Common Understanding of Environmental Pollution: Challenges & Perspectives for EU-China Cooperation

Final Conference of the EU FP7 Project “GLOCOM” - Global Partners in Contaminated Land Management

September 2, 2015
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What is GLOCOM about

GLOCOM is an EU Marie Curie Staff Exchange Project, financed under the FP7 Programme, coordinated by University Ca' Foscari of Venice (UNIVE, Italy) and comprising other three partners: Umea University (UMU, Sweden), Beijing Normal University (BNU, P.R.China), and Chinese Research Academy of Environmental Sciences (CRAES, P.R.China).

GLOCOM aimed at filling the gap in the systematic approach for the sustainable management of contaminated sites, integrating socio-economic analysis, risk assessment, and remediation technologies comparison.

Through know-how transfer, communication and expertise exchange between European and Chinese researchers, the project pursued the following objectives over its 4 years duration (Dec. 2011 – Nov. 2015):

1) to carry out a comparison of regulatory and operational frameworks for the management of chemical substances and contaminated land and water resources in China, stimulating a regulatory and scientific harmonization process at international level;

2) to conduct analysis and comparison of methodologies and tools for exposure and risk assessment in Europe and China, through the application of exposure and assessment models to selected case studies in Italy, Sweden and China;

3) to advance the decision making on complex issues in contaminated land and water management through the development and application of tools for stakeholders involvement in environmental decision-making processes;

4) to enhance the evaluation of environmental policies through sustainability impact assessment tools;

5) to strengthen the quality of research by developing international collaborations;

6) to trigger constructive collaborations for future research projects.
Conference Committees

List in alphabetical order by surname

Scientific Committee

Brombal Daniele
University Ca’ Foscari of Venice/Italy

Cheng Hongguang
Beijing Normal University/P.R.China

Critto Andrea
University Ca’ Foscari of Venice/Italy

Haglund Peter
Umea University/Sweden

Hao Fanghua
Beijing Normal University/P.R.China

Lin Chunye
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Marcomini Antonio
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Ouyang Wei
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Tysklind Mats
Umea University/Sweden

Song Yonghui
Chinese Research Academy of Environmental Sciences/P.R.China

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Pizzol Lisa
University Ca’ Foscari of Venice/Italy

Stoycheva Stella
University Ca’ Foscari of Venice/Italy

Wang Bingyan
Beijing Normal University/P.R.China

Xia Rui
Chinese Research Academy of Environmental Sciences/P.R.China
Program

9.00-9.30  Registration/Coffee time

9.30-9.50  Opening session  
Chair: Zhang Mengheng  
Prof. Song Yonghui (Vice-president CRAES)  
Prof. Marcomini Antonio (Director of DAIS, University Ca’ Foscari of Venice; GLOCOM scientific coordinator)

9.50-10.00  Introduction of international cooperation activities at CRAES  
Xia Rui

10.00-12.00  Scientific session 1  
Chair: Critto Andrea  
10.00-10.20  Soil environmental management systems for contaminated sites in China and the EU: Common challenges and perspectives for lesson drawing  
Guo Guanlin  
10.20-10.40  China’s water environmental management towards institutional integration. A review of current progress and constraints vis-a-vis the European experience  
Deng Yixiang  
10.40-11.00  Sustainability impact assessment for water environmental management policies. A case study from Lihu Lake, P.R.China  
Brombal Daniele  
11.00-11.20  Ecological status classification of the Taizi River Basin, China: a comparison of integrated risk assessment approaches  
Fan Juntao  
11.20-11.40  Evaluation of non-point source pollution in the northeastern China under land use change and climate change scenarios  
Huang Haobo  
11.40-12.00  Aggregate exposure assessment to cadmium in a mining area in China via a PBPK model  
Cui Xiangfen

12.00-13.30  Lunch break/Poster session

13.30-15.10  Scientific session 2  
Chair: Lin Chunye  
13.30-13.50  Identification and prioritization of sources for optimal coastal and river basin management using multivariate statistical tools  
Tysklind Mats  
13.50-14.10  Targeted and exploratory approaches for characterisation and exposure assessment of new emerging contaminant  
Haglund Peter  
14.10-14.30  Applying watershed outlet sediment geochemistry pattern to indicate long-term agricultural non-point source (NPS) pollution loading  
Ouyang Wei  
Wang Xianliang  
14.50-15.10  Pharmaceuticals and other new emerging contaminants in the water management context  
Xu Jian

15.10-16.00  Coffee break/Poster session

16.00-17.20  Roundtable discussion  
“Perspectives for EU-China cooperation in the field of environmental pollution assessment and management”

17.20-17.30  Closing remarks and greetings  
Prof. Song Yonghui  
Prof. Marcomini Antonio

Common Understanding of Environmental Pollution: Challenges & Perspectives for EU-China Cooperation  
GLOCOM Final Conference, Beijing (PRC), September 2, 2015  
www.dais.unive.it/~glocem
Abstracts

Scientific session 1

Soil environmental management systems for contaminated sites in China and the EU: common challenges and perspectives for lesson drawing
Brombal Daniele¹, Wang Haiyan², Pizzol Lisa¹, Critto Andrea¹*, Giubilato Elisa¹, Guo Guanlin²

¹University Ca' Foscari of Venice, Italy
²Chinese Research Academy of Environmental Sciences, P.R.China

ABSTRACT:
This paper aims at appraising the current progress of China’s contaminated sites environmental management system, identifying its bottlenecks and individuating areas for lesson drawing based on the relevant EU experience. The paper provides an overview of policies, laws, standards, administrative functions, and management processes relevant to China’s contaminated sites environmental management. Based on its current development status, the following shortcomings can be individuated in the Chinese case: (a) inadequate monitoring system; (b) incomplete legislation; (c) overlapping of competencies in sites administration; (d) lack of a dedicated funding scheme. Similar challenges have been characterising also the development of the management system for contaminated sites in EU Member States. Based on the experience matured in the EU in tackling such challenges, the final section of the paper puts forward recommendations targeted on the Chinese case. Proposed recommendations are discussed against the broader background of China’s institutional and policy environment.

China’s water environmental management towards institutional integration. A review of current progress and constraints vis-a-vis the European experience
Deng Yixiang¹, Brombal Daniele², Farah Paolo³*, Moriggi Angela², Critto Andrea², Zhou Yun¹, Marcomini Antonio²

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²University Ca’ Foscari of Venice, Italy
³Eberly College of Art and Sciences, West Virginia University, USA

ABSTRACT:
In recent years, China has launched ambitious measures to tackle water pollution. As political commitment and public investment soared, Chinese environmental scientists and practitioners have engaged in a substantial debate on the reorganization of the country’s water management system. Domestic discussion has largely revolved around best practices adopted abroad, particularly in the EU, where the Water Framework Directive (WFD) has introduced an integrated management model based on the core concept of unity of the water cycle. This paper seeks to contribute to this debate, by appraising the regulatory, administrative, monitoring, and public participation dimensions of China’s water environmental management. Related progress and constraints are discussed in the evolving context of Chinese environmental policies, against the background of the relevant EU experience. Regulatory and administrative coordination and integration, and the adoption of a watershed-based management model, appear at present as essential prerequisites to overcome the fragmentation of China’s water environmental management. Despite recent efforts in this direction, institutional rationalization is still hampered by the persistence of conflicting interests and attributions among government bodies concurring to law making and implementation.
Sustainability impact assessment for water environmental management policies. A case study from Lihu Lake, P.R.China

Brombal Daniele¹, Niu Yuan², Pizzol Lisa¹, Moriggi Angela¹, Wang Jingzhi², Critto Andrea¹, Jiang Xia¹, Zabeo Alex¹, Marcomini Antonio¹

¹University Ca’ Foscari of Venice, Italy
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ABSTRACT:
This presentation introduces a framework for Sustainability Impact Assessment (SIA), developed to appraise the comprehensive sustainability of water management policies in a Chinese case study. More specifically, the framework aims at at measuring the overall impact on sustainability at local (district) level of a government-led program of water environmental management carried out in the area of Lihu Lake (Jiangsu Province) between 2002 and 2012, namely the “Lihu Comprehensive Water Environmental Improvement Measures”. This target is pursued by integrating environmental, economic, and social sustainability indicators, by means of a Multi-Criteria-Decision-Analysis (MCDA) methodology. Local stakeholders’ engagement practices are utilized in the proposed framework to validate and weigh indicators proposed by experts. Such practices consist primarily in iterative workshop sessions, aimed at generating consensus among stakeholders over (a) the importance to be attributed to different dimensions of sustainability; and (b) the degree of relevance of different indicators to measure progress towards sustainability targets.

References:

Ecological status classification of the Taizi River Basin, China: a comparison of integrated risk assessment approaches

Fan Juntao¹,², Semenzin Elena², Meng Wei², Giubilato Elisa³, Zhang Yuan², Critto Andrea³, Zabeo Alex³, Zhou Yun², Ding Sen², Wan Jun², He Mengchang¹, Lin Chunye¹

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³University Ca’ Foscari of Venice, Italy

ABSTRACT:
In this paper, the Integrated Risk Assessment (IRA) methodology developed in the EU MODELKEY project (and implemented in the MODELKEY Decision Support System) is applied to the Taizi river (China), in order to assess its Ecological and Chemical Status according to EU Water Framework Directive (WFD) requirements. The available dataset is derived by an extensive survey carried out in 2009 and 2010 across the Taizi river catchment. The results show a negative trend in the ecological status from the highland to the lowland of the Taizi River Basin. Organic pollution from agriculture and domestic sources (i.e., COD, BOD5), unstable hydrological regime (i.e., water quantity shortage) and chemical pollutants from industry (i.e., PAHs and metals) are found to be the...
main stressors impacting the ecological status of the Taizi River Basin. The comparison between
the results of IRA methodology and those of a previous study (Leigh et al., 2012) indicates that the
selection of indicators and integrating methodologies can have a relevant impact on the classification
of the ecological status.

Reference:
Leigh C., Qu X., Zhang Y., Kong W.J., Meng W., Hanington P., Speed R., Gippel C., Bond N.,
Catford J., Bunn S., Close P., 2013. Assessment of River Health in the Liao River Basin (Taizi Sub-
catchment). International Water Centre, Brisbane, Australia.

Evaluation of non-point source pollution in the northeastern China under land use
change and climate change scenarios
Huang Haobo1, Ouyang Wei1, Hao Fanghua1, Critto Andrea2, Pesce Marco2

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ABSTRACT:
Study Region: Abujiao River basin. Study Focus: The Soil and Water Assessment Tool (SWAT)
was used to evaluate sensitivities and patterns in non-point source (NPS) pollution due to projected
landuse and climate changes. The landuse pattern in 1979, 1992, 1999 and 2009 were interpreted
from Landsat TM image, and the spatial and temporal distribution of the NPS pollution were simu-
lated for the four periods due to these landuse data. The daily climate data from CORDEX (Coordi-
nate Regional Climate Downscaling Experiment) was used to modelling the future climate scenari-
os. The sensitivities and impacts of projected climate changes on NPS pollution were simulated for
the rcp 4.5 and rcp 8.5 scenarios and analyzed relative to the baseline scenario of 1970-2015. New
NPS pollution insights: For landuse change, the four periods simulation results indicated that the
long term agricultural development intensively increased the NPS pollution yield. The NPS pollu-
tion yield was found to be sensitive to the conversion from forest and wetlands into the agricultural
land. Concerning the analysis of climate change impacts, the differences between the historical data
and future climate data for the different investigated climate scenarios will be calculated, in order to
modify the historical climate records of precipitation and temperature, and to perform the final sim-
ulation with SWAT.

Aggregate exposure assessment to cadmium in a mining area in China via a PBPK model
Cui Xiangfen1, Cheng Hongguang1, Giubilato Elisa2, Critto Andrea2, Standaert Arnout3, Marcomini
Antonio2

1Beijing Normal University, P.R.China
2University Ca’ Foscari of Venice, Italy
3Flemish Institute for Technological Research, Belgium

ABSTRACT:
Cadmium (Cd) is not an essential but a toxic element for body associated with various adverse
health effects, especially for renal damage. Urinary cadmium is commonly used as a bio-marker for
long-term cadmium exposure. However, it is difficult to attain the index for large scale population
since ethical issues and limited resources. A modified version of the Nordberg-Kjellström model
was developed and applied specifically to predict urinary cadmium after long-term cadmium expo-
sure, but whether it is suitable to Chinese population is unknown. Objective: Present study aims to
evaluate the application of above PBPK model to estimate the urinary cadmium levels around a typ-
Identification and prioritization of sources for optimal environmental management using multivariate statistical tools

Tyskling Mats¹, Assefa Anteneh¹, Lundstedt Staffan¹, Xu Jian², Zhang Yuan², Shan Yushu³, Ouyang Wei³, Pu Xiao³, Cheng Hongguang³, Lin Chunye³

¹Umea University, Sweden
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³Beijing Normal University, P.R.China

ABSTRACT:
The objective of the collaboration was to demonstrate a strategy for identification of critical sources for prioritization and basis for mitigation activities on regional environmental scales. On a regional environmental scale, such as river basin scale, the level and composition of contaminants are generally originated from multiple sources. The contribution from point sources and diffuse sources will vary both on temporal and spatial scales. In order to identify sources of significant which should be prioritized for mitigation a strategy, which includes “chemical fingerprinting” of environmental samples and sharp statistical tools capable of decompose systematic source patterns, can be applied. Soil samples from a farming area in the Sanjiang Plain, Northeast China, were screened for a heavy metal content covering different land use types during different time periods. Sediments samples from the Baltic Sea coastal areas (Sweden) and Taihu Lake (China) were screened for chemical fingerprints of polychlorinated dioxins and dibensofurans (PCDD/Fs) and polycyclic aromatic hydrocarbons (PAHs), respectively. By applying a combination of principal component analysis (PCA) and positive matrix factorization (PMF) source patterns were identified, suggesting the most likely significant anthropogenic activities influencing the system. In the soil case (China) an anthropogenic factor could be extracted which related to farming practices. In the case of PCDD/Fs in coastal sediments (Sweden), 4 – 6 sources were identified, related to diffuse sources as well as a number of specific industrial activities situated along the coast. The PAH fingerprinting from the Taihu Lake in China revealed 3 major sources, with varying influence along the river basin system. Multivariate statistical tools, such as PCA and PMF, based on chemical fingerprinting are powerful tools in management of contaminants on different environmental scales.
References:

Targeted and exploratory approaches for characterisation and exposure assessment of new and emerging contaminants
Haglund Peter\textsuperscript{1}, Zhang Yizhang\textsuperscript{2}, Ouyang Wei\textsuperscript{2}
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ABSTRACT:
Recent developments in analytical instumentation have opened up new possibilities in terms of emission characterization and exposure assessment of new and emerging contaminants. Two-dimensional gas chromatography (GC×GC) and liquid chromatography (LC×LC) offers exceptionally peak capacity allowing 1000's of chemicals to be physically separated. If combined with high-resolution time-of-flight mass spectrometry (HR-TOF-MS) it is possible to perform comprehensive characterization of contaminants in complex mixtures or, alternatively, perform a highly selective target analysis of specific emerging contaminants of concern or perform. However, the greatest promise is in the combined use of the two approaches and statistical and hazard assessment tools. In an exploratory phase a comprehensive characterization is done of as many environmental contaminants as possible and the initial hypothesis is used to guide a statistical evaluation to find contaminants of potential concern, which are then identified. In the next phase a hazard assessment can be performed using existing or modelled data (e.g. using quantitative structure-activity relationships; QSARs). Finally, this information can be used to calculate hazard ratios such as the measured environmental concentration - predicted no effect concentration (MEC/PNEC) ratio, which can be used to rank new and emerging contaminants for further studies or regulatory actions.

Applying watershed outlet sediment geochemistry pattern to indicate long-term agricultural non-point source (NPS) pollution loading
Ouyang Wei\textsuperscript{1,*}, Jiao Wei\textsuperscript{1}, Hao Fanghua\textsuperscript{1}, Lin Chunye\textsuperscript{1}, Giubilato Elisa\textsuperscript{2}, Critto Andrea\textsuperscript{2}
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\textsuperscript{2}University Ca’ Foscari of Venice, Italy

ABSTRACT:
Watershed agricultural non-point source (NPS) pollution cause more risk to the water safety and some part of loading can be accumulated in the watershed outlet section. It was hypothesized that the geochemistry characteristics of watershed outlet sediment can present the long term NPS pollution loading. To better understanding the interaction between them, it is crucial for evaluating the historical interactions between sediment properties with watershed NPS loading. In this study, we
collected the sediment core from the outlet of a typical agricultural watershed in Northeast China. The core was age dated by \(^{210}\)Pb method, and sedimentation rates were determined using the constant rate of supply (CRS) model. It was found that total nitrogen (TN), total phosphorus (TP), Cd, Pb, Cu, Ni and Cr accumulations in the sediment generally showed a trend of fluctuating increase with the highest sedimentation fluxes all observed around 1998. The measurement of specific mass sedimentation rates reflected a record of watershed soil erosion dynamics during long-term agricultural development, which was closely associated with the sediment geochemistry. With SWAT (Soil and Water Assessment Tool) model, the historical interactions of sediment properties with agricultural NPS pollution were further evaluated. The excessive application of phosphorus fertilizers was identified as the major cause for recent sediment geochemistry variability. To some extent, the N leaching process weakened this interaction, but the historical accumulation of TP and heavy metals in sediments generally correlated well with watershed NPS TP loading. The regression analysis suggested that Pb and Cr were the most suitable indexes to assess the long-term NPS TN and TP pollution, respectively. The analysis provided the evidence for the hypotheses and the new method for the long term NPS pollution assessment.

Identification of risks of chemical mixtures in exposure assessment - identification of novel epigenetic risks of complex mixtures

Wang Xianliang\(^1\)*, Tysklind Mats\(^2\), Liu Yan\(^1\), Ma Jin\(^1\), Zhou Junli\(^1\), Qian Yan\(^1\), Lv Zhanlu\(^1\)

\(^1\)Chinese Research Academy of Environmental Sciences, P.R.China
\(^2\)Umea University, Sweden

ABSTRACT:

Environmental contaminants occur as mixture in the environment and thus its an urgent need for development of methodology for assessing complex environmental mixtures. Epigenetic mechanism, mainly DNA methylation change, has become one of the focusing fields for the etiology of many disorders, including the adverse effect of many environmental stressors such as heavy metals and organic contaminants. To study demethylation epigenetic toxicity of pollutants based on an artificial recombinant pEGFP-C3 plasmid, pEGFP-C3 plasmid was methylated in vitro first and transfected into HepG2 cells. Taking 5-AZA-CdR as positive demethylation agent, the levels of methylation of the EGFP CMV promoter region, EGFP gene expression and green fluorescence intensity of the recombinant cell lines was quantified with sodium bisulfite sequencing assay, quantitative real-time quantitative PCR and flow cytometry at the time of 24 h after the cells co-cultured with 5-AZA-CdR gradients, respectively. The demethylation ability of the aquatic from polluted area of Tianjin basin was tested with this method. Good dose-respond relationships were found between DNA methylation of CMV promoter, EGFP gene expression, green fluorescence intensity of the recombinant cells and 5-AZA. The equation for fluorescence intensity of the test cells and 5-AZA is y = 0.640lnx + 10.284 with R^2 = 0.890. This method has a detection limit of 0.00004 μM 5-AZA and good repeatability with variation of 7.5%-23.9%. Almost half of them from the Tianjin basin was found demethylation ability positively with this method.
Pharmaceuticals and other new emerging contaminants in a water management context
Xu Jian\(^1\), Zhang Yuan\(^1\), Tysklind Mats\(^2\)

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\(^2\)Umea University, Sweden

ABSTRACT:
In this presentation, the occurrence, distribution and possible sources of several classes of legacy and emerging organic contaminants, including polycyclic aromatic hydrocarbons (PAHs), antibiotics, brominated flame retardants (such as TBBPA and HBCDs), and perfluorinated compounds (PFCs) in the aquatic environment of Taihu Lake in east China were determined. All target contaminants were ubiquitously detected in the whole lake water body. PAHs were mainly from vehicular emission, followed by coal and wood combustion. Human-derived and animal-derived drugs significantly contributed to the total contamination of antibiotics in the lake, indicating the high complexity of contamination sources in the lake. The estuary inputs around Taihu Lake were important sources of TBBPA and HBCDs. As for PFCs, the majority of pollutants was from direct emissions from manufacturing processes. The degradation of volatile precursor substances and atmospheric deposition to the epilimnion also contributed to the total PFCs levels in the lake. The monitoring results of these contaminants suggested the great influence of human activities on the natural aquatic environment.

References:
Poster abstracts

List in alphabetical order by surname of the first author

Process simulation on applying a kind of slow-released filler for PRBs to remedy groundwater contamination
An Da1,2, Yang Yu2, Jiang Yonghai2, Xi Beidou2,3, Pizzol Lisa3, Chen Fangyi2, Lian Xinying2, Critto Andrea3
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2Chinese Research Academy of Environmental Sciences, P.R.China
3University Ca’ Foscari of Venice, Italy

ABSTRACT:
Permeable reactive barriers (PRBs) have received a great deal of attention as an innovative and cost effective method for in situ remediation of contaminated groundwater. A challenging factor is the selection of the most suitable and advantageous filler. The objective of this study was to explore the release mechanism of the slow-released persulfate material, used as PRBs filler for remediation of groundwater contamination, and to develop a model to describe the release mechanism of persulfate from the slow-release materials. The NEN7375 tank leach test and scanning electron microscopy have been used to study the release mechanism of slow-released persulfate material, while the model was developed by the method of differential and integral calculus. The result showed that there was a strong linear relationship between the total amount of potassium persulfate and the leachability of potassium persulfate. Diffusion control was the major release mechanism of the potassium persulfate from the slow-release material. The simulated release process was consistent with the result of the laboratory study and the electron microscope scanning. It indicated that applying the developed model to simulate the release process of persulfate from the releasing material was feasible and effective.

Contamination and human health risk of lead in soils around lead-zinc smelting areas in China
Lei Kai1, Giubilato Elisa2, Critto Andrea3, Pan Huiyun3, Lin Chunye1
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2University Ca’ Foscari of Venice, Italy
3Henan Polytechnic University, P. R. China

ABSTRACT:
Pb-Zn smelting is an important economic activity in China. However, Pb contamination has pervaded many areas of China due to Pb-Zn smelting activity, which has seriously impacted soil environment quality and represent a relevant hazard to human health. This article reviews studies on Pb contamination in soils around Pb-Zn smelting areas in China published during the period 2000-2014. The concentration and spatial distribution of Pb contamination for the investigated areas and the associated human health risk have been analyzed and discussed in this study. The assessment methods include the application of the Pollution Index (PI), Geoaccumulation Index (Igeo) and the human health risk assessment procedure recommended by USEPA. The results demonstrate that not only Pb-Zn smelting activity generates severe Pb contamination in soils in most investigated areas, but also that the health risk caused by Pb contamination in soils poses potential threat to local inhabitants, especially to children. The Pb-Zn smelter areas in southwest and southeast provinces of China, along with Liaoning province, show particularly critical contamination conditions and
should receive priority in controlling Pb contamination in soils and associated health risks. The results of this study can provide relevant information for setting priorities in pollution control and environmental management in Pb-Zn smelting areas in China.

References:

**Comparison of modelling approaches for the assessment of children exposure to Pb in a smelter site in China**

Li Peizhong1, Giubilato Elisa2, Critto Andrea2, Lin Chunye1*, Cheng Hongguang1, Marcomini Antonio2, Duan Xiaoli1

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2University Ca’ Foscari of Venice, Italy

**ABSTRACT:**
Children are more vulnerable than adults to the cognitive and developmental effects of lead poisoning; therefore the assessment of risks posed by children lead exposure in China represents a priority issue for research. Several investigations were focused on the characterization of pollution sources and contamination of environmental media, however, the scarce availability of biomonitoring data and limited detailed exposure assessments in small industrial sites hamper the identification of the most relevant sources and exposure pathways to receptors, which are the potential key factors to be considered for preventing lead poisoning events. The application and comparison of two human exposure models has been performed in order to identify the relevance of different lead exposure routes for children in rural and smelter areas and to support the definition of effective risk management measures. A new toolbox for the integrated assessment of human exposure has been recently developed by EU researchers within 2FUN project, which coupled an environmental multimedia exposure model and an internal exposure model (physiologically based pharmacokinetic, PBPK) in the same platform. Through the application on a case study concerning children exposure in a historical Pb-Zn smelter site in southwest of China, the results of this new model were compared with the ones from the most common used Integrated Exposure Uptake Biokinetic model. Finally the application provided the identification of the most relevant exposure routes and the ranking of their individual contributions to the total children exposure.

References:
Regional risk assessment approaches to land planning for industrial polluted areas in China: the Hulunbeier region case study

Li Daqing1, Zhang Chen2, Pizzol Lisa3, Critto Andrea1, Zhang Haibo2, Lv Shihai1, Marcomini Antonio3

1 Chinese Research Academy of Environmental Sciences, P.R.China
2 Beijing Normal University, P.R.China
3 University Ca’ Foscari of Venice, Italy

ABSTRACT:
The rapid industrial development and urbanization processes that occurred in China over the past 30 years has increased dramatically the consumption of natural resources and raw materials, thus exacerbating the human pressure on environmental ecosystems. In result, large scale environmental pollution of soil, natural waters and urban air were recorded. The development of effective industrial planning to support regional sustainable economy development has become an issue of serious concern for local authorities which need to select safe sites for new industrial settlements (i.e. industrial plants) according to assessment approaches considering cumulative impacts, synergistic pollution effects and risks of accidental releases. In order to support decision makers in the development of efficient and effective regional land-use plans encompassing the identification of suitable areas for new industrial settlements and areas in need of intervention measures, this study provides a spatial regional risk assessment methodology which integrates relative risk assessment (RRA) and socioeconomic assessment (SEA) and makes use of spatial analysis (GIS) methodologies and multicriteria decision analysis (MCDA) techniques. The proposed methodology was applied to the Chinese region of Hulunbeier which is located in eastern Inner Mongolia Autonomous Region, adjacent to the Republic of Mongolia. The application results demonstrated the effectiveness of the proposed methodology in the identification of the most hazardous and risky industrial settlements, the most vulnerable regional receptors and the regional districts which resulted to be the most relevant for intervention measures since they are characterized by high regional risk and excellent socioeconomic development conditions.

Persistent organic pollutants in agricultural soil and prevention of leakage to the surroundings

Lundin Lisa1, Tysklind Mats1, Zhao Xuchen2, Ouyang Wei2, Hao Fanghua2, Wang Fangli2

1 Umea University, Sweden
2 Beijing Normal University, P.R.China

ABSTRACT:
Agricultural soils are burdened with chemicals in different ways either by amendments or the use of herbicides and the soils become important sources of non-point source pollutants. The groundwater can be polluted with the migration of contaminations in soil and water. Biochar which produced by pyrolysis of biomass under limited oxygen conditions can be used as soil remediation agent to reduce the risk of contamination of the environment. We show that persistent organic pollutants (POPs) present in amendments are transferred to the soil and that adding biochar to the soil is a feasible way to prevent leakage of herbicides from agricultural soils. Soils amended with compost or sewage sludge absorb POPs but it varied between the compound groups. The sorption of atrazine on the pure soil and biochar-amended soil showed that the 3% biochar addition increased the sorption capacity of the soil for aztrazine which was about 3 time larger that pure soil from the parameter...
(K_F) obtained from Freundlich model. Biochar as an agricultural soil amendment could be a potential strategy to reduce the agrochemical pollution of agricultural environment.

References:

Predicting the toxicity of metal oxide nanoparticles by means of QSAR modelling
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ABSTRACT:
Background-Due to their diversity, unique properties, and seemingly limitless uses, metal oxide nanoparticles (MeONPs) pose special challenges during assessments of risk. Because of their physical and chemical properties, it is also a challenge to quantify exposures and bioaccessibilities, thus making it difficult to quantify threshold doses that will cause adverse effects. Principle-Quantitative structure - activity relationships (QSARs) is useful for allowing understanding of the properties that affect potencies of MeONPs and prediction of toxic effects. Results-In the present study, an improved predictive nano-QSAR model based on limited cytotoxicities data of manufactured MeONPs was developed and a periodic table, which contained predicted cytotoxicities of 52 MeONPs, was developed. Inspiration-These models are intended to help identify what may need to be known in order to make more comprehensive assessments of risks related to MeONPs.

Climate change risk assessment for water quality in coastal watersheds
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ABSTRACT:
Nowadays, freshwaters face a series of threats primarily caused by human activity. In particular, the overload of nutrients and the release of toxic substances (i.e. organic pesticides) can lead to an evident degradation of their ecosystems (Novotny, 2003). Moreover, the availability and quality of
freshwaters can also be affected by anthropogenic climate change (Döll & Bunn, 2014; Whitehead et al., 2013). The leading motivation of this study consists into taking into account the possible changes in Earth’s climate when assessing future scenarios of ecological risk for river ecosystems. The ultimate goal of the study is to assess, for different climate scenarios, the effects of climate change on the fate, transport and bioavailability of nutrients and toxic chemicals, as well as the effects and feedbacks of these latter on the ecosystem of an Italian river, the Zero river, flowing into the Lagoon of Venice. The objective will be reached through the implementation of regional climate scenarios (spatial resolution of 12.5 km) forced by the RCP 4.5 and RCP 8.5 emission pathways into two environmental models, SWAT (Arnold et al. 1998) and AQUATOX (Park et al., 2008), able to represent physico-chemical and ecological processes of a coastal watershed.

References:

Health risk assessment and remediation technologies selection for POPs and metals contaminated sites in Tanggu chemical industrial region using DESYRE
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ABSTRACT:
In this study, the Decision support system DESYRE is used as an effective tool for estimating the extend of the contaminated area, assessing the health risk and selecting the most suitable remediated technologies to be applied to the Tanggu Chemical Industrial Region case study which has been selected due to its representativeness in the Chinese context. Although the contaminants concentrations and distributions of POPs and heavy metals were analyzed in other previous works, however, in these studies, the health risk and remediation plans were not well assessed. Thus, the main objectives of the present study are a) to assess the exposure pathways and risks of POPs and heavy metals posed to the population located in the case study; b) to recognize the contaminated area in need of remediation and to rank a set of suitable remediation technologies considering a wide set of criteria; and c) to suggest the best remediation technologies and the related management plans. The application of DESYRE allowed to assess that the HCHs and some heavy metals (Zn, Cu and Hg) may pose a significantly health risk for local people, while the health risk associated to DDTs, PCBs and other heavy metals can be ignored. Finally, soil washing and solidification/stabilization achieved the highest ranking scores associated to the compared remediation technologies, supporting their application in the investigated contaminated sites.
Use of physiologically-based pharmacokinetic models to estimate lead exposure in children in 11 Chinese cities

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ABSTRACT:
Exposure to lead is a public health concern and has been associated with intellectual development in children. However, the current lead exposure levels often fail to ensure children’s safety even when environment lead levels are enough lower than the quality standards, since human are exposed to lead via multiple pathways. There are growing concerns on the average blood lead levels (4.55–16.53 μg/dL) and the percentage of children with elevated blood lead levels (3.2%–80.7%) in children in China, whereas lead concentrations in environmental compartments and food items were always reported to be below the corresponding national quality standards. In order to investigate children exposure to lead to protect from associated hazards, two pharmacokinetic modelling tools (specifically, Merlin-EXPO tool developed within 4FUN Project funded by the EU 7th Framework Programme, and the IEUBK model developed by the USEPA) were used to estimate lead exposure via multiple pathways based on biomonitoring data and external exposure data of 11 big cities in China collected by literature review. The source allocations for diet, drinking water, soil/dust, and air in these 11 cities will be investigated. The further analysis on the predicted results in Merlin-EXPO and the discussion of the comparison between MERLIN-Expo and IEUBK results will be performed.

References:
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