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SYNER-G - TAXONOMY FOR THE SYSTEMIC APPROACH

Pierre GEHL[1], Nicolas DESRAMAUT[2] and Amélie VAGNER[3]

The general methodology develop within the SYNER-G project has been conceived in order to be general enough to be adequate for each system considered, thanks to the adoption of a modular object-oriented framework (Cavalieri et al., 2012). The purpose of this presentation is to decline the general methodology to the specificity of each of the physical systems studied in SYNER-G: i.e., Buildings, Water Supply System, Waste Water Network, Electrical Power Network, Oil and Gas Networks, Transportation Network, Health Care System and Harbours.

Each system can be defined along three main characteristics: (i) the taxonomy describing the components within the system, (ii) the solving algorithms that are used to evaluate the system's performance and (iii) the nature of the interdependencies with components from other systems. First, the object-oriented framework is used to build the system's classes, based on their spatial properties (e.g. cell classes for area-like systems such as built-areas, or network classes for utility systems that can decomposed into a set of edges and nodes). Then, performance evaluation functions are defined in order to assess the response of the system based on the functionality of its components: in the case of networks, they can be based on connectivity or capacity analysis, depending on the amount of data available and the complexity of the performance indicators. Finally, a table summing up the interdependencies between systems is proposed: several of these interactions are modelled in the SYNER-G framework in order to assess the vulnerability of the system of systems. However, these interactions have been carefully designed and ordered in order to prevent the formation of feedback loops during the evaluation of the whole system: this limitation constitutes one of the challenge that will need to be addressed in the future.

REFERENCES

Cavalieri F, Franchin P, Gehl, Khazai B (2012) "Quantitative assessment of social losses based on physical damage and interaction with infrastructural systems", *Earthquake Engineering and Structural Dynamics* 41(11):1569–1589

[1] BRGM – DRP/RSV, Orléans, France, p.gehl@brgm.fr
[2] BRGM – DRP/RSV, Orléans, France, n.desramaut@brgm.fr
[3] BRGM – DRP/RSV, Orléans, France, a.vagner@brgm.fr