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Bundesministerium für Wissenschaft und Forschung

 International Institute for
Applied Systems Analysis
IIASA

2nd Viennese Talks on Resilience Research & Networks

New Perspectives on Growth, Development, Science and Innovation

Location:

House of Industry
Schwarzenbergplatz 4,
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KEYNOTE LECTURE

Seeking Sustainability with Both Eyes Open

Robert Ulanowicz (USA) – Prof. em. of Theoretical Ecology, University of Maryland, Chesapeake Biological Laboratory

RESILIENCE & NETWORKS IN NATURE



Harald Katzmair (Chair)



Brian Fath



Felix Müller



Jan Sendzimir

RESILIENCE & NETWORKS IN ECONOMY, INNOVATION & SOCIETY



Roland Sommer (Chair)



Balázs Vedres



John Casti



Sergio Ulgiati

RESILIENCE & NETWORKS IN POLICY MAKING, GOVERNANCE & SOCIAL CHANGE



W. Neurath (Chair)



Joanne Bayer



Th. Fundneider



Lance Gunderson



H. Katzmair

2nd Viennese Talks on Resilience Research & Networks

New Perspectives on Growth, Development, Science and Innovation

Resilience is about the capacity to deal with change and continue to develop. To facilitate the emergence of resilient systems and actors will become a main challenge for politics, economy, and society in our increasingly instable world.

Resilience research is an ascendant paradigm aiming to explore the structural features of adaptive and robust ecosystems, societies, enterprises, and economies. Network theory provides a robust language to better describe and understand those features. The workshop will bring together the fields of resilience research & network theory and will demonstrate their value for adaptive management and strategy development in politics, economy, environment, and society.

The talks of the speakers are focused around three guiding questions:

- What is the evidence of resilience within a specific system?
- What are the threats for resiliency in a specific system?
- What role do networks play in the design of decision making structures?

ORGANIZERS AND FUNDERS (in alphabetical order)

- Federation of Austrian Industries (IV)
- FAS.research
- IIASA - International Institute for Applied Systems Analysis
- Ministry for Science and Research (BmWF)

KEYNOTE: Seeking Sustainability with Both Eyes Open

Robert Ulanowicz, Prof. em. of Theoretical Ecology, University of Maryland, Chesapeake Biological Laboratory

PANELISTS (in alphabetical order):

Joanne Bayer - IIASA (AUT)

Global Networks for Insuring Catastrophic Risks

John Casti - IIASA (AUT)

Resilience, Complexity and Extreme Events

Brian Fath - Biology Department, Towson University (USA)

Ecosystem Resilience and the Adaptive Cycle

Thomas Fundneider - TheLivingCore (AUT)

Paradigm of Enabling and Enabling Spaces

Lance Gunderson - Emory University (USA)

Adaptive Governance Networks and Ecological Resilience

Harald Katzmair - FAS.research (AUT)

Managing Resilience: Principles & Strategies for Building Cross-Scale Networks

Felix Müller - University of Kiel (GER)

Resilience as an Emergent Ecosystem Property

Jan Sendzimir - IIASA (AUT)

Stalled regime transition in the upper Tisza River Basin: the dynamics of linked action situations

Sergio Ulgiati - Parthenope University of Naples (IT)

Resource basis and resilience of urban systems along the transition to high-information and low-resource intensity future

Balázs Vedres - Center for Network Science at Central European University (HUN)

Structural Folds: Generative Disruption in Overlapping Groups

09:15 WELCOME NOTES

- **Barbara Weitgruber** – Ministry of Science and Research (AUT)
- **Harald Katzmaier** – FAS.research (AUT)

09:25 KEYNOTE LECTURE - Seeking Sustainability with Both Eyes Open

- **Robert Ulanowicz** – Prof. em. of Theoretical Ecology, University of Maryland, Chesapeake Biological Laboratory (USA)

10:00 Coffee Break

10:15 RESILIENCE & NETWORKS IN NATURE

Chair: Harald Katzmaier – FAS.research (AUT)

- **Brian Fath** - Towson University (USA)
Ecosystem Resilience and the Adaptive Cycle
- **Felix Müller** - University of Kiel (GER)
Resilience as an Emergent Ecosystem Property
- **Jan Sendzimir** - IIASA (AUT)
Stalled regime transition in the upper Tisza River Basin: the dynamics of linked action situations

30 min for general discussions

12:00 Lunch Break (Buffet)

13:00 RESILIENCE & NETWORKS IN ECONOMY, INNOVATION & SOCIETY

Chair: Roland Sommer – Federation of Austrian Industries (AUT)

- **Balázs Vedres** - Central European University (HUN)
Structural Folds: Generative Disruption in Overlapping Groups
- **John Casti** - IIASA (AUT)
Resilience, Complexity and Extreme Events
- **Sergio Ulgiati** - Parthenope University of Naples (ITA)
Resource basis and resilience of urban systems along the transition to high-information and low-resource intensity future

30 min for general discussions

14:45 Coffee Break

15:15 RESILIENCE & NETWORKS IN POLICY MAKING, GOVERNANCE & SOCIAL CHANGE

Chair: Wolfgang Neurath – Ministry of Science and Research (AUT)

- **Joanne Bayer** - IIASA (AUT)
Global Networks for Insuring Catastrophic Risks
- **Thomas Fundneider** - TheLivingCore (AUT)
Paradigm of Enabling and Enabling Spaces
- **Lance Gunderson** - Emory University (USA)
Adaptive Governance Networks and Ecological Resilience
- **Harald Katzmaier** - FAS.research (AUT) (20 min +1 question)
Managing Resilience: Principles & Strategies for Building Cross-Scale Networks

30 min for general discussions

17:15 LESSONS LEARNED

Chair: Brian Fath / Harald Katzmaier

30 min for general discussions: key concepts, outcomes, and next steps

17:45 CLOSING REMARKS

- **Roland Sommer** - Federation of Austrian Industries (AUT) (5 min)

17:50 Get-together (Buffet)

Robert E. Ulanowicz (USA), Prof. em. of Theoretical Ecology,
University of Maryland, Chesapeake Biological Laboratory and Arthur
R. Marshall Laboratory, University of Florida.

Robert E. Ulanowicz is Professor Emeritus of Theoretical Ecology with the University of Maryland's Chesapeake Biological Laboratory. He is a 1961 graduate of the Baltimore Polytechnic Institute and received a B.E.S. and Ph.D. in Chemical Engineering from the Johns Hopkins University in 1964 and 1968, respectively.

He served as Assistant Professor of Chemical Engineering at the Catholic University of America before joining the Chesapeake Biological Laboratory in 1970. His primary research focus has been upon the application of information theory to networks of ecosystem trophic flows.

Ulanowicz is the author of three monographs, *Growth and Development; Ecology, the Ascendent Perspective* and *A Third Window: Natural Life beyond Newton and Darwin*. He and his wife, Marie, now reside in Gainesville, Florida, where he is Courtesy Professor with the Arthur R. Marshall Laboratory of the Department of Biology, University of Florida.

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KEYNOTE LECTURE

Seeking Sustainability with Both Eyes Open

The positivist focus of science portrays networks as representations of the constraints on connections in systems. But networks also exhibit considerable indeterminacy regarding where influence can flow. Fortunately, the relative degrees of constraint and indeterminacy inherent in any network can both be quantified using information theory, and sustainable

ecosystems appear to cluster tightly around a particular balance between the two properties. Knowing where the balance lies allows a manager to identify and prioritize those elements of the network that must be changed to bring his/her system closer to a sustainable configuration.

Joanne Bayer (AUT), IIASA - International Institute for Applied Systems Analysis, Laxenburg, Austria

Joanne Linnerooth-Bayer leads IIASA's Program on Risk, Policy and Vulnerability. Her current research focuses on financial solutions for low-income households and businesses to help them cope with their catastrophe risk exposures, a topic she pursues with many collaborators, including insurers, NGOs and partners in the developing world. The design of social insurance systems combines Dr. Linnerooth-Bayer's interests in fairness with respect to sharing social burdens with her commitment to finding democratic "clumsy" solutions that take account of the usually diverse and conflicting stakeholder views.

Most recently, and as part of the EU integrated project, ADAM, Dr. Linnerooth-Bayer is endeavoring to put insurance and other risk-transfer mechanisms on the climate-adaptation agenda.

Dr. Linnerooth-Bayer received her M.S. and Ph.D. in economics from Carnegie-Mellon University and the University of Maryland, respectively. She has over 100 publications in the area of risk participation, communication and management, and she is on the editorial board of three international journals.

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Global Networks for Insuring Catastrophic Risks

Providing safety nets against economic shocks from natural hazards in developing countries may be one of the most pressing and challenging issues facing governments, development organizations, international financial institutions, NGOs and insurers in the coming 20 years. The stakes are high. In the past quarter century over 95% of deaths from natural disasters occurred in developing countries, and direct economic losses (averaging US\$54 billion per annum) as a share of national income were more than double in low-income versus high-income countries. The inability of highly exposed and low-income households, farms and governments to recover from these shocks perpetuates poverty traps and retards development. Due to high uninsured risk exposure, the poor adopt low-risk, low-return strategies reducing the likelihood that they can accumulate the assets needed to escape poverty. Global networks to provide needed safety nets can increase the resiliency of highly exposed households, farms and governments in the developing world.

This presentation will discuss challenges and opportunities for building global networks

involving governments, development organizations, international financial institutions, NGOs and insurers for the purpose of providing protection against natural disasters in developing countries and thus increasing their resilience. This is a topic of interest not only to development organizations but also to the climate change community. The Bali Action Plan calls for "consideration of risk sharing and transfer mechanisms, such as insurance" to address loss and damage in developing countries particularly vulnerable to climate change. If insurance instruments are to be included in the post-Kyoto adaptation regime, the potential role of risk-pooling and risk-transfer systems must be firmly established. This presentation will focus on the IIASA proposal as part of the Munich Climate Insurance Initiative to include insurance in a climate adaptation regime.

Building on this topic, the presentation will briefly present the conceptual underpinnings, based on cultural theory, of designing robust and resilient policy proposals, such as the MCII proposed global insurance facility.

John Casti (AUT), IIASA - International Institute for Applied Systems Analysis in Laxenburg

Received his Ph.D. in mathematics at the University of Southern California in 1970. He worked at the RAND Corporation in Santa Monica, CA, and served on the faculties of the University of Arizona, NYU and Princeton before becoming one of the first members of the research staff at the International Institute for Applied Systems Analysis (IIASA) in Vienna, Austria in 1973. In 1986 he took up a position as a Professor of Operations Research and System Theory at the Technical University of Vienna. He also served as a member of the External Faculty of the Santa Fe Institute in Santa Fe, New Mexico, USA, where he worked extensively on the application of biological metaphors to the mathematical modeling of problems in economics, finance and road-traffic networks, as well as on large-scale computer simulations for the study of such networks.

Dr. Casti has published eight technical monographs in the area of system theory and mathematical modeling, as well as eleven volumes of popular science, including the books *Paradigms Lost*, *Complexification*, *Would-Be Worlds*, and *The Cambridge Quintet*. His most recent book is *Mood Matters*. He is currently leader of the initiative on Extreme Events in Human Society at IIASA.

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Resilience, Complexity and Extreme Events

This presentation will argue that the concept of resilience, the ability of a system to absorb unexpected shocks and continue to function, and even to possibly benefit from the shock, is intimately intertwined with the related system-theoretic notion of complexity. In particular, we argue that the possibility of a

system displaying a systemic “extreme event” is dramatically heightened when the gap between the complexity of the system and the complexity of its regulator becomes too large. We explain this “complexity balance” principle with an example from finance using Ashby’s Law of Requisite Variety.

Brian D. Fath (USA), Department of Biological Sciences, Towson University, Towson, Maryland, USA and Advanced Systems Analysis Program, IIASA International Institute for Applied Systems Analysis, Laxenburg, Austria

Brian D. Fath is an Associate Professor in the Department of Biological Sciences at Towson University (Maryland, USA). He teaches courses in ecosystem ecology, environmental biology, networks, and human ecology and sustainability. Dr. Fath has also taught courses on ecological networks and modeling in Portugal, France, Croatia, Denmark, China, and Germany. Dr. Fath is also a research scholar at the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. Dr. Fath graduated in 1990 from Miami University, Ohio, USA, with degrees in Physics and Aeronautics. He completed an MS degree in Environmental Science at Ohio State University (1993) and earned a PhD in Ecology from the University of Georgia in 1998. He was a Post-Doctoral Fellow at the University of Georgia (1998-2000) with Dr. Bruce Beck and the U.S. Environmental Protection Agency in Cincinnati (2000-2001).

He has published over 60 research papers and book chapters in journal such as the Journal of Theoretical Biology, Ecological Modelling, BioSystems, Ecological Complexity, Total Science of the Environment, Environmental Modelling and Software, and Ecosystems. He co-authored the book *A New Ecology: Systems Perspective* and is Associate Editor-in-Chief for *Encyclopedia of Ecology*. He is

currently Editor-in-Chief for the journal *Ecological Modelling*; President of the North American Chapter of International Society for Ecological Modelling; and chair of the Baltimore County Commission on Environmental Quality.

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Ecosystem Resilience and the Adaptive Cycle

Holling's four-stage adaptive cycle of Growth-Equilibrium-Collapse-Reorganization reintroduced a cyclic perspective into ecological system dynamics – one that had been crowded out by linear ideas of upward progress and providential end points. The ecological narrative has application in many realms of science and society, but in ways that we still grapple to understand its implications. In this presentation, I report on work with colleagues (Benjamin Burkhard and Felix Müller) to investigate the behavior of the adaptive cycle to various ecosystem attributes such as organizational, informational, eco-physiological, and network properties.

We hypothesize that, unlike most ecological properties, resilience follows a counter trend during the adaptive cycle stages. In other words, system resilience decreases with growth and development, which may contribute to the onset of the collapse stage. While the collapse is often triggered by external events, it is the internal organization (i.e., network) of the system which conditions the overall system-dynamic interactions. The adaptive cycle offers an important perspective on how to deal with dynamic systems, and our understanding of it in terms of ecological systems and services can help design sustainable socio-ecological systems.

Thomas Fundneider (AUT), TheLivingCore

Thomas Fundneider is founder of the innovation agencies *tf consulting* (www.tfc.at) and *theLivingCore* specializing in the areas of innovation and work environments.

Having his background in landscape planning, his focus since many years is on game-changing innovations, enabling spaces, entrepreneurship and design (thinking). He teaches at several universities (Johannes Kepler University in Linz, University of the Arts in Berlin, and at FH Hagenberg).

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Paradigm of Enabling and Enabling Spaces

In a world of increasing complexity, methods and tools of "managing" or "controlling" are obsolete. Instead, the alternative framework of "Enabling Spaces" will be introduced: what does "enabling" mean in the context of generating new knowledge and innovation? The answer covers two aspects which are crucial: on the one hand we have to give up on the regime of control, determinism, and

making. On the other hand, enabling implies to provide a set of constraints or a facilitating framework supporting the processes of bringing forth new knowledge. Further, the talk covers an overview of the concept of Enabling Spaces and of the design process leading to such spaces. Finally the concrete case of a knowledge creating university will be discussed.

Lance Gunderson (USA), Department of Environmental Studies, Emory University

Lance Gunderson is a systems ecologist who is interested in how people understand, assess, and manage large ecosystems. He has worked as a research botanist for the US National Park Service (1979-89), and as a research scientist at the University of Florida (1992-98). He is a Professor and the founding chairman of the Department of Environmental Studies at Emory University. He is Co-Editor in Chief of *Ecology and Society*, a journal on resilience in socio-ecological systems.

He has been involved in the environmental assessment and management of large-scale ecosystems, including the Everglades, Florida Bay, Upper Mississippi River Basin, and the Grand Canyon. He has written and co-edited books including; "*Barriers and Bridges to the Renewal of Ecosystems and Institutions*", "*Panarchy: Understanding Transformations in Systems of Humans and Nature*", "*Resilience and the Behavior of Large Scale Ecosystems*", and "*Foundations of Ecological Resilience*".

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Adaptive Governance Networks and Ecological Resilience

Ecosystem management in the United States over the past two decades has been characterized by the emergence of governance networks. These networks have been described as forms of adaptive governance and are comprised of formal government authorities and informal interest groups, including epistemic communities. Two different problems faced by ecosystem managers relate to ecological resilience; one focuses on maintaining a desired ecosystem state, the other problem (called ecosystem restoration) occurs when plans and actions

attempt to move out of an alternative state into a more desired configuration. Governance networks, such as the Glen Canyon Adaptive Management Program of the Colorado River has conducted adaptive management experiments to facilitate ecosystem restoration. In contrast, in the Everglades, such networks have been unable facilitate ecosystem experimentation necessary to understand transitions among ecological states. Comparing these networks can provide some insight difficulties of managing for ecological resilience.

Harald Katzmaier (AUT), FAS.research – Understanding Networks

Harald Katzmaier is the founder and director at FAS.research, a Social Network Analytics & Strategies firm located in Vienna and New York. Harald holds a degree in Social Science and Philosophy (University of Vienna), he is lecturer, visiting scholar, and invited guest speaker at various universities (Stanford University, Carnegie Mellon University, Vienna University of Economics and Business Administration etc.).

His main focus is in the areas of networks and resilience. Because of the increasing unpredictability of our economic future, Harald's mission is to provide new means to empower executives, change makers, and their organizations to make robust decisions and to enhance their leadership capabilities for resilient and effective action.

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Managing Resilience: Principles & Strategies for Building Cross-Scale Networks

Harald Katzmair and Christian Gulas

Resilience thinking is offering a promising framework for new strategies and tactics in management and governance. Network theory is offering a strict language to describe principles that lead to resilient social systems (cross-scale fold networks). Given the fact that scholars in the field of Complexity Theory, Systems Ecology and Network Theory gained enough insights over the last centuries how resilient systems are designed we have to ask how to get there and why we haven't already gotten there.

It is suggested to work on a better understanding of opportunities and limits for establishing incentives and social frames to link different agents at different scales and different stages within the adaptive cycle. It seems that the periphery of networks is

frequently trapped in short cycles, prohibiting access to scales above. However, the study of elite networks reveals their ability to execute principles of adaptive cross-scale management as part of their elite culture (cross scale orientation, structural fold structures, functional diversity, and eccentric network designs). Power and its institutionalization seem to be strongly linked with a capacity for resilient action.

To foster the resiliency of the periphery and to manage the overall resilience of organizations and social systems new management tools are required. Some ideas for new strategy tools like the introduction of a mandatory "resilience mainstreaming" in public institutions or the concept of a new "balanced scorecard for turbulent times" are presented.

Felix Müller (GER), Institute for the Conservation of Natural Resources, University of Kiel

Felix Müller has studied Biology and Geography at the Universities of Kiel and Regensburg. His PhD thesis about soil-geographical investigations on the fate of pesticides and nutrients in ecosystems was published in 1987. Since that time he has been working at the Ecology Centre of the University of Kiel. FM was the scientific coordinator of the long-term R&D project "Ecosystem Research in the Bornhöved Lakes District" and has since that time participated in 15 national and international research projects. Since 2010 FM is affiliated as leader of the Department Ecosystem Management at the Institute of Resource and Nature Conservation of Kiel University.

The main recent research interests are ecosystem analysis, ecosystem modeling, ecosystem services and ecosystem theories, applications of ecosystem approaches at the landscape scale and the derivation of holistic indicator sets for the management of human-environmental systems. Felix Müller has been editor or co-editor of 21 books and special issues and has published more than 130 scientific papers. He is editor-in chief of the journal "Ecological Indicators" and board member of 5 journals, e.g. "Ecological Complexity" and "Ecological Modelling". In 2010 FM received the Prigogine Medal of the Wessex Institute of Technology and the University of Siena. He is the president of the German chapter of the International Association of Landscape Ecology and Secretary of the German Chapter of the International Long-Term-Ecological Research Program.

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Resilience as an Emergent Ecosystem Property

The objectives of the presentation are (1) to propose an ecosystem based definition of resilience and adaptability, (2) to show two ecosystem data sets on resilient and non-resilient behavior and (3) to derive some theoretical hypotheses. From the ecosystem viewpoint, resilience refers to the ability of a system to reorganize after a disturbance and remain in the previous basin of attraction, while adaptability describes the ability to continue self-organized dynamics and

therefore develop in a complexifying direction after disturbances. Both concepts will be demonstrated basing on analyses of wetland retrogressions and restorations and from forest monitoring activities in Northern Germany. The subsequent hypotheses will be directed towards the dynamics of resilience as an emergent ecosystem property and to the depiction of resilience e.g. in stability landscapes.

Wolfgang Neurath (AUT), Ministry for Science & Research

holds a degree in History and Philosophy from the University of Vienna.

He works in the Austrian Federal Ministry of Science and Research as Head of the Department for Promotion of Research. He published work in the fields of network analysis as well as history.

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Jan Sendzimir (AUT), IIASA International Institute for Applied Systems Analysis in Laxenburg

Jan Sendzimir (presenter) is a systems ecologist working as a Research Scholar to lead the Resilience and Water Group in the Risk and Vulnerability Program at the. He uses participatory science processes such as group model building and social simulation exercises to examine the vulnerability and resilience of social-ecological systems to uncertainty from global change in river basins in temperate, tropical and semi-arid climates.

The paper was written together with **Zsuzsanna Flachner** (deceased), a research scientist at the Research Institute for Soil Science and Agrochemistry, Hungarian Academy of Sciences, **Claudia Pahl-Wostl**, professor for resource management at the Institute of Environmental Systems Research at University of Osnabrück, Germany, and **Christian Knieper**, a geographer who works at the Institute of Environmental Systems Research at the University of Osnabrück.

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Stalled regime transition in the upper Tisza River Basin: the dynamics of linked action situations

In river basins transformation from traditions of reactive flood defense to more adaptive management regimes is difficult. Management

regimes are far more than the people involved. Current conventional river management regimes in Central Europe have sustained their identity

for centuries through different political contexts (monarchy, democracy, communism) and crises (world wars, economic depression, floods). The resilience of the current regime to such diverse sources of change emerges from the variety of feedbacks that reinforce its functional components to set its development path, in many cases inducing inertia and path dependency. Transformation may require profound shifts in the institutions, technologies, and personnel as well as the ecological, economic and social processes they influence in setting the basin's trajectory. Since the current regime's resilience appears to prevent it from experimenting and adapting, then navigating the transition may involve *managing* resilience, i.e. first lowering it in moderately risky experiments to allow reconfiguration and then strengthening a more adaptive configuration of regime components. Regime change has become an issue in Hungary following repeated failures of conventional management policies to handle a series of floods on the Tisza river starting in 1997. Increasing public participation pushed

water policy debate toward more experimentation with alternatives, but implementation appears stalled. In this paper we review hypotheses about what factors are bridges or barriers to transformation and then use the Management Transition Framework to examine how the interactions linking action situations, operational outcomes, knowledge and institutions influenced the river management policy debate in Hungary from 1997 to 2009. Specifically we examined which factors characteristic of conventional Control vs. progressive Adaptive management regimes influenced these interactions in ways that contributed to or hindered transformation. We found that governance and social learning issues predominated, especially in the contention between different networks, both epistemic and main stream, to define the defining paradigm for management policy. Lesser roles were played by factors related to integration of sectors and different levels in the science and policy of river management.

Roland Sommer (AUT), Federation of Austrian Industries

studied landscape architecture in Vienna, Austria and Wageningen, the Netherlands.

He started his career in the management of a research funding programme on sustainability in 2000 and changed after one year to a research funding programme that fosters the research cooperation between business and academia.

In 2004 he followed the Federation of Austrian Industry where he is responsible for research and innovation policy. His main fields of activity are the internationalisation of R&D, the EU framework Programmes, research financing, the cooperation between academia and business and research at universities and non-university research organisations. Sommer is in several national selection committees. Since January 2010 he serves as Vice-Chair of the Technology Group of the Business and Industry Advisory Committee (BIAC) to the OECD.

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Sergio Ulgiati (ITA), Department of Sciences for the Environment, Parthenope University of Naples.

Education in Physics and Environmental Chemistry. Professor of Life Cycle Assessment and Environmental Certification. Expertise and research interests in Energy Analysis, LCA, Environmental Accounting and Energy Synthesis, zero emission technologies and strategies (ZETS). Member of the Editorial Board of Energy, Ecological Modelling, and Environment, Development and Sustainability. Organizer and Chair of the Biennial International Workshop "Advances in Energy Studies" (6 editions already held since 1998). President 2010-2011 of ISAER - The International Society for the Advancement of Energy Research.

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Resource basis and resilience of urban systems along the transition to high-information and low-resource intensity future

Concepts of ecological resilience (ability to face and deal with perturbations in the surrounding environment, in order to decrease vulnerability) are crucial in urban systems. Modern cities are experiencing shortages of energy, water, clear air, among other resources, and must face the challenge of reorganizing their structures (buildings, green areas, hospitals), infrastructures (energy and water services, transportation, sewage systems) and lifestyles in order to cope with the decreasing availability of resources.

Oscillating patterns of a city's assets and lifestyles according to resource availability is the most likely trend. Focus is not, however, on a gloomy picture of a city's death, but instead on efforts to identify suitable policies to reorganize the urban life in the presence of unavoidable resource perturbations... Since resources such as minerals, water, energy and air quality are highly dependent on markets and environmental conditions, a city's administration should be deeply concerned on the potential fluctuations of the availability of these resources and the ability of the system to cope with such perturbations (technical and environmental resilience).

Reorganizing city's structures, infrastructures, services and lifestyles in order to face these challenges is a priority in policy making. All sectors of a city's life will have to be redesigned in a way that they are less energy and material demanding, although still

providing high quality standards of life. Of course, this cannot occur without investments and, more than that, cannot occur without important and shared choices about lifestyles (community services instead of individual solutions, mass transportation patterns instead of car transport, preference to slow-speed instead of high-speed transportation devices, reorganization of life styles in order to reduce commuting from residential areas to working and leisure sites, energy conservation measures, prevention of waste, reuse and recycle of potentially useful materials, district heating instead of low efficiency individual boilers, renewable energies instead of fossil based electricity and heat, among other strategies to be identified).

In times of shrinking resource basis (including the environment as a sink), more redundant and flexible resource supply patterns (e.g. more diverse energy conversion devices, such as thermal and photovoltaic solar modules, fuel cells, decentralized and cogenerative electricity generation) coupled to life style changes might be the basis for less resource intensive urban life. New holistic assessment tools are also explored in order to integrate and enhance the existing statistical, demographic and energy analysis tools for deeper understanding of the role and perspectives of urban systems in their progress towards a high-information & low-resource future.

Balázs Vedres (HUN) - Center for Network Science, Central European University

Balázs Vedres is the director of the new Center for Network Science at the Central European University. Vedres' research furthers the agenda of understanding historical dynamics in network systems, combining insights from historical sociology, social network analysis, and studies of complex systems in physics and biology.

His contribution is to combine historical sensitivities to patterns of processes in time with a network analytic sensitivity to patterns of connectedness cross-sectionally. Over the last decade Balázs Vedres developed data collection, data cleaning, and analysis techniques to handle datasets with hundreds of thousands of entries, coding my own algorithms to realize methodological innovations.

He was engaged in qualitative case study work – over the last fifteen years he conducted hundreds of interviews with businessmen, politicians, civic activists. Balazs Vedres demonstrated in his dissertation and subsequent research that a historical network approach can tackle substantive research questions about processes of transnational and domestic networks coming into contact.

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Structural Folds: Generative Disruption in Overlapping Groups

Balazs Vedres and David Stark

Entrepreneurial groups face a twinned challenge: recognizing and implementing new ideas. We argue that entrepreneurship is less about importing ideas than about generating new knowledge by recombining resources. In contrast to the brokerage-plus-closure perspective, we identify a distinctive network topology, structural fold: the overlapping of cohesive group structures. Actors at the structural fold are multiple insiders, facilitating familiar access to diverse resources. Our dataset records personnel ties among the largest 1,696

Hungarian enterprises from 1987-2001. First, we test whether structural folding contributes to group performance. Second, because entrepreneurship is a process of generative disruption, we test the contribution of structural folds to group instability. Third, we move from dynamic methods to historical network analysis and demonstrate that coherence is a property of interwoven lineages of cohesion, built up through repeated separation and reunification.

NOTES: