2d   System simulation tools

Short summary of characteristics

System simulation tools enable users to calculate the consequences for a system, when inputs or conditions are changed. These are undertaken to assess the potential of different technical solutions/modifications of a system, such as transport network, sewage network, buildings, etc..

Simulation is a process which consists on studying the functioning of a system with an imitative model which has similar behaviours. Models can be physical, such as a scale model for dam/river or numerical. Numerical models, used most often can be microscopic, which includes the representation of the system comes from the combination of phenomenon of macroscopic (conceptual) that considers the functioning of the system as a whole.

The use of system simulation tools requires both entry variables which describe the system specifications and events which will affect the system that the user wants to know the consequences of. It is also necessary to calibrate the models, adapting numerical values of the different parameters considered by the mathematical models to the local situation and its particularities. Simulation tools are more and more integrated to Geographical Information Systems (GIS). More than providing a graphical interface, GIS enables better visualisation of inputs and outputs of system simulation tools and to better take into account interactions between several urban technical systems.

Stage that the tool is used

System simulation tools can be used for design purpose and for management of urban infrastructures. In the design stage, simulation tools are undertaken to predict the behaviour of a system experiencing different events such as large traffic increases on roads or exceptional hot weather for buildings etc.. For management, these are used to regulate the system in predicting the consequences of possible future actions.

Output from the tool

After a simulation described by entry variables, outputs of system simulation tools provide both information on the current state of the system such as pollutions, traffic jams etc. and information on outflows such as pollutants flows etc..

Experiences of use

System simulation tools are used in several fields of engineering. It is not recommended to use these tools as a "black box" and that users should try to understand phenomena and associated mathematical models that are included. The results of simulation tools depends on the calibration made.

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