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TUESDAY MORNING

International Environmental Issues: Perspectives and Concerns

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G. P. Cobb, B. Jovancicevic, J. H. Exner, I. Popovic, and B. Jovancicevic, *Organizers*
J. H. Exner and I. Popovic, *Organizers, Presiding*

8:30 —51. The long road to sustainability: Recycling trends in Serbia. **I. Popovic**

8:55 —52. Advanced air quality indexing in a transition economy city: The Belgrade example. **B. Radak**, A. Zuic, L. Ignjatovic

9:20 —53. Megacity air quality. **C. E. Kolb**

9:45 —54. Investigation of bioremediation potential of bacteria and fungi for petroleum degradation in soil. **B. Jovancicevic**, M. Vrvic, M. Antic, T. Solevic, M. Ilic, M. Novakovich

10:10 — Intermission.

10:20 —55. Pesticide use and environmental problems in Central America. **L. E. Castillo**

10:45 —56. Legacy and new contaminants in arctic air. **T. F. Bidleman**, L. M. Jantunen, F. Wong, G. A. Stern

11:10 —57. Occurrence of perchlorate across the world and the implication for human health impact. **A. Jackson**, G. J. Orris

11:35 —58. Environmental challenges in transition economies. **M. Mozur**

ABSTRACTS

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The long road to sustainability: Recycling trends in Serbia

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As a country aspiring to join the European Union, Serbia has taken a hard look at its environmental policies and regulations. In the past year, several relevant laws and documents have been passed, such as the Strategy of Sustainable Development in Serbia. The Law on Waste Management and 15 other environmental laws that should align Serbian environmental policy with that of the EU and the European REACH (Registration, Evaluation, and Authorization of Chemicals) regulations are in the process of being ratified. There are more than 300 companies to select, sort, process and import/export waste materials registered in Serbia, which has a population of 7.5 million inhabitants. They mostly deal with ferrous and non-ferrous (copper, aluminum, zinc) scrap, paper and cardboard, glass and ceramics, car batteries, automotive tires, phosphogypsum, pyrite waste, fly ash, textiles, electronic scrap, used car catalysts, plastics including PCB contaminated waste, pharmaceutical and construction waste. The adoption of laws concerning waste management should considerably improve the business environment for recyclers. The annual amount of collected recyclable waste per capita in Serbia in 2006 was 0.376 metric tons. The amount of recycled waste has increased from 3% in 2004 to 15% in 2008. Serbia is a country in economic transition, which implies that it is faced with many economic and financial issues that take precedence over the environment. It is still not fully understood that integrated waste management can provide economic opportunities for both private and public investors.

ENVR 52

Advanced air quality indexing in a transition economy city: The Belgrade example

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Even though many air pollutants have been monitored since 1953 in Belgrade, Serbia, only sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and black smoke (BS) are common to all 20 monitoring stations set up in the Belgrade metropolitan area. We critically evaluated and selected the most reliable measurements, and defined pollution characteristics for the area in those terms. Belgrade is found to have a typical pollution of a city in economic transition. SO₂ and BS concentrations remain high, with seasonal

variation, while moderate NO₂ levels persist. These data are discussed in terms of sources, spatial, and temporal distribution. In order to improve characterization we investigated possibilities of using air quality indices associated with individual pollutants for comparisons between different pollutants, characterization of monitoring sites, and extended their use to include elements of population exposure. A methodology of correcting results, obtained at monitoring stations located in severe pollution areas (e.g., street canyons), was proposed and used. The procedure confirmed the proper location of monitoring sites in the area.

ENVR 53

Megacity air quality

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The United Nations (UN) tabulated 19 “megacity” metropolitan areas with populations in excess of 10 million in 2007, up from two in 1950 and three in 1975. UN demographers project that there will be 27 megacities by 2025. These massive urban agglomerations are unique human dominated ecosystems with metabolic characteristics that profoundly influence their environments, with local, regional, hemispheric and even global impacts. The urban metabolism of megacities will be reviewed with emphasis on urban respiration and its impacts on climate and air quality. Air quality characteristics of selected megacities in both developed and developing regions will be presented and their impacts discussed.

ENVR 54

Investigation of bioremediation potential of bacteria and fungi for petroleum degradation in soil

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Bioremediation potential of bacteria and fungi isolated from sediment samples from an alluvial formation of the Danube (wastewater channel) of the Pancevo Industrial Zone (Serbia) was investigated earlier. (Ilic M., Antic M., Antic V., Schwarzbauer J., Vrvic M. and Jovancicevic B., Investigation of bioremediation potential of zymogenous bacteria and fungi for crude oil degradation. *Environmental Chemistry Letters* (submitted)) In this

paper, results concerning bioremediation potential of bacteria and fungi isolated from soil samples will be presented. Total isolated microorganisms were divided into three parts and sown in an appropriate medium. Actidione fungicide was added to one inoculum so that only bacteria propagated in it. Streptomycin antibiotic was added to a second inoculum, wherein fungi propagated. The third portion (with no additives) contained consortium of fungi and bacteria. Paraffinic petroleum, in inorganic medium in phosphate puffer, was a substrate for assessment of bioremediation potential of the mentioned microorganisms. The experiments of the simulated oil biodegradation lasted 30, 60 and 90 days. Extracts were isolated from the samples with chloroform liquid-liquid extraction. Extracts were fractionated by column chromatography. Alkane fraction was analyzed by gas chromatography-mass spectrometry (GC-MS) techniques.

ENVR 55

Pesticide use and environmental problems in Central America

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Pesticide use in Central America is one of the highest in the world. Pesticides were introduced in the 1950s for use on agriculture and for vector control. By 1970 pesticide imports amounted to 5.18 million kilograms in Costa Rica; and in Nicaragua and Guatemala the insecticides used on cotton alone during 1977 surpassed 8.5 million kilograms. Currently an estimate of 70,000 tons of active ingredients of pesticides per year are imported annually in Central America. The main groups of pesticides used are organophosphates, carbamates and pyrethroids among the insecticides; the dithiocarbamic fungicides; and phenoxyacids, dipyrityls, and triazines as herbicides. The major crops in Central America include bananas, pineapple, rice, sugarcane, coffee and vegetables. In Costa Rica, approximately 75% of the pesticides imported are compounds with high or extreme toxicity to fish and crustaceans. Also more than 50% of the pesticides imported have not been tested for their toxicity to algae. Additional to high volume and toxicity of pesticides in use in Central America tropical conditions and usage practices can also increase environmental risks. Studies in the Central American region have shown that pesticide residues are present and strongly associated with areas of intensive agriculture, although even in the areas practicing more traditional agriculture, pesticide residues were not absent. Pesticides are also present in pristine areas as atmospheric transport studies have shown. Impact on aquatic ecosystems have been demonstrated but further studies are needed to obtain a more complete picture of the situation and impact on biodiversity and ecosystems. At the same time it is necessary to develop an effective policy framework to assist in minimizing adverse impact on environment and human health.

ENVR 56

Legacy and new contaminants in arctic air

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Occurrence of chemicals in remote regions is recognized as evidence of long-range transport under international protocols to control persistent, bioaccumulative and toxic substances. This paper reviews sources and atmospheric transport of “legacy” organochlorine compounds to the Arctic, and presents new results for the occurrence and air-water gas exchange of currently used pesticides (CUPs). Loadings of chemicals to the Arctic by gas exchange are likely to increase as climate change reduces ice cover, thereby opening more area for exchange to take place. Experiments to follow the evasion of α -hexachlorocyclohexane from the Arctic Ocean upon summertime ice melting demonstrate its value as a tracer of this process.

ENVR 57

Occurrence of perchlorate across the world and the implication for human health impact

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Perchlorate has been known to be present in salt deposits from the Atacama Desert for over a century. Reports of natural ClO_4^- in North America have been increasing recently. These reports indicate that ClO_4^- is widely distributed in groundwater and in unsaturated surface soils. Surveys of precipitation across North America indicate that perchlorate is ubiquitously present in precipitation and by extension we expect across the world. However, to date there is almost no information regarding the occurrence of perchlorate outside of the United States. For the first time we will show that perchlorate is also present in groundwater and soil from Europe, Africa, the Middle East, Australia, China, and other locations. The magnitude of these occurrences is dependent on the current and historic precipitation rate, and current land use. We will discuss the known occurrences outside of the U.S., discuss the potential factors that control the accumulation and occurrence, and finally discuss the potential impacts on human health.

ENVR 58

Environmental challenges in transition economies

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The tremendous changes that have occurred in the former communist countries in Eurasia since 1989 have been accompanied by considerable challenges to the environment. These challenges are both national and regional, with some aspects of transition proving to be beneficial to the environment while others clearly creating serious environmental problems. Southeast Europe has had special difficulties, experiencing economic transition against the backdrop of warfare and ethnic strife. However, much has been accomplished by the region and some positive examples stand out for emulation elsewhere. The presentation will set the broader political and economic context for a more detailed discussion of the problems of air, water and soil quality in the region, and will touch on transition economies of the former Soviet Union as well. Most critically important is the need for political will from the region's leaders. There is a role for increased societal involvement via local and regional NGOs. Also important to future progress and success are cooperation with the European Union in the context of the EU accession process and engagement by key partners and donor governments.