2005 YSSP Mid-Summer Workshop
July 20 – 21, 2005

ABSTRACTS
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Room</th>
<th>Project</th>
<th>Date</th>
<th>Time</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MORNING SESSIONS – 20 JULY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gvishiani</td>
<td>LUC</td>
<td>20 July</td>
<td>09:00-11:50</td>
<td>3-5</td>
</tr>
<tr>
<td>Wodak</td>
<td>TNT</td>
<td>20 July</td>
<td>09:00-10:30</td>
<td>10-11</td>
</tr>
<tr>
<td>Wodak</td>
<td>PIN</td>
<td>20 July</td>
<td>10:50-12:00</td>
<td>12-13</td>
</tr>
<tr>
<td><strong>AFTERNOON SESSIONS – 20 JULY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gvishiani</td>
<td>FOR</td>
<td>20 July</td>
<td>13:30-16:35</td>
<td>6-8</td>
</tr>
<tr>
<td>Gvishiani</td>
<td>DYN</td>
<td>20 July</td>
<td>16:50-18:00</td>
<td>9</td>
</tr>
<tr>
<td>Wodak</td>
<td>RMS</td>
<td>20 July</td>
<td>13:30-17:50</td>
<td>14-17</td>
</tr>
<tr>
<td><strong>MORNING SESSIONS – 21 JULY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gvishiani</td>
<td>ECS</td>
<td>21 July</td>
<td>09:00-11:30</td>
<td>18-20</td>
</tr>
<tr>
<td>Gvishiani</td>
<td>GGI</td>
<td>21 July</td>
<td>11:40-12:30</td>
<td>21</td>
</tr>
<tr>
<td>Wodak</td>
<td>POP</td>
<td>21 July</td>
<td>09:00-10:30</td>
<td>25-26</td>
</tr>
<tr>
<td>Wodak</td>
<td>SRD</td>
<td>21 July</td>
<td>11:40-12:10</td>
<td>27</td>
</tr>
<tr>
<td><strong>AFTERNOON SESSIONS – 21 JULY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gvishiani</td>
<td>ADN</td>
<td>21 July</td>
<td>14:00-16:50</td>
<td>22-24</td>
</tr>
<tr>
<td>Wodak</td>
<td>TAP</td>
<td>21 July</td>
<td>14:00-15:50</td>
<td>28-29</td>
</tr>
</tbody>
</table>
Land Use Change (LUC)
Wednesday, 20 July: 09:00 – 11:50
Gvishiani Room

Integrated Flood Risk Analysis in the Tisza River Region, Ukraine
Dmytri Treebushny

A framework for integrated catastrophic flood management of the Tisza river will be presented (Reitano, 1995; Ermolieva et al., 2001). It combines geographic data on property values in the region with a stochastic flood risk scenario generator to give estimates of potential flood losses. Catastrophe flood modeling and a management system is defined in terms of modules: (1) a river flow module, (2) an inundation module and (3) a property/vulnerability module for loss estimation. The system is further extended with a multi-agent economic module, insurance and catastrophe fund modules. The framework can be effectively used in the robust policy evaluation process. Details of a river flow module construction, and the results of the evaluation of two flood mitigation structural measures, as shown below, are planned for implementation on the Tisza river:

- introducing a system of reservoirs and
- cleaning a bottleneck (a bridge with lots of sedimentation and vegetation) plus widening a river cross-section.

Analysis of both approaches shows the predominant positive effect of the second measure with respect to agricultural and structural losses, while a minimal effect on flood peak reduction was observed in the first measure.

Integrated Water Resources Management in the Nile Basin
Ahmed Abdel-Khalek

Integrated water resources management in the Nile Basin is the most efficient way for promoting cooperation between the Nile basin countries in the development and management of water, in order to maximise both economic and social welfare and minimise losses at any feasible locations in the Nile Basin. The research focuses on analyses of the social, economic, and political aspects of Nile Basin management. It will also investigate the cooperation and potential for conflicts between the Nile Basin countries; considering several issues associated with the development of the basin. It will analyze the ability to implement the proposed projects, the effect of water management plans for riparian countries on the Nile flow, mainly on water share for both Egypt and Sudan, and will analyze different scenarios of Egypt’s management of extreme events. The goal of the analysis is to define other options for Egypt to maintain its water share and economic development to face the population growth and the increase of water demand.
International River Basin Management Under the EU Water Framework Directive
Susanna Nilsson

River basin management is a well-acknowledged concept of Integrated River Basin Management and a key-principle of the EU Water Framework Directive (WFD). The directive requires EU member states to identify river basins, assign them to River Basin Districts (RBDs) and appoint competent authorities to manage the districts. As there are around 70 international river basins in Europe, many of the RBDs will probably be international. The WFD has been criticized for its weak legal requirements with regard to joint international management, and it may thus be questioned whether the river basin approach – one of the corner stones of the directive - will be achieved. This study identifies the actual number and geographical extent of international RBDs established under the WFD. The results show that around 1/3 of the RBDs are international and that the international districts cover around 2/3 of the total area. Further, an on-going case study aiming at linking indicators of international cooperation with indicators of water status for targeting ‘critical’ districts in the Baltic Sea Region is presented.

Utility Value Analysis for Eco-Food Production System - Possibilities and Means for Rural Small Enterprises
Maarit Pallari

The commercialization of environmental values requires a new system of product development and marketing. Small and medium sized enterprises have begun to use environmental aspects as a strategic resource enabling creation of a comparative advantage. This present research supports small enterprises in improving their competitiveness in the field of environmental marketing and customer oriented product development, while fulfilling the principles of sustainable development. The utility value analysis (UVA) tool, developed in both the USA and Germany, was used for the analysis. UVA evaluates decision processes upon which product development depend and serves as a strategic development tool for both enterprises and stakeholders and supports development of marketing strategies. Principally UVA helps to find solutions for decision problems, where besides monetary aspects, also quality and other non-monetary aspects determine the selection of the best alternative.

Calibration of Crop Yield to Vegetation Indexes.
Gleb N. Peterson

The goal of this project is to develop a regression model to predict yield in Russia for the last 20 years, since such reliable information is not available for this period. A statistical model predicting yield from vegetation indexes will be built. My current research at IIASA is concerned with the estimation of the relationships between satellite vegetation indexes and crop yield. I will use the US as a test area as reliable yield data for relatively small areas (counties) are available there. In order to estimate these relationships, statistical regression models will be built for each county in the main agricultural states. The weekly values of the two satellite indexes that correlate most closely with yield will be used as input data for the statistical models. The result of this part of the work will be a number of statistical models for the different combination of crops and climate conditions. In this part of the work we will concentrate on various sorts of wheat – winter wheat, spring wheat and durum wheat.
Assessing the Impact on Chinese Wheat Production of Future Climate Change
Tian Zhan

The climate is changing due to higher concentrations of greenhouse gases. If concentrations continue to increase, climate models project climate change in this century, with significant impacts on many human sectors, and particularly agriculture. Agriculture is a fundamental production sector for society, especially for large populated countries such as China. Wheat is the second most important crop in China. Therefore, using climate change projections and crop models in order to understand the impacts of climate change on Chinese agriculture, especially on winter wheat, is extremely helpful to policy makers and international agencies. CERES-Wheat, a dynamic process crop growth model, will be calibrated and validation for current production at ten sites in the major winter wheat-growing region of China-Yellow Huai-Hai plain. Using a Regional Climate Model, (RCM)-PRECIS, it will then be used to simulate production changes under IPCC SRES A2 and B2 climate change scenarios. Simulations will consider impacts for rain-fed and irrigated winter wheat, with and without CO₂ fertilization.

Application of a GEPIC Model for the Simulation of China’s Crop Yield and Crop Water Productivity
Junguo Liu

In China, water plays a vital role in increasing yields, maintaining food security, alleviating poverty, and stabilizing the world grain market. Previous research rarely focused on the water-food relationship at the national scale due to the lack of suitable methods. However, integration of the EPIC crop growth model with GIS (GEPIC) provides an effective way for analyzing spatial and temporal water-food relationship. The GEPIC model was used for simulating crop yield and CWP of rain-fed and irrigated winter wheat (Triticum aestivum L.) and spring wheat at a 5 arc-minute resolution. First results of 29547 grid cells show that in 72% simulated yields are within 20% of the statistical yields. Aggregated at country level, results show a fairly good correlation ($r^2 =0.73$) as well. The results also indicate that the majority (70%) of tested grid-cells rain-fed winter wheat has a CWP as low as 200 to 600 kg m⁻³.
A Basal Area Increment Model for Individual Trees
Georg Kindermann

In forest management, the decision whether a harvest should be made is often based on the experience of forest managers. The growth response to selective harvest can actually be described with tables or growth models. Such models should use input parameters which are usually measured by forest inventory. In practical applications it is relevant to show the results in graphs. In the model which we consider the following input parameters are used:

- Stem diameter
- Tree height
- Yield level
- Stand density (stocking)

Different stand density indices have been tested concerning their benefit to the increment model. It could be shown that the basal area, which is widely used, is one of the best stand density indices. The tested model types are:

- Linear regression
- Local Polynomial Regression Fitting
- Lazy learning for local regression
- Breiman and Cutler's random forests for classification and regression
- Neural network

With the fitted model we analyze the response of different types of models to thinning.

Effects of Heat and Water Gradients on Ecosystem Gross Primary Production and Respiration Along the Forest Transects in China
Leiming Zhang

The net ecosystem exchange (NEE) is measured continuously using the eddy covariance method of typical forest ecosystems, i.e. Changbaishan temperate mixed forest (CBS), Qianyanzhou subtropical evergreen plantation forest (QYZ), Dinghushan subtropical evergreen broadleaf forest (DHS) and Xishuangbanna tropical seasonal rainfall forest (XSBN), along the forest transect in Eastern China. In 2003, the seasonal variations and eco-physiological mechanisms of gross primary production (GPP) and ecosystem respiration (Re) were analyzed. The results indicated that both the daily and monthly GPP and Re were correlated with the temperature of each site. However, due to the extreme drought in the QYZ site, also the water conditions apparently influenced the GPP and Re. The GPP and Re appeared to rise with the increase in temperature and precipitation along this transect. Due to the rapid increase of Re with temperature, the ratio between Re and GPP appeared to increase with the decrease of latitude.
Integrating Forest Management Practices into Process-based Regional Ecosystem Modelling
Deniz Koca

Process-based models were initially developed for terrestrial ecosystem research purposes and have recently been applied as practical tools in forest management. Regional applications of such models are however very limited. This study presents and tests the performance of a process-based regional ecosystem modelling framework (LPJ-GUESS), in which forest management practices are integrated. The model is driven by CRU historical climate data and applied over a regional scale covering the entire landmass of Sweden to simulate the influence of recent historical management practices on the forest structure and its productivity. The study focuses on species level interactions and investigates how stem wood volume increment has changed during this period. The performance of the model is evaluated by comparing the simulated results with the observed data provided by national forest inventory.

Global-Mean Model Applications to Uncertainty Analysis and GWP Test
Katsumasa Tanaka

The Aggregated Carbon Cycle, Atmospheric Chemistry & Climate Model (ACC2) is a global-and-annual-mean model which has been developed using the ICLIPS Climate Model (Bruckner et al., 2003) as a starting point. Uncertainties in the model, including CO₂ fertilization factor and climate sensitivity were estimated by an inverse calculation, which uses independent observational and literature data including associated uncertainty ranges. The posterior estimates of the state variables showed that the model generally reproduces well the historical evolution of the earth system during 1750 – 2000. ACC2 was then applied to test how well the historical evolution of the radiative forcing can be reproduced when the forcings of non-CO₂ Kyoto gases are defined using the respective Global Warming Potentials (GWPs). Our first results indicate the best results (when the GWP time horizon is chosen between 20, 100 and 500 years) for the time horizon of 100 years. Sensitivity with respect to time horizons and attributions of individual gases to radiative forcing evolution are yet to be investigated.

Forest Fire Modelling
Mari Myllymäki

The Forest Fire Modelling project is a part of the INSEA project, which aims to develop an analytical tool for the assessment of the economic and environmental effects for enhancing carbon sinks on agricultural and forest lands. Forest fires influence the biomass dynamics and thus the carbon sink potential. Our aim is to build a global forest fire model to estimate effects of fires on biomass. We will use a stochastic approach, since we want to simulate patterns over large (50 x 50 km) spatial and time domains and we are not interested in predicting individual events. This is very much a work in progress. Until now we have considered a simplified dynamic small-scale model, which we plan to elaborate further in the hope that it will help to understand the workings of the large-scale model.
New Product Development and Innovation Management: Applying a Microeconomic Toolbox
Stefan Weinfurter

This research is an attempt to link some aspects of managing New Product Development (NPD) and innovation with microeconomics. A variety of new product evaluation models, particularly, concept testing methods, including conjoint analysis and multi-attribute approaches, are discussed as well as many existing studies on the role that innovation and technological change play in micro- and macroeconomics. Data from consumer surveys on innovative composite wood products fit in an existing model based on standard economic cost-benefit logic. Emphasis is also placed on “benchmarking”, that is the continuous process of measuring products against the toughest competitors or industry leaders. Theoretical concepts, such as complexity research, adaptive dynamic systems, systems research thinking, network economics, knowledge economics, agent based modeling, industrial ecology, new growth theory, and evolutionary economics are reviewed for their potential in incorporating consumer choice.

The Role of Russia’s Terrestrial Biosphere in Bottom-Up/Top-Down Emission Accounting Exercise
Kirsten Barrett

International accords such as the Kyoto Protocol that seek to regulate greenhouse gas emissions on a global scale necessitate methods sufficiently robust to account for uncertainties in emissions data. Signal detection of changes in carbon emissions must account for such uncertainties to conclusively determine when emissions reductions have occurred. When used in combination, ground-based (bottom-up) assessments of carbon emissions and atmospheric inversion models (top-down) are powerful tools for reducing uncertainties and validating flux estimates. Because top-down methods cannot differentiate between different ecological processes or human-induced fluxes, it is important that emissions accounting consider carbon fluxes in toto to properly validate flux estimates. This study compares two such comprehensive evaluations – the Russian Full Carbon Accounting and SIBERIA-II full greenhouse gas accounting projects. Carbon flux estimates from the terrestrial biosphere are compared in terms of mean values and uncertainties. In addition, top-down data are used to further reduce uncertainties and validate flux estimates.

Daniela Knorr

This research project deals with the development of geographical methods for generating a vegetation map of the Siberia-II study region in Central Siberia for the purpose of a full terrestrial carbon accounting. It consists of vegetation units, which are homogenous in vegetation composition and stand conditions and therefore in above-ground carbon content (living biomass) and rates of CO2- absorption (NPP). This vegetation map is part of a regionalization system for IIASAs GIS-based landscape ecosystem model for full terrestrial greenhouse gas accounting. Following decision rules that were developed especially for this boreal region, the input data sets which are mainly remote sensing products, such as land cover or digital elevation models, are used as indicators for vegetation distribution. With this research, the potential of remote sensing data for mapping the strongest and rapidly changing component of the terrestrial carbon cycle namely, the vegetation, will be estimated.
Site selection Criteria for Off-shore Mussel Cultivation Use: A Modelling Approach
Daniele Brigolin

In the last decade, the Mediterranean mussel (*Mytilus galloprovincialis*) production in Italy has been steadily increasing, reaching in 2002 8% of the worldwide production. This trend is mainly due to the increase in landings from aquaculture, which in 2002 accounted for about 70% of the country’s annual production. Despite this growth, off-shore mussel culture activities are raising some concerns about its negative environmental impacts and its sustainability. The main aim of this research is the development of a model for site selection and optimization of farm sizes along the Western Adriatic coast. The model will be developed stepwise. In the first step, a simple NPZ model will be fitted to the available field data. Mussel dynamics will be subsequently included in the model, in order to investigate the main interactions between the mussels and the pelagic ecosystem and bottom sediment and the dependence of biomass yield on external forcings.

Cyclic Interactions in Food Webs
Geir Halnes

The term ecosystem normally refers to a wide concept, including both biotic and abiotic components, while food webs are simpler diagrams of who eats whom. In spite of this, food webs are often interpreted as flow diagrams. While it is true that predation implies energy transfer, the opposite is not necessarily true. As an energy flow diagram, the food web is therefore incomplete, and does not consider energy exchange with the environment. Something that concerns even a structural, static analysis of the diagram is the notion that energy might leave and re-enter the food web through detritus (dead organic material) and detritus feeders. This feedback loop is often ignored in food webs, since detritus is not a species. By comparing five different food-web models, including two original models allowing for detritus feedback, we show that this feedback loop is crucial for the total energy cycling in the system.

A Model of Technological Growth Under Emission Constraints
Elena Rovenskaya

The project is devoted to the analysis of economic growth under prescribed constraints on the emission of greenhouse gases (GHG). We use a model of the world’s GDP where growth leads to the increase of the industrial GHG emission provided investment in cleaning technology is insufficient. We take into account that the total annual GHG emission (to be kept below the prescribed level) has two essential components: the industrial emission and the land use emission. At first, we simulate the land use emission as a deterministic process. At the next stage, we introduce random jumps due to natural catastrophes; the total GHG emission turns into a random process and the upper constrained is assumed to be satisfied with a given probability. We identify the model using IPCC scenarios for the world’s GDP, fossil fuel emission and land use emission. We use the proportion between investment in industrial technology and cleaning technology as the major control parameter, and analyze the cost for developing cleaning technology and for the reduction of the land use emission.
Transitions to New Technologies (TNT)
Wednesday, 20 July: 09:00–10:30
Wodak Room

Mathematical Optimization of Spatially Explicit Estimates of Economic Activity (GDP)
Alexander Matviychuk

Information on the spatial distribution of economic activity is of considerable interest for a variety of research topics ranging from modeling spatial diffusion of new technologies to climate research. The objective of my research is to contribute towards the validation of this first attempt of “downscaling” of economic activity data from the national to the sub-national grid-cell level through:

- comparison of the global IIASA data set to selected regions where spatially explicit statistics or model estimates are available;
- developing appropriate criteria to measure similarity/dissimilarity between the spatial GDP patterns that emerge from different statistical sources and/or estimation methods;
- using the above, developing mathematical algorithms for optimizing the spatial disaggregation algorithms developed at IIASA in terms of minimizing dissimilarities between alternative models of deriving spatially explicit GDP estimates that are scale-independent, i.e. are applicable across a wide variety of spatial scales from small countries/regions to large ones.

The final expected results of my YSSP research consist in suggestions for improved optimization algorithms to modify existing GDP “downscaling” methods from the national to the sub-national grid-cell level through appropriate calibration and changes in the input parameters of the “IIASA downscaling model”.

Integration of Mitigation and Adaptation Policy Frameworks into the UNFCCC Process
Kanako Morita

Ever since adaptation policies have been introduced into international climate negotiations, a widening argumentative gap between developing and industrialized countries has emerged. Whereas industrialized countries implementing the Kyoto Protocol focus on the negotiation process, almost exclusively on mitigation policies, developing countries in their turn almost exclusively focus on adaptation policies. Recently, there has been some evidence that mitigation policies are being considered also by China and India. The goal of my research is to explore ways of integrating mitigation and adaptation policies in international climate negotiations which are seen as of vital importance for narrowing the gap between the perspectives and positions of developing and industrialized countries and thus increasing the chances for success in negotiations. In order to elucidate various country groupings and coalitions in international climate negotiations, I analyze quantitative indicators related to respective mitigation potentials and adaptive capacities of different groups of countries. My research draws on the emissions scenarios in the literature. It is based on a scenario database, which is being developed to provide a framework for scenario analysis in the forthcoming IPCC Fourth Assessment report. Part of my TNT research this summer is to contribute to the further development of the IPCC scenario database and assist subsequent scenario analysis through my quantitative research in coalition formation. In the presentation, I will provide a brief description of the IPCC database and will also show some preliminary results of analysis of indicators of mitigative and adaptive capacities.

The Influence of Carbon Permit Price and Economies of Scale on the Relative Economics of Biomass and Coal Gasification Systems with Carbon Capture and Storage
Salem Esber

The substitution of fossil fuel energy production with biomass-fuelled production, including carbon capture and storage, can offer the benefits of a greenhouse gas reduction and a lessened reliance on resources of finite supply. The cost-competitiveness of biomass systems, however, is quite complex, and includes such factors as economies of scale, relative fuel prices, carbon dioxide permit prices, learning effects, and government incentive structures. Under previously studied conditions, biomass-fuelled gasification systems have not proven to be attractive when compared with coal plants. When using carbon dioxide capture and storage, biomass power systems can actually achieve a net reduction in atmospheric carbon dioxide as the carbon sequestered from the atmosphere by biological processes is eventually isolated from the atmosphere after the conversion of energy into electricity. In an economic environment in which carbon reductions are valuable, a biomass system can hence realize an additional source of profit which is not available for a coal system. With this advantage, and at larger plant sizes, there may exist attractive markets for biomass power generation systems. The purpose of this study is to explore the combination of factors which could render the electricity from biomass-fuelled gasification combined cycle power plants with carbon dioxide capture and storage competitive with similar coal-fuelled plants. This study uses a bottom-up engineering economics analysis to compare the effects of plant scale and credits for carbon capture and storage on the cost of electricity for biomass and coal-fuelled gasification plants, and provides a new perspective on biomass power generation systems under climate change mitigation regimes.
Negotiation as Means vs Negotiation as End
Konstantin Rachev

Negotiation is a heterogeneous and contradictory field of research, especially when it comes to the discussion about the different approaches that can be applied to the practice of negotiations. The practice of negotiations is sometimes difficult because different approaches suggest different devises depending on the issues or subject matters that are negotiated. Hence, negotiators often have to pick and choose between a medley of different approaches without any clear guidelines or system as to which approach is more effective in a given situation. The goals of this study are therefore: (1) to make the theoretical definition of negotiation more universal by clarifying the common features that exist in all negotiations/approaches (such as outcome, interests, expectations etc.). (2) to make a common set of guidelines that can be useful for negotiators when trying to find appropriate negotiation responses. The framework created is based on a three-dimensional approach to negotiations, which can help us understand the complexity of negotiations with regard to their role in processes of decision-making, communication and problem-solving (when negotiation is an element of conflict resolution or part of a strategy).

What Role do States and Non-state Actors Play in the ASEM Negotiation Process on the Protection of Human Rights in the ASEAN Region, Particularly in the Case of Burma/Myanmar?
Simone Eijsink

ASEM is an interregional, multilateral dialogue forum, in which all states participate in their own capacity. The role of NGOs is limited in this forum: they are not given an official status, but are sentenced to have their own parallel sessions, which are hindered by mainly the Asian member states of ASEM. However, the role of non-state actors, especially NGOs in human rights protection, on an international, national and local level is of crucial importance. In order for human rights protection to be discussed in the forum Summits, which has been very difficult so far, I will argue that the European states should try to persuade their Asian counterparts to allow non-state actors to participate in the Summits, which can have a strong influence on the human rights dialogue.
Incomplete Negotiations: The Belgium Case
Dragica Fridl

This paper is part of a PIN research project. It will be published as a chapter in a book on Incomplete Negotiations which both through negotiations theory and case studies seeks to explain why negotiations fail and don’t end in agreements. The primary focus of this case study is 19th century Belgium and its separation from the Kingdom of the Netherlands which was formed as a buffer zone against French expansion by the Great Powers at the Vienna Congress in 1815. The London Conference of 1830 which followed had as its main task to determine the future of Belgium and reach a peaceful settlement between the Dutch and the Belgians. This study analyzes the dynamics of the conference, decisions and actions taken by the main actors and explains why the conference ended without an agreement. The outcome is explained by using the tools from the international negotiations theory, such as power imbalance, lack of trust, lack of a Mutually Hurting Stalemate (MHS), Backward-Looking Outcomes and Mutually Enticing Opportunity (MEO). Even though the London Conference afforded Belgium its independence with a condition of neutrality to be achieved by it, the conference was suspended from 1833 until 1839 when the Dutch finally acquiesced to signing the agreement.
Qualitative Models of Impact of Climate Variations on Crop Yields
Wojciech Kotlowski

The presentation deals with the investigation of the relationship between climate variations and yields of selected types of crops. The goal is to explain the crop yields variability caused by weather (represented by precipitation, average temperature and temperature difference, collected monthly). The methodology applied to establish a fairly explainable model comes from the machine learning domain and is based on a qualitative and symbolic approach, namely decision rules induction. Rough sets theory is also considered to deal with possible inconsistencies in data. I will present a way of identification and separation of non-climate factors, substantially affecting crop yields, like fertilization or mechanization. Then, the decision rules and rough set framework will be introduced followed by a discussion of their application to model construction from climate and crops data. Finally, I will summarize an approach to the classification of several kinds of crops in term of the climate impact (model) characteristics.

Weather Time Series Analysis
Bartosz Kozlowski

This presentation looks at the analysis of weather changes and the impact on crops yield focusing on two case studies, namely China and the United States. In particular, identification of unusual as well as periodical weather behavior will be addressed. Attempts to forecast this phenomenon will also be made and arising problems and questions due to different resolutions of data gathered for weather and crop yield will be looked at. Subsequently, possible directions to solve those issues will be briefly described, including upscaling and downscaling. A brief introduction will be given to wavelet analysis and wavelet based methodologies which will be used throughout the research.

Application of Data Mining Techniques to Study Impacts of Climatic Factors on Crop Yields
Thi Minh Hai Nguyen

The presentation deals with the analysis of possible impacts of climatic factors on crop yields, and forecasting long-term climate change. To achieve the first goal, a novel association rule mining algorithm for time series data has been developed. The confidence of the association rules will support knowledge creation from a set of climatic factors that have the strongest effect on a crop yield. The algorithm will also enable determination of outliers of climate factors and crop yield. To achieve the second goal, the applicability of a sliding time windows approach will be explored. Furthermore, due to spatial and temporal heterogeneities of the data, problems of downscaling and upscaling will be addressed.
Price/demand Sub Model for the AIM/Enduse Model
Osamu Akashi

AIM (Asia-Pacific Integrated Model)/Enduse model simulates future CO2 emissions from energy related activities, using diffusion of concrete technologies under market mechanism. It is formulated as an optimization problem which minimizes the total cost under constraints, such as satisfaction of energy service demand. In the current version of the model, fixed energy service demand is given exogenously. However, in the real world, energy service demands vary by service prices. My long term goal is to propose a sub model of service demands price elasticity to be used in a new version of the AIM/Enduse model. I explore models which already consider price/demand mechanism. For example, Markal and SAGE models exploit a simple micro-economic theory which shows that market equilibrium is reached when a certain criteria is maximized. This methodology will be explored to check if it is relevant to the AIM/Enduse model.

Modeling of Hydrological Consequences of Land Use/Land Cover Change in Shenzhen, China
Jing Zheng

Land Use/Land Cover Change in urbanization has profound impacts on regional hydrological systems, which may lead to higher flood risk and potential greater flood losses. Shenzhen, located at the south of Guangdong Province and neighboring to Hong Kong, has been undergoing urbanization at an unprecedented speed since its establishment as a Special Economic Zone in 1980. While the land use and land cover in this region has been changing dramatically due to urbanization, the hydrological consequences are still unknown. By integrating Remote Sensing science, Geographic Information System technology and hydrological models, hydrological consequences of land use/land cover change in this region is studied. Four Remote Sensing images at different stages of urbanization in Shenzhen are used to acquire land use and land cover information, which is then used for mapping land use/land cover change and calculating parameters for the Soil Conservation Service model. Change of surface runoff is then simulated using the SCS model and GIS techniques. Spatial analysis is then carried out to find out hydrological impacts of land use/land cover change in urbanization. The result shows high variety and complexity of the impacts of land use/land cover change in urbanization on surface runoff. Some land use change types may give rise to increase of surface runoff, while others will decrease it.
Modelling Pandemic Influenza
Wai-Sui Almberg

Based on a recurring cycle of influenza pandemics and recent incidents of avian influenza – killing 59 out of 109 known cases – scientists have expressed rising fears that the next pandemic will strike soon and could potentially be very deadly. In preparation for such an event there is much ongoing research on the epidemiological nature as well as socioeconomic impacts of influenza. My study this summer focuses on the epidemiological aspects of influenza, how it spreads geographically, seasonal patterns, etc. The presentation will describe current influenza models and then highlight some interesting epidemiological challenges specific to influenza, pivotal to the construction of a simulation model. The objective of the research, of which my work this summer forms a part, is to study global socioeconomic impacts of influenza while credibly modelling the epidemiological spread of the disease.

The Influence of Climate Change on the South African Wine Industry
Suzanne Carter

The wine industry is an integral part of the Western Cape’s economy, contributing just over 8% to Gross Provincial Product (GPP). The intensive labour required by the industry also provides employment for semi-skilled labour. Changes in climate induced by global warming will affect many aspects of this industry. Current regional projections of rising temperatures and decreased precipitation will put pressure on both the phenological development of the vines and on the necessary water resources for irrigation and production. This study will look at these affects using six statistically downscaled GCM projections for the mid 21st century to ascertain the impacts on this industry under future climate stressors.

A Critical Review of Pluralist Approaches to Policy Analysis
Sam Evans

Understanding how policy is made and developing alternative ways of making policy is the realm of policy analysis. Pluralist approaches to policy analysis argue that complex policy issues can be best understood and addressed by incorporating a full range of actors (which may be, for example, people, organisations, states, or discourses) and types of interaction. What forms the main actors take, and the types of relationships researched, vary between theoretical approaches. Different approaches also have different realms of applicability, including types of issues addressed and the scale of the issue, and different goals, such as describing a policy process or actually engaging in it. My research this summer focuses on relating current developments on a number of these pluralist approaches. In particular, I am analysing the differences in claims these approaches make about the value of pluralism in dealing with complex, intractable policy issues, such as disputes over agricultural biotechnology between the US and EU. I will present at the workshop my preliminary findings, including an overview of the major similarities and differences between three approaches: cultural theory, the argumentation approach, and the advocacy coalition approach.
Assessing the Benefits and Feasibility of Seismic Mitigation
Amit Kumar

There is a substantial stock of poorly constructed, non-engineered buildings in the developing world in earthquake-prone areas. Improving seismic safety, e.g., by retrofitting, is of highest priority. As this involves a substantial cost, a clear understanding of its benefits is necessary. In the literature, there is lack of clear evidence on the benefits and the returns of seismic mitigation. The objective of the research is to develop a method for assessing such benefits as (1) avoidance and reduction of loss of life, and (2) reduction of property damages. Such research is helpful for the efficient and reliable estimation of losses at varying intensities and the selection of best mitigation alternatives, e.g., by means of cost-benefit analysis. The method will be applied to a case study of the Khandwa district of Madhya Pradesh in the central part of India. Furthermore, for implementing mitigation measures an understanding of the preferences of stakeholders at the local, regional and national levels is necessary. The second part of the research project will focus on the implementation context and analyze constraints to and possible strategies for implementing local cost-efficient seismic mitigation programmes.

Climate Change, Disaster and Poverty
Unmesh Patniak

While it is widely held that poor people in developing countries are likely to be the worst sufferers due to climate change (UNFCCC, 2002), there is large uncertainty relating to potential average and extremes in climate the channels through which the impacts will be transmitted, as well as empirical investigation of impacts on society, particularly the poor. In view of this, the study will aim at developing a framework for studying the climate-related risks faced by the people in the vulnerable areas. It will focus on the aspect of poverty faced by individuals and the relationship between natural hazards, vulnerability to these hazards, poverty and the impacts of climate change on the risk faced by individuals. The methodological framework will be applied to the state of Orissa in India. India is the second most populated country in the world with people depending highly on climate-sensitive sectors like agriculture, fisheries, forestry, and farming for their livelihood. Furthermore, India with its large exposed coastlines and its location is quite vulnerable to climate-related disasters such as tropical cyclones which are likely to increase in frequency and severity.

Indicators for the Resilience of Socio-Ecological-Systems – Do They Exist?
Martin Wildenberg

Increasing loss of natural and cultural diversity is one of the miserable characteristics of our time. Often these losses are linked to transitions on various scales of the linked human-nature systems. Understanding what drives these changes and how the environment and the people cope with them can contribute to developing sustainability pathways. Resilience describes the ability of a system to cope with change. High resilience indicates that the system can cope with change and disturbance from the outside (or inside) and still remain basically the same. A high resilience is usually seen as favorable for socio-ecological-systems (SES) as it increases the capability of the people to cope with unforeseen changes and disturbances. There are no clear definitions of (1) SESs in general and (2) specific features that make up the resilience of such systems. It is also not clear if there is any possibility to measure the resilience of an SES. Focusing on case studies that describe successful reactions of communities to changes, I want to identify general features in SES that contribute to a high resilience. The aim is to understand why these features enhance resilience and finally to derive a set of indicators that can be used to assess the resilience of a SES.
The Technology Options for \( \text{CO}_2 \) Emission Reduction in China
Rong Chen

As one of the biggest developing countries, China can be expected to have a major impact on the future direction of climate change negotiations. In this connection, the Chinese government is most concerned about the impact of GHG mitigation on future economic growth. This presentation will give an overview of existing mitigation scenarios of China based on an earlier project that IIASA undertook together with the German Advisory Council on Global Change (WBGU). Firstly, this presentation reports mitigation cost of China according to the results of IIASA’s MESSAGE-MACRO model. Secondly, it will assess the dynamic change of the technology supply system that is required to achieve the \( \text{CO}_2 \) control target. Thirdly, it will present an outlook on the work planned for the second part of this summer’s work, the main topic of which will be an estimation of the \( \text{CO}_2 \) mitigation potential of innovative energy technology.

Using Energy Proxy to Explain Economic Growth of Catch-up Countries
Jie Li

The main purpose of this work is to look for a good proxy to explain economic growth of developing countries (or catching up countries). This is consequential on the further development of the Ayres-Warr economic growth model, which has successfully simulated the economic growth of the USA and Japan for the past 100 years. In contrast with the standard neoclassical (Solow) model, useful work is introduced in a production function, together with labor (L) and capital (K), to explain past and predict future growth. However, for most developing countries and even for some developed countries, it is not possible to find all the necessary historical data. Therefore, we try to simulate the development gap between ‘catch-up’ countries and the USA which is one of the most developed countries. Then a prediction of the ‘gap’ together with a prediction of US growth can be used to predict the future economic growth of developing countries. From the standpoint of useful work, electricity and oil consumption are two likely indicators. We are now trying to use the combination of them as a proxy to explain the gap of per capita GDP between catch-up countries and the USA. There are factors such as fraction of hydroelectricity, oil exports and so on that can affect the choice of proxy. Variables describing these modifying factors are also included in the analysis to control their effects. Social and political factors are not considered in this simulation.
V2G Energy Systems: The Potential to Influence the Energy Mix
Filipe Moura

“Vehicle-to-Grid” (V2G) energy systems use Electric-Drive Vehicles (EDVs), powered by battery, hybrid or fuel cell, to provide power to the electricity grid. This is done by “plugging-in” vehicles when they are parked and not used for mobility. The concept of V2G power generation is attractive because the average vehicle is used for mobility purposes only 3-6% of the time and the power capacity of the global automobile fleet exceeds by an order of magnitude installed electricity generation capacity. Accordingly, V2G systems have the potential to transform the electricity generation sector, resulting in a more decentralized energy system and potentially lower greenhouse gas emissions. The present research aims to analyze the potential of V2G power generation in the energy utility system, focusing on a range of power markets, including regulation services, spinning reserves and peak-power demand. The main objective is to identify the operating conditions (investment and operating costs for both mobility and electricity supply services) under which V2G systems could constitute an alternative to conventional electric systems and promote the deployment of EDVs.

The Effect of Learning Spillovers Between Technologies: A Case Study on Synthetic-Fuel Production
Sergiu Robu

The learning of a technology component as a result of an investment in this technology can have an influence on the investment costs of other technologies that include this component. Technologies including such a “learning component” can thus be thought of as clusters, and all technologies included in such a cluster can benefit from accelerated investment cost reductions. This effect is referred to as spillover. The objective of this study is to analyze the importance of spillover effect between technologies using a cluster approach. Individual technology learning is used as a reference point. Special attention is given to technologies for synthetic fuel production (hydrogen, ethanol and methanol). The work will include building a matrix of technologies and components for the clustering analysis and further using this matrix to evaluate the importance of spillover effects as well as the possible implications of these effects.

Climate Policies in the Power Market: The Effect of Start-up Costs
Orvika Rosnes

Climate policies directed towards the electricity industry aim to reduce CO₂ emissions by reducing the use of fossil fuels. Long-term developments have been the focus of most studies. However, by changing market prices and costs of producers, climate policies influence not only long-term investment and closure decisions, but also the short-term decisions of current electricity producers – whether to produce today or not. Due to several constraints (e.g., start-up costs), the production decision is an intertemporal decision, and the conventional ‘price vs. marginal cost’ rule is not sufficient to predict production in the thermal power plants. Consequently, the impact of climate policies on power plants is not clear-cut: total production and the resulting emissions may be either lower or higher during a given time period than that predicted by the conventional ‘price vs. marginal cost’ rule. In addition, the start-up process in a power plant itself causes higher emissions as compared to the common assumption of a smooth mode of production. This paper analyses the short-term effects of climate policies in a power market when such constraints are taken into consideration. For this purpose, a numerical power market model is extended to include the start-up costs.
Long Term Demand for Freight Transportation in Developing Countries
Katalin Nora Szarka

Future freight mobility is one of the major factors underpinning economic development, but also potentially a significant consumer of energy and source of pollution. By modeling future freight demand we can improve our understanding of development and identify challenges to sustainability. This study aims to develop and apply a methodology for formulating scenarios of long-term freight transportation demand for developing world regions. Developing this methodology will involve identifying the characteristics and principal quantitative driving forces affecting freight transportation demand (e.g. population, material flow, GDP), collecting historical data and deriving statistical relationships between drivers and freight activity. Historical and future freight activity will be determined at different levels of geographical detail using a number of methods for estimating physical quantities and flows of goods to be transported (O-D matrix) and allocating these flows to different transport modes (modal split). This methodology will then be applied to and validated with driving forces of specific IPCC SRES scenarios. The main expected results from this analysis include both a methodology for quantitative estimation of freight transportation demand (tonne-km) until 2100, and freight transport projections consistent with the IPCC SRES scenarios for six developing world regions.
Exploring Implied Policies of Lower Bound Long-term Emission Stabilization Scenarios
Holmes Hummel

Despite the indication that carbon dioxide concentrations of 450 ppm may impose significant climate impacts, long-term energy and emission scenarios that stabilize concentrations below 450ppm have received little attention, and these low outlier scenarios are regarded as having low feasibility. To consider the plausibility of reducing this apparent lower bound, this study analyzes sample low-emission scenarios produced by two long-term energy models with rich detail for energy resources and technologies. The first step examines scenario assumptions and model structures to understand why reaching stabilization levels below 450ppm is difficult, and also to explore ways to address these barriers. The subsequent objective is to identify policy portfolios essential to realizing stabilization conditions, as indicated by the robust characteristics of the energy systems emerging from the low-emission scenarios. Furthermore, scenarios that stabilize emissions from a reference case suggest mitigation measures (demand reduction, fuel-switching, and carbon sequestration) dependent on policy support in order to be realized. Of particular interest in this research is exposure to risks associated with technologies such as carbon sequestration and nuclear power as well as renewable energy technologies still under development.


Future Transportation Scenarios for China: Emphasis on Technological Advancements and Modal Shifts
Shuwei Zhang

Transport activity is the dominant consumer of petroleum products and it is expected to grow rapidly as incomes in developing countries rise in the future. With the penetration of advanced technologies in the market, there could be a significant (albeit uncertain) shift in the dynamics of the system. Both these factors will be crucial actors in the evolution of the future energy consumption of the transportation sector in developing countries. This project attempts to develop a comprehensive methodology to analyze future trends in the transportation sector. It builds on existing studies and improves the representation of important issues of modal shifts, differentiation between short- and long-distance travel, land availability and population density. Initial results using AIM/Enduse model indicate a substantial increase in energy consumption in the reference transport scenario for China in the next 30 years. The results of this analysis will further be improved and used to study the resulting policy implications.
Emergence of Influenza A Viruses in New Species of Hosts
Sarah Cobey

Understanding emerging infectious diseases requires considering changes in the population ecology of hosts and evolutionary changes in the parasite. In the past, disease emergence has usually been viewed through the lens of either epidemiology, which ignores the possibility of evolution, or evolutionary optimization, which ignores population dynamics and transient evolutionary states. These perspectives may be too restricted especially for highly mutable parasites in rapidly changing environments. In such cases, ecological and evolutionary dynamics may interact over short time scales. Influenza A viruses provide relevant examples of how these processes may jointly determine host range. I will summarize recent worldwide changes in the ecology and evolution of these viruses in their major host populations, including waterfowl, poultry, swine, and humans. I will then introduce a model that explores how one evolutionary constraint of host range, the virus’s preference for a sialic acid receptor, interacts with changing ecological conditions to affect the probability of emergence, re-emergence, and adaptation of the virus in different host species.

Modeling the Evolution of Human Influenza A
Sergey Kryazhimskiy

Influenza is a well known respiratory disease that, perhaps unexpectedly, is one of the most important causes of mortality and morbidity worldwide. RNA viruses such as influenza are characterized by an extremely high mutation rate. This ability allows influenza to evolve its surface proteins so fast that the human immune system cannot keep up – that's why we get sick with flu more than once in our life. In my project I study the peculiarities of the evolution of the Influenza A using mathematical models. I am trying to tie together analytical models, deterministic computer models and stochastic individual-based simulations. In my presentation I will discuss those features that distinguish influenza from other viruses. I will also talk shortly about some preliminary results that I have got so far.

Fisheries-induced Evolution in Northeast Arctic Cod
Anne Maria Eikeset

We are calibrating and applying an individual-based, eco-genetic model to predict how fishing influences the evolution of growth, reproductive investment, and maturation of Northeast Arctic (NEA) cod. This stock is currently the world’s largest stock of Atlantic cod (Gadus morhua) and is economically very important. It sustains both large open-ocean trawling fisheries, mainly from Norway and Russia, as well as fishing with conventional gear along the Norwegian coast. In addition to characterizing the magnitude and rate of fisheries-induced evolution in NEA cod, we plan to evaluate how different management strategies alter the stock’s evolutionary response. Fisheries-induced life-history changes may alter the economic conditions of the cod fisheries and lead to changes in the fleet’s structure and allocation; this, in turn, may either enhance or diminish the ongoing changes. The final stage of this project will be to incorporate the fishery’s effect on the evolving traits into a bio-economic model, to assess the economic impacts of fisheries-induced evolution in NEA cod and to quantify the long-term costs of overfishing.
Effects of Habitat Selection on Parapatric Speciation
Janne-Tuomas Seppänen

Bewildering diversity of species and ecosystems characterizes the living world. Until recently, mainstream evolutionary theory postulated that speciation nearly always requires geographic isolation of incipient species. This appears to be at odds with the diversity of many highly mobile animals. Also more recent models of speciation have suggested that mobility hinders speciation. These models, however, assumed that individuals move randomly. In reality, even simple organisms move non-randomly, responding to their environment. Such habitat selection behavior might reduce the gene flow between habitats to the extent necessary for speciation, while retaining the mobility that facilitates founding and survival of local populations. Therefore, together with habitat selection, mobility could even become a factor facilitating speciation, instead of restricting it. I will present preliminary results showing how a simple "avoid adverse conditions" movement behavior affects predicted processes of speciation. More complex habitat selection behaviors, to be explored in the remainder of my project, will also be discussed.

Genetic Footprints of Speciation
Pleuni Pennings

One of the main aims of evolutionary biology is to explain the species diversity we see today and infer from the fossil record. Apparently, processes of speciation, by which a single species is split into two genetically distinct ones, take place often enough to give rise to high species diversity, but not so often that we could not distinguish species anymore. Nowadays, biologists think that speciation can happen through several different mechanisms. Finding out which of these speciation modes is more prevalent in nature remains a major challenge. Because much genetic data is currently becoming available for many species and populations, it seems promising to use such data to learn about a species' speciation history. In my talk I will briefly introduce two ways in which speciation can happen and present some ideas on how genetic data might be used to distinguish between speciation modes.

Evolution of Dispersal Kernels
Andreas Gros

From an individual's perspective, dispersal may be motivated by a number of reasons: avoiding competition for resources, avoiding inbreeding, or coping with the temporal variability of resource availability. The dynamics resulting from dispersal in conjunction with intra- and interspecific interactions often lead to spatially uneven patterns of species abundance. When the underlying landscape is assumed to be homogeneous in space and time, it is only these patterns that define the heterogeneous environmental conditions to which a species' potential for dispersal adapts. Dispersal is often modeled by kernels describing the probability distribution of distances over which individuals are dispersing. The aim of this study is to predict the outcome of evolution in the shape of such dispersal kernels, and to examine how these shapes depend on the competition regimes considered.
The Influence of Harvesting Pressure on Evolving Food Webs
Jack Teng

Harvesting, especially in fisheries, causes drastic ecosystem changes, such as the simplification of trophic structure in food webs. While the demographic effects of harvesting have been at the focus of earlier research, harvesting can also cause population traits to evolve. So far, however, few studies have incorporated both the demographic and the evolutionary dimensions of harvesting. Accordingly, the main goal of my project is to study how evolving food webs respond to harvesting. To do so, I study the influence of different harvesting regimes and pressures on food webs built from simple evolutionary and ecological rules based on body size. Determining how harvesting, multi-trophic interactions, and adaptive dynamics interact will help in understanding the impact of fisheries on ecosystems.
The Education Projections for Selected European Countries
Pawel Strzelecki

My presentation has two parts. The first one is a short introduction to the methodology of the multi-state demographic projections. It emphasizes its use in education projections. This issue is very important for understanding the consequences of the changes in human capital in different countries in the next decades. The description of the method is illustrated with examples from my current IIASA project - education projections for selected European countries. The second part of my presentation is a brief description of the next steps of my research at IIASA and on my PhD thesis. At IIASA I will focus on the use of multistate methods in simultaneous education and labour force projections. In my PhD thesis I want to learn about the advantages and disadvantages of using multistate methods versus agent-based approaches in socio-economic research.

Human Capital Projection in Vietnam
Ying Ji

Human capital is an important factor in economic development. Using multi-state techniques, population can be projected by education level, providing information on the human capital stock. In this paper, we use 1989 and 1999 census data for Vietnam and some data from the United Nations to estimate the fertility rate, mortality rate and schooling transition rate by sex, age and education. Using the PDE multi-state population projection model developed by the World Population Program at IIASA and three scenarios, we forecast the population of Vietnam by sex, age and education from 2000 to 2050. The education differentials between male and female are compared. The policy implication of the results is discussed.

The Consequences of Educational Expansion and Human Capital Formation in Uganda: Reflections on the Decade of Education for Sustainable Development
Frederick Mugisha

The year 2005 marks the start of the Decade of Education for Sustainable Development and with this a need to investigate conditions under which the accumulated human capital through education will contribute to sustainable development. The human capital stock for Uganda is projected using multi-state population techniques. The results suggest that while the majority of the adult population currently has only up to primary education, in the next thirty-five years, the majority of the population will have at least secondary education with those of tertiary education increasing almost 4-fold. The research work also shows that this expansion in education, much as it is extremely welcome, will change the education composition of the labor force, the majority having tertiary education – causing a shrinking in the agricultural labor force, an industry that currently contributes 39 percent of GDP. The other industrial sectors will have to grow at a much faster rate than they are growing currently to accommodate the growing labor force, or agriculture will have to be structured to attract the growing educated labor force.
Estimates of Adult Mortality Due to AIDS in Kenya
Zewdu Woubalem

Using data from the 1989 and 1999 Population and Housing Census of Kenya this project attempts to estimate adult deaths due to HIV/AIDS by age, sex and education level. Preliminary result shows relatively more death among the educated than those with no or little education. This pattern is true for both men and women. Higher mortality for women is observed during the study period. This research is the first in using census data and demonstrates differential mortality due to AIDS by education level in sub-Saharan Africa.

Malawi’s Future Human Capital: Is the Country on Track to Meeting the MDGs on Education?
Jean-Christophe Fotso

This study uses demographic and multi-state population projections to estimate the future population structure by age, sex and educational attainment in Malawi, and importantly, to assess the likelihood of meeting the Millennium Development Goals (MDG) related to universal primary education and gender disparity no later than 2015. Data from the 1998 and 1987 censuses, as well as fertility and mortality estimates from Demographic and Health Surveys are used. First, we perform backward projection and adjust our model based on the comparison with the 1987 census data. Second, we estimate the population structure in 2000 and then perform forward projections to 2015. Finally, we examine enrollment ratios and ratios of enrolled girls to boys. Malawi is one of the poorest countries in sub-Saharan Africa, with a population close to 10 million as of 2000. Less than 80% of 6-14 year old children are still in school, and only 15% of those aged 14-17 have completed primary school.

Note: This study will not be presented at the Workshop
Water Allocation Processes in Yellow River and Colorado River Basins: 
A Comparative Analysis
Christine Boyle

Throughout the world’s major river basin networks, processes of allocating fresh water resources throughout regions and among sectors remains highly contentious, frequently in flux and politically divisive. This study compares water allocation processes for two of the world’s largest and most conflict-ridden basins, the Yellow River Basin in North China and the Colorado River Basin in the Southwest United States and Northwest Mexico. As these two river regimes progress in market-based reform of allocative processes, basin-level efficiency outcomes remain un-measured. Comparative analysis of the two river basins using economic measures of efficiency in productivity (agricultural and industrial) and domestic consumption (municipal and rural) will estimate the effectiveness of the respective water allocation mechanisms, command versus market and central versus democratic, in achieving policy objectives. This paper will explore the economic efficiency levels along distinct reaches of the two rivers and see what correlations exist between allocation mechanisms and water-use efficiency. Historic and cultural dimensions of water allocation will contextualize the role of economic efficiency within the water resource institutions of China and USA.
Atmospheric Emissions from Open Biomass Burning: 
Development of Date Set for RAINS Model 
Jarkko Niemi

Large amounts of biomass are burned in vegetation fires in different biomes (e.g. forests, savannas, shrublands and grasslands) and in agricultural residual burning in fields. Open biomass burning is a major source of several gaseous and particulate air pollutants. In my work at IIASA, I first compare available global and regional estimates (based on statistical sources or satellite remote sensing) for open biomass burning emissions and select/adapt the most reliable data sets with high spatial resolution. Then future projections on biomass burning emissions will be created based on potential changes in land use and management practices. Furthermore, potential mitigation options for open biomass burning will be examined. Both baseline and scenario emission data from open biomass burning as well as the costs and potential for control measures will ultimately be incorporated into the RAINS model to extend its coverage of sources and control strategies. These new data will allow for a more comprehensive analysis of costs and environmental effects of different emission control strategies.

Cost-effective Control of SO\textsubscript{2} and CO\textsubscript{2} Emissions in China 
Eri Saikawa

Adverse environmental impacts due to air pollution and climate change are a growing concern for both developed and developing countries. Yet, major air pollutants and greenhouse gases often stem from the same sources, thus offering a potential for cost-effective simultaneous environmental improvements. A methodology called GAINS (GHG-Air Pollution INteraction and Synergies) has already been developed at IIASA for Europe to extend the RAINS integrated assessment model in order to explore medium-term synergies and trade-offs in a multi-pollutant assessment framework. In this research, central elements of the GAINS model are developed and applied for China to evaluate plausible policy options. In particular, mitigation measures for carbon dioxide (CO\textsubscript{2}) and abatement options for sulfur dioxide (SO\textsubscript{2}) are assessed and combined to devise optimal cost-effective control strategies, which simultaneously address emissions reductions from the two pollutants in China in the year 2020.

Mitigation of Methane Emissions from Rice Cultivation in China 
Pinq Qin

As the world’s largest rice producer, China plays a very important role in methane emissions from global rice fields. Chinese rice area accounts for nearly one-fourth of the world’s sown area. Using IPCC emission factors, China’s rice fields are estimated to contribute with about 13.3 Tg yr\textsuperscript{-1} (11.4-15.2) CH\textsubscript{4}, accounting for about 22-40% of total methane emissions from world rice fields. The purpose of this study is to collect and compile data and information on rice cultivation in China in order to create scenarios for estimation of methane emissions from rice fields. The data is compiled at a provincial level and includes e.g., information about current activity, technology use and emission factors. Emissions from rice paddy vary e.g., by rice cropping system, soil type, water regime, use of organic fertilizer, climate and paddy characteristics. The study will describe the potentials to improve rice productivity in China and the possibilities to reduce methane emissions from rice paddy as well as the potentials and costs associated with methane mitigation.
Non-technical Measures to Reduce Air Pollutants and Greenhouse Gases from Agriculture
Martina Havlikova

The cost-effectiveness studies dealing with the reduction of multiple environmental problems have typically only included technical measures (e.g. Gothenburg protocol). However, the drivers causing environmental problems call for non-technical measures that aim for changing human behaviour and the socio-economic structure of society. The present research focuses on the agricultural sector and aims to answer the following research questions: What are the possible non-technical measures to reduce air pollutants and greenhouse gases? How to include non-technical measures into the baseline scenarios? What would be gained if non-technical measures would be included in the RAINS model in terms of accuracy of environmental assessments? In addition to this task, attention is paid to the verification of the RAINS WEB database for the Czech Republic, in order to be suitable for determining the Czech position regarding the revision of the international air pollution control legislations.

Towards an Integrated Assessment of Environmental Impact of Energy Sector in Poland
Artur Wyrwa

With the current use of 52% of hard coal and 13% of lignite as primary energy, Poland is the largest SO₂ emitter in Europe. Also the emissions of other air pollutants are significant. In this respect, EU regulations imposing emission standards on SO₂, NOₓ, and PM constitute a major challenge for the development of the Polish coal based energy sector. The research has been undertaken by the author to find the least cost options for the fulfillment of forthcoming regulations derived from the Clean Air for Europe Programme under Polish conditions. It is proposed to further develop the integrated assessment model RAINS Poland¹ and combine it with the chemistry transport model POLAIR 3D². The current status of work on integrated Sulfur-Nitrogen optimization is presented. Next steps needed to provide optimal emission abatement scenarios maintaining the environmental, social and economic equilibrium are outlined.

¹ Regional Air Pollution Information and Simulation (RAINS) model developed by International Institute of Applied System Analysis (IIASA).
² Developed by CEREA - a joint EDF&ENPC laboratory