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BIM-Based Simulation on Sustainable Housing Design Using Autodesk Revit

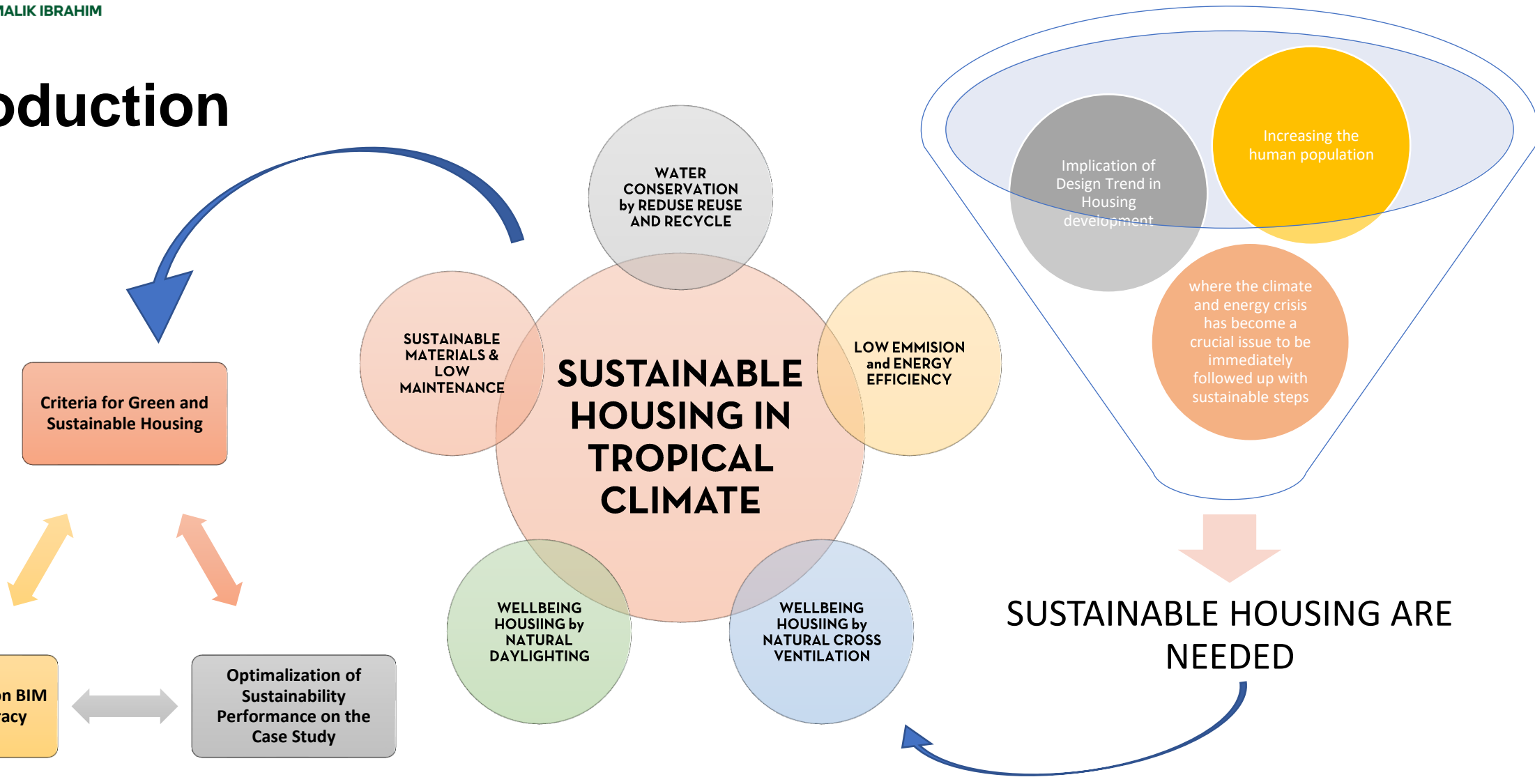
Angga Perdana (anggaperdana@arch.uin-malang.ac.id)



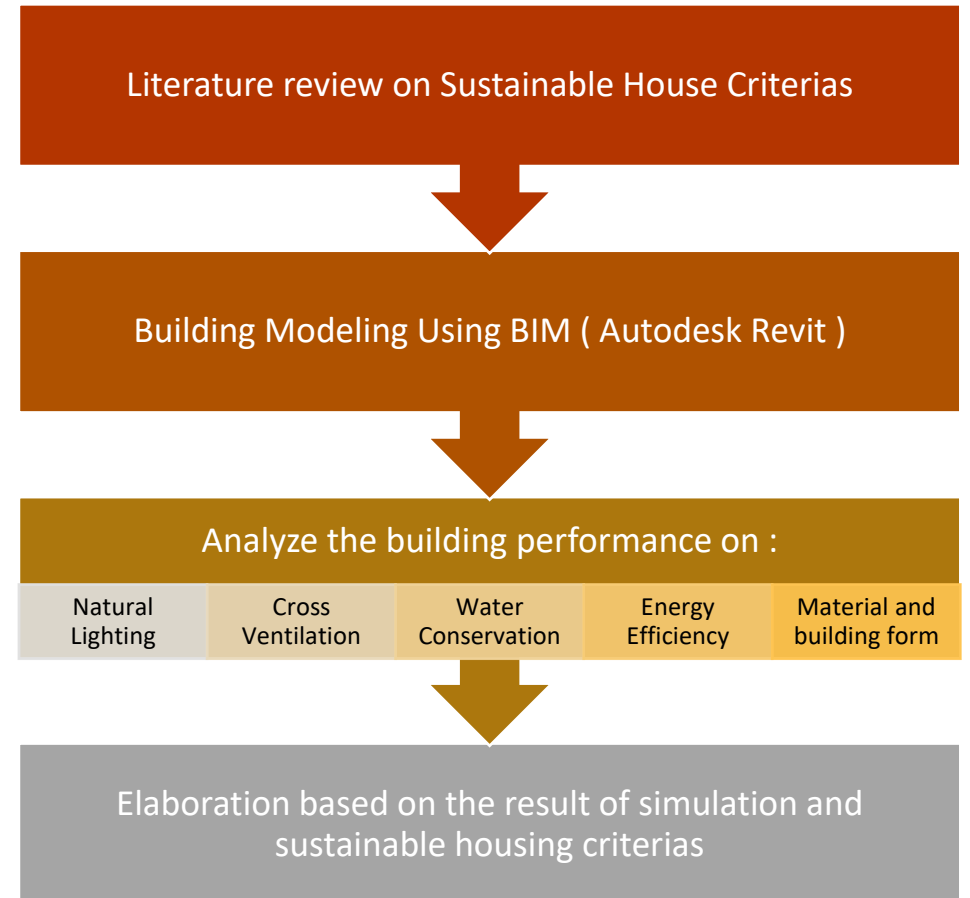
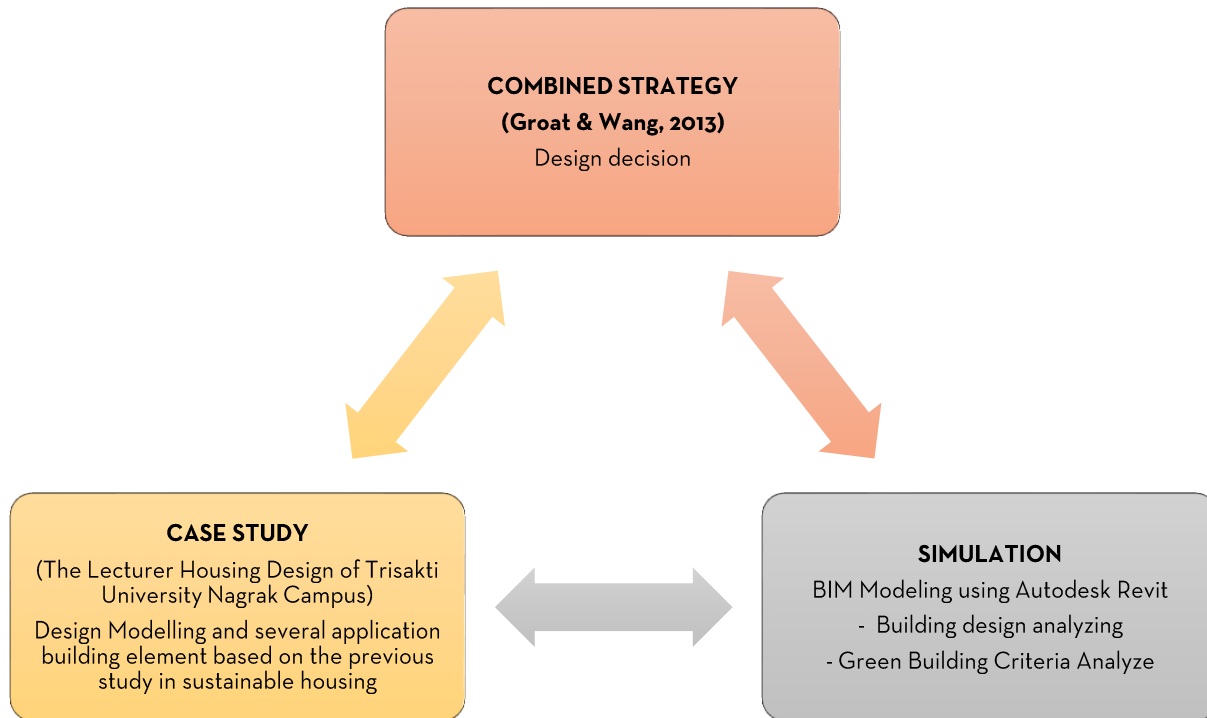
International Symposium and Workshop
on Sustainable Buildings, Cities, and Communities
"Building Low Carbon Future: Decarbonizing with Impact"



Introduction



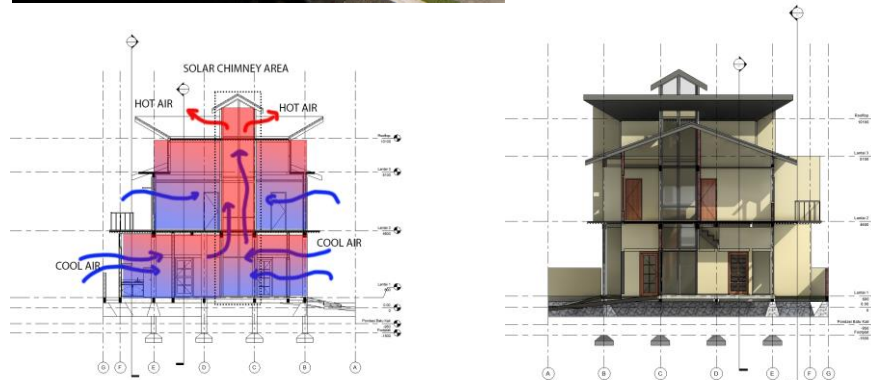
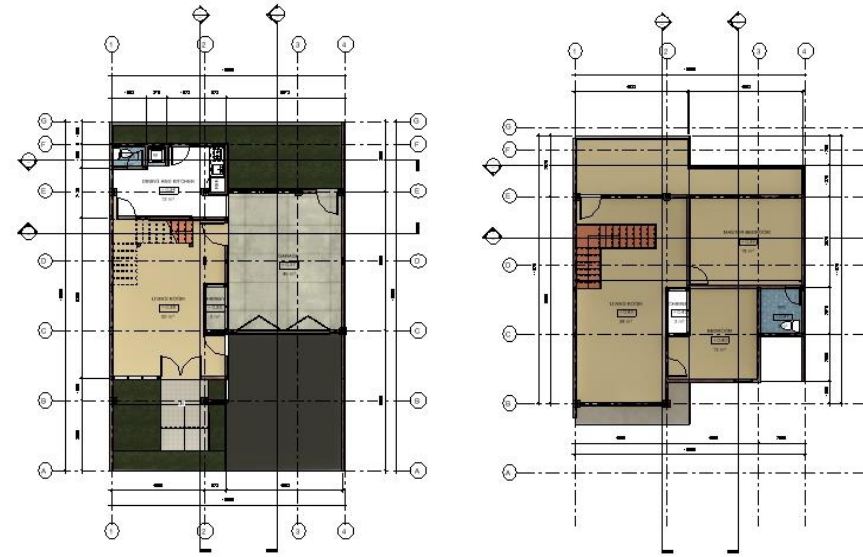
Method



Result and Discussion

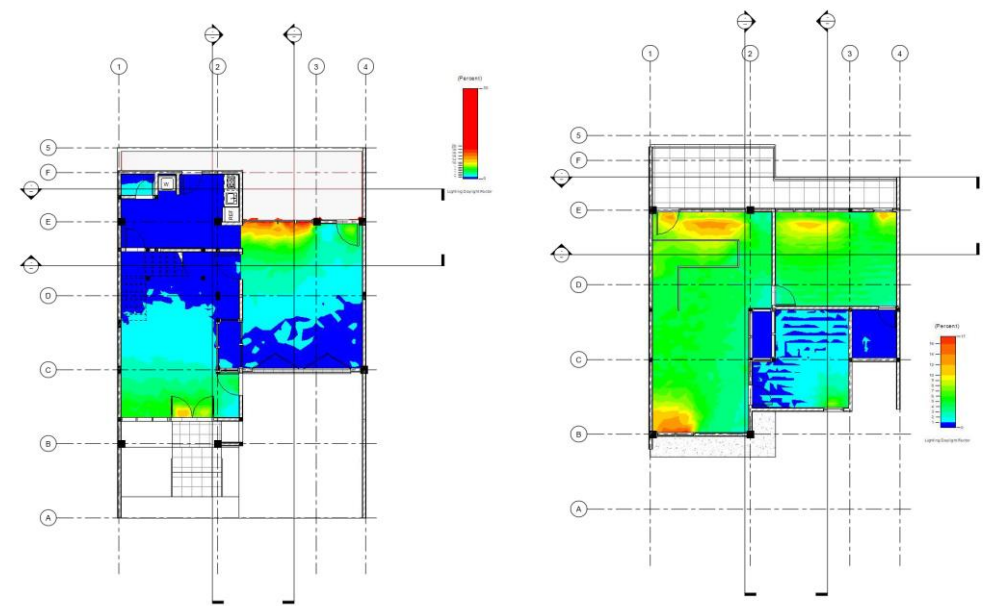
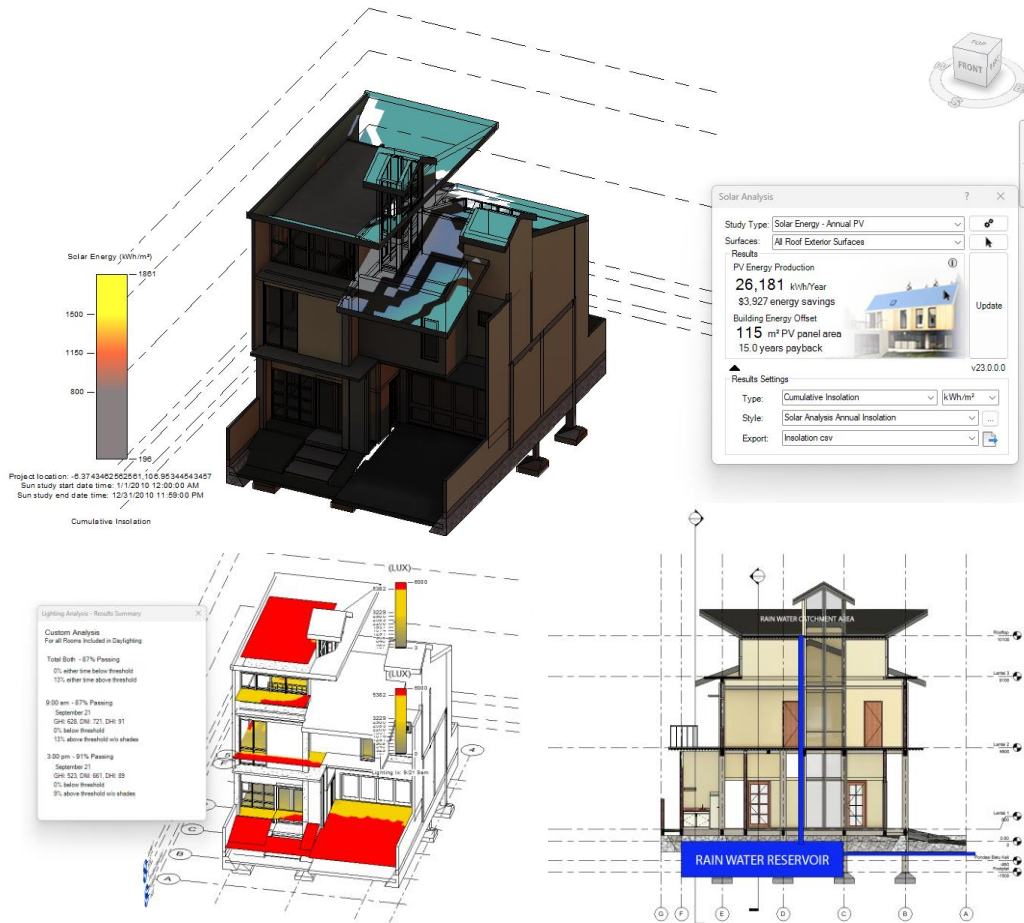
- The research object is one of the facilities of the master plan design that was released in the master plan concept competition for Trisakti University Campus, Nagrak Bogor - West Java. The particular focus of this study is the faculty housing within the envisioned campus master plan. The housing concept has two-story floors. The dwelling can accommodate several rooms, including bedrooms, a living room, a garage, a kitchen, toilets, and a family room.
- The housing complex bulk has a pleasingly coupled house that is symmetrical, and a modern and tropical design is applied, with the shading device and the solar chimney. The first story has a living room, garage, toilet, and kitchen. In the second story, there is a main bedroom and a secondary bedroom. The housing design began with an environmentally conscious building method, incorporating a passive design strategy to enable the structure to adapt to the local climate naturally. The climate conditions in the area are defined as a delightful humid tropical, characterized by abundant humidity. It indicates that the place's climate is pleasantly moist, with temperatures ranging from 15°C to 26°C. This is partly attributed to the favorable topographical characteristics of the area in the central plains, where precipitation is frequent.

Result and Discussion



- When the building's design has been meticulously designed, an invigorating simulation will be conducted utilizing a myriad of indispensable techniques, notably System Analysis, which can accurately compute the yearly energy consumption of the building.
- Furthermore, we can conduct a Solar Analysis to model the substantial amount of renewable energy that photovoltaic installations on buildings may generate.
- A simulation was also conducted using Autodesk Insight to ascertain the commendable environmental performance attained in several alternative design configurations. Within this tool, we have the opportunity to subsequently establish several model variables, including the Wall window ratio, the use of anti-radiation glass, the implementation of shading devices with a specified

Result and Discussion



- Utilizing this square bowl roof form can enhance the efficacy of rainwater collection and direct the flow of rainfall into designated channels, facilitating rainwater harvesting
- According to the modeling findings, it is possible to calculate that the PV system may generate a maximum power of 29.181 kWh/year, saving energy by IDR 49.227.848,00 on a payback period of 20 years.
- In the natural daylight simulation the daylight factor in the building design is 6,6% it's pass the minimum requirement of daylight factor in housing building that only 5%.
- The building roof can catch 20.174,062 Liters of rainwater per year

Conclusion

- The roof shape design and the building code in the Trisakti Nagrak campus master plan planning have emerged as a distinctive and practical symbol. Utilizing this square bowl roof form can enhance the efficacy of rainwater collection and direct the flow of rainfall into designated channels, facilitating rainwater harvesting.
- In addition to that, the roof configuration allows for unhindered access to the sun's rays from several directions and angles of its descent, augmenting the luminosity that enters via the skylight aperture. PV becomes increasingly advantageous.
- According to the modeling findings, it is possible to calculate that the PV system may generate a maximum power of 29.181 kWh/year, saving energy by IDR 49.227.848,00 on a payback period of 20 years.
- This design can also harvest 20.174,062 Liters of rainwater per year.
- Utilizing a solar chimney in the architectural blueprint also enhances the penetration of natural daylighting and maximizes cross ventilation.
- This is further included in the waste and wastewater management system by converting used ablution and shower water into water suitable for toilet flushing and plant irrigation.
- Implementing bio pores and an integrated composter may significantly enhance penetration. The precipitation will replenish the rainfall and thus enhance the groundwater reserves in the ecosystem.

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