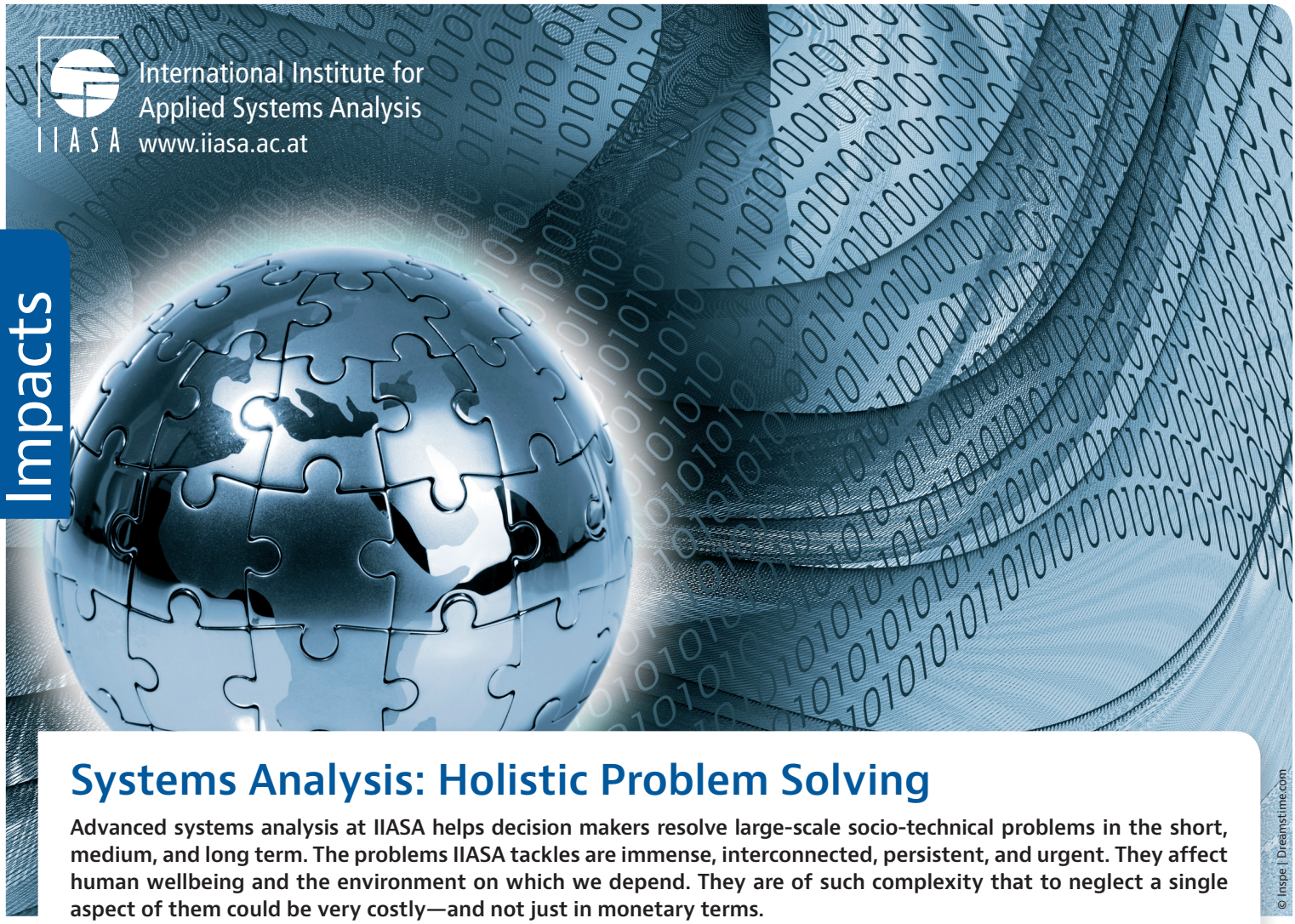
International Institute for
Applied Systems Analysis
IIASA www.iiasa.ac.at

Impacts



Systems Analysis: Holistic Problem Solving

Advanced systems analysis at IIASA helps decision makers resolve large-scale socio-technical problems in the short, medium, and long term. The problems IIASA tackles are immense, interconnected, persistent, and urgent. They affect human wellbeing and the environment on which we depend. They are of such complexity that to neglect a single aspect of them could be very costly—and not just in monetary terms.

Systems analysis used to be the preserve of government and the military. It has since spread to many sectors, but it was IIASA and its partners in the early 1970s that steered it into the domain of human-environment interactions, incubated the research community, built a body of scientific literature, and developed the science. The IIASA Advanced Systems Analysis Program, which uses exploratory applied mathematics to develop new computer models, has enabled it to stay at the leading edge of systems thinking.

Systems analysis at IIASA

IIASA is structured to reflect the multidisciplinary and interdisciplinary way of thinking and researching. Advanced systems analysis is a problem-solving process in which many people participate: scientists, stakeholders, and decision makers. These are not just problems per se, but problems with all their attendant concepts and factors. Stakeholder input is key to successful advanced systems analysis, as are the practicability of solutions and evaluations of possible impacts. It can achieve the often delicate balance that satisfies multiple stakeholders.

Systems analysis and sustainability

Over the coming decades, urbanization, global infrastructure expansion, and increases in consumption will require vast capital investments, locking in patterns of demand and supply for decades to come, with profound implications for climate change and the environment. It is increasingly recognized that decisions at the smallest spatial and time scales aggregate to shape global, long-term trajectories. Yet sustainability challenges are often focused on improving "fast" variables, such as crop yield and water quality, without recognition of slower, underlying dynamics, such as the supporting ecosystem services.

IIASA is currently working with the Santa Fe Institute in the USA to develop a mature, predictive science of sustainability, robustly grounded in complex systems theory, to guide the exploitation of earth's resources toward a more sustainable operating space for people and the planet.

Impacts

- Many IIASA alumni attribute the scientific pathways they have pursued in life to the pervasive cross-fertilization between systems analysis and their own disciplines. For example, the renowned scientist, Brian Arthur credits IIASA with providing the fertile interdisciplinary environment that inspired and encouraged him as he developed his theory of increasing returns.
- Advances in systems analysis at IIASA are enabling scientists to look not only at systems but at interactions between social-ecological systems, for example, the land/water/energy nexus areas. Nexus areas are the "shadowy" areas between disciplines that are most effectively studied using systems analysis. Nexus analysis offers interdisciplinary researchers a fertile ground for fresh insights and innovative ways forward.
- The integrative approach at IIASA has led to the creation of large-scale integrated models and analytical tools capable of looking at the synergies and trade-offs available when multiple sectoral problems are tackled simultaneously. A major application of this approach is the IIASA Global Energy Assessment which reveals the co-benefits of simultaneously addressing energy, mitigation of greenhouse gas emissions, and air pollution control.
- IIASA systems analysts are able to "bolt together" models that can analyze multi-sectoral effects and changes: for instance, for the EU Energeo project, they integrated IIASA-based models like MESSAGE and RAINS/GAINS with the high-resolution models of project partners.

Further information:
www.iiasa.ac.at/impacts/systemsanalysis

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