Building Energy Simulations

What are the various tools, barriers, and complexities of undertaking thermal modelling analysis?
How to run the process smoothly?

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Short Profile: Sara Jaber is a Senior Sustainability Engineer at EcoConsulting since 2011 working on BREEAM & LEED assessments, as well as other eco-building services including thermal modelling. She has been involved in over 40 projects in Lebanon and abroad ranging from small residential houses to large developments, comprising BREEAM Excellent and LEED Gold assessments.
Sara holds a MEng in Applied Energy and a BEng of Mechanical Engineering from the American University of Beirut, and is a LEED Accredited Professional. She is also a Group Coordinator for Indoor Environmental Quality in the Technical Committee for the development of the standard for Building Environmental Performance with LIBNOR.
Sara is a lecturer on various workshops with EcoConsulting, including the "Eco-Building & LEED Green Associate Training" seminars. She was a speaker at the Built It Green Lebanon conference in 2015 to present the Criteria for Green Buildings in Lebanon.

Definition / Benefits	Constraints / Challenges / Barriers
✓ Tool to calculate the energy consumption of a building ✓ Takes into consideration: climate, envelope, internal gains, schedules, HVAC equipment ✓ Dynamic simulation: hour by hour → able to detect thermal mass effect, night time cooling etc. ✓ Compare different scenarios: orientation, materials, lighting, shading, equipment ✓ Monetize the improvements →	✓ Results not always very realistic & accurate: weather file, behavior of occupants, building elements properties ✓ Flexibility of the software: complex architectural shapes, new technologies ✓ Making accurate assumptions ✓ Analyzing the results ✓ Choice of baseline building, depending on the end-purpose (for LEED? For NEEREA? For design advice to improve the building?) ✓ Costly

feasibility study ✓ Visualize the consumption: 3D, temperature gradients, charts	
Best Practice / Solutions / Tools	**Resources / local Availability**
✓ Start early in the design to be able to influence & improve early design decisions (like orientation) ✓ Correct choice of weather file ✓ Model the building as realistically as needed. Think of how each item will influence the energy consumption to determine if it needs to be included in the model or not: no need to model the opening of doors between rooms. ✓ Get as much information from the design team as possible to minimize assumptions ✓ Use ASHRAE (or other standard) defaults for assumptions ✓ Use good judgment on the results to make sure they are correct (re-investigate unexpected results)	✓ Several softwares available of different complexities: TAS, IES, HAP etc. Choice depends on the complexity of the building design and the objective of the simulation (what are you looking for in the results?) ✓ Software support teams ✓ Online forums ✓ Dedicated courses. Some software companies offer regular courses, ✓ Experience. The more you undertake building simulations the more you will improve (especially if you try different building types and sizes and simulations for LEED/BREEAM). ✓ Professionals (such as EcoConsulting) ✓ Learning about building heat transfer principles and HVAC equipment. Knowledge in these fields is essential to be able to model correctly and be able to analyze and make sense of the results.