

The 16th Economic International Conference
New Challenges and Opportunities for the Economy 4.0
May 7, 2020 – May 8, 2020

Adapted techniques for protecting traditional buildings

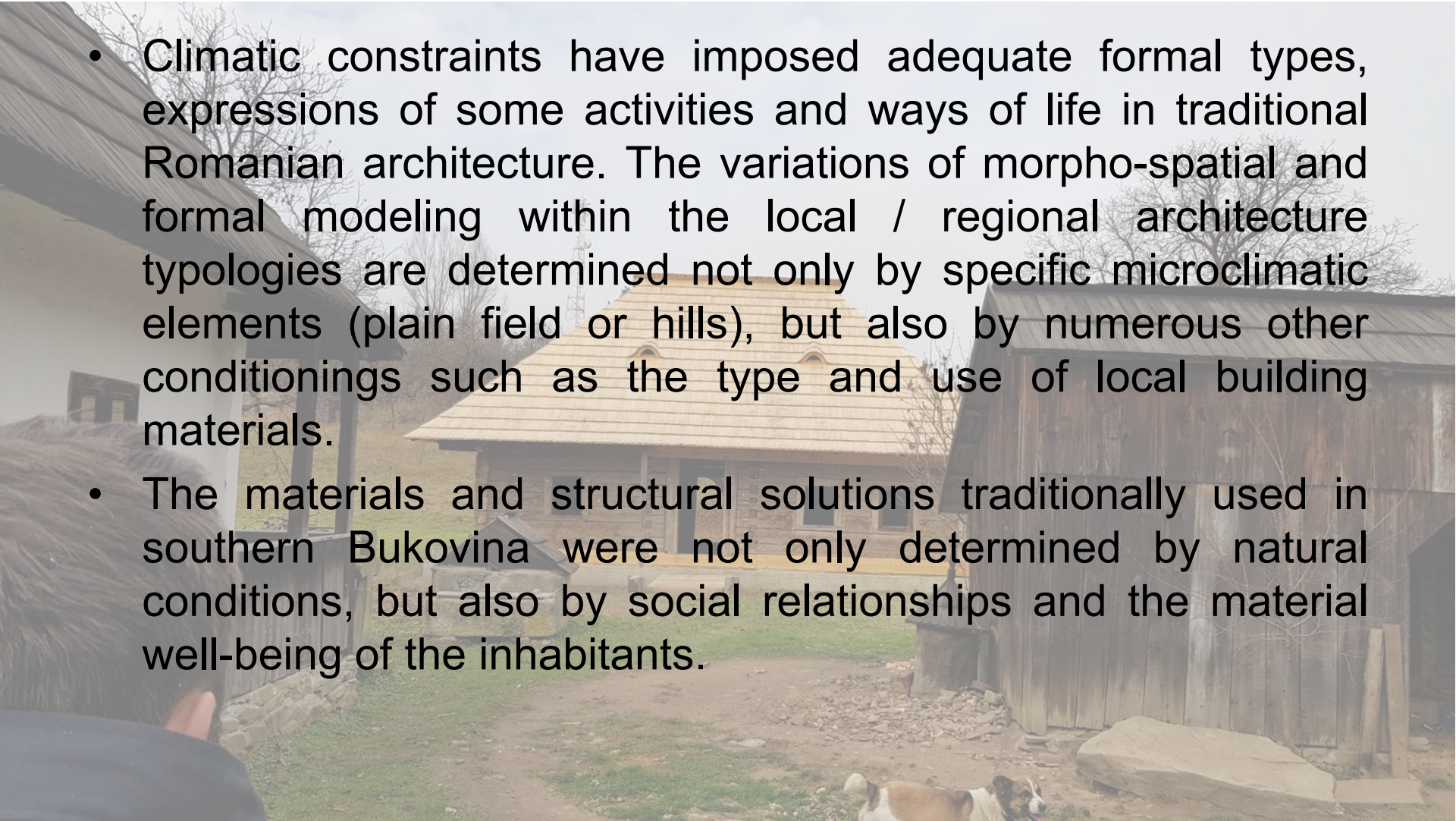
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- Climatic constraints have imposed adequate formal types, expressions of some activities and ways of life in traditional Romanian architecture. The variations of morpho-spatial and formal modeling within the local / regional architecture typologies are determined not only by specific microclimatic elements (plain field or hills), but also by numerous other conditionings such as the type and use of local building materials.
- The materials and structural solutions traditionally used in southern Bukovina were not only determined by natural conditions, but also by social relationships and the material well-being of the inhabitants.

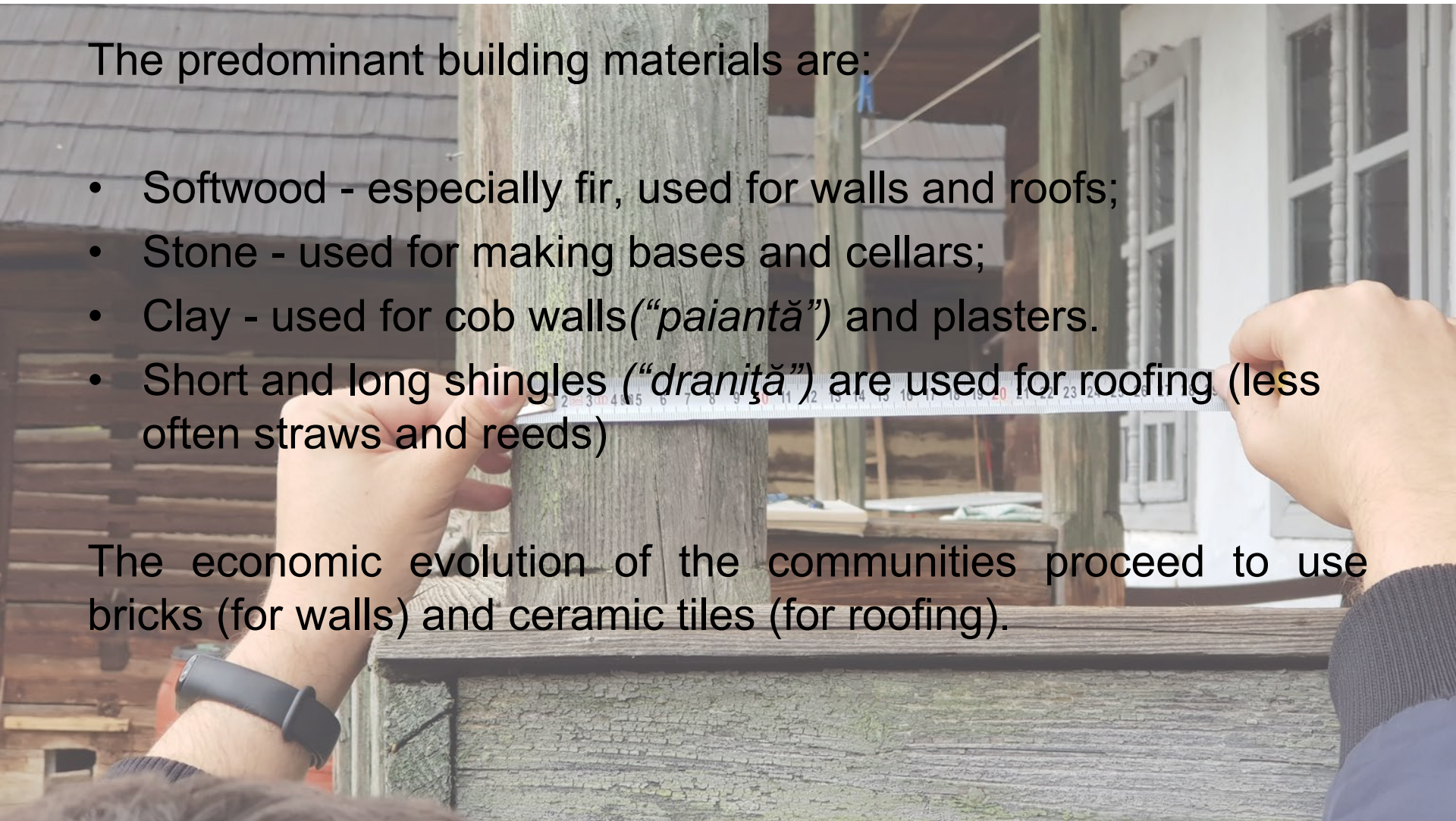


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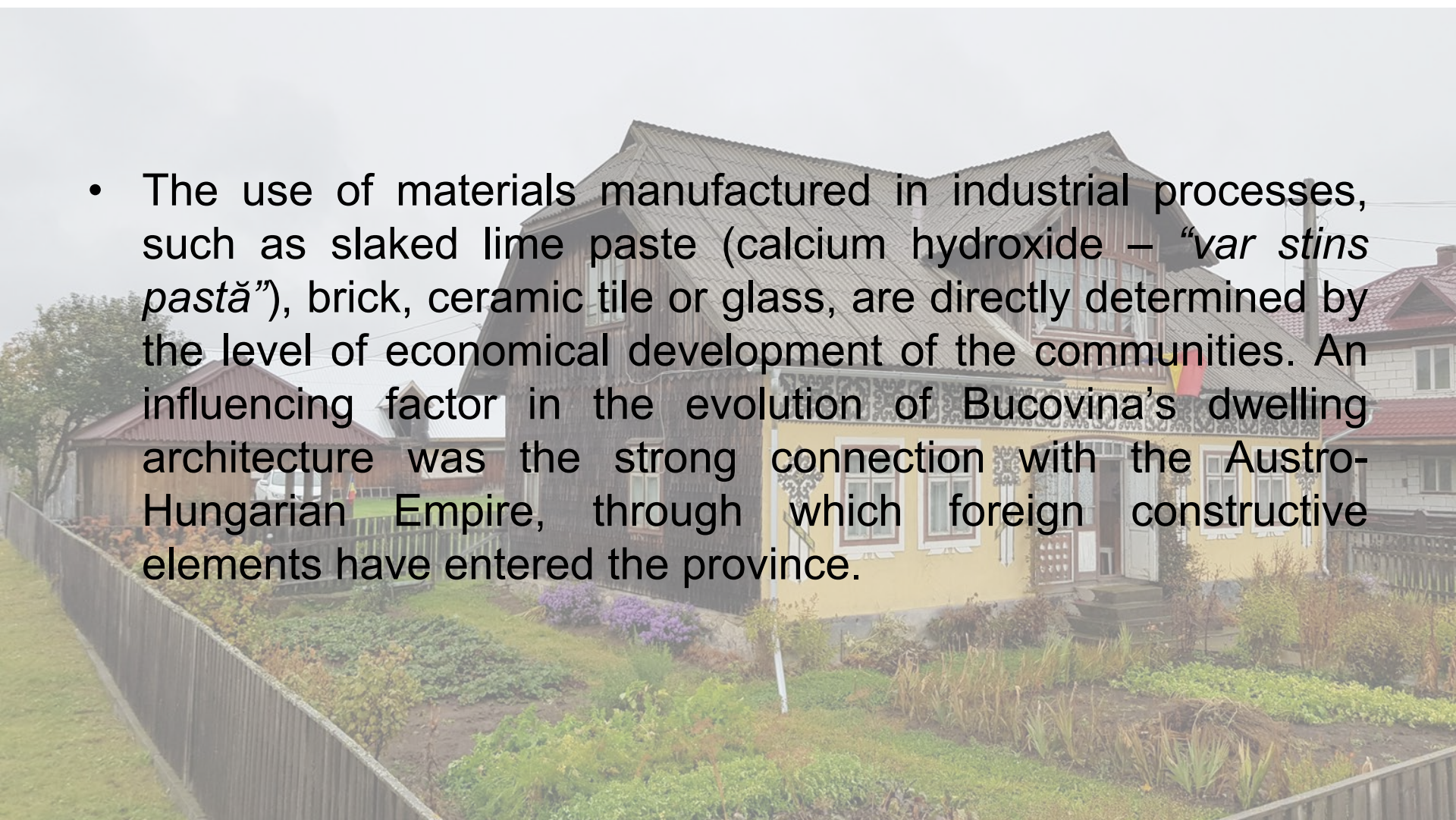
The predominant building materials are:

- Softwood - especially fir, used for walls and roofs;
- Stone - used for making bases and cellars;
- Clay - used for cob walls (“*paiantă*”) and plasters.
- Short and long shingles (“*draniță*”) are used for roofing (less often straws and reeds)

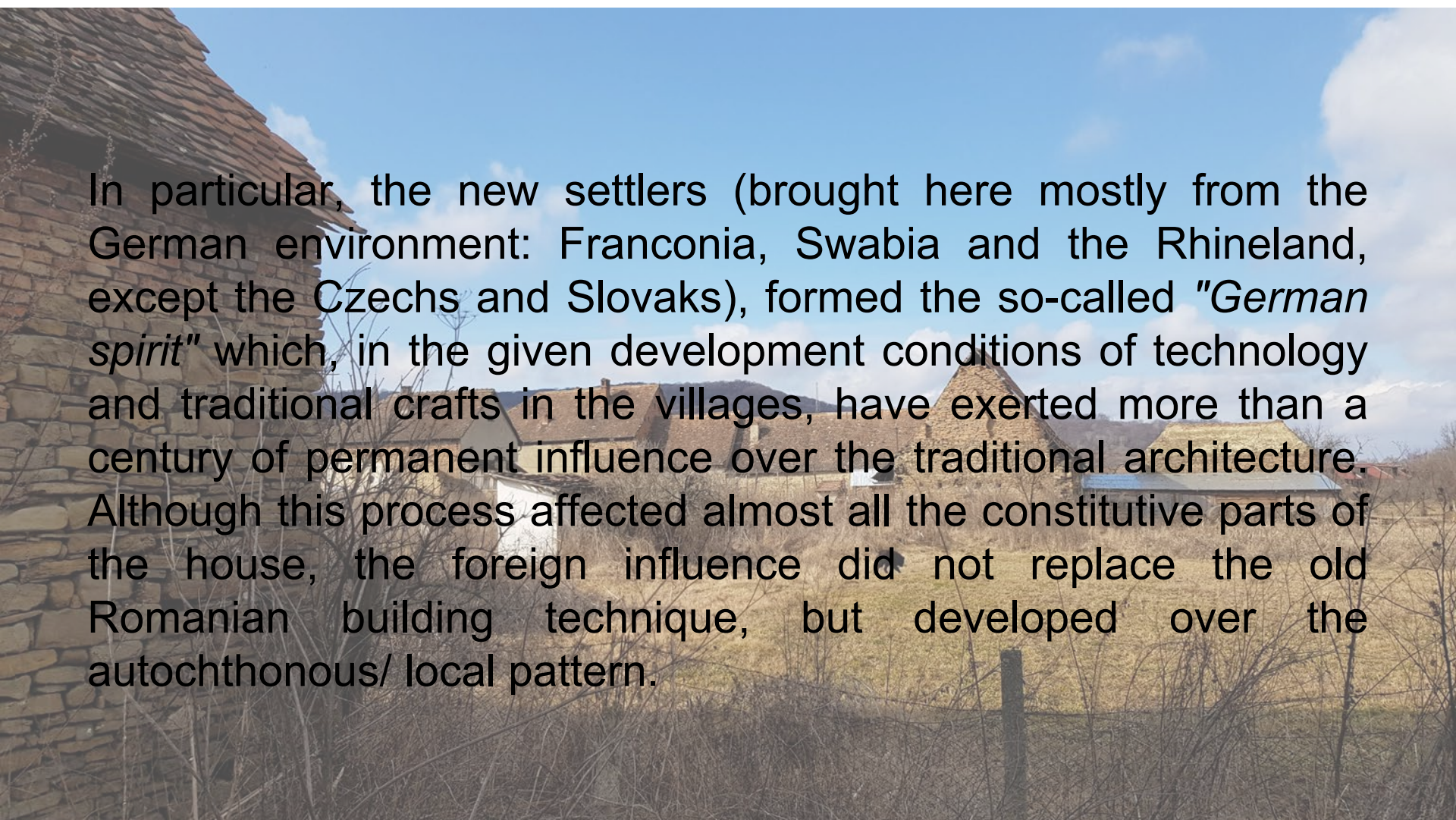
The economic evolution of the communities proceed to use bricks (for walls) and ceramic tiles (for roofing).



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- The use of materials manufactured in industrial processes, such as slaked lime paste (calcium hydroxide – “*var stins pastă*”), brick, ceramic tile or glass, are directly determined by the level of economical development of the communities. An influencing factor in the evolution of Bucovina’s dwelling architecture was the strong connection with the Austro-Hungarian Empire, through which foreign constructive elements have entered the province.
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- A photograph of a traditional wooden house with a yellow facade and a dark roof, surrounded by a garden and a fence. The house has a prominent gable roof and a small porch. The garden in the foreground is filled with various plants and flowers. A wooden fence runs along the left side of the property. The background shows other houses and trees under a clear sky.

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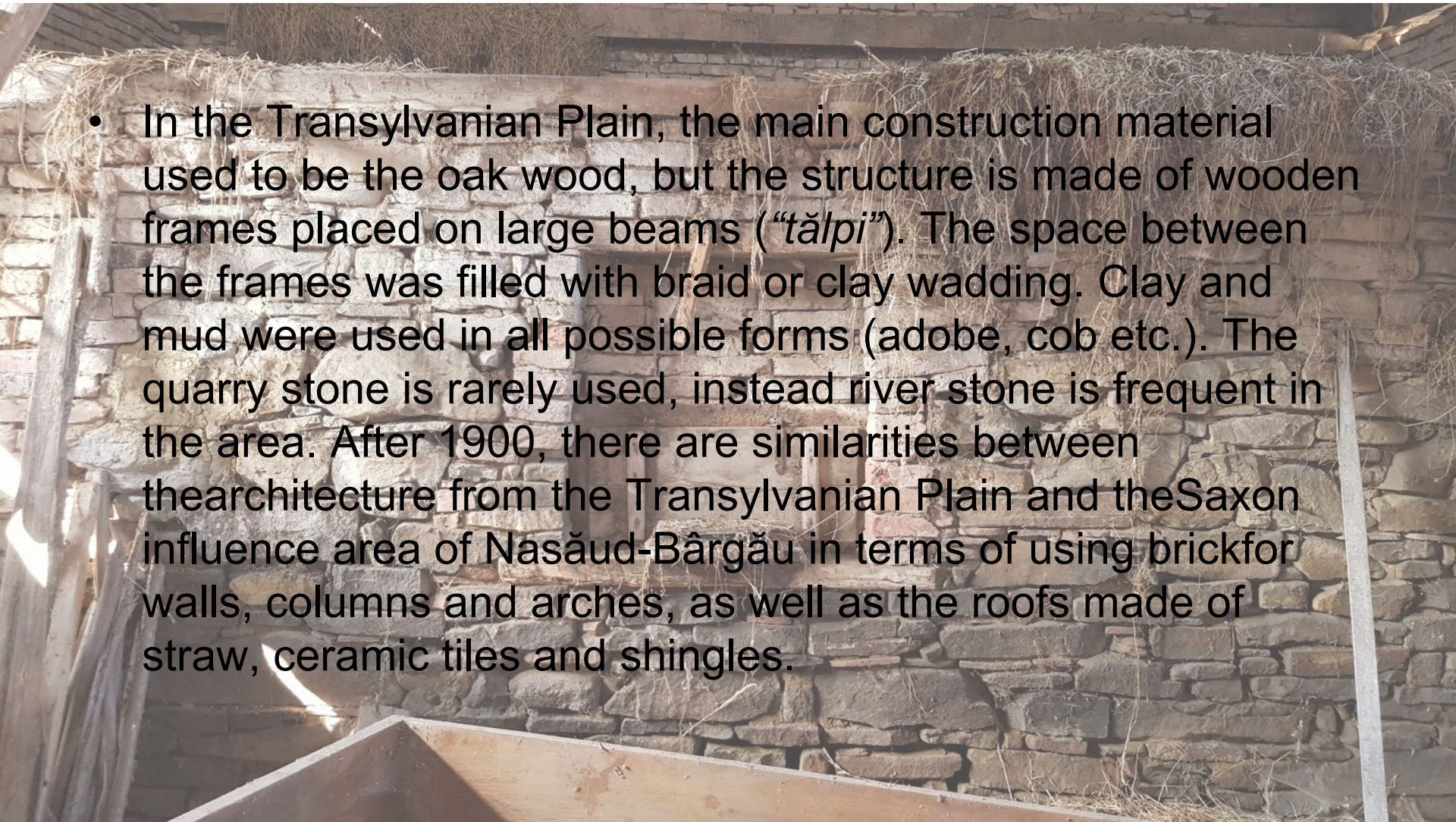
In particular, the new settlers (brought here mostly from the German environment: Franconia, Swabia and the Rhineland, except the Czechs and Slovaks), formed the so-called "*German spirit*" which, in the given development conditions of technology and traditional crafts in the villages, have exerted more than a century of permanent influence over the traditional architecture. Although this process affected almost all the constitutive parts of the house, the foreign influence did not replace the old Romanian building technique, but developed over the autochthonous/ local pattern.

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- In the past, throughout Moldova, to the east and the west of the Prut river, people built from materials considered ecological today: raw earth (“*ceamur*”) for houses, outbuildings and social constructions (schools, cultural center, inns), wood for places of worship, stone –rarely for houses and outbuildings and quite often for churches. For the construction of raw earth houses, a clay roll (“*valatuc*”) was used on a wood structure (“*furci*”), by beating the *ceamur* in successive layers. More recently, at the beginning of the 20th century, adobe was used. The oldest types of roofs, still stand the test of time especially in villages from Botoșani county, were the vegetal ones, made of cereal straw, reed and shingles (“*draniță / șiță / șindrilă*”).

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- In the Transylvanian Plain, the main construction material used to be the oak wood, but the structure is made of wooden frames placed on large beams (*“tălpi”*). The space between the frames was filled with braid or clay wadding. Clay and mud were used in all possible forms (adobe, cob etc.). The quarry stone is rarely used, instead river stone is frequent in the area. After 1900, there are similarities between the architecture from the Transylvanian Plain and the Saxon influence area of Nasăud-Bârgău in terms of using brick for walls, columns and arches, as well as the roofs made of straw, ceramic tiles and shingles.



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Nowadays, low quality modern materials and the effects of poorly understood modernization have a negative impact on the environment and the rural ambience; e.g:

- traditionally, interior and exterior plasters were made on a network of wooden slats using mortars based on sand and lime. These have been replaced with sand / cement based plasters and gypsum cardboard (used outdoors and indoors) that increase the rate of depreciation in the perishable traditional mortar substrates.

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- natural wood floors (floor boards, wooden parquet etc.) have been replaced with laminate flooring, a synthetic, non-ecological and vapor-impermeable material;
- exterior and interior finishes of walls and ceilings, based on natural lime, have been completely replaced, with synthetic materials such as washable or oil-based paints, losing an important source of health for residents; natural lime based finishes have a debactericidal and antifungic effect, preventing water accumulation inside the walls by regulating moisture.

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- thermal insulation for ceilings, attics, floors, initially made with traditional, ecological materials, have been replaced with thermally efficient synthetic materials or compounds that no longer have qualities of generating healthy living conditions. The use of polystyrene as a thermal insulator for wooden beam walls alters the durability of the construction.

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- The need for classification in presenting the main constituent elements of the traditional building systems leads us to the analyzing the houses on subassemblies: the roof (roof frame and covering), walls, foundations and socle, carpentry and opening. Proper repair of traditional houses must be carried out accurately, taking into account the fact it is imperative to use good quality materials that prove effective during the reconstruction process. Beyond the importance and cultural relevance of the traditional house, the compatibility of materials is a complex and thorny process that involves a lot of responsibility. We can say that there are no perfect recipes, but only a few general sketches ready to be adapted for each case.

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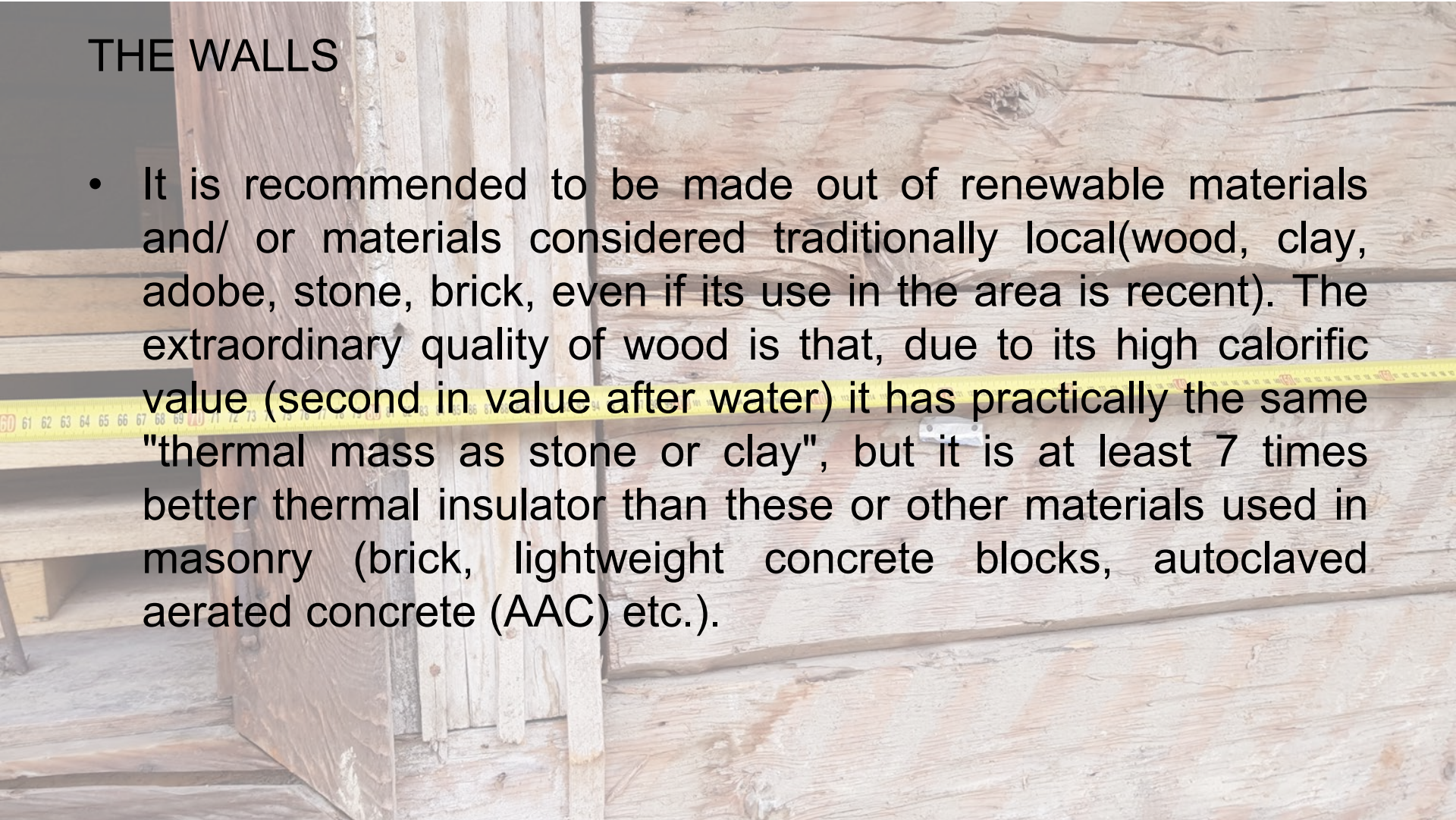
THE ROOF

- The frame will be repaired using exclusively wood, only using traditional local techniques and joints (or starting from local technologies), as much as possible, by involving local carpenters. By using renewable natural materials wherever possible, any negative effects on the construction will be virtually eliminated. Organic materials resulting from polymerization processes should not be used, as they change their qualities over time (strength, torsion, flow) due to environmental conditions (repeated freezing / thawing process, ultraviolet radiation, summer / winter temperature variations). However, it is possible to use other materials obtained by contemporary technological means: CLT, lamellar wood, cross-laminated wood

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THE WALLS

- It is recommended to be made out of renewable materials and/ or materials considered traditionally local (wood, clay, adobe, stone, brick, even if its use in the area is recent). The extraordinary quality of wood is that, due to its high calorific value (second in value after water) it has practically the same "thermal mass as stone or clay", but it is at least 7 times better thermal insulator than these or other materials used in masonry (brick, lightweight concrete blocks, autoclaved aerated concrete (AAC) etc.).



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CARPENTRY AND OPENINGS

- The traditional proportions between width and height of the doors and windows will be observed, especially on the main and street facades, in order to give a stylistic unity to the street front. It is recommended to alternate small openings of vernacular architecture with large, contemporary glazing, the size of a wall, for spaces that require proper lighting. It is recommended to use wood (raw or laminated) and metal to make the carpentry. The carpentry can be single, with insulating glass, or double, with single glazing. The components of the carpentry (frames, window splashes, transoms) shall be made of wood or metal (exceptionally, for a certain compliance with the fire resistance regulations, which can not be obtained by using wood).

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FOUNDATIONS

- Recommended materials are stone, cyclopean concrete, brick and concrete. The cellars and vaults will be made mainly of brick and/or stone, bound with lime/sand based mortar. For the stone socles, local materials will be used, with local technologies and labor, by activating the craftsmen from the area. Do not excessively use cement as a working material or as a base material for binder. Starting with the middle of the twentieth century, cement has been used as a binder for stone foundations, although it is not the best solution. Cement is a harder material than most rocks and considering water infiltration (the foundation is exposed on average to 40 freeze / thaw per year), the concrete will grind the surface of the rock with which it is in contact.

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Within this evolutionary process, a series of general principles were perpetuated, regarding the efficient capitalization of the local resources like construction materials, the adaptation of construction systems to the seismicity of the area and the plastic expression of the load-bearing structure. Therefore, traditional materials, have particularly proved important common characteristics, which make them clearly superior in terms of ecology and sustainability over the synthetic materials. Thus, the materials originating and forming in the natural environment are particularly resistant to the action of ultraviolet solar radiation that causes rapid degradation of any synthetic material. Also, given the fact reducing environmental pollution is a global concern, all these materials are proving to be more environmentally friendly than modern ones, and at the same time more sustainable.

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Thank you!