



Research centre
for toxic compounds
in the environment



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Research Centre for Toxic Compounds in the Environment

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2007-13
OP Research and
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Research Centre for Toxic Compounds in the Environment

The Research Centre for Toxic Compounds in the Environment (RECETOX) at the Faculty of Science, Masaryk University, was founded on 1st March, 2010, and is supported by the CETOCOEN Project (CZ.1.05/2.1.00/01.0001) of the Operational Program Research and Development for Innovations, priority axis 2 (Regional Research and Development Centres). It supercedes the Research Centre for Environmental Chemistry and Ecotoxicology, the original institution which had been active in the field for a quarter of a century. The CETOCOEN Project focuses on the issues of environmental pollution and its effects on quality of life and sustainable development. It is a highly innovative project with a particular focus on industrial and commercial applications. This report provides a review of the Centre's activities and successes achieved in 2010.

The centre's structure and management

The Centre is headed by the director, Professor Ivan Holoubek, Ph.D.; he is deputized by Associate Professor Luděk Bláha, Ph.D., who is responsible for the coordination of research activities. The education coordinator of the Centre is Jakub Hofman, Ph.D.

The executive director of the CETOCOEN Project is Associate Professor Jana Klánová, Ph.D., the technical director of operations is Radovan Kareš, M.Sc., and the financial and organizational director is Vojtěch Příbyla B.Sc. The realization of project operations is coordinated quarterly by the CETOCOEN Project Board.

The advisory board to the Centre's director is the RECETOX Centre Committee, composed of professors, associate professors and the leaders of the Centre's strategic projects. An Extended Committee, joined by representatives of the Faculty of Science and Masaryk University's management as well as important partners from the applications field sits twice a year. The Extended Committee approves the long-term research strategy and the detailed annual research plan of the Centre. It also monitors the quality of research activities and research practice in meeting research targets and outputs. In addition, the Extended Committee also guides the Centre's strategic direction and research priority focus, and also actively supports the Centre's cooperation with the applications field and commercial clients.

The Centre comprises research and education divisions, application laboratories and implementation centres developing cooperation with the applications field at both national and international levels.

Research infrastructure of the Centre

The building of the Research Centre for Toxic Compounds in the Environment was subsidised by OP RaDfI to the amount of nearly 544 million Czech Crowns. OP RaDfI investment funds of 423 million CZK have allowed the construction of a new pavilion for the Centre with an area of 3200 m² on the Masaryk University Campus at Bohunice. These investment funds will

also provide unique equipment and make it possible to create excellent conditions for young scientists. The total costs of the project will reach 685 million CZK.

The construction of the Centre's new pavilion began in the middle of 2010 and has been progressing successfully according to the approved schedule. The opening of the pavilion for fifty highly specialized researchers and as many post-graduate students is planned for March 2012.



The Centre, in its current premises, already allows part of its unique infrastructure to be used by other Czech and foreign research teams. Therefore, the RECETOX Centre was added to the Roadmap of Large Research, Development and Innovation Infrastructures in the Czech Republic (see <http://www.msmt.cz/file/12262>).

Human resources advancement at the Centre

Along with the development of the research infrastructure, human resources have also been advancing. In 2010, five research leaders and fifteen experienced researchers worked on five research programmes. Beside Czech researchers, the team included one German, one Slovak and a Czech after her long-term work placement in the US. The research programmes were joined by eighteen professors, associate professors, assistant professors and senior scientists, eight junior scientists, twenty-four doctoral students and eight technical assistants.

An eight-member-team of managers sees to the realization and other operational tasks of the CETOCOEN Project. A complete list of team members and Ph.D. students is attached below.



Research Projects

Research activities of the Centre have been developing on a long-term basis in five general research programmes defined in the CETOCOEN Project as follows:

- Instruments for monitoring the distribution of chemicals in the environment ([Jana Klánová, Ph.D.](#))
- Processes affecting the fate of chemicals in the environment ([Professor Petr Klán, Ph.D.](#))

- The development of biosensors and natural biocatalysts (Jiří Damborský, Ph.D.)
- Toxic effects of chemicals and natural toxins on living organisms (Luděk Bláha, Ph.D.)
- Environmental risks, models and information systems (Ladislav Dušek, Ph.D.)

The Centre's researchers contribute to progress in these key fields in several national and international projects.

Framework Projects of the European Union (EU FP7)

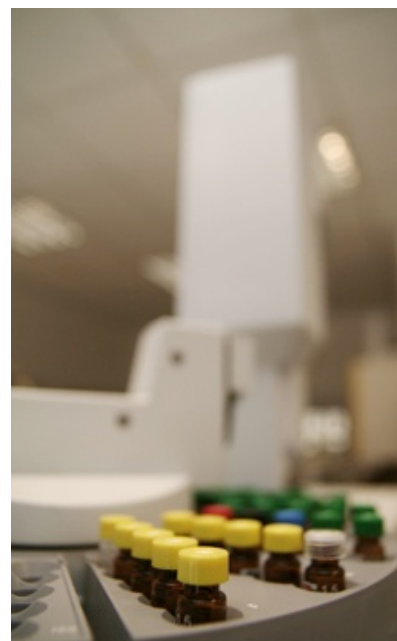
The isoSoil Project deals with the development of analyses of specific contaminant isotopes as an exact instrument for the characterization and monitoring of remediated sites, as well as for the determination of soil pollution sources.

The ArcRisk Project studies the health risk effects related to changes in pollutant cycling due to climate change in the Arctic and Europe. This project investigates the impacts of the long-range transport and specific fate of contaminants in the arctic regions as well as the accumulation of the pollutants in food chains leading to chronic effects on the human population.

The AQUOREHAB Project focuses on the development of innovative rehabilitation technologies for ground and surface waters. The project also assesses the decrease in the loads and risks of priority pollutants (nutrients, pesticides, chlorinated and aromatic substances) in waters after the newly developed technologies have been applied.

The EURORECETOX Project surveys the use of alternative ecotoxicity tests, their development and the scope of their application in Europe.

The enhancement of border cooperation between the Czech Republic and Austria in the field of ambient air pollution by POPs in the border regions is supported by the MonAirNet Project.



Projects of the Ministry of Education, Youth and Sports of the Czech Republic

The coordination of the INCHEMBIOL Research Plan is the most important of the national projects. Its main theme is the complex and multilevel (local, regional, global) approach to studying relationships between chemicals present in particular environmental compartments and their effects on the environment and living organisms including humans.

The Centre also participates in the National Research Program II of the ENVISCREEN project, which is focused on molecular-biological and biochemical methods for the monitoring of estrogens and other endocrine disrupting chemicals in the environment.

Several projects conducted at the Centre are financed by the Higher Education Development Fund. These projects aim at developing modern approaches to assessing persistent organic pollutants' sorption into soil. They will also lead to improvements in educational courses such as "Mathematical Analysis" and help in the development of a new course, "The Analysis of genomic and proteomic data".

Projects financed by the Czech Science Foundation

In 2010, nine projects financed by the Czech Science Foundation were conducted at the Centre. These projects deal with a wide range of issues: the interaction of humid substances and UV-Vis radiation with dioxin-like environmental pollutants; tumor promotion mechanisms of toxic cyanobacterial metabolites; the bioaccumulation of persistent organic pollutants in earthworms in relation to the contaminants' bioavailability in soil; the determination of a set of biological effects of atmospheric pollutants *in vitro*; the development of new photoactivable systems for biological studies, organic chemistry and biology; the consequences of photochemical activity of organic pollutants in polar regions; harmful persistent halogenated compounds in urban environments; and processes affecting long-range transport of POPs in aerosols in Europe.

Projects supported by the Ministry of the Environment, Ministry of Agriculture and Ministry of the Interior of the Czech Republic

Projects financed by the Ministry of the Environment focus on the complex characterization of dust fractions in the ambient air and the determination of risks related to chemicals in various environmental compartments; the assessment of new emerging pollutants is highly emphasized.

Projects funded by the Ministry of Agriculture study adverse effects of cyanobacterial water-bloom metabolites on fish and the risks resulting from consuming the fish. Another issue being addressed by these projects is research into the effects of river and pond sediments applied to agricultural soils and the optimization of an assessment system in order to avoid the risks of this fertilizing practice. In addition, methods for the assessment of forest soil contaminant burdens and the identification of implicit ecological risks are being developed.

The Centre also contributes to a project run by the Ministry of the Interior investigating the impacts of floods on soil and food chain contamination by hazardous chemicals.

Operational Programme Projects

In 2010, the Centre contributed to the ChemPoint project in an effort to create a community of environmental scientists – EnviroPoint. This project supports the organizing of seminars and workshops to facilitate communication between scientists dealing with environmental issues, industry and the public. Two Operational programmes under the heading Education for Competitiveness (ECOP2.2 and ECOP2.3) were awarded to the Centre in 2010 and started in 2011.

Outputs and publications

In 2010, author contributions from the Centre's researchers were published in two books and various international impacted journals; altogether, twenty-three scholarly articles were published in such journals.

One new international patent (Šindelář, Švec – New Macrocyclic derivatives of glycoluril, and methods of preparing and using the same) was sent to the European Patent Office (No. PCT/CZ2010/000110).

The Centre's researchers presented guest lectures at 11 international and 2 national conferences; regular lectures were presented at 43 international and 13 national conferences.

The Centre's applications potential

The National and Regional Centres for Persistent Organic Pollutants have a special position within the Centre's infrastructure, since they are the major platforms for contact with clients at both national and international levels.



**National centre
for persistent
organic pollutants**

The National Centre provides new scientific findings about POPs for the needs of Ministries, the Government, Regional Offices and private businesses, especially in relation to commitments resulting from international conventions on environmental contamination.

The programme of the integrated monitoring of persistent organic pollutants at the background station of the Czech Hydro-meteorological Institute in Košetice and the network of passive air contamination sampling in the Czech Republic, MONET (MONitoring NETwork), are major concerns of the Centre in the field of applications. MONET has been operating since 2003 and, as a unique network, has served as a successful model for introducing similar activities elsewhere.

GENASIS (Global Environmental Assessment and Information System) is another strategic project of the Centre. This project aims to develop environmental information systems for the collection, aggregation, processing and visualization of environmental data and also systems for management and communication. GENASIS is currently an official part of the integrated environmental information system of the Czech Republic (JISŽP) and the development of GENASIS outputs is in accordance with the development concept of the Ministry of the Environment.



**Stockholm Convention Regional centre
for capacity building and transfer of technology
in Central and Eastern European countries**

The Stockholm Convention Regional Centre plays an important role in technology and know-how transfer in Central and Eastern Europe, including the realization of education and training. In addition, the Centre works as a strategic partner in Africa and Asia within the framework of the Global Monitoring Plan.

The Centre took part in developing the passive sampling technique, later chosen as the official technique for global monitoring, to which the Centre's researchers have been contributing since 2006. Since 2009, the Centre has been cooperating with the EMEP stations network (European Monitoring and Evaluation Program) on the realization of POPs monitoring in all European countries (MONET EUROPE). The Centre carries out a monitoring project in selected African countries (MONET AFRICA) financed by the EU and contributes to building analytical capacities in these countries within the framework of the GEF Projects (Global Environmental Facility).

Education

The Centre offers doctoral study programmes in Chemistry and Biology (accredited fields – Environmental Chemistry, Ecotoxicology and Mathematical Biology). It also offers master's study programmes in Chemistry and Biology (accredited fields – Environmental Chemistry and Ecotoxicology) and a bachelor's study program in Biology (accredited field – Ecotoxicology). The Centre also takes part in the education of bachelor's students in the Chemistry program of the Faculty of Science at Masaryk University.

In 2010, fifteen chemistry, ten ecotoxicology, and twelve mathematical-biology students defended their bachelor's theses, as well as eight students from other main fields of study. 10 students defended their master's theses. The successful defences of eight doctoral theses, and the subsequent awarding of eight Ph.D degrees, was a particular highlight.

International summer school

The International Summer School of Environmental Chemistry and Ecotoxicology, which is attended annually by fifty participants from all over the world, is an important educational activity of the Centre. It is held in cooperation with the Stockholm Convention Secretariat as one of the main activities of the Convention focused on the development of regional capacities.

In 2010, the topics for the 6th year of the summer school were issues concerning the



bioavailability of contaminants in the environment and passive air, water, sediment and soil sampling techniques. Besides the Centre's researchers, the summer school hosted several top experts from the UK, Denmark, Switzerland, Slovakia and Finland. The summer school comprised lectures, laboratory practice, interactive seminars and an excursion to the background meteorological station of the Czech Hydro-meteorological Institute in Košetice.

International student awards

Petr Kukučka, a doctoral student, won the Otto Hutzinger award in September 2010 for the best student presentation at the 30th international conference DIOXIN 2010 (San Antonio, Texas, USA), where he introduced his work on halogenated persistent organic pollutants.

At the third EuCheMS Chemistry Congress in Nuremberg, Germany in August 2010, Petr Kukučka, M.Sc., along with another doctoral student, Romana Kurková, M.Sc., were awarded a prize for young chemists and a scholarship for the support of mobility and career growth.



Events in 2010

The International workshop of the Stockholm Convention Regional Centre for capacity building and the transfer of technology in central and eastern European countries

The Research Centre for Toxic Compounds in the Environment in cooperation with the Secretariat of the Stockholm Convention held a workshop entitled “Regional training workshop on new POPs, the process of reviewing and updating NIPs, and reporting requirements under the Stockholm Convention” from 15th to 18th June 2011. The main aims of the workshop were to raise awareness among the member states of their responsibilities resulting from the signing of the Stockholm Convention and the introduction of nine new organic substances added to the Convention list.

Seminar for the enhancement of cooperation in the implementation of multilateral treaties focused on chemicals and waste

RECETOX in cooperation with the Ministry of the Environment held a “Seminar for the enhancement of cooperation in the implementation of multilateral treaties focused on chemicals and waste” on 21st and 22nd October, 2010. The program included up-to-date information on international environmental conventions and the implementation of treaties at national and regional levels as well as the priorities of the Czech Republic in this respect,

including the issue of financing. In addition, approaches to disseminating information about chemicals and events planned for the International Year of Chemistry were discussed.

Events for elementary and high schools

The Centre began its cooperation with the South Moravian Centre for International Mobility (JCMM) and the project TALENT in 2010. The Centre prepared an e-learning course called “From root to tip or GMO vs. organic farming” and organized an excursion for talented high school students. Another e-learning course “Chemicals – aid or threat” has been accessible to high school students since September 2010.

The Centre organized one-day courses called “Learn to understand the environmental context and start behaving differently” for selected high school seniors. The students learned interactively about the issues of environmental protection, ecotoxicology and environmental chemistry and also experienced selected methods from these fields in practice.



Open Days for elementary school pupils were held to introduce the Centre as a part of Masaryk University and enable the children to carry out various entertaining tasks in the laboratory.

Events for the public

The Centre introduced itself during the Faculty of Science Open Days, when its laboratory and educational facilities were open to public, who could also address researchers and students.

The Centre also took part in the “Science Festival”, a week of events focused on the popularization of natural sciences. The Centre’s activities were presented at a stand in the city centre, where several examples of passive air and water samplers as well as ecotoxicological test organisms such as daphnids, brine shrimps, green algae, cyanobacteria and tadpoles were exhibited. The Centre’s experts gave lectures on several scientific topics.

The Centre also provided a programme called “Toxic substances around us” for the traditional “Night of the Scientists” event. The visitors could learn interactively about the contamination of the internal environment by toxic substances and other related issues which are in the Centre’s competence and interest.

Development Plan for 2011

Further development of human resources

Project supporting human resources development ECOP2.3

The RECETOX NETWORK project, which will start in 2011, will support the international networking and growth of the Centre's researchers and doctoral students, particularly in associated or neighbouring fields of research. Two foreign researchers will join the Centre and form two new teams in the fields of environmental modelling and risk analysis. Other activities of the project will support the international networking of researchers and their further education.

SOMOPRO Program of the South Moravian Centre for International Mobility

The issue of environmental endocrine disruptors and male fertility from the mechanistic and toxic effects point of view will be addressed by a project enabling researchers both to build their scientific career and to support a newly formed research team, which will be led by Iva Sovadinová, Ph.D., after her return from a work placement in the US. This inter-disciplinary project will combine the results of *in vitro* toxicology and analytical and environmental chemistry, and will present the latest findings in the field of male reproductive ability disorders.

International Training Network - FP7 project CSI Environment

Determining the sources and fate of organic contaminants in the environment by tracking specific isotopes is the main theme of the CSI ENVIRONMENT project, which aims to create a training platform for young scientists in the fields of environmental sciences, biogeochemistry and modelling with access to a unique research infrastructure and the experience of international experts. To work specifically on this project, the Centre will take up two foreign doctoral students in 2011 – one from Poland and the other from France.

Education Development Project ECOP2.2

Since the beginning of 2011 the Centre has been conducting the RECETOX EDUCATION project, financed by the European Social Fund and by the national budget of the Czech Republic. This project focuses on preparing graduate students for the demands of the job market and on systematic education in the field of sustainable development. Current courses will be revised and new courses created within the framework of this project. Another aim of the RECETOX EDUCATION project is the establishment of stronger links with the applications field, by holding seminars with guests from industry and government, and by organizing fieldtrips and work placements.

Job and study opportunities in 2011

In 2011, in conjunction with the newly realized OP RaDfI, OCOP and FP7 projects, the Centre will conduct interviews to fill 12 new junior and senior research posts in the fields of environmental chemistry, ecotoxicology, risk analysis and data processing.

Applicants to doctoral study programmes in Environmental Chemistry and Ecotoxicology were offered sixteen new research topics.

Applications to master's study programmes will be accepted until 30th April 2011. The applicants may apply to study Environmental Chemistry within the Chemistry study program, General Biology with a specialization in Ecotoxicology, or Mathematical Biology within the Biology study program.

Plan of events organized in 2011

International workshop on persistent organic substances

RECETOX in cooperation with the Secretariat of the Stockholm Convention, the European Association for Chemical and Molecular Sciences (EuCheMS) and the American Chemical Society (ASC) will organize an international workshop entitled "Identifying the research needs in the global assessment of POPs ten years after the signature of the Stockholm Convention" from 22nd to 24th May 2011. The main themes will include the identification of new toxic compounds and the assessment of their properties, toxicity mechanisms and fate in the environment; the assessment of the effectiveness of the Stockholm Convention; and the application of experimental and modelling approaches to studying the distribution, transport, temporal trends, transformation and long-range transport of these compounds. Topics such as data management, databases, models and expert systems for data interpretation and visualization will also be addressed.

7th International Summer School of Environmental Chemistry and Ecotoxicology

The Centre in cooperation with the Secretariat of the Stockholm Convention and the Ministry of the Environment will organize the 7th International Summer School of Environmental Chemistry and Ecotoxicology from 27th June to 2nd July 2011. This year the focus will be on the issue of contaminants in the environment in relation to climate change and its impact on the presence and behaviour of persistent organic pollutants in arctic regions.

Czecho-Slovak Conference Ovzduší (Air)

From 4th to 6th April 2011, the 10th traditional meeting of Czech and Slovak specialists dealing with the issue of air protection, the Ovzduší conference, will take place in Brno. The meeting is intended for people working in administration in the field of environmental protection, for

industry and its managers, for universities, research centres and students, and for anyone who is interested in the issue of air protection. The aim of this conference is to support communication and the exchange of knowledge and expertise among the participants, to establish new contacts, and to provide a friendly environment for research, scientific and commercial meetings and the preparation of joint projects.

MONET REGION Seminar

RECETOX along with the Ministry of the Environment plans to organize a MONET REGION seminar on 15th March 2011. The seminar is intended for employees in regional and municipal administration. The Centre will present its results from MONET REGION – a set of regional studies of ambient air contamination by persistent organic pollutants in the whole of the Czech Republic, realized through the support of a research and development grant from the Ministry of the Environment (VaV MŽP).

Events for elementary and high schools

In 2011, the Centre in cooperation with the South Moravian Centre for International Mobility (JCMM) and the TALENT project will organize a series of excursions for talented high school students called “From root to tip or GMO vs. organic farming”, as in 2010. The Centre will continue with the one-year online course “Chemicals – aid or threat” and the one-day course “Learn to understand the environmental context and start behaving differently”. These activities are intended for senior high school students who are interested in environmental issues and who achieve excellent results in biology and chemistry.

RECETOX organizes events for elementary schools, at which the study focuses of university education within the Centre are presented and at which the visitors may participate in laboratory work in an entertaining way. Such events are intended to promote general interest in science among children and are part of a larger project run by Masaryk University and Brno’s University of Technology aiming to reverse the decline in the numbers of students wishing to study science and technological subjects at university.

Events for public

In 2011, the Centre is going to introduce itself and its work during the Faculty of Science Open Days and during open discussions with the public at the planned public lectures and lectures for high school students. For September 2011, the Centre is preparing a special programme to present its research and further activities at the traditional “Night of Scientists”. In 2011, which has been designated as the International Year of Chemistry, the Centre will offer a presentation entitled “Chemistry in ecotoxicology” in several Czech towns and cities and at chemical fairs. The public will be informed about the close interconnection of environmental chemistry and ecotoxicology in the form of an entertaining competition.

The Staff of the Centre

Professors

Prof. Ing. Jiří Holčík, CSc.
Prof. RNDr. Ivan Holoubek, CSc.
Prof. RNDr. Jiří Hřebíček, CSc.
Prof. RNDr. Petr Klán, Ph.D.
Prof. RNDr. Josef Komárek, DrSc.
Prof. Gerhard Lammel, Ph.D.
Prof. Ing. Jiří Matoušek, DrSc.

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Doc. Mgr. Jiří Damborský, Ph.D.
Doc. RNDr. Ladislav Dušek, Dr.
Doc. RNDr. Jakub Hofman, Ph.D.
Doc. RNDr. Jana Klánová, Ph.D.
Doc. Ing. Blahoslav Maršálek, CSc.
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Doc. Ing. Vladimír Šindelář, Ph.D.

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RNDr. Alice Dvorská, Ph.D.
RNDr. Danka Haruštiaková, Ph.D.
Mgr. Dominik Heger, Ph.D.
Mgr. Klára Hilscherová, Ph.D.
RNDr. Jiří Jarkovský, Ph.D.
Mgr. Klára Kubošová, Ph.D.
Mgr. Jaromír Literák, Ph.D.
Mgr. Natália Martínková, Ph.D.

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Mgr. Jiří Machát, Ph.D.
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Mgr. Soňa Jesenská
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Mgr. Romana Kurková
Mgr. Jan Kuta
Mgr. Petra Macíková
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RNDr. Lenka Škrdlíková
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Mgr. Jana Vašíčková
Mgr. Klára Vlčková

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Mgr. Šárka Bidmanová
Mgr. Chachchaya Chomsri Cervinkova
Mgr. Martina Čížková
Ing. Kamil Čonka
Mgr. Ray Debajyoti
Mgr. Anita Érseková
Ing. Anna Fabišíková
Ing. Adam Jonáš
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Mgr. Petra Kubincová
Mgr. Linda Landlová
Mgr. Hana Lišková
Mgr. Martina Nešporová
RNDr. Hana Paskerová
Mgr. Nela Pavlíková
Mgr. Zuzana Rábová
Mgr. Inka Rusová
Mgr. Eliška Sychrová
RNDr. Ivana Ungrádová
Ing. Lenka Vlčková

External doctoral students

Mgr. Radka Bačovská
Mgr. Jan Brezovský
Mgr. Jan Drapáč
Mgr. De Hoogh-Carpentier Cornelia Johanna
Mgr. Jana Harzerová
Mgr. Eva Chovancová
Mgr. Martina Hvězdová
Mgr. Klára Kobetičová
Mgr. Táňa Koudeláková
Mgr. Jan Lána
Mgr. Zlatica Novotná
Mgr. Pavel Odráška
Michael Pescheck
Mgr. Pavel Piler
Mgr. Lucia Piliarová
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Mgr. Martin Váňa
Mgr. Darina Vinklárková
Mgr. Martin Vojtěšek
Mgr. Tereza Štěpánková
Mgr. Eva Šuteková

List of members of the Board of CETOCOEN

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Prof. RNDr. Ivan Holoubek, CSc.
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RNDr. Veronika Pašková
Ing. Pavlína Mikolášková
Ing. Arch. Karla Pokludová
Ing. Martina Dvořáková

List of members of the Extended Committee

Ing. Karel Bláha, CSc., Director of the Department of Environmental Risks of the Ministry of the Environment
JUDr. Michal Hašek, Governor of the South Moravian Region
Ing. Dr. Marie Zezůlková, Head of the City Development Strategy Office of the Brno city
Prof. MUDr. Jiří Vorlíček, CSc., Head of the Department of Internal Hematooncology, Faculty Hospital in Brno
Ing. Rostislav Fianta, Production Manager of Českomoravský cement, a.s.
Ing. Zdeněk Horsák, Managing Director of SITA CZ
Ing. Martin Procházka, Technical Director of Bochemie, a.s.
Dr. David Uhlíř, Deputy Director of the South Moravian Innovation Centre
Prof. MUDr. Ivan Rektor, CSc., vice-rector of the Masaryk University
doc. RNDr. Jaromír Leichmann, Dr., Dean of the Faculty of Science
prof. RNDr. Ivan Holoubek, CSc., Director of the Research Centre for the Toxic Compounds in the Environment
doc. RNDr. Luděk Bláha, Ph.D., Deputy Director of the Centre
doc. RNDr. Jakub Hofman, Ph.D., Education Coordinator of the Centre
doc. RNDr. Jana Klánová, Ph.D., Executive Director of the CETOCOEN Project
prof. RNDr. Petr Klán, Ph.D., Head of the Research Program of the CETOCOEN Project
doc. Mgr. Jiří Damborský, Dr. Head of the Research Program of the CETOCOEN Project
doc. RNDr. Ladislav Dušek, Dr., Head of the Research Program of the CETOCOEN Project

List of publications in 2010

Books

1. Matoušek J.: Hrozby moderních chemických zbraní a Úmluva o jejich úplném a všeobecném zákazu. In: SMOLÍK J., ŠMÍD T. (Eds.): Vybrané bezpečnostní hrozby a rizika 21. století. Masarykova univerzita, Mezinárodní politologický ústav, Brno 2010, pp 201-225. ISBN 978-80-210-5288-8
2. Matoušek J.: The Chemical Weapons Convention and the Role of Engineers and Scientists, In: FINNEY J.L., ŠLAUS I. (Eds.): Assessing the Threat of Weapons of Mass Destruction. IOS Press, Amsterdam 2010, pp 92-108. ISBN 978-1-60750-084-1

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