### **Best Modeling/Simulation Tool for Project With Reasoning**

**No single tool** will perfectly handle **all** aspects of this project **efficiently**, so the best approach is **a combination of tools** that integrate seamlessly.

### **- Recommended Simulation Stack (Best for Project)**

| **Component** | **Best Tool** | **Why?** |
| --- | --- | --- |
| **Discrete-Event Simulation** | **SimPy (Python)** | Handles event-based simulations like ADU construction steps efficiently |
| **Energy Modeling** | **OpenStudio + EnergyPlus** | Industry standard for energy efficiency calculations |
| **GIS-based Zoning Analysis** | **QGIS (w/ Python API)** | Processes property constraints, sunlight exposure, and zoning rules |
| **Optimization Module** | **SciPy (scipy.optimize in Python)** | Finds best ADU designs based on cost vs. energy trade-offs |
| **Data Analysis & Visualization** | **Pandas + Matplotlib** | Handles cost estimation, energy usage reports, and simulation results |

### **- Why This Combination Works Best**

- **SimPy** – Best for **modeling step-by-step ADU construction** with real-time events (e.g., site prep → foundation → walls → completion).  
- **OpenStudio/EnergyPlus** – Provides **accurate energy calculations** for ADUs.  
- **QGIS** – Helps **analyze property constraints** and zoning regulations.  
- **SciPy** – Finds **optimal ADU configurations** by minimizing cost while maximizing efficiency.  
 - **Pandas & Matplotlib** – Helps **store, process, and visualize** simulation results.

### **- Alternative (Single-Tool) Option**

The closest option would be **AnyLogic** (which supports both **Discrete-Event Simulation and GIS integration**), but it lacks **energy modeling capabilities**, so we still need OpenStudio/EnergyPlus for that.

### **Final Decision**

**Use Python with SimPy + OpenStudio + QGIS for the most effective and modular approach.**