29-30 NOVEMBER
2022

REMEDIATION AND REHABILITATION INTERNATIONAL CONFERENCE

Hungarian Association of Environmental Enterprises

ÖKOINDUSTRIA

2023
18-20 October

GREEN EXPO AND CONFERENCE
WWW.OKOINDUSTRIA.HU

CONTENT

HAEE INTRODUCTION

The Hungarian Association of Environmental Enterprises (HAEE) is a nonprofit advocacy organization, established 30 years ago to represent Hungarian companies in the environmental industry. The Association is an acknowledged partner of the public administration and the economic operators in the preparation of legislation and strategy-making.
At present the Association has 255 member companies, which represent all the different fields of environmental protection sector from waste management to noise and vibration protection, from water management to air, climate, soil and water protection. 10% of our companies handle remediation. Our members working in this field offer not only services (assessment, analysis, evaluation, planning, execution), but are also engaged in processing and manufacturing activities, producing environmentally friendly products, as well as instruments, tools and technologies.

For more than a decade, we have been organising the ÖKOINDUSTRIA international environmental exhibition every two years - next time in autumn 2023 - to bring together green industry companies and leaders, professionals and entrepreneurs committed to sustainable technologies. The exhibition showcases products, services and technologies of domestic and foreign exhibitors responding to current environmental challenges.
In addition to networking, the professional conferences accompanying the event will allow participants to share their results and experiences.

We have working groups for certain current or important topics to form the common standpoint of the Association and to word our opinions or suggestions. In addition to that, we build on them in organizing professional conferences, educational and awareness-raising programmes.

For more information please visit our homepage:
www.kszgysz.hu/en/

BECOME A MEMBER OF THE HAEE; JOIN THE GREEN TEAM!

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29.11. Tuesday

REMEDIATION AND REHABILITATION INTERNATIONAL CONFERENCE

WWW.KSZGYSZ.HU/EN/RE-BROWN

29-30 NOVEMBER 2022. (tuesday - wednesday)

9.30	**REGISTRATION**
10.30-10.40	**Welcome speech** Mr. Dr. Tibor Bíró, Dean of National University of Public Service
10.40 – 11.00	**Opening speech – Remediation strategy and regulation, trends and plans** Ms. Nikoletta Keszthelyi, Deputy State Secretary for the Environment at the Ministry of Technology and Industry
11.00 – 11.20	**Upcoming EU regulation, the Soil Strategy for 2030 and revitalising contaminated land** Mr. Dietmar Müller-Grabherr General Secretary, Common Forum
11.20 – 11.40	**Tasks in urban planning, connections** Mr. Márk Gombos, Head of department, Ministry of Construction and Investment (to be confirmed)
11.40 – 11.50	**QUESTIONS AND ANSWERS**
11.50 – 12.05	**COFFEE BREAK**
12.05 – 12.25	**Remediation activities under the liability of the State** Mr. Csaba Tóth, Managing director, Nitrokémia Plc.
12.25 – 12.45	**Brownfield Dialogue – the new Austrian initiative to enhance revitalization** Ms. Sabine Rabl-Berger, environmental expert, Environment Agency Austria
12.45 – 13.05	**Remediation facing new challenges – coherence with strategies, alignment with EU priority topics, financing options** Mrs. Zsuzsanna Dócsné Balogh, Managing Director, Trenecon Ltd.
13.05 – 13.15	**QUESTIONS AND ANSWERS**
13.15 – 14.00	**LUNCH BREAK**
14.00 – 14.20	**Environmental Burdens of Remediation – Remediation Guide** Mr. Csaba Markó, technical director, HAEE Ms. dr. Beáta Kispál, Insolvency Practitioner, Hungarian Association of Reorganisation and Insolvency Practitioners
14.20 – 14.40	**Experience of public authorities** Mr. Dr. Szabolcs Cserkúti, Head of Division, Government Office of Pest County
14.40 – 15.00	**Foreign remediation examples** Mr. Gábor Raska, MRICS, Manager of Estate and Transaction Group, denkstatt
15.00 – 15.10	**QUESTIONS AND ANSWERS**
15.10 – 15.25	**COFFEE BREAK**

	SECTION A: REMEDIATION CASE STUDIES	**SECTION B:** REMEDIATION TECHNOLOGIES
15.25 – 15.45	**Development of a brownfield into a Bosch Campus in Budapest** Mr. Hartwig Bayersdorf contaminated site manager, Bosch Group	**Development of in situ bioremediation technology for sites with short-chain chlorinated hydrocarbons contamination** Mr. Gergely Krett, Microbiologist, ELTE Department of Microbiology
15.45 – 16.05	**Case studies based on experience of rail site remediation** Mr. Zoltán Lénárt, Environmental Expert, Hungarian State Railways	**Support of soil and groundwater remediation with geophysical methods** Mr. János Stickel, Professional Director, Elgoscar Ltd.

16.05 – 16.25 ▶▶▶

State of the art High Resolution Site Characterisation and the 3D conceptual site model
Mr. Pieter Buffel, Teamleader HRSC Services, EnISSA

Vertical water quality distributions in thick, uniform water taxes and their detection by sampling
Ms. Ágnes Réka Máthé, remediation expert assistant, Adept Enviro Ltd.

16.25 – 16.40 ▶▶▶ COFFEE BREAK ▶▶▶

16.40 – 17.00 ▶▶▶

Sodium Persulfate with Integrated Activator Destroys >99% of Trichlorethylene in 5 Weeks at a Manufacturing Facility in Holland
Mr. Michael Mueller, Business Development Manager, Soil & Groundwater Remediation, EMEA, Evonik Operations GmbH

Development of bioaugmentation injection materials for the remediation of contamination by aliphatic and aromatic hydrocarbons and their chlorinated derivatives and their potential for field application
Ms. Dr. Zsuzsanna Nagymáté, Microbiologist, scientific advisor, Fermentia Microbiology Ltd.

17.00 – 17.20 ▶▶▶

The innovative spin injection technology pushes boundaries of in situ soil remediation (case studies)
Mr. Jeroen Vandenbruwane, Director, Injectis Co.

Biological treatment options for metal -containing wastes (mine waste, red sludge)
Ms. Margit Balázs, Bay Zoltán Non-profit Ltd., Biotechnological Institute

17.20 – 17.40 ▶▶▶

The New Museum of Transport at the plot of the former Northern Maintenance Depot
Mr. Gábor Raska, MRICS, Manager of Estate and Transaction Group, denkstatt

Determination of (D) remediation target values on ecotoxicological basis for hydrocarbon contaminated sediments
Mr. Béla Finta project manager, BGT Hungaria

17.40 – 19.00 ▶▶▶ NETWORKING ▶▶▶

▶▶▶ 30.11. Wednesday

10.15 – 10.20 ▶▶▶ **Welcome speech**
Mr. Dr. Csaba Ágoston president, HAEE

10.20 – 10.40 ▶▶▶ **Data and definitions in the Hungarian Environmental Legislation that require clarification alias Let's arrange our ranks!**
Mr. Artúr Köhler remediation specialist, Adept Enviro Ltd.

10.40 – 11.00 ▶▶▶ **Oxygenates and their biodegradability – selective microbiological injection material development**
Mr. Dr. Balázs Fehér, Bay Zoltán Non-profit Ltd., Biotechnological Institute

11.00 – 11.20 ▶▶▶ **Ecotoxicological methods supporting implementation of site remediations**
Mr. Dr. István Szabó, Head of Department, Associate Professor, Hungarian University of Agriculture and Life Sciences

11.20 – 11.40 ▶▶▶ **Resilience performance assessment (RPA) for brownfields, with Hungarian examples**
Ms. Iryna Parakhnenko, General Manager, Sixense Monitoring Hungarian Branch Office

11.40 – 12.00 ▶▶▶ **Orczy-kert bus garage decontamination - practical experience**
Mr. Béla Farkas projektmanager, Envirotis Holding

12.00 – 12.20 ▶▶▶ QUESTIONS AND ANSWERS

12.20 – 13.30 ▶▶▶ LUNCH BREAK

13.30 – 15.00 ▶▶▶ **A completed rehabilitation project: Introduction of the Orczy Garden**
Professional presenters: Envirotis Plc., National University of Public Service

STRATEGIC ISSUES OF THE REMEDIATION

29.11.

10.40 – 11.00

Nikoletta Keszthelyi

Deputy
state secretary
for environment,
Ministry of Agriculture

Several strategic development goals of the UN Sustainable Development Framework adopted in 2015 affect water and soil protection. The fulfilment of the strategic goals became the basis of the EU's environmental protection policy, in which new strategies aimed at the protection and sustainable use of water resources and land and create a pollution-free world appeared. Among these, the strategic measures on chemicals, groundwater and the protection of healthy soils deserve special attention. What challenges do these present in the remediation policy?

The Government is committed to achieving climate protection goals along the lines of the strategies and action plans it has adopted. The goal of the Government is to improve the quality, safety, and health of the environment, as well as the effective performance of tasks related to remediation and rehabilitation in order to protect and sustainable use natural values.

The survey of contaminated sites began in Hungary at the same time of the industrial restructuring of the former socialist industry and the withdrawal of Soviet troops in the 1990s. We have 30 years experiences on contaminated land management surveying, registering and managing. It was then estimated at the beginning ca. 35 to 40 thousand potentially contaminated sites. The presentation focus on the national and international challenges and strategic issues of the remediation policy and summarize the experiences.

UPCOMING EU REGULATION, THE SOIL STRATEGY FOR 2030 AND REVITALISING CONTAMINATED LAND

29.11.

11.00 – 11.20

Mr. Dietmar Müller-Grabherr

General Secretary,
COMMON FORUM on Contaminated Land in Europe

Land and soils are still subject to severe degradation processes, and probably most undervalued elements of our environment. Although some EU policy instruments like the Environmental Liability Directive (ELD, 2007) and the Industrial Emissions Directive (IED, 2010) started to build a common legislative framework, contaminated land management up to now still rather stays being a national level policy issue.

Nowadays the EU Green Deal (EGD) is the EU's policy response to the environmental degradation and the transition to circular economy is one of the corner stones of the EGD. Here land and soil are an unquestionably critical parameter of a sustainable Circular Economy as also reflected in the new Circular Economy Action Plan (2020). Moreover connected to the Biodiversity Strategy (2020) it is the new EU Soil Strategy (2021) introducing ambitious objectives and new concepts for "healthy soil", sustainable use of soils and "no-net-land-take" by 2050. Finally, the European Commission will bring forward a draft proposal for e EU Soil Health Law (EU SHL) until summer 2023. In this context as well new policymaking tools regarding excavated soil reuse ("passport for excavated soil") and the issue of liability transfer ("soil health certificate") are under discussion and may have a significant role in a new era of contaminated land management.

NICOLE, the Network for Industrially co-ordinated Sustainable Land Management in Europe, and COMMON FORUM in its role as regulators network explored new opportunities and challenges introduced by the EU Soil Strategy or upcoming by a EU Soil Health Law at a joint workshop held in Athens by 24-25 November 2022. Beyond discussing European policy frames, the aim of the workshop was to identify bottlenecks, encourage innovation and promote feasible solutions in the application of circularity principles within contaminated land management.

Discussions were hold for analyzing recent EU policies and moreover report on findings of the joint workshop. When it was decided to organize the workshop of NICOLE and COMMON FORUM it was emphasized, that coherency of the EU-wide policy frame is crucial. Climate Change, Biodiversity Loss and Pollution are recognized as major societal challenges. Striving together for resource efficiency and combating societal challenges requires new tools for contaminated land management, which are ready to support all Member States and stakeholders in transition.

ENVIRONMENTAL REMEDIATIONS BELONG TO THE RESPONSIBILITY OF THE STATE

29.11.

12.05 – 12.25

Csaba Tóth CEO Nitrokémia Ltd.

ENVIRONMENTAL REMEDIATIONS IN GENERAL TERMS:

- Legislative frameworks and references
- Definition of environmental remediation, main steps, objectives pursued and illustrations

RELATIONSHIPS BETWEEN THE STATE RESPONSIBILITY AND ENVIRONMENTAL REMEDIATIONS:

- Issue of the state responsibility (the State is the successor or the State obtained the polluted property during the winding-up processes)
- The role of Hungarian National Asset Management Inc. (MNV Zrt.) (how it connects to the process)
- Financing of environmental remediations (state or EU sources)
- Problems during state coordinated remediations (public procurement, lack of enforceability of tolerance obligation, regulatory deficiencies, lack of authority involvement)
- Use of the remediated lands: brownfield projects

WHERE IS NITROKÉMIA LTD. INVOLVED IN THE PROCESS:

- A brief history of Nitrokémia Ltd.
- Where is Nitrokémia Ltd. connected to the process (legislative authorization, the difference between the company and MNV Zrt. obligation to remediate environmental damages, why it is not a classic market player, and a few words about the use of budgetary resources)
- Role of Nitrokémia Ltd.: coordination, execution (with internal and partly with external resources)
- Company procedures about the implementation of remediation activities (planning of the use of state resources, procurement and public procurement procedures, external expertise and contractors, internal expertise and planning activities)
- Ongoing and completed remediation projects (also on the map)

ENVIRONMENTAL REMEDIATION OF THE FORMER ALKALOIDA LANDFILL IN TISZAVASVÁRI:

- The problem (privatization process)
- Outline presentation of detailed site assessment
- Outline description of technical intervention planning
- Technical intervention - construction of facilities and installations (subterraneous curtains or diaphragms, building of the remediation system is in progress)
- II. stage of environmental remediation

BROWNFIELD DIALOGUE – A NEW AUSTRIAN INITIATIVE TO ENHANCE REVITALIZATION

29.11.

12.25 – 12.45

Sabine Rabl-Berger

Environment Agency Austria

Soil consumption and land use have been the subject of more and more headlines in the domestic media over the past year. Land consumption in Austria still amounts to about 11.5 hectares per day or 42 km² per year (Environment Agency Austria EAA, 2020) and is thus well above the reduction target by 2030 of the "Sustainable Development Strategy" of 2.5 hectares per day or 9 km² per year.

Accordingly, there is still much to be done to achieve the European goal of no net land take by 2050.

The mobilization of brownfield-sites can play an important role to reduce land take: Studies made by the EAA show that there are around 5,000 to 10,000 commercial/industrial brownfield sites that could be reused to meet part of the annual demand for land.
In 2022 the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) launched supported by the EAA the BRACHFLÄCHEN-DIALOG (Brownfield Dialogue) as a long-term program to utilize this land recycling potential.

The declared goal of this program is to contribute to more efficient land use by bringing brownfield sites back into use. In this context, it

- provides a platform for knowledge exchange and consultation,
- promotes the cooperation of experts throughout Austria, and
- develop instruments for the reuseof vacant or underused areas.

To achieve these goals and to address all involved stakeholder groups, the Brownfield-Dialogue uses a wide range of communication channels and working formats:

www.brachflaechen-dialog.at

[1] Note:
we use the term "brownfield-sites" for sites, areas and objects that are abandoned or no longer used in accordance with their site potential.

REMEDIATION FACING NEW CHALLENGES (COHERENCE WITH STRATEGIES, ALIGNMENT WITH EU PRIORITY TOPICS, FINANCING OPTIONS)

29.11.

12.45 – 13.05

Zsuzsanna Dócsné Balogh

Managing Director,
Trenecon Ltd.

- An overview of the current approach and management of brownfield areas and remediation sites in national, regional and municipality strategies and plans, the interrelations of site management with the sustainable development goals.
- The role of brownfields and remediation areas in various EU strategies and guidelines, presenting current understanding with regard to requirements and regulations.
- The importance, opportunities, and challenges of remediation considerations in the current brownfield strategies also discuss the expectations of different fields such as soil, water and climate strategies and their interrelations revealed.
- Strategic aspects of remediation in developing municipality strategies with a view to the new EU requirements
- Key issues of EU financing of remediation:
  - polluter pays principle and liability policy
  - -value for money principle
- The experiences of remediation projects of the previous programming period:
  - indicators
  - specific costs
  - the nature of the remediation process
  - strategic soundness
  - low absorption and its causes in TOP, VEKOP, GINOP
- Future opportunities
  - strategies, support strategy, regulatory options
  - connection to financing opportunities
  - connection to the Green Deal
  - connection to national economic processes

ENVIRONMENTAL BURDENS OF REMEDIATION – REMEDIATION GUIDE

29.11.

14.00 – 14.20

Csaba Markó

Technical director, HAEE

Beáta dr. Kispál

Insolvency Practitioner, Hungarian Association of Reorganisation and Insolvency Practitioners

In 2021, the HAEE was delegated by the ministry responsible for the environmental affairs to compile a technical guide for experts in the liquidation of companies to effectively manage the existing and residual environmental burdens of companies.

The guide provides an overview of the EU and national liability frameworks, the legal requirements in case of bankruptcy, for the liquidation procedures and the legal requirements for environmental damage clearance and prevention procedures. It presents and prioritises the potential environmental burdens, potential sources of pollution and pollution prevention measures that can be taken in the event of a winding-up.

We will follow the steps of the procedure and the necessary and possible actions to eliminate environmental burdens, as well as the financing options, from polluter pays to societal engagement. The guide describes the tasks in the case of persistent environmental damage, including the implementation of remediation.

We also provide a detailed discussion of such circumstances that may arise during the winding-up process and make difficult to remedy environmental burdens, and the possible solutions to overcome them, including measures that can be taken in the absence of financial cover. We discuss the importance of an environmental burden statement, the environmental status report, the need to involve experts, and the appropriate content of interim and final accounts.

EXPERIENCE OF PUBLIC AUTHORITIES

29.11.

14.20 – 14.40

Mr. Dr. Szabolcs Cserkúti

Head of Division,
Government Office
of Pest County

1. In the case of remediation, the environmental protection authority cannot talk about quick success stories usually, as in most cases the remediation phases can take years or even decades. Positive and negative examples from the authority's practice are mentioned.

2. Remediation cases fall into 2 main categories. One group where the environmental conditions of the site(s) are unknown, the other group where the environmental burden is already known to the environmental authority, possibly already remediated (e.g. pollution left over from the former socialist era).

3. Examples of problems encountered by public authorities in the course of remediation in real estate sales.

4. Winding-up cases involving remediation procedures - illustration of the authority's role in these cases.

5. Suggestions on the legislative environment, e.g. in land registry matters and the regulation of liquidation proceedings.

FOREIGN LIQUIDATION EXAMPLES

29.11.

14.40 – 15.00

Gábor Raska

MRICS, Head of Business Unit,
Property and Transactions, denkstatt

In Hungary, according to the Hungarian Association of Insolvency Practitioners and Asset Controllers, 7-8 thousand companies are liquidated every year, about 85-90% through a simplified liquidation procedure, where no actual disclosure of environmental burdens is made (e.g. no documents, no assets, no real estate, or the value of the real estate does not cover the costs), and the liquidated company's manager does not declare to the Authority and the liquidator is not required to declare such burdens. In only about 10% of cases is the director asked whether (s)he is aware of any subsurface pollution and only 1-5% where pollution is reported to the environmental authority.

For the evaluation of the domestic procedural practice, we examined how environmental burdens are assessed in some EU member states during company liquidations.

France has a dedicated law on this procedure, under which any producer or service provider activity that may have a negative impact on the quality of the environment is subject to authorization. A list of these activities or, in the absence of specific designation, indicators set out in the Environmental Code. At the closure of a firm, the firms carrying out such activities are required to undergo an environmental site assessment and, if necessary, remediation. The process is overseen by the French counterparts of the Hungarian Government Offices. The method of investigation and assessment must be carried out in accordance with the guidelines drawn up by the Ministry of the Environment ("National procedures for the management of potentially contaminated sites").

In Germany, the regulatory framework is set out in the Act on the Protection against the detrimental effects (...) (BImSchG), which also provides requirements for so-called after-life care. Prior to the Act, it was a growing problem that the last operator could not be held liable for environmental damage caused earlier, and so in the event of liquidation the cost of investigations and remediation was taken over by the state, making a difficult situation for future development. With the Act entering into force, the operator of a company or establishment carrying out a licensed activity covered by the Act is obliged to construct, operate and abandon the establishment carrying out the licensed activity in such a way that no environmental damage remains after abandonment. The legislation has been given a priority status, i.e. no other legislation or regulatory requirement may conflict with or override the provisions and permits under the BImSchG, (e.g. building permits, recycling, soil protection and to some extent commercial/industrial permit procedures).

The liquidation procedure in the Netherlands is also governed by specific legislation. Firms and companies operate under the Dutch Activities Ordinance, with an obligation to obtain an environmental permit if certain indicators are met. If a company is engaged in potentially polluting activities, it must prove that no environmental damage has occurred in the event of liquidation. During the winding-up process, the liability of doing this is on the liquidator, while the local environmental authority verifies professional compliance. The NEN 5740 Dutch Standard specifies how and for which substances a detailed contamination assessment must be carried out. Prior to the detailed investigation, a preliminary (screening) test must be carried out, the technical content of which is described in Dutch Standard NEN 5725.

DEVELOPMENT OF A BROWNFIELD INTO A BOSCH CAMPUS IN BUDAPEST

29.11.

15.25 - 15.45

Hartwig Bayersdorf Contaminated site manager, Bosch Group

Bosch decided to purchase a brownfield site in Budapest and develop it into a Campus. The investigation and remediation were done together under supervision and guidance of consultant Denkstatt. Recently Bosch, a leading supplier of technology and services, has inaugurated the Bosch Budapest Innovation Campus, Hungary's newest automotive technology development centre. The campus, construction of which began in 2018 with a 70 billion forints investment, is part of Robert Bosch Kft. and is an extension of the Engineering Center Budapest campus. The Budapest Engineering Center is an increasingly important location for Bosch's global development activities, and one of Bosch's leading hubs for the development of electronic vehicle control systems and mechanical components. These include ABS, ESP, airbags, engine management and automated parking systems, as well as electric drive systems and electric motors. Other areas of development include dashboards and driver assistance systems, which are paving the way for the creation of self-driving cars. In most cases, all the related work is done here, including system and algorithm development, electrical and mechanical design, simulation, and reliability checks and tests.

The investigation was done in several steps, initially Historical data research: First developed in 1904. Main production activities have always been fabric/textile production, dying, finishing, heating and steam generation first by coal and mazut, later district heating and steam supply, extensive use and storage of miscellaneous chemicals. Site survey Phase I ESA showed large amounts of asbestos roof slates and insulation, large volumes of various chemicals still to be found on site, extensive basement network incl. a fully equipped air raid shelter (chem. suites, gas masks, medication, etc.). In addition, Site investigation Phase II ESA showed significant TPH and PAH soil and groundwater contamination identified at several locations (oil, fuel, mazut), spots of heavy metal contamination in the artificial fill under the site impacted by external origin chlorinated hydrocarbon groundwater contamination. For demolition and decontamination topics in total approx. 7.8 Mio EUR were spent. The scale of the investment is reflected in the more than 200 new trees, 40,000 shrubs and perennials and 1.5 hectares of grass and mulch planted in the campus park. The building used 46,000 cubic meters of concrete, 5,600 tons of rebars, 700 tons of structural steel and one and a half million meters of electrical cables.

authors: Bosch-Denkstatt - Hartwig Bayersdorf-Raska Gábor

PRESENTATION OF CASE STUDIES BASED ON THE EXPERIENCE OF REMEDIATION OF RAILWAY AREAS IS THERE ANY BEST PRACTISE? WHAT CAN WE LEARN FROM THE MISTAKES WE MAKE?

29.11.

15.45 – 16.05

Zoltán Lénárt

Environmental Expert, Hungarian State Railways (MÁV Zrt.)

During its more than 150 years of activity, MÁV Zrt., as the operator of a significant part of the Hungarian railway track and at the same time the owner and/or operator of the related area, has sometimes caused more, sometimes less pollution in the soil and groundwater. Currently, we carry out remediation in 58 areas based on official obligations. These remediation tasks are at different levels of the official procedure.

In some cases, the ongoing remediation tasks challenging the company in meeting the expected official, environmental protection or customer goals, which may require revision of the stages in the remediation procedure. We present the steps we have taken to achieve our goals, the professional consultations between authorities and entrepreneurs in the effective legal environment, differences of opinion, and case studies, simulating cases that have occurred in practice.

„Best practice can rarely be transferred one-to-one, but it can still provide useful guidance. Bad practice can serve as a lesson."

STATE OF THE ART HIGH RESOLUTION SITE CHARACTERISATION AND THE 3D CONCEPTUAL SITE MODEL

29.11.

16.05 – 16.25

Pieter Buffel Teamleader HRSC Services, EnISSA

Chlorinated solvents are known to be a major challenge in both the investigation and remediation of soil and groundwater contamination. Most problems and difficulties are related to inadequate investigation. This limitation arises from an underestimation of the complexity of the subsurface and the typical low resolution of soil and groundwater data. The distribution of DNAPL's (dense non aqueous phase liquids) is largely determined by the heterogeneous geology of the subsoil with subtle variations in properties influencing the migration pathways. Consequently, source and plume zones of DNAPL pollution often follow a very erratic course. When based on insufficient data points, uncertainties quickly creep into the Conceptual Site Model (CSM) and the risk of incomplete, incorrect characterization and missing the contaminant plume is substantial. Detailed and reliable information on the contamination is a key aspect to design an effective remediation. The daily output of a skilled drilling and sampling team that is providing geologic descriptions and collecting proper soil samples is not very high. And when it comes to sampling groundwater, a high vertical data density is absolutely impossible to achieve.

Today's site characterization toolbox also features High Resolution Site Characterization (HRSC) methods. In situ screening methods like MiHPT (Membrane Interface Probe + Hydraulic Profiling Tool) are designed to provide higher data densities with a scale of measurement that is adopted to the scale of the geologic variations and resulting contaminant distribution. HRSC tools are capable of enhancing the data density in soil and groundwater investigations and can deliver usefull information to guide subsequent drilling and sampling efforts. With a combination of new and traditional methods a clearer representation of the subsurface can be achieved and CSM's will move closer to the ground truth.

To increase sensitivity and selectivity of the conventional MIP system, the EnISSA method uses a modified GC-MS system which is connected to the MIP. The advantages of using a GC-MS detector, are the low intrinsic detection limits of the detector and the capabilities to measure individual compounds. Field evaluations demonstrated that the EnISSA MIP is capable of measuring soil and groundwater profiles for individual compounds with detection limits near 10-20 µg/l. Since individual components are measured below or near soil remediation standards, the applicability of the membrane interface probe has substantially increased. Both source and plume delineation are possible.
The component specific soil profiles allow reliable "on site" decisions and a dynamic sampling strategy.

When one has more data, it is also important to organize it in a thorough way. Without a good structure or tools, some of the information may remain hidden in the data or the situation may become more confusing at first. Modern visualization tools such as EVS (Environmental Visualisation System) allow for a clear representation of the data. By toggling through different data sets correlation can be oberserved or demonstrated in discussion with the project team or stakeholders. 3D visualisation tools can also support the calculations of contaminated volumes at different tresholds.

SODIUM PERSULFATE WITH INTEGRATED ACTIVATOR DESTROYS >99% OF TRICHLORETHYLENE IN 5 WEEKS AT A MANUFACTURING FACILITY IN HOLLAND

29.11.

16.40 - 17.00

Michael Mueller

Business Development Manager,
Soil & Groundwater Remediation, EMEA,
Evonik Operations GmbH

For several years, a manufacturing facility was in operation near Uden, Holland. Soil and groundwater had been impacted with chlorinated hydrocarbons. . Site Investigations (SI) revealed high levels of contamination and risk to nearby receptors. In the groundwater aquifer, concentrations of more than 16,000 µg/l of trichlorethylene (TCE) were measured, indicating the presence of a source zone (SZ). The impacted SZ was 270 m2 and contaminated in the saturated zone from 3 to 7 meters below ground level. For planned redevelopment of the site local regulatory authorities mandated remediation of the contamination to stringent clean-up target levels.

Following SI, the first step was excavation of contaminated soils to the top of the groundwater level, then backfilling with certificated clean soils. End-use by the site owner was construction of high-density residential housing, thus rapid remedial results were required. Key objectives of the Remedial Options Appraisal process included selection of a technological solution that provided i) high reliability, ii) cost-effective implementation and iii) rapid monitoring results. The Klozur® One ISCO technology was selected. This fully soluble blend of sodium persulfate (SP) with built-in activation chemistry provided powerful oxidation capacity as a “ready to use” product suitable for highly contaminated treatment areas. The formulation also has built in pH buffer to help maintain near neutral pH, and multiple activation methods (i.e. iron chelate and manganese) combined into the single blend. A total of 9,225 kgs was required, delivered in 25 kg bags from a nearby warehouse, helping to keep the logistics carbon footprint low. Subsurface injections were prepared onsite and made per batch (4m3). In total, the contractor injected though 40 points at 3 different subsurface levels, in a grid pattern with a center-to-center distance of 2 meters. With this grid, it was possible to engineer all-important contact across the entire source area. At zones with higher concentrations of contaminant, more solution was applied with a higher concentration of activated SP. Through use of a manifold system, 4 to 6 wells were worked simultaneously, using overpressure to prevent blow-out at the surface. In total, the field works lasted 9 days to inject 155 m3 injection fluid of self-activated SP.

Prior to start of the injections, a fresh evaluation of the actual TCE concentrations was performed. Monitoring activities during and after the application included measurements of pH, oxygen, redox, and electrical conductivity. Following the SP injections, a notable decrease in pH and increase in electrical conductivity was visible. After four weeks, most of the active SP was consumed, allowing the monitoring wells to be used for groundwater quality. In total, monitoring was conducted through 10 wells, and in all of them the TCE concentration was decreased to below remediation targets. Four weeks later, an independent verification by the engineering consultants reconfirmed the positive results. They also concluded that there was no active SP left and that the TCE was sufficiently removed. In total, the ISCO process removed 99.6% of the contamination, resulting in regulator sign-off and full site closure.

Authors: M. Mueller (Evonik Operations GmbH, Austria) & Harald Opdam (Heijmans Infra BV, The Netherlands)

THE INNOVATIVE SPIN® INJECTION TECHNOLOGY PUSHES BOUNDARIES OF IN SITU SOIL REMEDIATION (CASE STUDIES)

29.11.
17.00 – 17.20

Mr. Jeroen Vandenbruwane Director, Injectis Co.

For the remediation of soil and groundwater contaminations, injection-based in situ techniques are more and more used as a sustainable and cost-effective remediation alternative for ex situ techniques or pump&treat systems. Several injection techniques and strategies exist to deliver the reagents to the aquifer and bring the reagents in contact with the pollution. However, aquifers characterized by low permeability soil material or aquifers with a heterogeneous soil build-up remain difficult to treat by conventional injection techniques. Injection wells are not suited in these circumstances. Injection flow rates are rather limited in case of low permeability soils and injection fluids are injected in the most permeable soil layers in case of heterogeneous soils due to the longer well screens.

In these circumstances, direct push technology (DPT) injections are frequently used as an alternative since the injection openings have a limited vertical dimension and injection should be able to focus on very small soil layers. However, DPT injections have several limitations, that narrows its applicability. Soil compaction and smearing at the point of injection reduce the porosity and thus permeability of the soil. This leads to the need of increased injection pressures, what may cause short-circuiting and daylighting of the injection product. Moreover, hammering is often used to drive the rods and injection point into the soil. These vibrations create a preferential channel along the injection rods, leading to blow-out of the injection solution along the rods.

To overcome the above described problems and limitations observed with the conventional injection methods, Injectis has developed a direct injection technique where compaction and smearing at the injection openings is avoided and hammering is not necessary; the patented SPIN® injection technology. As a consequence, injection pressure can be decreased and effects like blow-out and daylighting of the injection product are avoided.

In this presentation we will present the experiences with the application of the SPIN® injection technology at different sites with challenging geologies. We will discuss the distribution of the injected reagent, problems encountered during the injections and how they were resolved and the effect on the degradation of the contamination. We will also show how the information gathered during the injections can be used to generate e.g. cross sections of the soil permeability.

THE NEW MUSEUM OF TRANSPORT AT THE PLOT OF THE FORMER NORTHERN MAINTENANCE DEPOT

29.11.

17.20 – 17.40

Gábor Raska MRICS, Head of Business Unit, Property and Transactions, denkstatt

The presentation is about the future home of the Hungarian Museum of Technology and Transport, focusing on the preparation and planning aspects of the brownfield investment. The new building of the museum will be built on the plot of the former Northern Maintenance Depot in Kőbánya in the rustbelt of Budapest, which is one of the most important locations in Hungarian transport and industrial history. Repairing of motor trains and diesel locomotives took place in the area up until the closing of the workshop in 2009. Therefore, it is heavily contaminated at some locations, but after rehabilitation, it will provide an authentic location for the museum with good transport connections for the artefacts as well. Several urban rehabilitation projects are taking place in its vicinity, and according to the Museum's intentions, it will be the main focal point of a future cultural and recreational district.

The preparation works and the international design competition started in 2018. Diller Scofidio + Renfro, the New York-based architecture studio, winner of the design competition, has been designing the building complex of the New Museum of Transport since June 2020. The Designer is currently working on the construction plans. The preservation and presentation of the railway and built heritage is a task of high importance during the investment. Thus, the plans pay special attention to the authentic restoration of the remaining buildings - including three monuments - and to the presentation of their preserved historical values, as well as to the preservation of the industrial relics and railway artefacts left in the garden.

As part of a rustbelt, the remediation of the area of the New Museum of Transport is a priority task. Starting in 1995, several rounds of fact-finding investigation were carried out in the plot to reveal pollution resulting from previous industrial activity. Contamination of the soil and groundwater was proven. The sources of contamination were eliminated with the closure of the workshop, and after 2004, several partial remediation processes took place in the plot. Based on the expert review conducted in 2021, as an additional precautionary measure, it is sufficient to remove the contaminated soil at 7 points within the plot by determining a unique limit value. This can be implemented parallel to the start of the investment with continuous monitoring.

Environmental awareness is a key aspect of the investment. The entire area will be renewed in accordance with the requirements of LEED certification. The Museum pays particular attention to the use of renewable energy, the workers' and visitors' health care, the efficiency of water use, the recycling of demolished materials, and by building and transforming the related public areas, it also contributes to sustainable urban development in a wider environment.
The environmentally conscious renewal of this large brownfield area in Budapest can be an exemplary project in the life of the capital, but also of the entire Central-Eastern European region.

DEVELOPMENT OF IN SITU BIOREMEDIATION TECHNOLOGY FOR A SHORT-CHAIN CHLORINATED HYDROCARBON CONTAMINATED AREA

29.11.
15.25 – 15.45

Gergely Krett
Microbiologist,
ELTE Department of Microbiology

One of the most economical and environmentally friendly ways to decontaminate short-chain chlorinated aliphatic hydrocarbons occurring in groundwater is the in situ bioremediation, which can be carried out using microbial communities capable of dechlorination. However, these communities can be underrepresented or even absent from the contaminated area in many cases, thus the addition (bioaugmentation) and/or stimulation (biostimulation) of these microorganisms can be crucial regarding the efficiency of bioremediation.

During present study, the investigation of the efficiency of two types of inoculation systems was carried out in an experimental area contaminated with trichloroethylene by measuring the amount of pollutants and their decomposition products, and by qualitatively and quantitatively monitoring the bacteria involved in the remediation. Firstly, gravity based spreading method was used, during which the direction and speed of the spread of the bioaugmentation inoculum (containing the dechlorinating bacteria) and the biostimulating agent (stimulates the growth of formers) was determined by the gravity and the flow of the groundwater. Based on the results of microbiological and chemical investigations, the method successfully increased the abundance of complete dechlorinating bacteria (Dehalococcoides mccartyi) in the treated wells and the presence of several partial dechlorinating taxa (Geobacter, Sulfurospirillum, Desulfomonile, Dehalobacter) and reduced quantity of the pollutants was also pointed out locally.

Although the dechlorinating capacity developed by the treatment was maintained in long term (1 year) without further bioaugmentation/biostimulation, in order to expand the limited remediation area caused by the slow flow of the groundwater, a vacuum system was used to accelerate the water flow and thus spread the inoculant and increase the remediated area. The introduction of the vacuum system had a double effect: On the one hand, the larger moved ground water mass contributed to the more effective spread of the inoculum. On the other hand, the disturbing effect caused by the significant water movement temporarily reduced the dechlorination activity and may have moved additional pollutant from the surrounding areas to the experimental area. After the vacuum system was stopped, the abundance and activity of the complete dechlorinating bacteria increased significantly, which was supported by the decreased quantity of pollutants and the significant increase in the copy number of the gene encoding the key enzyme of complete dechlorination (vinyl chloride reductase) and in the end product of complete dechlorination (ethene). Taking all the results into account, the maximum bioremediation efficiency was observed in the case of intermittent operation of the vacuum system.

BASEING THE SOIL AND GROUNDWATER REMEDIATION WITH GEOPHYSICAL METHODS

29.11.

15.45 – 16.05

János Stickel

Professional Director, ELGOSCAR Ltd.

One of the most important - but not the only - pillar of soil and groundwater remediation is the development of a good remediation plan.

The amount, nature, quality and effectiveness of the data required for the specific contamination conditions, as well as the characteristics of the receiving environment (geological medium, groundwater), are crucial for the development of an effective remediation solution.

Environmental law focuses on the understanding of chemical and quantitative characteristics and their detailed presentation, and this is essentially the right approach. However, a good plan requires the fullest possible understanding of the circumstances, the tools and methodologies for which go well beyond the grass-roots sampling requirements of environmental regulations.

The environmental constraints (petrophysical, permeability properties of the host reservoir rock, stratigraphic-depositional conditions, groundwater hydraulic-percolation coupling) determine the constraints or options for carrying out the remediation. Data collection in this context, in addition to drilling, is mostly a non-standardised method, but is well known and widely used in other research fields, especially in geology, hydrogeology and environmental geology. One such family of methods is the suite of geophysical techniques, which can provide cost-effective information for environmental protection and is so methodologically rich that it is divided into specialised fields.

In the presentation we will show the role of geophysical methods in environmental reconnaissance, which we consider important, through some examples that have helped, sometimes determined, the development of the remediation plan, thus laying the foundation for remediation.

VERTICAL WATER QUALITY DISTRIBUTIONS IN THICK, HOMOGENEOUS AQUIFERS, AND THEIR DETECTION BY SAMPLING

29.11.

16.05 – 16.25

Ágnes Réka Máthé

Remediation Expert assistant,
Adept Enviro Ltd.

Groundwater can be contaminated by anthropogenic processes, the investigation of this problem is considered a routine task nowadays. However, this field continues to challenge us and the sampling methods used over the decades, as well as the analytical methods, require continuous review and improvement.

Some of the contaminants that migrate downwards from the surface or from near the surface are retained in the unsaturated zone, then, on reaching the capillary zone, LNAPL-type (light nonaqueous phase liquids) contaminants accumulate and dissolve into the saturated zone, while DNAPL-type (dense nonaqueous phase liquids) contaminants continue to migrate further downward towards an underlying aquitard while some of them are dissolved. In a thick, homogeneous aquifer, the pollutant concentration is not vertically homogeneous throughout the thickness of the aquifer. Dissolved LNAPL-type contaminants are present in higher concentrations in the upper part of the saturated zone, while DNAPL contaminant concentrations are higher towards the underlying aquitard. Samples taken from monitoring wells in the aquifer represent an average of thedissolvedcontaminantconcentrationsalongthescreenedsection, so the measured contaminant concentration is a function of the length of the screen. Samples from long screened wells are expected to have lower measured contaminant concentrations than samples from wells screened along a shorter section. In our experiments, by chance, we created two separate flow zones inside the well, which allowed us to investigate the vertical concentration gradient in the groundwater. We performed double pumping sampling in areas contaminated with LNAPL and DNAPL type contaminants, which allowed us to detect differences in the concentration gradient in the aquifer.

In our presentation we will present the theoretical background and results of our experiments.

THE DEVELOPMENT OF BIOAUGMENTATION AGENTS SUITABLE FOR BIOREMEDIATION OF ALIPHATIC AND AROMATIC SHORT-CHAIN HYDROCARBONS AND ITS CHLORINATED DERIVATIVES CAUSED CONTAMINATION, AND THEIR FIELD APPLICATION

29.11.

16.40 – 17.00

Dr. Zsuzsanna Nagymáté

Microbiologist,
Scientifical advisor,
Fermentia Mikrobiológiai Ltd.

Aliphatic and aromatic short-chain hydrocarbons and its halogenated derivatives cause serious environmental damages all over the world. In situ bioremediation techniques are feasible and innovative methods to eliminate short-chain halogenated hydrocarbons contamination by stimulating microbes (biostimulation) involved in decomposition processes or using dechlorinating microbial inocula (bioaugmentation). The ability to degrade aliphatic, aromatic and polyaromatic hydrocarbons are widespread among the microorganisms, while chlorinated aliphatic hydrocarbons can be reduced by the member of genus Dehalococcoides as the only group of microorganisms capable of the complete dechlorination of chlorinated ethenes to non-toxic ethene under anaerobic conditions.

Our aim was to isolate and enrich microorganisms and microbial communities capable of hydrocarbon degradation. We intended to develop bioaugmentation agents capable of the bioremediation of contaminated sites, to reveal their microbial composition, to identify the microorganisms involved in the process and to monitor their effects under field conditions. To isolate microorganisms and microbial communities originated from different contaminated sites selective enrichment procedures were applied.

Microorganisms utilizing various aliphatic and aromatic hydrocarbons as carbon and energy source were identified and enriched in mixed cultures for bioaugmentation purpose. Microbial communities isolated from PCE and TCE contaminated sites were enriched in selective microcosm experiments amended with solid phase, and then scaled up to a volume of 1000 liters under industrial conditions. The microbial communities capable of anaerobic reductive dechlorination with conserved and diverse metabolic potential were characterized with cell count values of the order of 107 ml-1. The dominant members of the microbial communities were Dehalococcoides sp. characterized with different reductive dehalogenase genes playing a role in complete reductive dechlorination of chlorinated aliphatic hydrocarbons, and microorganisms capable of partial dechlorination of the mentioned compounds. Microorganisms capable of reductive dechlorination require hydrogen as an electron donor, acetate and lactate as carbon source, and vitamin B12. The above-mentioned compounds are continuously produced in the enrichments by the activity of the fermenting, acetogenic and methanogenic microbes present, promoting the growth and activity of the microorganisms involved in reductive dechlorination process, such as Dehalococcoides sp., resulting dechlorination of the chlorinated hydrocarbons within a week. The presence of the solid phase, the low temperature (<20°C) and the applied fermentation technology contributed to the development of a unique microbial community and the applicability of the enrichments as bioaugmentation agent. In field conditions, the developed microbial agent - supplemented with appropriate biostimulation technology - resulted in a significant reduction of contaminant and the development diverse dechlorinating microbial community with increased cell count values. During the dosing-free periods, the dechlorination potential and activity remained, indicating the establishment and adaptation of the microorganisms to field conditions.

BIOLOGICAL TREATMENT OF METAL CONTAINING WASTES (MINE TAILING, RED MUD)

29.11.
17.00 – 17.20

Margit Balazs, PhD

Bay Zoltan Non-profit Ltd. Biotechnological Institute

New and innovative solutions in the environmental and waste treatment technologies are gradually emerging and gaining ground, where the biotechnology and applied microbiology have relevancies.

Since the ancient ages, microbiological treatments - such as bio-hydrometallurgy – are applied in metal recovery, however they are integrated into technology only in the last 75 years. Biotechnological processes are spread mainly in non-ferrous mining, but today there is increasing scientifically and technological interest in their application. In the bio-hydrometallurgy both bioleaching and bio-oxidation leads to recovery target minerals, mainly from low grade ores or wastes where tradition technologies are unprofitable. Main advantage of biotechnology is the low energy consumption (lower temperature, utilisation of wastes, less environmental impact) compared with traditional mining technologies. Depending on basic substances and the aimed compound of value, autotrophic and/or heterotrophic organisms are suitable, and the leaching process can achieve ex situ (bioreactor) or in situ on site system. Recognising the industrial demands and the scientific challenges of the biomining processes Our Institute carried out research and development activity on bacterial metal recovery and its integration into technologies since 2016. Our research and development effort focuses on the recovery of valuable compounds of mining waste, red mud, and we also examine applicability in the utilisation of spent catalyst and e-waste.

DETERMINATION OF (D) REMEDIATION TARGET VALUES ON ECOTOXICOLOGICAL BASIS FOR HYDROCARBON CONTAMINATED SEDIMENTS

29.11.

17.20 – 17.40

Béla Finta

Project manager,
BGT Hungaria

In the vicinity of industrial sites contaminated industrial sewage or rainwater may enter the surface waterbodies that are the final receiver of such water. In case of long lasting and large volume emissions even in concentrations under the limit values, the less volatile aromatic hydrocarbons (PAH) and the less volatile aliphatic hydrocarbons (EPH) compounds can accumulate in sediments and may pose ecological risk.

Ecological risk of hydrocarbon contaminated sediments can be assessed with the sensitive ecotoxicological test method using Heterocypris incongruens mussel shrimp (Ostracoda), according to ISO standards.
During in-situ or ex-situ remediation, it is of particular importance to take into account the interactions of individual hydrocarbon compound groups based on LC50 ecotoxicological values when determining the (D) remediation target values.

Two methods were used to analyse the interactions between PAH and EPH compounds at a test site. One of the methodes was calculating combination index (CI) which can be used to quantify the degree of interactions. The other method was the graphical representation of interactions using isobolograms, where LC50 values normalised to toxic units (TU) are plotted. With the two above mentioned methods, reference sediments spiked with different proportions of PAH and EPH mixtures, some diluted field samples as well as non-diluted field samples were analysed. Based on our results the degree of interaction in each sample group shows significant difference. The reason for this can probably be explained by the different organic matter content, particle composition and the differences between typical microbiological processes in the samples examined.

Using isobolic curves specific to each area, the EPH and PAH mixture concentration values that are tolerable up to 50% Ostracoda death were determined, which can be used to form (D) remediation target values.

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DATA AND DEFINITIONS IN THE HUNGARIAN ENVIRONMENTAL LEGISLATION THAT REQUIRE CLARIFICATION ALIAS LET'S ARRANGE OUR RANKS

30.11.

10.20 – 10.40

Artúr Köhler

Remediation specialist,
Adept Enviro Ltd.

The upper-level legislation of the Hungarian Environmental Protection lives since 1995, indigenous remediation activities are regulated by departmental measures since 2000. The initial 33/2000 (III.17.) Government decree and 10/2000 (VI.2) KöM-EüM-FVM-KHVM decree were replaced by 219/2004 (VII.21) Government decree and 6/2009 (IV.14) KvVM-EüM-FVM decree, however there are other legislative entities, that are not connected directly to remedial activities, but their content facilitates connection, beside there are some not bypassable regulatory standards.

Critical investigation of the datavise content of the 6/2009 (IV.14) KvVM-EüM-FVM decree, and cross-check of this content on other legislative entities raises some awkward questions, moreover some datavise content themselves raises other questions.

Definitions laid out in 219/2004 (VII.21) Government decree and term use of some related legislation and widely used standards are not forming a coherent structure.

This presentation is not aimed to tackle the questions arose, rather aims to initialize an inspiration that would lead to resolve these discrepancies that are rather bothersome, than of vital importance.

OXYGENATES AND THEIR BIODEGRADATION - TARGETED MICROBIAL INOCULUM DEVELOPMENT

30.11.

10.40 – 11.00

Dr. Balázs Fehér

Bay Zoltán Non-profit Ltd., Biotechnological Institute

Fuel oxygenates, used to replace lead as antiknock agent in engine combustion, have spread rapidly due to their many advantages. Although the extraction of lead is considered to be environmentally beneficial, the ether-type fuel additives used as a substitute, which are difficult to biodegrade, pose a serious problem when released into soil and groundwater.

The use of oxygenates as fuel additives was initially dominated by MTBE (methyl tert-butyl ether). MTBE's high solubility (48 000 mg/l) compared to other fuel components can pose serious problems when it is released into groundwater, where it can be transported very rapidly by it, easily entering surface water or even drinking water supplies. ETBE (ethyl tertiary butyl ether), which replaces MTBE, is considered a better alternative, inter alia due to its lower solubility (12 000 mg/l), as it typically remains in the phase of BTEX in case of contamination.

The structure of these compounds makes them resistant to physical, chemical and biological degradation. Moreover, on an evolutionary scale, micro-organisms have had only a relatively short time to adapt, so that only, so that only a handful of microbes able to efficiently degrade oxygenates.

Both MTBE and ETBE do not have a remediation threshold limit in Hungary, according to the current law (Joint Decree 6/2009 (IV. 14.) KvVM-EüM-FVM), and as a consequence, at many damaged sites, they are not identified at all. However, mainly due to the proven carcinogenicity of MTBE, a review of the regulation is highly expected. Fuel oxygenates, in general, are typically mineralised in the presence of oxygen (under aerobic conditions). Under anaerobic conditions, there is often no biodegradation at all, or only the appearance (and often accumulation) of the carcinogenic tert-butyl alcohol (TBA) daughter compound, which is characteristic in the case of both compounds.

Our institute has several ether-type oxygenate-degrading inoculants, which will be presented as part of this presentation, based on successful laboratory and field experience with in situ (biobarrier) and ex situ (bioreactor) applications.

ECOTOXICOLOGICAL METHODS SUPPORTING IMPLEMENTATION OF SITE REMEDIATIONS

30.11.
11.00 – 11.20

Dr. István Szabó

Head of Department, Associate Professor, Hungarian University of Agriculture and Life Sciences

Zsolt Csenki-Bakos

Hungarian University of Agriculture and Life Sciences
Institute of Aquaculture and Environmental Safety,
Department of Environmental Toxicology

The environmental effects of different individual chemicals can be evaluated properly by toxicological methods. These results could contribute to improve the level of governmental threshold values of soil and groundwater. During an on-going site remediation these tests are also important to determine the actual biological effect of the complex contaminations. Measuring biological effects of polluted samples, by testing living organisms, can be the part of risk assessment in the investigation phase, or efficiency of site applied clean-up technologies can also be monitored with these methods. Toxicological methods are suitable for analyzing the combined (cocktail) effects of environmental samples, i.e. they are eligible for detecting the combined effect that endangers the environment. Chemical analytical tests are limited as they adequately can determine the amount of the components but e.g. additive effects of individual contaminants cannot be indicated. So, these methods should be applied supplementary. Therefore, the toxicology tests can help to carry out the remediation work rationally, to monitor biological changes, to analyze the effects of pollutants remaining on the site, and to measure biodetoxification beyond biodegradation. With the assistance of toxicological methods, we can understand the biological risks arising at specific remediation sites, and sometimes these results can even be extrapolated to human health.

In our presentation, ecotoxicological methods, which are able to support the remediation processes, available at the Institute of Aquaculture and Environmental Safety of the Hungarian University of Agriculture and Life Sciences will be promoted. Our self-developed test methods will also be presented, which can also be used to carry out special analyses, such as the examination of endocrine disrupting (ED) effects or analyzing the toxicity of samples with high organic matter content.

Our research work is supported by the Ministry of Innovation and Technology within the framework of the Thematic Excellence Program 2021, National Defense and Security Subprogramme (TKP2021-NVA-22).

RESILIENCE PERFORMANCE ASSESSMENT (RPA) FOR BROWNFIELDS, WITH HUNGARIAN EXAMPLES

30.11.

11.20 – 11.40

Ms. Iryna Parakhnenko

General Manager,
Sixense Monitoring Hungarian Branch Office

Brownfields have high potential to create social impacts by converting and integrating them into the landscape. Then, the redevelopment (and/or remediation) of brownfields sites could contribute to improve urban environment and quality of life, enhance sustainable development and promote biodiversity.

To promote this, climate informed decisions are in key role key, e.g. to understand the impact of climate hazards and enhance the resilience of the brownfield.
The Resilience Performance Assessment (RPA) is an innovative solution allowing to assess the vulnerability of brownfield to climate change. It further analyzes the efficiency and balance between climate change mitigation and adaptation about the full life cycle of the brownfield. It provides a holistic approach combining visualization of both current and future climate change impacts on brownfields. It also brings vulnerability scoring of future and existing assets that are planned within the brownfield. This decision-making tool also allows the formulation of detailed recommendations and a costs-benefits assessment to estimate the resilience performance of each brownfield aiming at improving resilience and avoiding GHG emissions. Among many adaptation and mitigation solutions, such as Nature-based Solutions (NbS) forms a useful and sustainable regeneration strategy for brownfields.

The presentation also includes examples and experience obtained through Hungarian rebrown projects performed by FTV company, Sixense' Hungarian partner:

- Szeged, Öthalom ex-Soviet Barracks barrel storage remediation and monitoring, as well as of the Science Park SZTE Automotive Competence Center project planned here
- Rózssaszentmárton, Industrial area, remediation, rehabilitation monitoring and getting back the area into industrial use
- An industrial area project planned, aiming to eliminate environmental damage caused by the activities of the former power transformer, and to use the area as a residential building including an art gallery and a recording studio.

Presentation Authors: Iryna Parakhnenko, Edina Bak supported by: Soto Didier, Selouane Karim, Capitaine M, Alsayah M, Sohouenou Ph, Vignote C, Jioruskova N, Mislimshoeva B and Dutel M

ORCZY GARDEN BUS GARAGE DECONTAMINATION - PRACTICAL EXPERIENCE

30.11.

11.40 – 12.00

Béla Farkas Project manager, Envirotis Holding

In 1997, the City of Budapest decided to rehabilitate the Orczy Garden and to re-establish a public park in the entire area. In the northern corner of Orczy Garden, a bus garage of the Budapest Transport Company operated for almost 40 years on an area of about 40 000 m2. Its operation caused significant hydrocarbon pollution of the soil and groundwater.

The development of a public park on the site of the former bus garage required the following tasks:

- remediation of soil and groundwater contaminated with hydrocarbon derivatives,
- excavation, removal and replacement of non-natural materials (fill, paving, tanks, etc.) with clean, natural materials,
- demolition of unnecessary structures and works.

The works were carried out in two phases. The test results showed that TPH was the predominant contaminant in the soil causing the contamination requiring action. Four, well defined soil bodies were excavated, contaminated both above the "C2" limit and above the "D" limit. During the demolition of the flooring, a 6.0 m deep shaft was found, which was exclusively used for the disposal of waste oil without any technical protection. The separated phase above the groundwater was 2.0m thick!

The area contained significantly less clean soil than originally estimated, as large amounts of debris fill, contaminated debris fill, slag fill and contaminated soils were found under the floorings. Three years of groundwater treatment results a significant decrease in tetrachloroethylene concentrations, but further decreases were not progressing at a satisfactory rate. It was foreseeable that the completion to the deadline would not be met in full, however, groundwater contamination levels of TPH, BTEX and PAHs were reassuringly reduced to below the specified D limits.

The repeated risk analysis examined the case of the use of groundwater for irrigation, in contrast to the previous analysis, where even direct contact with groundwater, assuming it also entered the human body were analysed and found it safe for this use. In the case of ground water, the "D" value was therefore achieved with modifications and water use restrictions in the case of the VOCL contaminants.