics and pollutants adsorbed on them;
- Methodologies for predicting bioaccumulation of toxic metals from polluted soil to aromatic and medicinal plants using soil characterization data and mobile metal fraction.

Services in the field of environmental pollution assessment and control:

- Controlling the pollution of environmental components water, soil, sediments, sludge, waste by identifying pollutants, establishing sampling points/frequency, performing sampling and specific physical-chemical analyses;
- Monitoring the quality of environmental components water (drinking water, mineral, groundwater, surface, wastewater, for irrigation, for concrete, for swimming pools), soil, sludge, sediments according to the requirements imposed by the inforce legislation or by the local environmental authorities;
- Carrying out leaching tests for waste and characterizing the leachates, in order to establish the type of deposit where these wastes can be accepted for storage - according to Order. MMGA no. 95/2005;
- Analytical investigations to establish the contaminant removal rates of municipal wastewater treatment plants (influent/effluent, sludge, physical-chemical parameters);
- Consultancy for testing laboratories in order to obtain accreditation according to the requirements of the SR EN ISO/IEC 17025:2018 standard;
- Training of the personnel from the testing laboratories regarding the Quality Assurance and Quality Control (QA/QC), how to apply new analytical methods and techniques in current laboratory practice, as well as the requirements of the SR EN ISO/IEC 17025:2018 standard.

AIR POLLUTION CONTROL LABORATORY

Main research directions:

- The development/implementation/application of high-performance, high-sensitivity methods that allow the identification and quantification of small concentrations of metals present in micronized powders;
- Identification, development and validation of new methods for evaluating air quality from the point of view of odor emissions, especially emissions due to surface and volume diffuse sources;

- Evaluation of the level of chemical and noise pollution through direct measurements and/or mathematical modeling, as follows:
 - research on ambient air quality through mathematical modeling of the dispersion of pollutants in the air;
 - studies regarding the assessment of the level of noise pollution by developing sound wave dispersion maps;
 - research on the evaluation of the level of mechanical vibrations due to various activities adjacent to inhabited areas;
- Evaluation of the level of odor and olfactory discomfort due to technological processes generating compounds with unpleasant odors;
- Research on the quantification of airborne allergens (plant pollen), by applying biomarker techniques, with the aim of evaluating air quality and its influence on quality of life - aerobiological monitoring;
- Studies to verify the validity of the results of measurements of automatic analyzers by comparison with reference methods;
- Research on the use of waste (from the textile and leather industry) to obtain sound-absorbing composite materials.

Environmental services:

- Monitoring of air pollutant emissions generated by fixed sources (Order 462/1993; Law 278/2013);
- Assessment of the level of ambient air pollution through direct measurements or through mathematical modeling (Law 104/2011; STAS 12574-87);
- Determination of the industrial noise level (SR 10009:2017; SR ISO 1996-2:2018; SR 6161-1:2020; SR 6161-3:2020);
- Assessment of air quality inside buildings, including workplace (SR EN 15251:2008);
- Determination of odor intensity by dynamic olfactometry and the rate of odor emissions from stationary sources (SR EN 13725:2022);
- Pollutant dispersion studies in the air, including the evaluation of the odor level through mathematical modeling (Law 278/2013, BAT Conclusions);
- Monitoring of emissions from incinerators and other emission sources: flue gases (CO, SO₂, CO₂, NO_x, NO₂, O₂), dusts, individual organic compounds (benzene, toluene, xylenes, hexane, formaldehyde, methanol, etc.), VOCs in the form of total organic carbon, NH₃, HCl, H₂S, SO₄²⁻, HF/F⁻, polychlorinated dibenzidioxins (PCDD) and polychlorinated dibenzofurans (PCDF), O₃, HCl, etc.;
- Determination of the concentration of NO₂, SO₂, CO emitted from technological processes according to the requirements of BAT conclusions.

BIOTESTS-BIOLOGICAL ANALYSES LABORATORY

► Expanding and diversifying research in the field of priority and priority hazardous substances:

- assessment of biodegradability and analysis of recalcitrant metabolites and metabolic pathways involved in the biodegradation processes of substances and mixtures of hazardous chemicals as such and from environmental samples;
- analysis of bioaccumulation/bioconcentration mechanisms of hazardous/priority hazardous chemicals in aquatic organisms (fish and macrophytes) and terrestrial organisms (plants);
- evaluating the effects generated by chemicals/chemical mixtures on the environment and establishing the ecotoxicological characteristics to ensure their free and safe circulation on the community market;
- evaluating the effects generated by chemicals/chemical mixtures on the environment and establishing the ecotoxicological characteristics to ensure their free and safe circulation on the community market;

► Implementation of modern techniques of (immuno) histochemistry, biochemistry and molecular biology for:

- identification and characterization of molecular biomarkers induced, at the transcriptional and translational level, by climate change and anthropogenic activities;
- the generation of molecular models for predicting the impact of anthropogenic pollutants (physical-chemical and microbiological) on the environment, using biological models from bacteria to fish;

► Implementation of advanced microbiological techniques for:

- quantification and identification of microorganisms from different environmental matrices and characterization of their pathogenicity and virulence potential;
- determination and analysis of the antibiotic resistance profile of potentially pathogenic microorganisms, isolated from natural ecosystems;
- analysis of bacterial adaptation mechanisms to different environmental conditions of anthropogenic pollution and biocides;
- identification of potentially pathogenic bacterial populations through specific antigen-antibody-type interaction and highlighting techniques;

- ▶ Implementation of alternative methods of metagenomics and metabarcoding for the evaluation of the biological diversity of the environment.
- ▶ Assessment of the ecological state of aquatic systems according to the Water Framework Directive and International Conventions on the reconstruction and sustainable use of water resources based on biological quality elements (benthic invertebrates) using conventional methods of microscopic analysis.

Environmental services:

- Assessment of the level of pollution from a biological and microbiological point of view of environmental components: air, water, soil/sediment/sludge;
- Evaluation of microbial air pollution from various indoor and outdoor locations through air microbiota density control and surface and skin sanitation tests;
- Establishing the characteristics of acute lethal toxicity, biodegradability, bioaccumulation for the classification of the danger of priority dangerous substances / chemical preparations and the development of the safety data sheet, according to the European Regulations REACH and CLP;
- Characterization of the ecotoxicity of Romanian products (detergents, varnishes, paints) with a view to eco-labeling and ensuring their free circulation on the European market;
- Evaluation of the pollution level of surface waters (rivers and lakes) to quantify the pressure of human activities and establish the ecological state, according to the regulations in force; evaluation of the eutrophication degree of aquatic ecosystems based on the analysis of the concentration of chlorophyll "a";
- Studies and investigations regarding the efficiency of municipal wastewater treatment plants and effects generated by the effluents of the treatment plant on the receiving aquatic ecosystem;
- Technical assistance and specialized consultancy for: organization and equipment of biological/microbiological analysis laboratories; assimilation and application of biological/bacteriological analysis methods and ensuring repeatability and reproducibility of analysis results; documenting and implementing the quality management system according to ISO/CEI 17025:2018 in order to accredit environmental laboratories.

ASSESSMENT, MONITORING, ENVIRONMENTAL POLLUTION DEPARTMENT

03

Main research directions:

- Impact assessment of industrial and non-industrial anthropogenic activities on surface water, groundwater and soil quality;
- Development of integrated management methods/systems for the management of pollutant emissions and preservation of natural resources;
- Ecological risk assessment for economic activities with a significant impact upon the environment;
- Evaluation of soil and water environmental media in protected natural areas in order to establish reference geochemical thresholds;
- Evaluation of the environmental components quality in the vicinity of non-compliant household waste deposits (functional and closed) and highlighting the evolution on a spatial-temporal scale;
- Development of appropriate waste management systems and their hazard assessment;
- Development of new methods for characterization and analysis of complex matrices of waste and fuels;
- Development of new processes for the capitalization of some wastes by transforming them into secondary raw materials;
- Development of new procedures for recovery of some useful components from mixed waste;
- Development and validation of advanced methods for the quantification of rare metals in solid samples;
- Laboratory-level technologies aiming to reduce the content of pollutants in wastewater using new functionalized materials;
- Development of new methods for characterisation and analyse of alternative fuel matrices obtained from waste fractions with energy potential.

Assessment of environmental pollution - authorization documents for industrial activities - waste management:

- Environmental impact assessment studies for projects from various spheres of activity;
- Environmental assessment studies for authorization, termination of activity, privatization, establishing environmental obligations;
- Balances of organic solvents containing volatile organic compounds;
- Ecological risk assessment studies in the conditions of a significant impact on the environment;
- Environmental documentation for obtaining integrated environmental authorizations;
- Reports on the reference situation for sites that use, produce or emit hazardous substances relevant to the specific activities; Characterization of waste and related materials in order to establish the type of deposit where waste can be accepted for storage - according to Order MMGA no. 95/2005;
- Evaluation of the quality of waste in order to establish the hazardousness and assign a waste code - according to Directive 98/2008 amended by Directive no. 851/2018, Emergency Ordinance no. 92/2021 and Government Decision no. 856/2002; Characterization of biodegradable waste for composting - according to Law 181/2020;
- Analysis of hazardous waste for transport - according to Decision 1061/2008;
- Physical-chemical characterization of solid/liquid fuels and combustible waste;
- Granulometry determination of solid samples by sieving and sedimentation.

DEPARTMENT OF ENVIRONMENTAL TECHNOLOGIES & TECHNOLOGICAL TRANSFER

04

Main research directions:

- ▶ Experimental research focusing on introduction of modern procedures for the advanced removal of hazardous substances from waste water/natural sources;
- ▶ Development of innovative and sustainable treatment/purification technologies/biotechnologies for advanced removal of nutrients, emerging organic micro-pollutants and priority substances from water/wastewater with the following sub-directions:
 - reduction/removal of pollutants from water sources intended for human consumption;
 - experimental research for minimization and control of intermediate disinfection by-products formation in the drinking water supply network for surface/underground water sources; innovative technologies for advanced treatment of industrial and municipal wastewater with complex pollution matrices; technologies based on advanced oxidation processes for degradation of emergent organic pollutants from aqueous systems;
 - research on renewable hydrogen production resulting from the use of biomass resources generated by wastewater treatment processes;
 - operational research regarding the use of sequential batch bioreactors (SBR) with variable feeding regime adapted for wastewater with high organic loadings;

► Promotion of alternative technologies for upgrading / modernization of wastewater / water treatment plants:

- integration of biotechnological and photo induced processes in the treatment flow of drinking water for sources with complex pollution matrix;
- innovative purification systems based on technology with granular aerobic sludge and mixed granular sludge microalgae-bacteria;
- specialized and sustainable technologies for wastewater and sludge treatment, as well as development of technologies for exploitation of renewable resources generated within wastewater treatment processes;

► Eco-nano-technologies based on physical-chemical and biological processes for remediation of contaminated soils:

- treatment of organic waste (sludge from wastewater treatment plants, biodegradable fraction from municipal waste) for use as renewable energy resources and fertilizers / amendment for agricultural land;
- remediation of soils polluted with hazardous organic products and heavy metals, by applying alternative processes (eco-technologies);
- the use of microalgae in wastewater treatment systems - performance of the treatment process and possibilities of using / capitalization of biomass.

► Monitoring of physical-chemical and biological treatment processes through advanced scanning electron and correlative microscopy techniques;

► Ensuring advanced control of biological processes by monitoring microbial diversity and dynamics and evaluating activated sludge quality using molecular and enzymatic techniques;

Services in the field of environmental pollution control and assessment, environmental technologies:

- Development of combined procedures for removal of natural and anthropogenic pollutants in the drinking water obtaining processes using underground / surface water sources;
- Industrial research to identify/optimize high-performance technological solutions for waste water treatment/water treatment for human consumption, suitable for the specific pollution matrix;

- Development / assessment of technological solutions for the advanced use of sludge generated by wastewater treatment plants;
- Diagnostic analysis (direct control) for evaluating the efficiency of technologies applied for water treatment/purification;
- Study on alternatives for optimisation of wastewater treatment plants operation using combined practical and theoretical approach, modelling-simulation tools;
- Optimization /upgrade / completion of existing technological flows: modification of operational parameters for wastewater / water treatment plants, replacements / additions of treatment reagents (including testing of new products), recommendations for equipment replacement/upgrade;
- Elaboration of technical documentation for obtaining water management permits and authorizations;
- Cleaner Production assessment for various industrial installations and assistance for the implementation of clean technologies;
- Carrying out strategic audits and developing models for the implementation of the sustainable development strategy of enterprises;
- Experimental studies regarding the evaluation of the efficiency of various reagents / technologies for water treatment / wastewater treatment;
- Analytical investigations for the development / application of environmental technologies;
- Consultancy, technical assistance and provision of expertise in the field of environmental technologies;
- Applying the principles of eco-efficiency and industrial symbiosis in approaching the corporate development of industrial operators;
- Carrying out applied studies and researches in order to restructure, re-engineer, modernize enterprises, from the point of view of environmental protection, environmental costs and their sustainable development.

MANAGEMENT SYSTEMS DEPARTMENT

05

Quality and environmental management, occupational health and safety, innovation and internal managerial control system through:

- the implementation and certification of quality management systems, environmental systems, occupational health and safety, innovation, as well as the internal managerial control system;
- the development of procedures for keeping environmental aspects under control by documenting and implementing an integrated management system for quality, environment and work safety;
- development / optimization of methodologies for the design, documentation, implementation and evaluation of management systems in accordance with reference standards.

Occupational standards:

- the development of occupational standards in the field of quality and environmental management;
- developing courses, procedures and tools for the training and assessment of professional skills based on occupational standards.

Environmental services:

- Consultancy and technical assistance for the development and implementation of management systems in order to certify them in accordance with reference standards;
- Auditing management systems in order to establish their compliance with reference standards, environmental audit, environmental analyses, audit analyses;
- Elaboration of the Accidental Pollution Prevention and Combat Plan necessary to obtain the Evacuation Acceptance, staff training in the field of management systems based on course materials developed in the department;
- Personnel training in the field of environmental protection through training programs developed in accordance with the occupational standards authorized by the National Qualifications Authority;
- Evaluation of professional competences in the field of environmental protection in accordance with occupational standards.

TIMISOARA AND RÂMNICU VÂLCEA BRANCHES

06

The Timișoara branch carries out scientific research activities in environmental engineering regarding the control, assessment of pollution and environmental technologies, being a replica of the institute for the western part of the country and for specific collaborations with Hungary and Serbia.

Current research directions are:

► The development of new analytical control techniques/methods for assessing the level of water pollution:

- evaluation of conventional and non-conventional commercial electrode materials as a suitable substrate for subsequent modification to obtain electrochemical sensors with improved detection properties;
- obtaining voltammetric and amperometric electrochemical sensors with a significant contribution in the development of advanced analytical methods for screening and monitoring of pharmaceutical products in all water bodies and implicitly, in the management of water resources with a specific objective for emerging pollutants;
- testing the sensing capacity of some perovskite materials by modifying some carbon-based electrodes for the electrochemical detection of emerging pollutants from waste and surface waters;
- the use of biosensors (diatom species) in monitoring the toxic effects induced by different pollutants on water quality;
- research on the concentration level of heavy metals in animal biological tissue and the influence of thermal treatments;

► Applied research to develop and optimize technologies for advanced wastewater treatment and potable water sources:

- wastewater treatment through phytoremediation processes using aquatic plants;
- degradation/mineralization of some emerging pollutants (pharmaceutical products) from waters through advanced electrochemical processes;

- technologies for phytoremediation/phytostabilization of polluted land;
- integrated waste management in accordance with the principles of the circular economy;
- the use of sludge from urban sewage treatment plants in rehabilitating of polluted lands and sites.
- diagnostic analysis for the evaluation of the efficiency of the applied technologies for potable water sources;
- optimization/retrofitting/unitary and integrated technical solutions on existing technological flows in order to obtain drinking water.

The Râmnicu Vâlcea branch meets the requirements regarding controlling and assessing of environmental pollution for the Oltenia region. Current research and service directions are:

- methodologies for the integrated investigation of the environmental risk based on the pollution indices, as a decision basis for the measures necessary to remove/reduce it;
- assessment of the impact of pollution with hazardous/priority hazardous substances (organochlorine substances, petroleum, heavy metals) on soil/water/sediment ecosystems;
- the development of new electrochemical methods/methodologies for the rapid determination of the concentration of heavy metals in aqueous media;
- integrated water management at the level of urban agglomerations based on the sustainable water concept (SUWM);
- research on the utilization of sludge resulting from urban sewage treatment plants;
- experimental studies on the determination of the ecotoxicity of geothermal waters.

Environmental services performed by both branches:

- controlling the pollution of environmental components water, soil, sediments, sludge and waste by identifying pollutants, establishing sampling points/frequency, performing sampling and physical-chemical analyses specific to each environmental factor;
- analytical investigations to establish the efficiency of treatment plants - by determining the quality of the influent/effluent, as well as the sludge samples, at the physical-chemical parameters of interest for each treatment plant;
- elaboration of documentation / environmental assessments for obtaining authorizations, agreements, integrated environmental authorizations;
- technical assistance, consultancy, expertise in the field of environmental legislation and the fulfillment of environmental obligations.



The Technology Transfer Center CTT - ECOIND is established as a department within the National Research - Development Institute for Industrial Ecology - ECOIND. Since 2016, CTT-ECOIND is part of the National Innovation and Technology Transfer Network (ReNITT) and functions as an entity of the innovation and technological transfer infrastructure, accredited according to Accreditation Certificate no. 126/2021.

Areas of accreditation:

- Environment and climate change
- Biotechnologies
- Decontamination technologies

The activities they carry out mainly aim at: increasing the level of information of the business environment (SMEs), NGOs and public institutions regarding new technologies and services in the field of environmental protection, developing the stage of implementation of these technologies and services, increasing the competitive level of Romanian SMEs in the competitive context, increasing the volume of technological information exchanged between INCDS, the university environment and the economic environment.

www.cttecoind.ro



INTERNATIONAL SYMPOSIUM
„THE ENVIRONMENT AND THE INDUSTRY“

International Symposium "The Environment and The Industry", reached edition no. 26, presents the latest results in: pollution assessment and environmental management, pollution control and monitoring, sustainable environmental technologies.

Extended abstract volumes are indexed in CABI, Google Scholar, Scilit, Crossref, ROAR, Open DOAR (open access repository platforms).

www.simiecoind.ro

ECOLIB



Library of R&D Institute for Industrial Ecology

The ECOLIB institutional repository represents an important step for the implementation of the Open Science Policy in Romania, regarding the category of tools for open science and open access repositories (Open ScienceTool and OpenRepositories).

The topics of the articles, conference papers, book chapters, Ph.D. abstracts are included in scientific topics such as: ecology and pollution control, environmental assessment, environmental technologies, as well as environmental management.

The repository has been updated with the Dspace CRIS application which allows, in addition to the upload of the documents in different collections, the creation of research groups/ laboratories/ departments, and the creation of researchers' pages. This application offers the interconnection with the bibliometric platforms ORCID, Scopus (Author ID), Publons from Clarivate (Researcher ID), resulting in statistics data both for researchers and for laboratories/departments, respectively tracking citations from the international bibliometric databases (Scopus, Web of Science).

ECOLIB is indexed in ROAR and Open DOAR (open access international repository platforms).

www.dspace.incdecoind.ro



The Romanian Journal of Ecology & Environmental Chemistry was published first in 2019, being a semestrial journal. It aims to promote advanced and applied research, increase visibility at the international level, create multi-institutional research teams, ensure support, promote the works of young researchers, and maintain the prestige of senior researchers.

The journal encourages new ideas in fundamental and experimental research in chemistry, biology, and fulfills its mission by publishing scientific articles in the fields of sustainable environmental technologies with applicability in the economic environment, research regarding the evaluation of environmental pollution, and relevant results regarding the analytical techniques and methods used for pollution control and monitoring.

www.rjeec.ro



INFORMATION CONTACT



+4021.410.03.77; +4021.410.67.16



ECOIND@INCDECOIND.RO



WWW.INCDECOIND.RO