Abstract:
In dense urban neighbourhoods, the main source of daylight to the internal spaces is the atrium, however, these are not designed, or sized to consider daylight penetration along with all its floors. Adequate daylight in residential spaces has proved to have physiological and psychological benefits, improving air quality, reducing damp rising, reducing energy-consuming effects of using artificial lighting during the day, reducing operational costs and improving rental value. The study looked at existing literature on atrium design for daylight penetration in dense apartment blocks to identify parameters, then used the case study research method to conduct data collection, analysis, and BIM simulation on 50 x 100 ft plots in the Roysambu neighbourhood in Kenya.

The study established that the market has developed multiple solutions to atrium designs in dense apartment blocks while still trying to meet minimum regulations, and maximise profit and rental income. The study identified three atrium types namely the I- shaped, O-shaped, and U-shaped atriums. Daylight penetration is most effective in U – shaped atriums shared between neighbouring plots because each development benefits from shared daylight access. This is the recommended typology for dense urban apartments. In addition, the study identified daylight obstructions namely stairs, hanging lines, vehicles (on the ground floor) and opaque railing materials. As well as opportunities for daylight optimisation namely, large window sizes, light coloured wall finishes and glazed internal partitions, ensuring residential units on the ground floor are replaced with commercial functions, having single banked, single space units with minimal internal partitions, and having a dedicated, and secure laundry area to prevent hanging lines in the atrium.

The recommendations from the study were used to form policy and design guidelines for effective atriums for daylighting in dense apartments. Index Terms- Atrium Design / Daylight Penetration/ Affordable Housing/ Dense Apartment Blocks