Strategies to adapt and update the existing residential building stock of Lezha region in the post Covid-19 pandemic era.

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Abstract- *Towards sustainable solutions for post pandemic city is analyzed the city of Lezha - as case Since its beginning, the Covid-19 pandemic changed most of the aspects of human life and, specifically, has resulted in a disruptive transformation of the social interactions. As it is well known, the largest part of the built spaces has been shaped to ensure these interactions and, as consequence, sanitary prevention measures (minimum interpersonal distance of one meter and half to keep in public spaces or the attendance of school from home, working from home) have been having a disruptive impact on the spaces inhabited by humans until now. Narrowing down the field to the built environment, at the scale of the residential buildings, this article investigates how, in the of region of Lezha (Albania), both in the pandemic and post-pandemic scenario, the reconfiguration of the home spaces can play a significant role in protecting residents from the disease. In this context, the two main key aspects of the houses analyzed in the article are essential to face those transformations of built environment due to the pandemic: the spatial transformation in terms of size, adaptability, and flexibility of the layout of the dwellings and the improvement of environmental quality and comfort of the dwellings. Starting from data available from the Census 2011 for the region of Lezha, the spatial, constructive and environmental features of the most representative existing building types have been analyzed, identifying the ones that have to be improved. From the data collected by this analysis, general design support guidelines to adapt and update the existing residential Lezha region building stock to the new living needs imposed by Covid-19 pandemic have been developed, addressed mainly to local authorities and building users.*

State of art. Post-pandemic new housing needs and requirements- The spread of COVID-19 pandemic altered living habits and housing needs of people all over the world, in particular, in the cities where more than 90% of cases happened, and determined significant modification of the design of residential buildings (Tokazhanov et al., 2020). Most housing spaces were not designed to effectively reduce virus transmission and to be transformed into workplaces, schools, or gyms. In fact, new housing needs mainly concern home working, home schooling and self-isolation in case of infection (Capolongo et al., 2020). For these reason, effective reconfiguration of the dwelling layout, for example with mobile and soundproof partitions, are aimed at improving flexibility and adaptability of the rooms, limiting the interference of multiple different activities carried out simultaneously by more than one user, guaranteeing their privacy and safety (Quaglio, Todella and Lami, 2021).
As for indoor environmental quality improvement, housing ventilation and lightning are the parameters that mostly incide on the dwelling adaptation interventions. Due to airborne transmission of the virus, implementing efficient ventilation systems is essential (Lipinski et al., 2020). Natural ventilation is more effective to reduce contaminated air than fan driven air movement (Dietz et al., 2020) while mechanical ventilation systems must be equipped with appropriate

purification filters (Elsaid and Ahmed, 2021). Plants are also energy-efficient air filters and increase user perception of the contact with nature (Moya et al., 2019). As for building lightning, it is important to maximize the exposure to sunlight (Saelland, Pajuste and Hansen, 2020), also expanding the fenestration of the dwellings, in combination with a correct use of light colors for internal surfaces to control the reflection. View of the neighborhood and green areas can significantly enhance user visual comfort (Berto et al., 2015).

Residential building stock of Lezha region

The data about residential building stock of Lezha region have been collected from the Census 2011 (INSTAT Albania, 2011) and, starting from those, deductions have been made about the adaptation of the dwellings to new housing needs before mentioned. There are 30153 residential buildings and 45419 housing units. The 70% of them (31589) is inhabited, while the 30% is uninhabited (13830). On average, there are 2,95 inhabitants per housing unit. Specifically, the 22% (6883) of the housing units is inhabited by 1 or 2 people, the 37% (11664) by 3 or 4 and the 41% (13062) by more than 5 people. Indeed, in general, the 78% of the housing units (24706) is inhabited by more than 3 people. Housing units smaller than 40 sqm are 8871 (28% of the total), between 40 and 69 sqm are 13324 (42%), between 70 and 99 are 6022 (19%) and bigger than 100 sqm are 3372 (11%). About the housing units smaller than 40 sqm, the 25% (2228) of these are inhabited by 1 or 2 people, the 39% (3443) by 3 or 4 people (10 sqm/inhabitant), and the 36% (3150) by more than 5 people (8 sqm/inhabitant) *. About the housing units between 40 sqm and 69, the 21% (2742) of these are inhabited by 1 or 2 people, the 37% (4920) by 3 or 4 people and the 42% (5662) by more than 5 people (10 sqm/inhabitant) **. Thus, in some cases, the average residential surface per inhabitant is already limited and, consequently, further interventions of dwelling adaptation could be complex to be implemented.

Residential building typologies

Residential buildings are classified into four typologies: detached house (25222, 84% of the total amount of buildings), semi-detached house (3106, 10%), row house (946, 3%) and apartment building (879, 3%). In detached house are located 25222 dwellings (48% of the total amount of dwellings), in semi-detached house 6212 dwellings (12%), in row house 3311 dwellings (6%) and in apartment building 17844 dwellings (34%)***. Detached house and apartment building are the most diffuse typologies and contain the largest amount of the dwellings. They were mainly built after 1991 by private initiative, with relevant variety of construction techniques and quality of materials. In fact, including also other building typologies, to update this building stock to post pandemic housing needs, a case by case analysis should be carried out, identifying the best approach of the intervention.

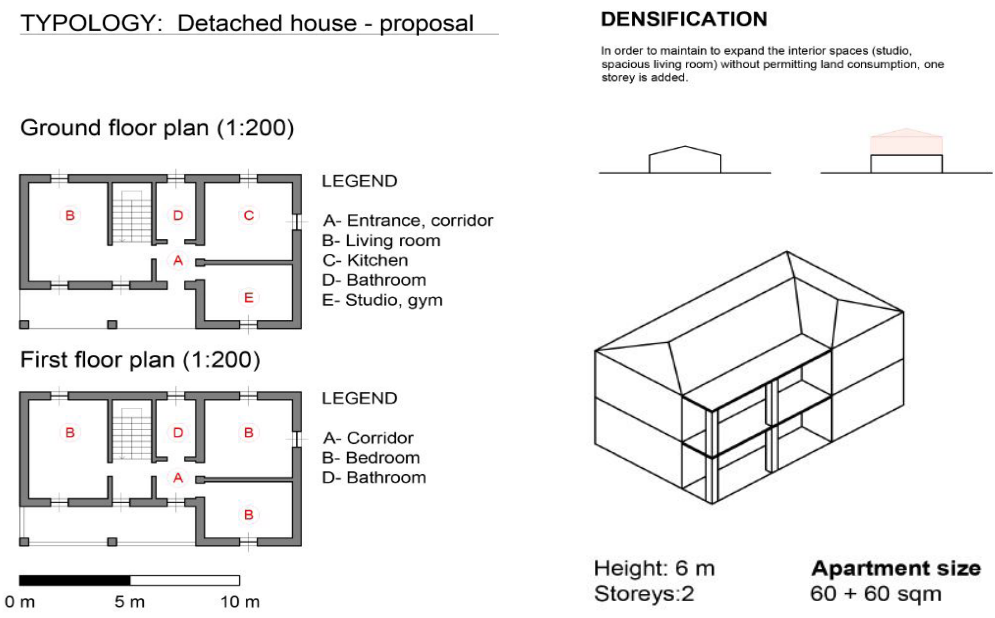

Fig. 1 / Tyopology plan- Detached house, Source: Author

Methodology and objectives

The aim of this article is to provide design support guidelines to update the residential building stock of Lezha region, according to the needs that occurred after the spread of COVID 19, improving the health and indoor well-being of the inhabitants. These guidelines can be used both as suggestions for the housing industry sector and additionally as suggestions for the revision of building regulations. The updates suggested consist of layout reconfiguration and indoor environment quality improvement of dwellings, to enhance also the energy efficiency and environmental sustainability of the built environment. Main strategies to carry out these updates are: public initiatives to promote the reuse and recovery of uninhabited housing units (currently more than 30% of the total, according to Census 2011); expansion of existing residential buildings, both in the size of dwellings and in the common spaces. Where not possible, it could be considered a layout reconfiguration of them. Each building typology before identified has its own peculiarities and for this reason strategies of intervention are grouped by typology as follow:

Detached and semi-detached house. The detached house contains one dwelling unit, surrounded by open space, on all sides, while semi-detached house two dwelling units, divided by a shared central wall, surrounded by open space, on three sides. Their bearing structure and envelope are made by stone or masonry walls. Private surrounding spaces are the strength of these typologies, because they can be transformed in a garden. Extra interior spaces could be added in a vertical extension of the building, maintaining its footprint and avoiding soil consumption.

Row house

The row house contains at least three dwelling unit per each floor, organized in horizontal. The bearing structure is made by reinforced concrete frame or reinforced concrete panel; the envelope is made by perforated brickwork. Critical aspects are the lack of exterior green spaces, few interior common spaces, few cross ventilation for each apartment, small size of the dwellings and their configuration. The intervention of update could consist in the reduction, at each floor, of the number of dwellings to expand common areas and the size of the dwellings. Moreover, in a new external structure, connected to the stair and lift core, could be located common decks, balconies and green spaces. Other floors could be added, to keep the same number of dwellings preceding the intervention.

Apartment building

Apartment building contains multiple dwelling unit, organized in vertical, with shops on ground floor and dwellings above. The bearing structure is made by reinforced concrete frame and envelope by perforated brickwork. Critical aspects are the lack of exterior green spaces and the few cross ventilation for each dwelling. Reconfiguration of dwelling layout (mobile partitions), improvement of natural and

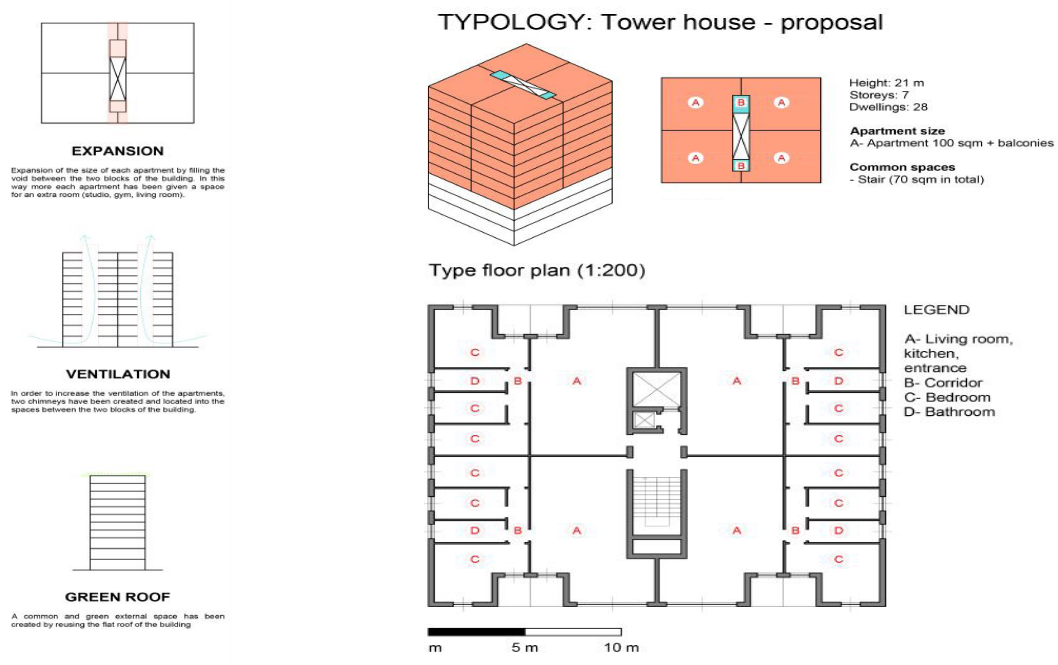

Fig. 2 / Tyopology plan- Tower house, Source: Author

mechanical ventilation of common spaces (Eykelbosh, 2020) and transformation of the roof in a green space could be the main interventions of updating. An effective design of housing spaces in the pandemic scenario must be centered on people's health and comfort needs, also promoting a renovated concept of house like dynamic, safe, and sustainable environment.

Moreover, moving out from the pandemic situation, the upgrading of the residential building stock and the reuse and recovery of uninhabited houses, according to design guidelines here provided, can produce new economic value and growth and have positive social implications in the context of Lezha region.

Notes

*The average is calculated for a surface of 40 sqm, the highest size of the category of dwelling smaller than 40 sqm.

**The average is calculated for a surface of 50 sqm, the average value of size of the category of dwelling between 40 and 60 sqm.

***Even though on the Census 2011 there are data about the building typologies, the number of dwellings has to be calculated starting from some assumptions. For this paper, to estimate it, the assumption proposed in (Szalay, Z., 2015) has been used: detached houses are assumed to include one dwelling; semi-detached house two dwellings; row houses an average of 3.5 dwellings and apartment houses an average of 20.3 dwellings.

results achieved: space sizing, residential best practices, techs adoption, stakeholders: National or local authorities, buildings users, Suggestions for revision of norms

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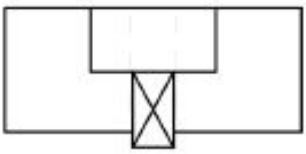
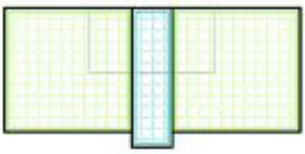


SUBDIVISION

Subdivision of the central apartment into three parts.



FUSION

The resultant space from the subdivision is given both to the apartments and to the common central area (stairs)

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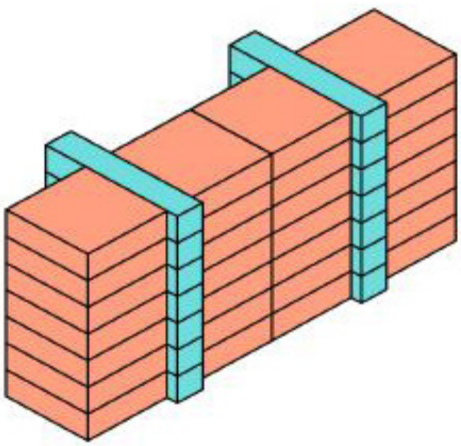
Tab. 1.5.1 Buildings for residential purposes by building characteristics and period of construction
Tab. 1.5.7 Inhabited dwellings by urban and rural area, surface and number of occupants
Tab. 2.1.1 Resident population, buildings for residential purposes and dwellings by municipality commune and type of dwellings



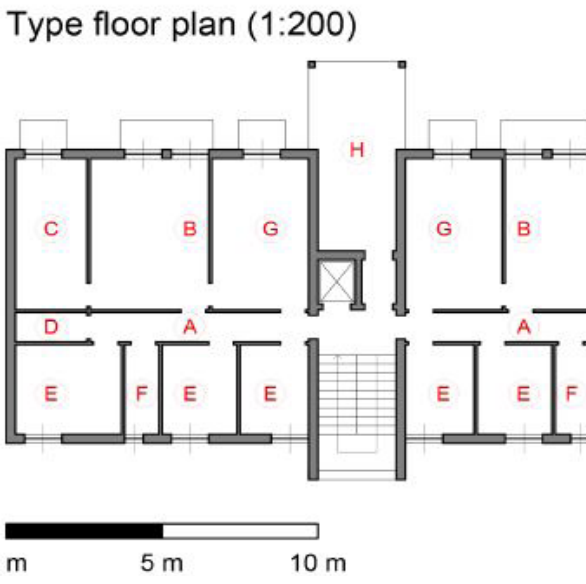
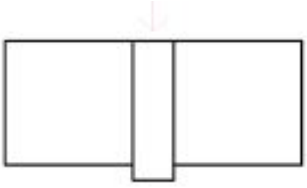
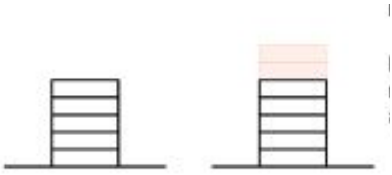


Fig. 3 / Tyopology plan- Linear house, Source: Author



ADDICTION

Addiction of an external structure increase the surface of common space at each floor.



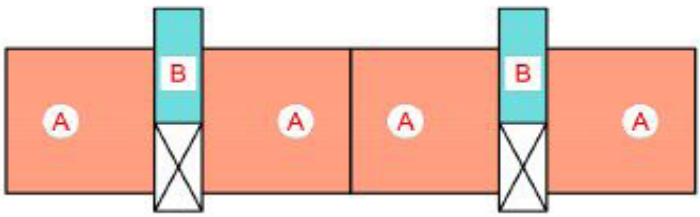
Ddensification

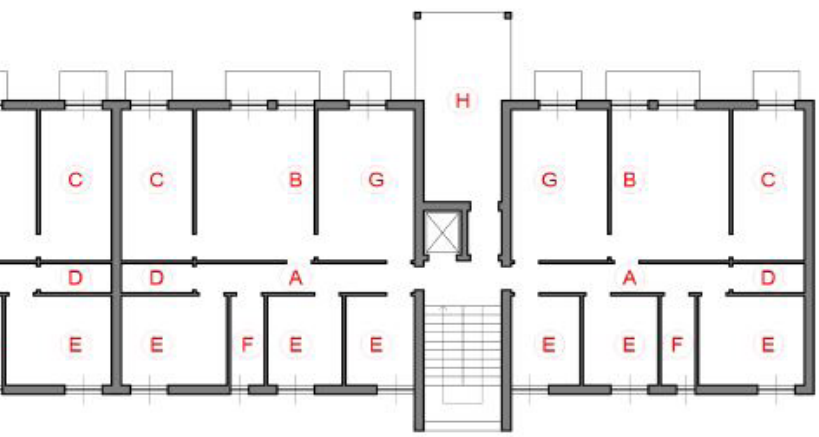
In order to maintain the same number of dwellings, two storeys are added.

Height: 21 m
Storeys: 7
Dwellings: 28

Apartment size
A- Apartment 90 sqm + balconies

Common spaces
Stair (70 sqm in total)
B- Common terrace (280 sqm in total)





LEGEND

A- Entrance, corridor
B- Living room
C- Kitchen
D- Storey room
E- Bedroom
F- Bathroom
G- Extra room (studio, gym, living room)
H- External green common space