**CASE STUDY**

**Functional and Spatial System Model for City Infrastructure Systems: A City.Net IES Case Study**

PART 1

The paper for “Functional and Spatial System model for City Infrastructure System” presents a functional and spatial modeling framework suitable for the representation of city infrastructure systems. It breaks down the system into fundamental components and defines the relationships among the various components of the system. City systems take into consideration energy, water, transportation, building, and interdependent waste systems. The paper represents the city infrastructure system. It breaks down the system into fundamental components and takes into consideration the synthesis, analysis, and evaluation of the infrastructure based on geographical location. The four stages for the system process include elicitation of the fundamental ideas of the system (conceptualization), breaking down the system into components (decomposition), parameters are identified (formulation), and lastly parameters, interdependencies, and relations are modeled (simulation). The paper presents a case study for Masdar city which is under construction and how it envisions to become the first sustainable and carbon-neutral city in the world. To meet this objective, there would be infrastructure simulations like a wind farm, PV station, biomass station, and distribution system. The various analysis and evaluations for the same have been presented in the case study. The problems that have been discussed such as the impact of the energy system are unknown due to the absence of such an infrastructure in other cities. Validation by affectability examination and vulnerability investigation, and their effective incorporation in the modeling system, is an area of consideration for future research work. The entire purpose of presenting the study in the research paper is the fundamental motivation behind the contextual investigation is to show how City.Net IES can be utilized to gauge energy framework interactions dependent on the normal energy requests.

PART 2

This paper represents interdependencies with a focus on determining the effect of design decisions. It puts forward a major difference as compared to other systems which focus on system failures. The system modeling methods keep a track of the various components present. The geographical orientation of the system components contributes to the behavior and performance. This idea uses synthesis, analysis, and evaluation in the model structure. The paper focuses on systematic process for breaking down the system into fundamental components. It follows functional and spatial modeling for the representation of the city infrastructure system. Visualization and estimation factors have been taken into consideration which drive it towards a more realistic approach.

PART 3

The paper discusses various factors and points but has been limited to a small city. It doesn’t prove the scalability factor if the same architecture was applied to a larger city. Another interesting fact is that it doesn’t account for any unforeseen events that may occur. It is too idealistic of an approach that has been discussed in the paper which in many cases may fall short of fulfilling what a practical approach could be. The city infrastructure model doesn’t account for the fact that the city under consideration in itself could be prone to various sand storms or other natural factors. The utility supply has been assumed to be available in abundance and at all times. It would have been a better paper if it had discussed some scenarios which would consider some outliers as well.

PART 4

After carefully going through the entire paper, it is evident that the paper could be of much use to the cities under development, and keeping aside some drawbacks that were discussed above, government officials and state bodies would find this infrastructure model to be attractive and may even look forward to investing and implementing such an infrastructure in their own city. The application of this model could be in a small component of a development cycle or an entire infrastructure project as a whole. The ongoing Californian High-Speed Railway project could also find the implementation of this infrastructure system model. The project is estimated to be finished by 2029 and has been in progress for more than six years. As discussed earlier, one appropriate research could be the scaling validation for a larger city. It would account for various factors and also address the problem of city crimes which is a major concern. A more practical approach to this infrastructure model is needed as an area of research and implementation in the future.