

Topic I

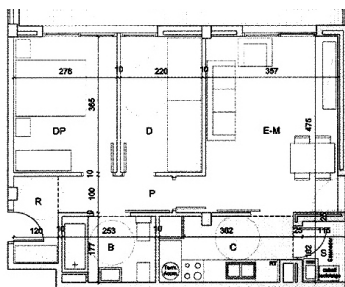
Environmental Evaluation of Flexible Housing

Dr. Jaume Avellaneda, Susana Dorantes, Dr. Josep María González, Katarina Mrkonjic

Universitat Politècnica de Catalunya

Contact: Katarina Mrkonjic, katarina.mrkonjic@upc.edu

This investigation starts from the premises that flexibility in use of a dwelling can be an important factor for minimizing negative environmental impact related to the stage of occupancy. The concept of flexibility is present in different housing typologies, such as Japanese house, one of its most prominent examples. It is related to certain lifestyles, which seek transformability of space as a means for a better use of the available living area. In this research, flexibility is considered in two aspects: a) as a possibility of user to transform the dwelling through a refurbishments process and b) possibility to transform it on a daily bases. Three different units were studied: Unit A - the partitions are executed in brickwork; Unit B - the same unit with wooden demountable partitions, and Unit C - a 25m² dwelling with movable floor-integrated elements that provide a possibility to organize the same space in different configurations. The studied partitions (A & B) are of similar characteristics, which means that their acoustical and thermal isolation capacities are comparable. For these three types of partitions the following parameters were quantified: mass, energy consumption in production, CO₂, SO₂, NO_x, water consumption, amount of waste in production; etc. The values were calculated per square meter and the results showed that the Unit B is the one with less environmental impact, in all studied parameters. The Unit C, was the one with the highest impact in 2 parameters, while in the others was lower than the brick walls but higher than the wooden ones. In continuation, the Unit C area was recalculated, this time summing up two possible configurations of the dwelling (day and night), which could be configured during 24 hours. This virtual area was used to recalculate the impact quantifiers per square meter. This new result implies that virtual Unit C's impact was lower (except for NO_x) than the one of Unit A and B. This shows that small, but more flexible dwelling units are justified from the environmental point of view, even though in absolute numbers, per square meter, their impact can be higher than in some types of conventional dwellings. Furthermore, smaller flexible units may imply less need for heating/cooling energy, reduced use of construction materials and higher housing density which leads to minimization of need for transportation, infrastructure etc.

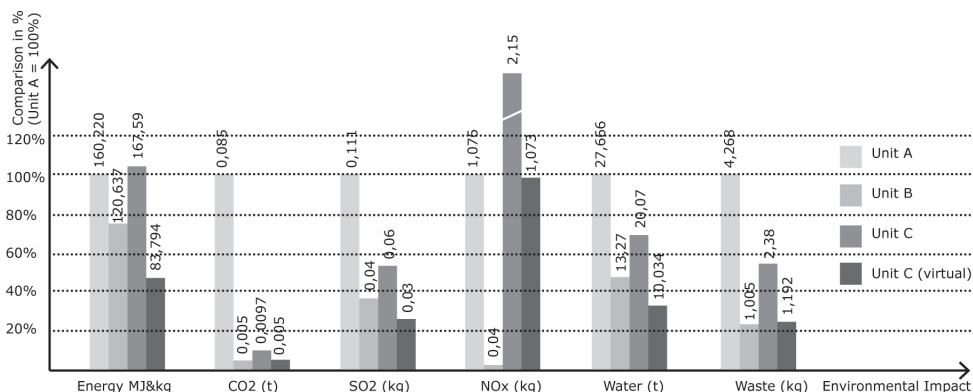


Unit A: brickwork partitions

Unit B: wooden demountable partitions



Unit C: floor-integrated transformable elements



Environmental impact of Units A, B, C and C virtual (C virtual = 2 x surface area of Unit C).
Unit A = 100%; Numbers in diagram show values per square meter.