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and Remediation of Contaminated Soils

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Paris, 13-15 April 1999

REPORT ON THE SEMINARPrepared by the secretariatIntroduction

1. The Seminar on Analysis, Methodology of Treatment and Remediation of Contaminated Soils was held in Paris (Villepinte), France from 13-15 April 1999 at the invitation of the Government of France and under the auspices of the ad hoc Group of Experts on the Chemical Industry of the United Nations Economic Commission for Europe. It was organized by the Association for the International Exhibition of Chemical and Process Engineering (Association Interchimie) of France.

2. Participants from the following UN/ECE countries attended the Seminar: Albania, Belgium, Bulgaria, Canada, Czech Republic, Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Slovakia, Slovenia, Spain, Switzerland, Ukraine, Turkey, United Kingdom of Great Britain and Northern Ireland, and United States of America. Participants from Morocco, the Republic of Korea, and Tunisia participated under Article 11 of the Terms of Reference of the Economic Commission for Europe. Representatives of the following international organizations also attended: the Organisation for the Prohibition of Chemical Weapons (OPCW); the Bureau Européen de l'Environnement (BEE); and the European Chemical Industry Council (CEFIC).

3. The participants were welcomed and addressed by Ms. Marie-Claude Dupuis, Head of the Industrial Environment Service of the Ministry of National and Regional Development and the Environment. She noted that pollution of soils from industrial activity is found in all industrialized countries, and that world awareness of this is evidenced by the interest UN/ ECE had shown in cooperating with the Government of France and Association Interchimie in organizing the Seminar. She commented that France had initiated detailed multi-step efforts to remedy these problems: first, by identifying and classifying such sites; second, treating these sites; third, dealing with financial and legal aspects of remediation; fourth, developing a strategic methodology in dealing with polluted sites; fifth, supporting research and standards on an international scale for such remediation; and sixth, by informing the public and training the relevant authorities in the need for remediation.

Opening address

4. The Seminar was opened by Ms. Carol Cosgrove-Sacks, Director of the Trade Division of UN/ECE. On behalf of the Executive Secretary of UN/ECE, she extended a warm welcome to the participants, expressing UN/ECE's appreciation for the initiative of the Government of France in hosting the Seminar and thanking the French Organizing Committee, chaired by Mr. Vincent Limousin, for the extremely efficient and extensive efforts made in the preparation of the event. She noted the wide range of countries represented, confirming the importance the environment plays within the chemical industry.

5. Ms. Cosgrove-Sacks then presented a short synopsis of the activities of ECE and of the ad hoc Group of Experts on the Chemical Industry. She stressed that changes occurring in central and eastern Europe were providing new opportunities for enhanced scientific and industrial cooperation throughout the ECE region. The present Seminar acts in that spirit, setting a forum for the exchange of both ideas and practical technologies in the soil decontamination industry.

Election of officers

6. Ms. Cosgrove-Sacks next proceeded to the election of the Chairman of the Seminar, to which post Mr. Pierre Fillet, General Commissioner of the Association Interchimie was elected. Mr. Fillet addressed the participants and thanked them for his election. He outlined the overall programme of the Seminar and the discussion to be held at the end of the Seminar on 15 April.

First session: ***Risk Assessment***

Discussion leader: **Michel Nominé**, Director of Research, INERIS (France)

Documentation: TRADE/CHEM/SEM.1/S.1; S.2; S.3; S.4

7. This initial session illustrated the need for and the complexity of risk assessment, as it must take into account not only human health aspects but also the quality of groundwaters. The complexity was increased by the different approaches throughout Europe in national standards and regulations, which, although starting from similar general principles, have evolved differing regulatory systems.

8. On the technical level, experts have shown the fundamental role of a conceptual scheme for the remediation of a site in the analysis of the risks, and the need to devote sufficient time and resources to develop that scheme. Recourse to suitable models was shown to be very practical, particularly in the case of urban development, but while the models provide indications, they cannot be used as "black-box" solutions.

9. Software has been developed which integrates the available tools, and which can be used to support individual analyses. The analyses should be sufficiently transparent to be understood by legislators, financial authorities and the general public, and yet sufficiently detailed to be workable on a technical level. They should also take into account the latest developments in research and recent practical experience.

Second session: ***Investigation Strategies***

Discussion leaders: **René Goubier**, Chief Polluted Soils Department, Agence de l'Environnement et de la Maitrise de l'Energie, Ademe (France); and
Pierre Colin, President, UPSD (France)

Documentation: TRADE/CHEM/SEM.1/S.5; S.6; S.7; S.8; S.9; S.10

10. The session illustrated the needs for both the remediation contractor and the site owner to have well-chosen models which were appropriate, reproducible, easy and quick to apply and which fully took into account the physico-chemical conditions of the pollutants in both the soil and the groundwater layer. The models must also consider the potential displacement or migration of the pollutants as well as the interaction between pollutants and other components which may be in the groundwater, such as complexing agents for heavy metals.

11. Experts from several research institutes illustrated the development of geophysical models for the analysis of pollutants, as well as biological assays of certain hydrocarbon contaminants. They also discussed development of *in situ* analytical devices and equipment for subterranean assays.

12. Reports from university laboratories discussed the forms of heavy metal contamination, and the differences in both the analytical techniques in determining their presence and concentration, and in ways of dealing with them at the remediation stage.

Third session: ***Methodology of Treatment with a View to Remediation***

Discussion leaders: **Tim Vogel**, Rhodia Eco Services (France); and
Pierre Colin, UPSD (France)

Documentation: TRADE/CHEM/SEM.1/S.11; S.12; S.13; S.14; S.15; S.16; S.17; S.18

13. The techniques discussed during this session covered bioremediation, soil washing, solvent extraction, steam stripping, biosparging, thermal desorption and reactive barriers. These techniques were studied in general at experimental or laboratory levels as well as at practical and applied levels in the field.

14. In all cases, the techniques have specific ranges of applications, where the soil or groundwater conditions define or limit the possibilities. The types of pollutants treated included petroleum hydrocarbons and chlorinated solvents. Costs varied in the range of FF 10 per cubic metre for groundwater and about FF 500 per tonne for soil.

Fourth session: ***Measures to Minimize Exposure***

Discussion leader: **Michel Monzain**, Union des Industries Chimiques (France)

Documentation: TRADE/CHEM/SEM.1/S.19; S.20; S.21; S.22

15. Several practical points were stressed during this session:

- It was deemed preferable to treat polluted soils at the site itself rather than transporting them to off-site treatment facilities.

- Monitoring of a site under remediation must cover, not only the technical aspects of the progress of the remediation, but also the financial and personnel management of the programme as well as the public relations policy and communication with the media.
- It is important to assure the credibility of the approach developed vis-a-vis the different participants in the project, including the public. This credibility must be based on transparency and honesty, and assumes open dialogue with all parties concerned (site owners, contractors, government authorities, consultants, etc.).
- For sites which were still in use, it was important to distinguish pollution deriving from the current activity from that which was due to former usage of the site.

Fifth session: ***Decontamination Strategies***

Discussion leader: **René Goubier**, Chief, Polluted Soils Department, Ademe (France)

Documentation: TRADE/CHEM/SEM.1/S.23; S.24; S.25; S.26 (not presented); S.27; S.28

16. During this session there were presentations from a number of French groups acting as general contractors for depollution projects: a public-sector agency, a private sector group and a governmental urban planning authority. One of the major objectives of these presentations was to illustrate the interest in integration of the priorities of human safety and ecological benefit versus those of urban requirements and industrial needs.

17. The second part of this session dealt with contaminated soils and their treatment in countries of central and eastern Europe. These presentations illustrated the political and economic aspects of the remediation of such contaminated sites, and were demonstrated by a detailed presentation of the UN/ECE Pilot Project Demonstrating the Environmental Cleanup of Selected Sites Polluted by Chemicals.

Sixth session: ***Legal, Financial and Communication Aspects***

Discussion leader: **Patrick Nollet**, Directeur Général, Entreprises pour l'Environnement (France)

Documentation: TRADE/CHEM/SEM.1/S.29; S.30; S.31; S.32; S.33; S.34

18. The session consisted of presentations from several different countries, showing the important progress made by many countries facing the non-technical aspects of depolluting contaminated sites. This progress toward pragmatic applications of theoretical concepts was supported by several driving forces:

- policies concerning depollution of a particular site should take into account its eventual usage, so that efforts to produce an ultra-clean site would not be wasted if the site did not require such a high level of cleanliness (e.g., if it were eventually to be covered with asphalt);
- remediation projects should be based on well-conceived risk analyses;
- policies should favour remediation of disused industrial sites, and they should be integrated into an overall land management plan;

- considering the extent of these and related problems in several countries, an order of prioritization should be imposed on the sites to be cleaned.

19. Furthermore, it was clear that remediation of polluted sites was not merely a question of technology and regulation, but that - perhaps above all - fiscal and financial aspects should be considered, so that the problems could be economically and realistically treated.

20. Finally, in this area as in all areas dealing with the environment, the general public and all concerned parties should be kept constantly and properly informed. This was a key and essential aspect to assure the success of a remediation project.

Conclusions and Recommendations of the Seminar

21. At the close of the technical sessions the Chairman summarized the overall results of the Seminar and formulated a number of recommendations:

- (a) The principal conclusion and recommendation of the Seminar was that it should become a regular biennial affair. Clearly the fact that more than 600 pre-registrations were received from 31 countries indicated the widespread interest in the subject matter.
- (b) It was considered very important that countries in transition attended the Seminar; that they were encouraged to attend future Seminars in this series, and that financial assistance be made available for their participation.
- (c) The structure of the Seminar sessions was considered appropriate, particularly as they covered technical issues as well as legal and public relations aspects. Financial aspects had been included but should be more highly developed in future.
- (d) While many countries (19) had made contributions to the programme, a large number of those came from France; future seminars should try to encourage more papers from other countries.
- (e) The Paris location was considered ideal for the seminars; it was geographically practical, technically well-equipped and inexpensive, and had an already existing infrastructure to prepare and service the Seminar.
- (f) The combination of the Seminar with the "Interchimie 99" exhibition was considered ideal, as there was synergy between the two.

Close of the Seminar

22. Mr. Howard Hornfeld of the ECE secretariat thanked the Government of France and the Association Interchimie for the excellent arrangements that had been made, as well as for the warm hospitality that had been enjoyed by all. He suggested that the Seminar entrust the secretariat with the task of writing the final report on the Seminar, which was unanimously accepted.

24. Mr. Pierre Fillet, Chairman of the Seminar and General Commissioner of the Salon Interchimie, thanked the participants and especially the authors and discussion leaders for their important contributions to the Seminar, as well as the ECE secretariat for its organizational support.

LIST OF PAPERS**Annex**

Symbol TRADE/CHEM/ SEM.1/	Title	Country	Author(s)
S.1	Risk Assessment for Contaminated Sites in Europe: An Overview	United Kingdom	Colin Ferguson
S.2	Practical Experiences of Using Risk Assessment	United Kingdom	Martin J. Bell Kelvin J. Potter
S.3	Assessment of Health Risks: Identifying and Taking into Account the Major Factors when Making Exposure Assessments	France	Rosaline Bonnard Guy Auburtin
S.4	Accidental Hydrocarbon Pollution: Study of the Risks of Pollution Transfer in a Complex Hydrogeological Context	France	Pierre Colin B. Despujol Thierry Blondel
S.5	The State of the Art in Investigation Techniques: Present State of Standardization and Perspectives for R&D	France	Pierre Colin René Goubier
S.6	The State of the Art in the Detection and Identification of Subterranean Pollution	France	Thierry Chassagnac Philippe Begassat
S.7	The Pollut-Eval Analyser: A Diagnostic Tool for Hydrocarbon-contaminated Soils	France	Jean Ducreux Eric Lafargue Yves Benoit
S.8	Heavy Metal Partitioning by SSE and SEM as Analytical Tools for Soil Remediation	Canada	Rosa Galvez-Cloutier Jean-Sébastien Dubé
S.9	Laboratory and in situ Research of the Ecotoxicological Forms of Heavy Metals in Polluted Soils	Russian Federation	Galina Motuzova
S.10	Physico-chemical Characteristics and Methodology for Analysing Contaminated Soils	France	Yvon Gervaise
S.11	Biosurfactant Enhanced Remediation of Soils Contaminated by Hydrocarbons	Belgium	Peter Cauwenberg Kris Lambert Luc Vriens
S.12	In situ Steam/Air Injection for NAPL Removal from the Unsaturated Zone	Germany	Reinhard Schmidt Angela Winkler Christoph Betz H.-P. Koschitzky
S.13	Bioremediation of an Industrial Site	Slovakia	Andrej Trnovec

Symbol TRADE/CHEM/ SEM.1/	Title	Country	Author(s)
S.14	Design and Application of a Full-scale Biosparging System in Northern Italy	Italy	Maurizio Buzzelli Paolo Muzzin Paolo Carrera
S.15	Reactive Barriers for Groundwater Treatment	France	Tim Vogel Pascal Roudier
S.16	Presentation of Ulis, Géoclean's Solvent-Extraction Soil Cleanup Process	France	Jean-Marie Abadie
S.17	Treatment of an Industrial Site by Thermal Desorption	France	Hubert Bonin
S.18	In Situ Soil Treatment by Thermal Desorption: Mobitherm, an Innovative Tool	France	Olivier Déchelette Pierre Briery
S.19	The Role of the Inspector of Classified Sites during Remediation of Polluted Soils	France	Robert Rénaud
S.20	Monitoring of Contaminated Sites and Soils	France	Michel Monzain
S.21	Site Monitoring: Example of a Functioning Chemical Industry Site	France	Dominique Didenot
S.22	Assessing the Risks from Contaminated Sites and Soils: the Special Case of Operating Sites	France	Roger Papp
S.23	Risk Assessment Method for Orphan Contaminated Sites and Choice of Remediation Scenarios	France	Nathalie Gonthiez
S.24	Rehabilitation of the Sites of Former Gas Works: the Experience of Gaz de France	France	Jeanne-Marie Costes
S.25	Polluted Sites and Soil: from Environmental Risk Management to Site Management	France	Marc Kaszynski
S.26 [not presented]	The New Policy for Soil Protection and the Rehabilitation of Contaminated Areas in Quebec	Canada	Michel Beaulieu
S.27	Remediation of a Highly Contaminated Industrial Area	Czech Republic	Mecislav Kuras Jan Mikolas
S.28	Pilot Projects Demonstrating Environmental Cleanup of Selected Sites Polluted by Chemicals	Switzerland	Hansruedi Felix

Symbol TRADE/CHEM/ SEM.1/	Title	Country	Author(s)
S.29	Environmental Risk Management, an Integral Part of Business Strategy	Switzerland	Jean-François Nicod
S.30	Legal, Economic and Public Relations Issues Related to Facilities with Contaminated Soils Located in the United States of America	United States	Jane DiRenzo Pigott
S.31	The Emerging Legal Position in France on Remediation of Contaminated Soils	France	Vincent Sol
S.32	The Dutch Soil Protection Act	Netherlands	Jan van den Broek
S.33	Insurability: The Role of the Insurer	France	Anne Magnan Tanguy Latron
S.34	Communicating with the Public during Cleanup of Contaminated Soils	United States	Barbara Maco