

3rd International Conference on

INTEGRATIVE APPROACHES TOWARDS SUSTAINABILITY

Sustainable development, knowledge society and smart future
manufacturing technologies
"knowledge"



27 – 30 June, 2012

Jūrmala, Latvia

www.lu.lv/knowledge

Draft Agenda

Wednesday, 27 June, 2012	
20.00	COME-TOGETHER ASSEMBLY
Thursday, 28 June, 2012	
8.00 - 9.00	REGISTRATION
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14.00-16.00	Part 2 – Sustainable development and knowledge based economy in the Baltic Region - Policy of education, research, and technological development
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Theme A: Social corporate responsibility and environment

ANALYSIS OF MERCURY POLLUTION IN AIR IN URBAN AREA OF RIGA USING ATOMIC ABSORPTION SPECTROMETRY

Egils Bogans, Janis Skudra, Anda Svagere, Zanda Gavare

University of Latvia, Institute of Atomic Physics and Spectroscopy, Latvia

The toxicity of mercury and its compounds is well known, and they are considered as substances of heightened concern. Though mercury is to some extent released into environment by natural processes such as volcanic eruptions, additional releases from anthropogenic sources have led to significant increase in environmental exposure and deposition.

There are many commonly used objects that contain mercury, for instance, mercury lamps, switches, and mercury thermometers. Disposed objects usually are thrown into trashcans, and it can lead to increased mercury concentration in air in that area.

We performed mercury pollution surveys at several districts of Riga (Capital of Latvia), using Zeeman atomic absorption spectrometer RA 915+. The concentration of mercury was sampled in the air above the subject of interest. The measurements have been performed mainly from the driving car. For Hg concentration assignment to particular measurement place GPS was used, giving the possibility to establish a digitized pollution database for different geographic coordinates in different times.

From results of surveys one can see that background atmospheric mercury concentration in Riga generally does not exceed 5ng/m^3 , but there are some places with increased mercury pollution that need particular attention and cleanup. Examples for such surveys will be shown.

Acknowledgments: The work was partly supported by European Social Fund project No. 2009/0210/1DP/1.1.1.2.0/09/APIA/VIAA/100

INVESTIGATION OF THE INFLUENCE OF CORPORATE SOCIAL AND ENVIRONMENTAL RESPONSIBILITY ON THE ENERGY EFFICIENCY OF RUSSIAN COMPANIES

Anastasia Pavlova

St. Petersburg State University of Refrigeration and Food Engineering, Russia

The expansion of social and environmental responsibility of business is recognized as a worldwide trend. Companies perceive corporate social and environmental responsibility (CSER) as a tool for reducing non-financial risks, increasing competitiveness, developing relationships with government and society. Mean-while, in Russia CSER is rapidly growing mainly in large corporations, particularly in fuel and oil companies. The peculiarity of the Russian version of CSER is that a significant emphasis is done at the administrative approach and the development of social responsibility takes place under the State pressure.

Since 2009 the Russian government has been increasing the companies' responsibility for non-compliance of permissible environmental impact standards in order to promote the transition to energy efficiency and clean technology. The government requires companies to conduct energy audits, develop energy passports and introduce energy labels of products.

To reveal the willingness of enterprises to transition towards energy-efficient development 37 Russian enterprises and organizations were interviewed. Among about one-third of respondents were top managers of large food, electrical, oil and gas companies which operate stable in the market.

The study was conducted on the basis of the participatory backcasting approach. Respondents were asked to identify the main problems in the energy efficiency field, to formulate the current trends and describe the desired future image of an energy efficient company and opportunities for its further development.

The survey results showed that the solution of problems of energy efficiency is constrained by the following reasons: low awareness of specialists about the current energy-efficient equipment and technologies, the lack of databases of successful energy saving projects, lack of funding and management reluctance to finance projects with a payback period more than two years.

In successful companies, which have the social and environmental policies, a corporate responsibility connects environmental protection with the need to save energy. System approach to management allows such companies to create right strategies and energy efficiency programs to achieve desired goals and objectives.

An innovative breakthrough in the energy efficiency field requires an appropriate institutional environment to support the development of corporate social and environmental responsibility and sustainability of Russian business.

GREENER, SMARTER, CSR

Renata Putkowska

University of Warsaw, Responsible Business Forum, Poland

It is possible to mention two types of business "response" to their environmental impact. The first one - internal – means to work on reducing the negative environmental impact, research on ecological methods of production and operation, responsible supply chain etc. However, there is a second one, which seems to have a significant ecological potential - the dissemination and promotion of sustainable consumption and ecological solutions as well as increasing environmental awareness.

An interesting example of this type of action is to promote the access to green energy among people with lower incomes. Despite technological progress, still many people around the world have lacked an access to regular sources of energy or they have used primarily the non-renewable sources such as coal and oil. At the same time, access to electricity or heat is a fundamental and universal need of the individual, so ecological changes in this area can bring very positive results.

Companies have an important task to perform in this regard. On the one hand, they have the financial and technological potential to reduce the gap in access to green energy. On the other hand, they can achieve a tangible profit if they come out to meet the expectations of new consumers with lower incomes. Presentations will be complemented by case studies that show the variety of forms (public - private partnerships/ with support of micro-credit system) and initiatives ("the bottom of the pyramid" approach/social innovations) on this topic.

SOCIAL CORPORATE RESPONSIBILITY AND TOURISM

DEVELOPMENT

Martynas Radzevičius

Vilnius University, Kaunas Faculty of Humanities, Lithuania

21st century's entrepreneurs are increasingly focusing on corporate social responsibility (CSR) which is called as behavior, voluntarily involving social and environmental issues. CSR covers a wide range of methods, but the most effective measure to ensure close cooperation and mutual benefit between the business and community, is public-private partnership (PPP). It is particularly important in development of tourism. Australian-New Zealand Environment Council formed the PPP-based tourism management model. The main thing in this model is clear strategy and cooperation among all stakeholders – business, community and public. Most important is the presentation of heritage because the local community carries out the control function, and tourism-intensive heritage encourages regional economy. Due to this model, four municipalities in Sweden retained the mining. There was initiated the project called "Gold of

Lapland". Historic mining were transferred to private business; it reduced care expenditure of objects and encouraged development of local business. At the beginning local government supported only those businesses that have popularized the mining, but eventually it was discovered that tourists, attracted by project, give much more benefit, so project incorporated businesses providing tourists services. Started out as "an open air museum", this project eventually became network covering large area and almost all local businesses. Project success shows that PPP is useful not only for development of large infrastructure projects, but also fosters regional economy and preserves culture. There is question whether this model could be applied to develop Lithuania tourism? This article will discuss the benefits of PPP in this issue.

SOCIAL CORPORATE RESPONSIBILITY AWARENESS THROUGH ENVIRONMENTAL MANAGEMENT SYSTEM IMPLEMENTATION IN LATVIAN UNIVERSITIES

Anna Survillo

University of Latvia, Department of Environmental Management, Latvia

According to the research of the Ministry of Welfare of Republic of Latvia there are not many companies which understands Social Corporate Responsibility (SCR) and supports companies involvement into required activities¹. How to engage companies to be more social corporate responsible?

The situation within developing SCR in Latvia cannot be proceed without active involvement of youth. Young entrepreneurs who encourage others by example. Regulating by law only couple of SCR aspects SCR in Latvia by itself is not mandatory action for enterprises, so how entrepreneurs can learn it if there is no place to look at how the environmental friendly behaviour can took place in a daily life? University can be the place where students - future entrepreneurs can see how ecological aspects of the concept of SCR looks like in real life.

That is the reason why author is developing the master thesis on the topic of Environmental Management systems(EMS) in Latvian universities. Implementation of EMS in University of Latvia Faculty of Economics and Management. Research is based on literature studies (scientific publications, EMS Manuals/Guides, EMS documentation), involves a good case practice of EMS implementation process at universities in different countries and Latvia. During the research author will evaluate University of Latvia ecological footprint and develop possible implementation of such a system in faculty of Economics and management.

EMS could be seen as a tool for systematic integration of sustainability aspects in education and research processes, as well as offering a structured approach to reduce the environmental impacts and to be as example for future entrepreneurs about aspects of SCR implementation in everyday life.

¹ <http://www.lm.gov.lv/text/753>

Theme B: Science for sustainable development

STEAM EXPLODED HEMP SHIVES AS A SUSTAINABLE SOURCE OF MATERIAL FOR BUILDING INSULATION

Martins Andzs

Latvia University of Agriculture, Latvia

Keywords biomass, hemp shives, heat insulation, steam explosion

Hemp (*Cannabis sativa L.*), an agricultural crop mainly cultivated to obtain fiber, lately is also finding use as a source for diverse construction materials from shives – the particles of hemp stalk left as residue after extraction of the fine fibers. However, utilization of the shives in construction composites together with various chemicals to achieve the desired physical properties of the product often reduces the factors determining its environmental qualities such as absence of health hazards during exploitation and toxic emissions at recycling particularly important in applications for heat insulation of living houses and working space. The effect of steam explosion treatment on the properties of hemp shives essential for heat insulating composites friendly to environment and humans is studied and an analysis of composition of the steam exploded hemp biomass reported.

URBAN TREES: WHICH FUTURE?

Ladislav Bakay

Slovak University of Agriculture in Nitra, Slovak Republic

Keywords: urban vegetation, hydroponics systems, climbers

Urban trees inevitable grow in conditions, which differ from the conditions in their natural habitat. Compressed soil, bad water regime of soils, human activity, emissions and traffic are reducing the life span of trees and this is forcing researchers to select new species or cultivars for urban conditions. But is this the right way? The poster deals with a new technology of using different climbing plants in autonomous pots and constructions on different urban sites. This new vegetation unit can solve problems in sites with lack of space, bad soil, and frequented traffic. The additional construction, which serves the climber as a support can be designed in various shapes. The nutrition is added with hydroponic systems. A closed soil growing system would eliminate the main problems on urban sites: water regime, soil compression, presence of melting salts. This new technology is economical, eco-friendly and the vegetation will fulfill all its functions.

NANOCARBON-METAL OXIDE HYBRIDS FOR PHOTOCATALYTIC HYDROGEN PRODUCTION

Alexey Cherevan, D.Eder

Institute for Physical Chemistry and Graduate School of Chemistry, Westfälische-Wilhelms Universität, Münster, Germany

There is an ever growing need to protect our environment by increasing energy efficiency and developing “clean” energy sources. These are global challenges, and their resolution is vital towards sustainable development. Using the energy of sunlight to split water into its constituent elements, oxygen and hydrogen, is the key requirement to realise the successful use of hydrogen as a clean energy source and was recently identified by the European Science Foundation as one of the world’s emerging key research fields.

Many conventional materials, such as metals, ceramics, and plastics, cannot fulfil all requirements for these new technologies. It appears that these frontiers will not be realised solely by developing new materials, but by optimising material combinations on different length scales, taking advantage of their synergistic functions.

Recent years saw the introduction of a promising new class of multifunctional materials, nanocarbon-inorganic hybrids [1], which have a huge potential to overcome these limitations. Hybrids are created by coating the nanocarbons with a thin layer of the functional inorganic material. The benefits of this system arise from the close proximity of the two compounds, which enables interfacial charge and energy processes. Based on these processes, the nanocarbon can act both as a photosensitizer for an extended absorption range as well as an efficient electron acceptor for photoexcited electrons from the semiconductor, which increases the lifetime of electrons and holes via charge separation.

The main challenge of this project is fabrication of hybrids by combination of carbon materials like CNTs or graphene and semiconducting oxides and their application in water splitting hydrogen production process

Reference:

Eder, D. Carbon Nanotube–Inorganic Hybrids. *Chemical Reviews* **110**, 1348-1385, (2010)

COST-EFFECTIVENESS OF NITROGEN OXIDES EMISSION ABATEMENT TECHNOLOGIES IN EUROPE

Olga Krukowskaya

Institute for nature management NASB, Belarus

Nowadays environment quality is a key challenge for mankind. Air pollution by nitrogen oxides is one of such problems. Its concentrations forms ambient air quality in direct and indirect way by formation of secondary PM and ground ozone. The main sources of nitrogen oxides are processes of fuel combustion in stationary and mobile objects and some industry processes. Nitrogen oxide emissions are regulated by national and international legislation. In order to reduce emissions and comply with the law special are used. Despite high importance of air protection in the context of sustainable development, environmental problems have less priority than economical. Therefore, the economic basis of the importance and effectiveness of air protection measures is necessary.

In this study approaches to economic efficiency of abatement technologies are analysed. Cost-effectiveness of abatement technologies is not always obvious, especially for enterprises. At the enterprise level implementation of emission abatement technologies is characterized by direct costs and indirect benefits. Direct economic benefits from implementation of abatement technologies lies in possible reduction of tax burdens and penalties. Prevented damage is the main benefit of reducing emissions. Preservation of public health and ecosystems is a huge benefit, which is manifested predominantly at the local and national level. To estimate economic cost-effectiveness of reduction nitrogen oxides emissions in Europe costs and prevented damages are compared. Possible emissions reduction and costs comes from integrated assessment modeling with GAINS model. Unit damage for EU countries comes from CAFÉ Program Cost-Benefit analysis, for other countries are calculated with similar methodology

METHODOLOGY FOR SUSTAINABILITY SCIENCE: INTERDISCIPLINARY COLLABORATION AND SYSTEMIC COMPREHENSION

Dina Kuslyaykina

Uppsala University, Sweden

The concept of sustainable development implies three pillars of sustainability, which correspond to environment, society and economy as complex and interconnected realms of life. Therefore research for sustainable development is bound up with the idea of interdisciplinarity, which incorporates methodological and substantial collaboration between

disciplinary platforms of natural, technical, social and economic sciences to provide a better understanding of object under consideration.

The proposed poster presents requirements for interdisciplinary methodology of sustainability science and necessary criteria for successful integration of interdisciplinary knowledge, and therefore intends to present the following ideas:

1. Approaches of all the involved disciplinary studies should have common epistemological principles (most importantly, of production and verification of knowledge) and paradigm conformity.
2. Practical orientation of interdisciplinary research and the presence of a real-life case needing solution justify both the need for interdisciplinary synthesis and the chosen range of relevant disciplines.
3. Methods, which are employed within interdisciplinary research, can be both specific to some particular discipline and inherent to many disciplines.
4. The new types of methods which emerge due to interdisciplinary scope cover the following aspects: (a) cooperation of representatives of different disciplines – including communication, discussion and interpretation methods, and (b) integration and synthesis of knowledge from different disciplines.
5. The most important issue for interdisciplinary research is synthesis of obtained knowledge, and for this goal approaches and tools of systems analysis are necessitated.
6. Interdisciplinary research for sustainable development should follow ethical norms and restrictions, originating from all the disciplines it incorporates.

PREPARATION AND CHARACTERIZATION OF NOVEL BIODEGRADABLE MATERIAL BASED ON CHITOSAN AND POLY(ITACONIC ACID) AS ADSORBENT FOR REMOVAL REACTIVE ORANGE 16 DYE FROM WASTEWATER

Aleksandra Nesic¹, Sava Velickovic², Dusan Antonovic²

¹ Vinca Institute for Nuclear Sciences, University of Belgrade, Serbia

² Faculty of Technology and Metallurgy, University of Belgrade, Serbia

Environmental protection has been a topic of great attention in recent years. Discharging azo dyes in aquatic systems leads to contamination of water and exhibits serious ecological problems. Azo dyes are subject to bioaccumulation, and due to their allergenic, cancerogenic, mutagenic and teratogenic properties they are a grave threat to people and the environment. Adsorption process is becoming increasingly popular as a way of treatment of various kinds of wastewaters, among them the azo-dyes containing ones, because it is economically feasible, processes are simple and there is a high level of efficiency present in such processes.

The increasingly interesting adsorbents are those that stem from sustainable sources and are biodegradable – both from ecological and economical point of view. The aim of this study is preparation and characterization of polymer complexes based on naturally occurring polysaccharide-chitosan as adsorbent for removal Reactive Orange 16 dye from wastewater. This study presents the preparation and characterization of chitosan/poly(itaconic acid) complexes containing 10% of poly(itaconic acid). The complexes were characterized by Fourier Transformed Infrared spectroscopy and Scanning electron microscopy. The influence of initial dye concentration (30, 50 and 80 ppm), temperature (8, 25, 37 and 55°C), and pH value of the solution (4, 5, 6 and 7,4) on the adsorption capacities were the main focus of this work. The comparison of adsorption capacities of these complexes with the previously published ones showed that the complexes presented in this investigation can efficiently replace the conventional adsorbents for removal of Reactive Orange 16 from wastewaters.

TERRITORIAL MANAGEMENT PEATLANDS TO REDUCE GREENHOUSE GAS EMISSIONS

Olesya Timofievitch¹, Vladimir Kapitsa²

¹ International Sakharov Environmental University. Minsk, Belarus

² International Sakharov Environmental University, Minsk, Belarus

The total area of peat in Belarus amounts to 2415,2 thousands hectares. About 400 thousands hectares are worked out and degraded peatlands.

The task of reducing the negative environmental impact and improving its quality, the restoration of the disturbed environmental balance is described in the "National Strategy for sustainable socio-economic development of Belarus for 2020" in the field of environmental protection. Therefore, the challenge of the environmental impact reduction by restoring of degraded peatlands and return their biodiversity and economic value is actual. Today exist several ways for the peatlands use:

- 1) Recycled water flooding. It is characterized by a gradual decrease of GHG emissions and restore ecosystems, as well as receive ecological fuel.
- 2) Afforestation, including the cultivation of fast-growing energy crops. Given priority when the flooding is not desirable due to the proximity of business objects. As a result, created the plantation for twenty years on which the soil is protected by the roots and leaf litter. Vegetative biomass intercepts of the greenhouse gases emitted. These arrays can be used for commercial purposes to obtain fuel, honey, medicines, furniture, and for the development of hunting and fishing profile.
- 3) Creation of perennial pastures. Planting of perennial crops territory that reduce GHG emissions and can be used for feed.

We have began an experiment for environmental and economic assessment of different ways using of degraded peatlands in Belarus. We scheduled to work on the identification of mineral soils. Will assess the greenhouse gas emissions

AN INVESTIGATION ON THE EFFECT OF ENVIRONMENTAL DEGRADATION ON GLASS FIBRE REINFORCED COMPOSITE MATERIAL PROPERTIES

David Oscar Vella

University of Malta, Malta

Composite Materials offer significant properties, with weight and cost saving, and the ability to design the material as required. They thus offer energy savings, technological improvements that reduce running costs and emissions, and new product solutions and designs [1].

Composites are selected for various applications, including automotive, aerospace, medical and maritime, whilst being at the forefront of tomorrow's solutions, incorporating nanomaterial technologies. These varied applications result in exposure to multiple environments, which can lead to synergistic degradation, with property loss, associated repair costs and reduced performance [2].

The University of Malta has analyzed the qualitative changes to composites, by environmental degradation. Currently, quantitative analysis of their property changes is being investigated. Methodology includes:

- 1) Measuring properties of as-manufactured samples.
- 2) Expose samples to accelerated degradation for 500 and 1500 hours.
- 3) Mechanical testing of the exposed samples to map the property change.

The subsequent results will help designers and industry understand how the material will behave during in-field applications and provide data for engineered decisions on how to cater for this environmental effect. This gained knowledge will offer industry:

1. An understanding of how the environment changes material properties. The best material and its protection for an application can thus be selected.
2. Information that can be applied to improve a design, to avoid excess or insufficient material.

The improved designs and material application from this knowledge base, put the product in a more competitive market position whilst reducing investment money, together with weight savings and technological improvements that reduce running costs and carbon footprint. Longer product life also means less waste and environmental impact.

References:

1. Miracle, D.B. and S.L. Donaldson, Introduction to Composites, Air Force Research Laboratory.
2. Armstrong, K.B., L. Graham, and W.F.C. II, Care and Repair of Advanced Composites. 2nd Edition ed, Warrendale, Pa: SAE International.

Theme C: Smart future manufacturing and zero emission concept

DBD PLASMA FOR DECOMPOSITION OF HARDLY DEGRADABLE ORGANIC POLLUTANTS

Edvinas Krugly, Tadas Prasauskas, Darius Čiužas, Giedrė Talačkaitė

Kaunas University of Technology, Lithuania

Hardly degradable organic pollutants, which are present in the wastewater, cause toxicity, mutagenicity and carcinogenicity to humans and surrounding environment. This kind of wastewater is produced during different kind of industrial processes. Treatment of such wastewater is problematic. Traditional wastewater treatment methods are not efficient enough and require high operational costs. There is a need for the development of effective, cheap and environmentally friendly processes for the degradation of organic pollutants from water. Currently plasma processes are replacing conventional processes because active radicals are stronger oxidizing agents and more effective oxidisers without any side effects. The electrical discharges in water may also produce ultraviolet (UV) radiation and shock waves, which help in the destruction of pollutants. DBD plasma technology for wastewater treatment is one of the most promising in this field. Our prototype is composing from several main parts. Air ionization will take place in the zone of dielectric barrier discharge plasma and it will be supplied to primary decomposition chamber. In the chamber, active radicals will react with wastewater and decompose persistent organic pollutants. Decomposition reactions are accelerated using active photo catalyst in the primary decomposition chamber. Future research of this field is necessary to understand degradation processes and find optimal conditions for treatment of various organic pollutants. This type of treatment processes requires electrical energy, but amount of energy needed to produce same plasma had decreased ten times in ten years period. Therefore this technology is really promising for money savings, energy savings and environment protection.

EMISSION OF HOTBED GASES FROM THE SURFACE OF SLUDGE PLATFORMS OF BIOLOGICAL CLEANING CONSTRUCTIONS

Ekaterina Krukovskaya

Y. Kupala Grodno State University, Belarus

The problem of sewage sludge treatment of biological cleaning is actual for the majority of the countries in the world. In the Republic of Belarus practically all sewage sludge takes place for a drying on sludge platforms which turn into objects of long storage. The area of sludge platforms in the Republic of Belarus in 3–5 times exceeds the areas of firm household waste. The result is chemical and biological pollution of the atmosphere, underground waters, soils.

The physical and chemical structure of sewage sludges of ‘Grodno Azot’ was studied for forecasting of hotbed gases emission.

Tests were selected from four layers of long stored sewage sludges. The period of storage increases with depth.

The top two layers are more friable and better moistened with an atmospheric precipitation so values of humidity are higher. pH of all layers is at one level and characterized as alkaline. The stable structure of inorganic substances is observed in all layers. Prevailing elements are iron, sulfur, potassium, phosphorus, titan, zinc, calcium, scandium, strontium, chrome, cobalt, barium, bromine and chlorine. The increase of chemical consumption of oxygen in 5-6 times in the bottom layers tells about big concentrations of oxidized substances.

The amount of carbon decreases in structure of sewage sludges during their storage. In the top layers aerobic processes prevail and carbon in the form of carbon dioxide gets in the atmosphere. With depth concentration of oxygen decreases and anaerobic processes prevails. As a result methane and carbon dioxide get in the atmosphere.

UTILIZATION OF POLYSTYRENE WASTE FOR NANOFIBER AIR FILTER PRODUCTION

Jonas Matulevicius, Edvinas Krugly, Julija Grigonyte

Kaunas University of Technology, Department of Environmental Engineering, Lithuania

Polystyrene (styrofoam) has many uses as packaging material, at the same time polystyrene foams are good thermal insulators and are therefore often used as building insulation materials; however disposing of or recycling this material is problematic and expensive.

Polystyrene waste can be successfully utilized into nanofibers by electrospinning method. Electrospinning is an inexpensive method where nanofibers are generated by a charged jet of polymeric solution in a high voltage electric field. When the jet travels in the air the solvent

evaporates and charged fibers are collected on grounded rotating drum. The diameter of nanofibers ranges from 100 to 2000 nm and depends on choosing the appropriate polymer solvent system (solvent origin; polymer concentration in solvent), technological parameters (the distance between the nozzle and rotating drum; the voltage level; solution flow rate) and environmental conditions (temperature, relative humidity).

Due to low basis weight, large surface area to volume ratio, high pore volume, tight pore size and relatively uniform fiber size, utilized polystyrene waste could be used as nanofiber air filters. The experimental results show that nanofiber air filters meet High-Efficiency Particulate Air (HEPA) filtration standard, where filtration efficiency of the most penetrating particles (0.3 μm) is >85%, and can be used to filter hazardous chemicals, biological, or radioactive particles from air streams. The production of nanofiber filters from utilized polystyrene waste can be seen as smart future manufacturing with low impact on environment.

INNOVATIVE TECHNOLOGIES FOR PRODUCTS FROM RENEWABLE RESOURCES

A. Putnina¹, S. Kukle¹, J. Gravitis²

¹Riga Technical University, ²Latvian State Institute of Wood Chemistry, Latvia

Keywords steam explosion, hemp shives, cellulose, natural nano-fibres

The micro- and nano-scale cellulosic fibres are attractive as replacement for man-made fibre reinforcement in green products friendly to the environment green chemistry, eco-efficiency, industrial ecology, and sustainability being the guidelines of the development of next-generation materials, processes, and products.

Hemp (*Cannabis sativa*) suitable for Latvian climate is one of fastest growing plants with a potential in a number of industrial areas. Shives, the woody core particles of the hemp stems left after removal of bast fibres, are used for livestock bedding, mulch, chemical absorbents and industrial insulating building materials such as “hemcrete” while hemp fibre remains the main and most widely applied source material. Therefore, it is important to find new applications for shives comprising 80 % of the plant biomass.

Several methods generally based on successive chemical and mechanical treatments are used to extract highly purified micro-fibrils from the plant cell wall. The steam explosion (SE) auto-hydrolysis is currently comprehensively studied as a promising pre-treatment technique.

During the SE treatment, the biomass is subject to high pressure of saturated steam and rapid decompression resulting in substantial breakdown of the lignocellulosic structure, hydrolysis of hemicelluloses, depolymerisation of lignin components and defibrillation. Removal of lignin after SE makes the cellulose accessible for further processing by electro-spinning – a novel process of forcing a suspension by electric field through a spinneret to obtain superfine fibres.

Effects of pre-treatment temperature and duration on characteristics of the steam exploded shives are studied by scanning electron microscopy and Fourier transform infrared spectroscopy.

ENERGETIC SELF-SUFFICIENCY UNDER ZERO EMISSIONS

Christian Teichmann

Berlin School of Economics and Law (Hochschule für Wirtschaft & Recht Berlin), Germany

One main part of our study is to realize a scientific – practical project. Our team undertakes researches how a community, township or small region can realize onehundred per cent energetic self-sufficiency under zero emissions at the example of small community in the south of Berlin. We are investigating which renewable resources are useful with reference to social, ecological, economical aspects. The results will be a guideline which gives an science-based proposal with technical solutions, necessary political terms and financial cooperation models for a subsequent implementation . Based on the paper the community will be able to transform itself to an own standing energy generating community which can deliver energy independent of big companies and major cooperations.

There will be many interested specialists at the conference. I'm sure there will be participants are also interested and experienced in that themes. I'm sure that guidelines like we are generating will become model and can used on many places worldwide. But every place on the planet is different.

Exactly there I see the potentials for the future and scientific challenge. I would be very glad if you will give me chance to give the knowledge I earned during our project to the scientists and participants. Also get information, tips and ideas especially from these well-versed participants from all over the world. So I see the conference as a big chance to share experiences and build networks. Give me chance to do my stint to make the world more sustain.

Theme D: Sustainable development, knowledge society and knowledge based economy

SUSTAINABLE DEVELOPMENT, KNOWLEDGE SOCIETY AND KNOWLEDGE BASED ECONOMY

Mantas Aliukonis

University of Šiauliai, Lithuania

In the Post – Soviet States knowledge may be the cornerstone of economical, environmental progress and social sustainability which could ensure the long – term development of national wealth. As in the case of Lithuania, one of the former Soviet Republics, the current state of social, economical and environmental sustainability factors – high levels of unemployment, poverty and criminality, social insecurity and ecological degradation – indicates the processes of unsustainable development.

The inability of Lithuanian political leaders and social elite representatives to enhance public possibilities of achieving the level of knowledge society could increase the threat to lose scientific, technical and cultural knowledge races in the global world. The global financial crisis nowadays is another potential challenge of transforming Lithuanian economy into knowledge based economy, which threatens future sustainable development of this Post – Soviet Republic. It should be considered that the long – term processes of unsustainable development in Lithuania as the Nation based on consumption society threaten the quality of life validated by sustainability principles of future generations. The opportunities to minimize those national threats should be implemented by the initiatives and knowledge of public, business leaders, scientific intelligentsia representatives based on the cooperation of Lithuanian science and business in the industrial high – technology sector. This national cooperation would be a successful way to compete closely with other nations in global knowledge races, to promote Lithuanian information, telecommunications technology, bio – nanotechnology industries into worldwide level and to boost long – term sustainable development in Lithuania

ADAPTATION TO EXTREME RAINFALL IN POLAND – WHAT DECISIONS MUNICIPALITIES TAKE AND WHY

Adam Choryński

Institute for Agricultural and Forest Environment, Polish Academy of Sciences, Poland

During last decades urbanisation processes are increasing. This together with natural hazards of extreme weather events, especially heavy rainfall, brings the risk of high damages or even threats for human health. This is because urbanisation is strongly linked with an increase in concrete covered surfaces (i.e. roads, parking spaces), through which rainwater cannot drain naturally to the ground and has to be transported via stormwater drainage systems.

The consequences appear in different contexts: environmental – losses of water in its natural area; economic – high cost of stormwater drainage systems; social – not sufficient effectiveness of drainage – risk for human health because of urban flooding. Moreover, an increase of heavy rainfall occurrence and its intensity is projected. This makes the urban areas even more vulnerable.

Apart of traditional ways of dealing with the issue of heavy rainfall in urban areas, like i.e. urban stormwater drainage systems, there are many different types of measures helping in adapting to the risk of the excess of rainwater. There are innovative technical solutions (e.g. permeable concrete) which are definitely cheaper than the traditional ones. Even though they are not used commonly by municipalities.

The aim of the study is to investigate the issue of decisions made on the used methods of dealing with the problem of extreme rainfall in the urban area. The analysis bases on in-depth interviews with local authorities, representatives of municipalities and private investors in Poland.

IS SUSTAINABILITY POSSIBLE IN SUBURBS OF BIG CITIES?

Nina Drejerska

Warsaw University of Life Sciences, SGGW, Poland

Keywords sustainability, rural areas, suburbs

The question raised in the title resulted from research entitled “Social and economic determinants of development of rural areas in the suburban and external zone of Warsaw”. Warsaw, as a capital of Poland, has relatively good economic and social conditions comparing to the rest of the country. Furthermore, it strongly influences neighboring areas which are rural from the administrative point of view. However, they do not like as traditionally perceived rural areas with agriculture dominating. Rural areas in the suburbs of Warsaw, but also in other territories close to big cities, have been undergoing significant transformations. They have been changing their functions from agricultural to industrial or service ones. Development of

the big city is a challenge and chance but on the other hand it puts pressure for example in a form of demand for new places for investments of different nature – for example housing or industry and services. All these processes contribute to very complicated situation connected for instance with a necessity of an efficient transport system or respect for protected areas of high quality and importance of natural environment.

The study will include some attempts to determine relationships between social, economic and environmental aspects of development of rural areas close to Warsaw with use of selected statistical methods and basing on indicators from the public statistics. The second part will consist of partial results of research – a questionnaire directed to local authorities and for example their opinions on influence of protected areas on development potential of local communities.

NATURE CONSERVATION - AN OPPORTUNITY FOR LOCAL DEVELOPMENT

Justyna Gutowska

Institute of Environmental Sciences, Jagiellonian University, Poland

Although nature conservation imposes constraints on the local economies, it is also an opportunity for local development. Because of the way the protected sites (national and landscape parks, Natura 2000 sites) were designated and lack of information at the local level this chance is still poorly perceived by the local communities and thus, not sufficiently used. There is now a broad consensus that local development while increasing local communities' participation in nature conservation is a requisite for increasing its effectiveness. However, process of Natura 2000 sites designation as well as on-going work on their management plans are causes of many conflicts between environmental administration and ecological NGOs on one side and local stakeholders, among them local governments and entrepreneurs on the other side.

The aim of my PhD research, a plan for which I would like to present on my conference poster, is to develop proposal for improving nature conservation management in Poland through the economic and educational tools. Which of the tools, such as:

- ecological fiscal transfer to municipalities for compensating the lost benefits because of the existence of protected areas on their land,
- the compensation system for private land owners,
- a program of the series of workshops for local governments and local entrepreneurs,
- or others

can be used in Poland, in what a shape and which of them will be more efficient for achieving sustainable development? What can we learn in this respect from other countries' experience?

EMERGY-GIS (GEOGRAPHICAL INFORMATION SYSTEM)

ASSESSMENT IN SUPPORT OF ENVIRONMENTALLY SOUND

LAND-USE

Salvatore Mellino, Sergio Ulgiati

Parthenope University of Napoli, Italy

Planning is one of the most important steps in order to achieve a sustainable development at local scale. Economic, social and environmental aspects affect and shape the local development of human communities and landscapes. In particular, nowadays, environmental aspects are essential and inescapable for productive processes to be sustainable. Natural resources are not uniformly distributed but vary spatially and, in consequence, land-uses and the social and economic development challenges also vary spatially. In this context, spatially organized information play a paramount role in the dynamics of economies and their interaction with the environment. Synergic use of Geographic Information Systems (GIS), territorial planning and emergy assessments may provide a very interesting framework towards sustainability. In this work we present maps showing the local emergy value of renewable flows (solar insolation, rainfall, wind, geothermal heat) for Campania Region (Southern Italy). The goal is to calculate and present spatially the annual renewable areal empower density (seJ ha⁻¹ yr⁻¹) for the Region in order to give a useful support informations for an environmentally sound land use management

CLUSTER DEVELOPMENT IN THE EUROPEAN UNION: DEFINING THE ROLE OF THE REGIONAL LEVEL (ON THE EXAMPLE OF ENVIRONMENTAL AND ENERGY TECHNOLOGY CLUSTERS IN FEDERAL STATE BAVARIA, GERMANY)

Irina Petrova

Erfurt University, Germany

Innovative economy, also called economy based on knowledge, has become the headline goal for the whole Europe since 1990s. Cluster policy is today recognized as one of the basic means to build innovative economy.

In the present study we have shortly touched upon all the levels with a special focus on the regional one and try to answer the following questions: how far Bavaria is an actor in its own right? What is exactly being made on regional level?

The analysis undertaken shows the effects of the EU structural funds support and Federal State supporting program “Cluster offensive Bayern” on the four environmental and energy technology Bavarian clusters: Forestry and Wood Cluster Initiative, Center of Competence in Environmental Affairs (KUMAS), Region – Competence and Cooperation Network of the Energy Industry in the Nuremberg Metropolitan (Nuremberg Energy) and The Environmental Technology Cluster Bavaria.

The study allows us to define the role of the regional level in cluster development: besides partly funding many clusters, including in the environmental technology sphere, local ministries initiated several clusters’ building and play substantial role in their further development, especially targeting at internalization of the clusters. Regional governments also facilitate cluster creation and development by information dissemination, building up platforms for cooperation and identification and popularization of best practices

LAND CONSUMPTION AND INTEGRATED URBAN DEVELOPMENT POLICIES: LIMITS OF CONVENTIONAL PLANNING TOOLS AND PROSPECTS OF HOLISTIC, MULTI-LEVEL STRATEGIES IN CONTAINING UNCONTROLLED URBAN GROWTH. CASE STUDY TURIN, ITALY

Piero Sassi

Bauhaus-University Weimar, Institute for European Urban Studies (IfEU), Germany

Keywords land consumption, uncontrolled urban growth, integrated urban development policy, Europe, Italy

The poster will introduce main questions and state of the art of the ongoing PhD research. Aim of the current study is to provide an analysis of planning tools and policies to reduce land consumption due to uncontrolled urban growth. The Turin case study is analyzed within the broader context of advanced practices in the field.

Between 1990 and 2000 more than 8.000 km² were urbanized throughout Europe (EEA, 2006). In Italy, in the last decades, uncontrolled urban growth has been responsible for an enormous consumption of land. Nonetheless, this problem has been disregarded for a long time, both in the scholarly and in the political debate. This has resulted in the fragmentation of ecosystems, increasing use of private cars, environmental pollution, social segregation and several others.

The core topic of urban consumption patterns will be deeply discussed at the next United Nations Conference on Sustainable Development Rio+20.

This work analyzes the limits of conventional planning tools, mainly dealing with spatial aspects of the phenomenon, and the prospects of integrated urban development policy (Leipzig Charter, 2007) in containing uncontrolled urban growth.

Land take is considered together with its socio-economic drivers. This is fundamental to evaluate planning tools and policies to deal with it. Nonetheless, this aspect is often overlooked in theoretical elaborations as well as in planning practices. Hence, the current research uses interdisciplinary methods comprehensively.