

Economic impact assessment of Critical Infrastructure failure in the EU: A combined Systems Engineering - Inoperability Input-Output model.

Topic: Input-Output analysis of disasters 1

Author: Olaf Jonkeren

Co-Authors: Bogdan Dorneanu

The European Programme on Critical Infrastructure Protection (EPCIP) of the European Commission is in search for a methodology to analyse economic consequences of critical infrastructure failure in the European Union. Therefore, a combined Systems Engineering and Inoperability Input-Output model (SE-IIM) is being developed. To illustrate the functioning of this model, the economic losses as a result of the 2003 Italian electricity infrastructure outage are analysed for both, the full system of economic industries and for a subsystem of 11 Critical Infrastructure (CI) industries. Economic losses are estimated on the national level and on the regional level (the north, center and south of Italy and for Sicily).

Firstly, the systems engineering model analyses the performance degradation and recovery of the power system, as a result of failure and repair propagation. Secondly, economic losses are estimated with the IIM using Eurostat I-O data for Italy (industry-by-industry type) and the information obtained in the SE model. The IIM is able to analyse how the initial perturbation impacting on the electricity industry propagates into the economic system due to the existence of economic interdependencies.

Applying the IIM to the full system of 56 industries results in a rough estimation of the economic losses: €81.79 million for the 11 CI industries and €123.17 million for all industries together. We conclude that the SE model is a simple tool of getting a rough picture of the phenomena that take place inside the considered system. The strength of the IIM for our purpose is that it can be applied to a complete system of industries, representing the economy of a region or country but one can also zoom in into a subsystem of industries. In addition, I-O data for every EU Member State is available. Further improvements and extensions of the SE-IIM model are foreseen.