

a new generation of scientists

YSSP

Young Scientists Summer Program



Proceedings of the YSSP Late Summer Workshop 2014



International Institute for
Applied Systems Analysis
www.iiasa.ac.at

IIASA's annual 3-month Young Scientists Summer Program (YSSP) offers research opportunities to talented young researchers whose interests correspond with IIASA's ongoing research on issues of global environmental, economic and social change. From June through August accepted participants work within the Institute's Research Programs under the guidance of IIASA scientific staff.

The Proceedings of the Late Summer Workshop constitute summaries of the research results obtained during Young Scientists Summer Program and presented in a workshop at the International Institute for Applied Systems Analysis, Laxenburg, Austria, 25–26 August, 2014.

The proceedings receive only limited review and are not for publication in the current form. Views or opinions expressed herein do not necessarily represent those of the Institute, its National Member Organizations, or other organizations supporting the work. This compilation contains all the summaries available at the time of finalization of the proceedings.

Table of Contents

Workshop Program	iii
Energy & Climate Change	1
Poverty & Equity	14
Advanced System Analysis.....	28
Food & Water	40

Workshop Program

Monday, 25 August 2014						
9:00 – 9:10	Welcome and Introduction by YSSP Dean Joanne Bayer (Wodak Room)					
	WODAK Room			GVISHIANI Room		
Day 1 - Session 1	ENERGY & CLIMATE CHANGE Transportation: Fuels and Emissions Chair: Jens Borken			POVERTY & EQUITY Social Heterogeneity Chair: Joanne Bayer		
09:10 - 09:35	Piera Patrizio	ESM	Enhancing the optimization model BeWhere by including the generation of biogas and its use as a vehicle fuel	Oreane Edelenbosch	ENE	The influence of social heterogeneity on consumer choices in the transport sector
09:35 - 10:00	Guilherme De Paula	TNT	Analysis of historical cost reductions in Brazilian ethanol production	Lukas Figge	ASA	Uncertain cultural consequences of global ecological overshoot: exploring future perspective change and dynamics
10:00 - 10:25	Younha Kim	MAG	Assessment of effectiveness of Seoul metropolitan area air quality management plan (SAQMP) using the GAINS-Korea framework	Farid Karimi	RPV	Carbon capture and storage: a cultural approach to understanding risks perceptions and experts' views in three European countries
	10:25 – 10:45 B R E A K					
Day 1 - Session 2	ENERGY & CLIMATE CHANGE Renewable Resource Modelling Chair: Nicklas Forsell			POVERTY & EQUITY Fertility Choices Chair: Elke Loichinger		
10:45 - 11:10	Pietro Elia Campana	ESM	Potential sustainable locations for photovoltaic (PV) water pumping systems	Sergey Orlov	ASA	Reproductive fitness and differential mortality: the role of social status
11:10 - 11:35	Madeleine McPherson	ENE	Development and application of an improved tool for renewable resource modeling within MESSAGE	Abhishek Kumar	POP	Intergenerational influence on fertility preferences of young women in rural Bihar, India
11:35 - 12:00	Tao Wang	ASA	Analysis of a multi-factor model for resource productivity in China	Zepeng Sun	EEP	Seasonal life histories in changing environments
	12:00 – 13:30 B R E A K					

Monday, 25 August 2014						
	WODAK Room			GVISHIANI Room		
Day 1 - Session 3	ENERGY & CLIMATE CHANGE Financing Renewability Chair: David McCollum			POVERTY & EQUITY Human and Natural Capital Chair: Rastislav Skalsky		
13:30 - 13:55	Robert Barron	ENE	Quantifying the impact of supply-side R&D investment on energy pathways for sustainable development	Haochen Wang	POP	A projection of human capital in Beijing—Education and health perspectives
13:55 - 14:20	Thomas Schinko	RPV	Governance of risks in financing concentrated solar power investments in North Africa	Kun Ma	ESM	Application of EPIC model to explain historical change in soil organic carbon stock of Roige Wetland, China
14:20 - 14:45	Fabian Schipfer	ESM	Biomass deployment strategies for the transition to a bio-based economy			
	14:45 – 15:00 B R E A K					
Day 1 - Session 4	ENERGY & CLIMATE CHANGE Climate Impacts Chair: Sylvia Tramberend			POVERTY & EQUITY Well-being and Futures Chair: Shonali Pachauri		
15:00 - 15:25	Gbenga Abiodun	EEP	Climate change and malaria incidence in South Africa	William Lamb	ENE	Basic needs, development pathways and the global carbon budget: Articulating the links between climate change mitigation and human well-being
15:25 - 15:50	Quiying Ding	WAT	Soybean production in China under climate change: Analysis of the effect of adaptive techniques based on DSSAT and AEZ-China model fusion	Mikko Dufva	ASA	Emergence of shared perceptions of futures in a foresight system
15:50 - 16:15	Etienne Fluet-Chouinard	WAT	Global conservation prioritization of wetland ecosystems: proof of concept of hydrogeomorphic classification	Niharika Tripathi	POP	Preferred life expectancy and its correlates among elderly women in rural Uttar Pradesh, India
	16:15 – 16:30 B R E A K					

Monday, 25 August 2014						
	WODAK Room			GVISHIANI Room		
Day 1 - Session 5				<i>POVERTY & EQUITY</i> Exports: People and Products Chair: Samir KC		
16:30 - 16:55				Thanicha Ruangmas	MAG	Decomposition of consumption-based emissions of SO ₂ and NO _x in the EU: Is emission decline due to leakage or technology adoption?
16:55 - 17:20				Adriana Reyes	POP	Could fertility patterns act as a driver of global migration?

Tuesday, 26 August 2014						
9:00 – 9:10	Welcome and Introduction by YSSP Scientific Coordinator Brian Fath (Wodak room)					
	WODAK Room			GVISHIANI Room		
Day 2 - Session 1	ADVANCED SYSTEMS ANALYSIS Dynamic Diffusion and Diversification Chair: Rupert Mazzucco			FOOD & WATER Ecosystem Services Chair: Sylvain Leduc		
09:10 - 09:35	Jesper Sörensson	EEP	Signatures of speciation: From theoretical mechanisms to observable patterns	Volodymyr Blyshchuk	ESM	Modelling of live biomass and net primary productivity of Northern Eurasian forests
09:35 - 10:00	Hana Nielsen	TNT	The Czechoslovak steel industry in a comparative perspective: From scale to efficiency	Daniel Suarez	RPV	The institutionalization of ecosystem services in transnational policy networks
10:00 - 10:25	Thi Luu	ASA	Dynamics of bank-firm interrelations	Floor Soudijn	EEP	Ecosystem-based fisheries management of cod and sprat in the Baltic Sea
	10:25 – 10:45 B R E A K					
Day 2 - Session 2	ADVANCED SYSTEMS ANALYSIS Socio-Ecological Networks Chair: Matthias Jonas			FOOD & WATER Agricultural Monitoring Chair: Stefan Hochrainer		
10:45 - 11:10	Danielle Haak	ASA	Coupling ecological and social network models to assess 'transmission' and 'contagion' of an aquatic invasive species	Minella Martins	RPV	Vulnerability risk index of agricultural production in the Brazilian Semi-Arid
11:10 - 11:35	Jessica Gephart	EEP	Impact of shocks on the global seafood trade network	Shengfa Li	WAT	An Estimation of the Extent of Cropland Abandonment in Mountainous Regions of China
11:35 - 12:00	Hongmei Zheng	ASA	An urban metabolism and carbon footprint analysis of the Jing-Jin-Ji regional agglomeration	Jon Nordling	ESM	Global agricultural monitoring and mobile data collection
	12:00 – 13:30 B R E A K					

Tuesday, 26 August 2014						
	WODAK Room			GVISHIANI Room		
Day 2 - Session 3	ADVANCED SYSTEMS ANALYSIS Optimal Forest Management Chair: Elena Rovenskaya			FOOD & WATER Water Resilience Chair: Adriana Keating		
13:30 - 13:55	Askhad Panesh	ASA	A model of size-structured population with asymmetric competition for resource: A case study of forests	Amandine Pastor	ESM	How can irrigated land be expanded while sustaining freshwater resources?
13:55 - 14:20	Moonil Kim	ESM	Optimal forest management model for climate change	Jie Zhang	ESM	Assess the capabilities of remotely sensed indicators for agricultural drought monitoring
14:20 - 14:45	Olga Turkovska	ESM	Forest management in recursive dynamic global partial equilibrium model	Apolonia Diana Sherly da Costa	RPV	Community Resilience for the 2011 Flood Disaster in Remote Area of Eastern Indonesia
	14:45 – 15:00 B R E A K					
Day 2 - Session 4	DRIVERS OF GLOBAL TRANSFORMATIONS Urban Impacts Chair: Wilfried Winiwarter			FOOD & WATER Hydrological Variability Chair: David Wiberg		
15:00 - 15:25	Miho Kamei	ENE	Urban energy systems and their increasing importance in global long-term energy strategies	Irene Nilsen	WAT	Assessing spatial and temporal patterns in energy fluxes during wet and dry extreme months using the NOAH land surface modelling scheme
15:25 - 15:50	Nur Aulia Bt Rosni	ESM	Determining urban sprawl geospatial indices using remote sensing and GIS	Margaret Garcia	RPV	Development of a Socio-hydrological Model of Las Vegas Water Management
15:50 - 16:15	Jun Liu	MAG	How to improve air quality in China: A policy scenario study	Edoardo Borgomeo	RPV	Don't leave me dry: Modelling vulnerability to drought in water supply systems
	E N D O F W O R K S H O P R E C E P T I O N I N C O N F E R E N C E A R E A					

Energy & Climate Change

Biomass deployment strategies for the transition to a bio-based economy

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Introduction. The knowledge driven functionalization of biomass can help to diversify our product portfolios for alimentation, material and energy application. Thus it holds the potential to enhance robustness of the systems where applied. In order to outline strategies for the integration and extension of an industry based on renewable resources it is helpful to draw possible relevant developments and to discuss these scenarios with regard to the boundaries of the affected systems.

Methodology. For this work we focus on the substitution of existing fossil based product flows for material applications. This follows the concept of the diversification of the fossil fuel product portfolio with energy deployment from renewables. Substitution pairs for the introduction of biomaterials are determined and investigated with regard to current capacities for their traditional counterparts. These pairs are further disaggregated considering historic trends and future developments described in literature. Consistent storylines are discussed and used to produce scenarios for the EU28 on a member state level for the time frame 2000-2050. In overall the format of the results are chosen to simplify further discussions through enabling the direct integration into the GLOBIOM-model.

Results. Several substitution pairs were identified. Pairs for which information on the historical trend and/or future pathways could be found have been selected for the scenario development. The 2013 reference scenario of the PRIMES-model (Capros et al., 2013) and statistical data from OECD iLibrary (IEA and OECD, 2014) was used to project the fossil based counterpart. Three storylines for the biobased part were discussed finding in one hand the highest theoretical potentials in the substitution of vinyl polymers, polyamides, synthetic rubbers and asphalt and on the other hand the most likely relevance in the substitution of polyester, lubricants and surfactants. Furthermore conversion factors for the production based on eleven feedstocks which can be modeled in the GLOBIOM framework are acquired. Through the application of these factors the major role of wood can be identified. Furthermore palm oil and starch from potatoes can become an important resource for the production of biomaterials as well if production capacities for biomaterials increase.

Conclusions. The used approach and derived scenarios are capable of addressing the main structure, its potential and boundaries of a possible upcoming market, in this case for the diffusion of selected biomaterials. The scenarios can and should be extended with additional existing and/or future biomass applications as well as feedstocks allowing for example also cascaded use to be represented. However since the material application of biomass can be based on the same objectives as bioenergy deployment an integrated knowledge driven discussion for these sectors is recommended not only assisting but also incorporating food and feed deployment. It is to be noted that structural changes in overall demand patterns could not be addressed within this work although they could have similar impacts on the affected systems than the substitution of demanded products.

References

Capros, P., De Vita, A., Tasios, N., Papadopoulos, D., Siskos, P., Apostolaki, E., Zampara, M., Paroussos, L., Fragiadakis, K., Kouvaritakis, N., others, 2013. EU Energy, Transport and GHG Emissions: Trends to 2050, Reference Scenario 2013.

IEA, OECD, 2014. World Energy Statistics and Balances. OECD- iLibrary. URL http://www.oecd-ilibrary.org/energy/data/iea-world-energy-statistics-and-balances_enestats-data-en (accessed 8.18.14).