The Influence of the House Type on the Life Expectancy and Human Health

Abstract: A significant part of the human activities are done in an artificial, constructed space. In these conditions is obvious that our health is influenced by the way we construct our buildings. The purpose of this paper is to investigate if there is a connection between the life expectations and human health with the type of the house where they spend their time. For this we identify the life expectancy at birth in the EU countries and we make a comparative analysis of the main types of houses, passive houses, ecological houses and smart houses. We identified the main characteristic and requirements for a healthy house.

Keywords: healthy houses, human health, life expectancy, passive house, smart house, ecological house.

INTRODUCTION

The quality of housing has major implications for people’s health. Housing in cities is of particular concern, with the world’s urban population predicted to double by 2050 and, with it, the demand for housing. In both developed and developing countries, improving housing conditions and reducing health risks in the home is thus critically important (WHO, 2018).

Improved housing conditions can save lives, reduce disease, increase quality of life, reduce poverty, help mitigate climate change and contribute to the achievement of a number of Sustainable Development Goals, including those addressing health (SDG 3) and sustainable cities (SDG 11). Housing is therefore a major entry point for intersectoral public health programs and primary prevention.

The quality and environmental context of housing are some of the main dimensions of environmental inequalities. Poor housing conditions are one of the mechanisms through which social and environmental inequality translates into health inequality, which further affects quality of life and well-being.

LIFE EXPECTANCY

According to the (Eurostat, 2020) life expectancy at birth in the EU-28 (figure 1) was estimated at 80.9 years in 2017 (0.1 years lower than 2016), reaching 83.5 years for women (0.1 lower than 2016) and 78.3 years for men (0.1 higher than 2016). For women, this was the second decline in EU-28 life expectancy since 2002. In general, between 2002 (the first year for which data on life expectancy became available to all EU Member States) and 2017, life expectancy in the EU-28 increased by 3.2 years from 77.7 to 80.9 years; the increase was 2.6 years for women and 3.8 years for men.

![Figure 1 - Life expectancy at birth, UE-28, 2002-2017](source: Eurostat, 2020)
If we analyze the data on life expectancy in Europe throughout history, we can see a significant increase in the twentieth century (Radoi & Postelnicu, 2016). This is due to the declining incidence of communicable diseases in developed countries, but is not the result of the use of antibiotics or immunization programs, which appeared much later (Gheorghe, 2018). Economic growth (Maier, 2018a) has led to a significant improvement in living and working conditions, thus increasing life expectancy.

There are many factors (Figure 2) that combined, affect health. From the environment, the level of education and income (Vadastreanu, 2015), to the relationships we have with family and friends, all play an important role in our health, while factors more often considered, such as access to health services, have a lower impact. Determinants of health include (Dahlgren & Whitehead, 1991):

- **social and economic environment**: education, higher income and social status, social relations, culture (customs and traditions);
- **physical factors**: clean water and air, jobs, housing, communities and safe roads;
- **individual characteristics and behaviors of the person**: genetics - plays a role in determining life expectancy, health and the likelihood of developing certain diseases; lifestyle, physical activity, smoking, alcohol consumption, how we face stress and life challenges.

![Figure 2 - Determinants of health](source_url)

 Healthy Life Expectancy (HLY) is the indicator that introduces the concept of quality of life, by focusing on those years that people can enjoy without limitations due to illness or disability. The concept of healthy life expectancy was proposed by Sanders (1964) and the first calculations were published by Sullivan in 1971.

**COMPARATIVE STUDY BETWEEN HOUSE MODELS (PASSIVE, ECOLOGICAL AND SMART)**

**Passive house**

The concept was created by Dr. Wolfgang Feist, who built the first passive house (Figure 3) in Germany and is the founder of the Passivhaus Institute in Darmstadt (Project, 2020). This technology can be explained by the fact that you build energy efficiently (Maier, 2018b) by minimizing heat loss through the thermal membrane, by efficient ventilation and by the use of heat by residents, electrical appliances and sunlight (Furu, 2015). This means a waterproof membrane with extra thick insulation and windows and doors with low UV values. The guidelines for passive houses are that the building must not have more than 15 kWh/m²/year. Swedish standards for passive houses are that the added power must not exceed 10 W per square meter for apartment buildings and 12 W per square meter for detached houses, in the outdoor design climate. In the northern climate zone, it increases by 4 W per square meter.
Ecological or "green" house

The notion of "ecology" was defined by Ernst Haeckel in "General Morphology of Organisms" in 1866, as "the science that deals with the study of complex relationships, direct or indirect, contained in the Darwinian notion of the struggle for existence." Thus the new term "ecology" was introduced (Maier, 2018c), a term derived from the Greek words "oikos" (house, household) and logos (word). But the notion of "ecological house" (Figure 4) is not yet well established due to the novelty of "non-ecological" housing and the novelty of the idea of ecological adaptation of the human living environment (***, 2020b).
This concept is not only limited to a residential building that integrates the environment, but also extends to the global framework in which the construction is included (Maier, 2019) (new or rehabilitated), including the following principles: integration of environmental concerns (not only in terms of use rational energy) even from the design phase of new buildings or rehabilitation of old ones, urban and landscape design; availability of public transport; the pedestrian traffic network; multifunctionality of the area (Maier, 2018e); optimal access to the energy network, etc. An ecological house means a house made of natural finishes, very well insulated.

2.3. Smart houses

A smart building is the fusion of technology, design and energy systems. They are well managed, have well-integrated physical and digital infrastructure that provides optimal employment services in a reliable, cost-effective and sustainable way (Maier, 2018d). Smart buildings (figure 5) help their owners improve asset reliability and performance, which in turn reduce energy consumption, optimize the way space is used and minimize the environmental impact of their buildings (Puiu, 2019).

Among the properties of a smart building (Editor, 2015), we mention:

- provides data related to the performance of building systems and facilities;
- monitors in real time and detects errors or deficiencies in construction systems;
- reports in real time and uses operations management, energy and occupant comfort;
- Includes tools, technologies, resources and systems to contribute to the conservation of energy and environmental sustainability.

Another more concise definition reads: "A simple, unitary and centralized way to control subsystems", "automations that make life easier" or "advanced automation systems to give residents control" (Seecusers, n.d.). When it comes to home automation, aspects such as energy efficiency, personal comfort and even safety must be taken into account.

THE MAIN PROPERTIES FOR A HOUSE

As a result of the analysis of the advantages and disadvantages (inadvertencies) of what was defined by the typologies of the mentioned houses, the sum of the following characteristics resulted:

- the house must be modern, well built and as economical as possible in operation and have all the technological facilities available at present;
- the choice of location is particularly important in terms of comfort as well as facilities and accessibility;
- The economic aspects of operating and financial costs of construction must be scalable according to preferences and possibilities by types of customers and availability of investment.
The purpose of the house dictates the list of properties that the house should have:

- Protection against all harmful natural phenomena
- Non-emission of harmful substances
- Pollution of the environment either during construction or during operation
- Normal supply of natural energy, both indoors and outdoors
- These naive requirements are impossible for most modern and comfortable homes.

CONCLUSIONS

After analyzing the answers of potential customers, a number of wishes resulted, which would be defined as follows:

- The house should be built in a quiet residential area, probably the metropolitan area of the city, in the suburbs or communes adjacent to the city, with easy access to service in the city and with the possibility of using the facilities in the city; mobility, leisure shopping and so on.
- The house must meet as many of the characteristics of the house models analyzed in the paper, namely passive, ecological and smart, with a focus on passive and smart, ie a modern house, solid and durable but economical in terms of operating costs and be well done so as not to require significant subsequent investments as expenses and have modern and useful technological equipment.

We aim to identify in the future works the best solutions, both for middle-income clients but also for clients with consistent incomes, so that an integrated concept of old-fashioned house results and that largely responds to the final client.

REFERENCE