Restoration and preservation of the authentic traditional housing model. Case study - the peasant house in the Danube Delta area

B D Pericleanu¹, M Pericleanu¹* and A M Grămescu²

¹ Faculty of Civil Engineering, Ovidius University of Constanta, Romania
² Institute of Doctoral Studies, Ovidius University of Constanta, Romania

* dragoi.mihaela@gmail.com

Abstract. The paper develops a new concept, relatively unique in approaching the concept of rehabilitation of the peasant house at the beginning of the XXI century, namely the traditional architecture of the Danube Delta as a system of integrated research, preservation of cultural and historical values. As it is known, the Vernacular Heritage Charter, ratified in 1999 in Mexico, draws attention to the fact that vernacular architecture around the world is valuable and requires protection, positive attitude in preserving, preserving and transmitting technologies, materials, architecture combined with authentic elements can even unique. This valuable built fund is increasingly subject to the pressures generated by urbanization, globalization (a phenomenon that affects local specificity) and lack of information or interest. The vernacular architecture of the Delta area was executed empirically, within the community using local materials, techniques and traditional crafts is what the Austrian American architect Bernard Rudofsky called it, in the title of his 1964 book, "Architecture without architects". The heritage reflected in the built environment of the villages in the Delta belongs to a type of vernacular architecture, and, of course, shares the general characteristics of the genre: a close communion with the natural landscape and the society in which it was "born". If we talk about contemporary ideology in architecture, in the context of very present discourses on sustainable development and sustainability (in absolutely all areas). The paper presents two approaches; high-tech, which supports the use of modern materials and advanced technology in construction and the low-tech approach, which aims at methods and techniques with low impact on the environment. The authors detail the concept of restoration corresponding to traditional materials and technologies.

1. Introduction
When we talk about Dobrogea, we are referring to 3 main areas – North Dobrogea, Central Dobrogea and South Dobrogea [1-4]. In this studied area we highlighted the construction techniques and methods, the materials specific to vernacular architecture that has withstood over the years of modernity. Popular architecture is highlighted in [1] by professor Andreşoiu Bruno as "... more fragile, less versatile and less glorious", but no less significant, authentic and even unique.

In the history of Dobrogea, several periods can be distinguished regarding the evolution of the Dobrogean settlements, including the houses characterized by the plan structure and the materials used. We can refer to the following periods [5]: before 1878, period characterized by huts and houses with 1-2 rooms built of “paiantă”, wicker twigs, “ceamur” and covered with straw, reeds, awnings predominate. Rarely 3 room dwellings of adobe and tile roofs; the period between 1878 – 1950 ...
characterized by the houses with 3 rooms predominate and at the same time the disappearance of the huts as living houses is noticed; the period after 1950 – 2000 characterized by three-room houses also predominate, but there is the introduction of new construction materials alongside the traditional ones, a tendency to increase the living space with new rooms and well-defined functions and decorative elements on the façade and the current period characterized by houses that are built on a load-bearing brick structure, BCA and / or with a structure in reinforced concrete frames, to the detriment of traditional materials that were handy and more environmentally friendly.

From the point of view of traditional architecture, the household of the house in the Danube Delta is composed of the house itself and the economic constructions arranged either in alignment with the house or behind the house, but in this situation, we find in the continuation of the house. The porch house plays a key role in the architecture of the Danube Delta as in figure 1. The studied building is characteristic of the vernacular architecture not subjected to the pressures generated by urbanization, globalization (phenomenon that affects the local specificity) and the lack of information or interest. It is made empirically within the community and uses natural materials, local resources, techniques and traditional crafts (or, as the American architect of Austrian origin Bernard Rudofsky called it, in the title of his 1964 book, “Architecture without Architects: a brief introduction to architecture without pedigree”).

The paper presents two approaches; high-tech, which supports the use of modern materials and advanced technology in construction and the low-tech approach, which aims at methods and techniques with low impact on the environment. The authors detail the concept of restoration corresponding to traditional materials and technologies.

![Figure 1. Example of specific houses of the studied area.](image1.jpg)

As in most rural areas, the heritage reflected in the built environment of the villages in the Delta belongs to a type of vernacular architecture, and, of course, shares the general characteristics of the genre: a close communion with the natural landscape and society in which it was "born". The house is located close to the road, perpendicular to it, with the short side on the street, which has a narrow porch that is partially found also in the facade of the yard [5].

2. Typical peasant houses in Dobrogea
The study highlights the use of local materials: wood, twigs, reeds, rushes, earth. These are some of the materials used by popular architecture along with pantiles [1], tiles, bricks masonry, etc. During the 20th century, other materials were brought, such as the stone from the Măcinului mountains and the Casimicei plateau. In this case study, aspects related to physical condition, aspects relevant to the evaluation of the strength and safety of a construction with such a structure, as well as the establishment of restoration solutions were investigated.

In the imagines below (figures 2 and 3) you can see the degradation survey for the entire house.
Figure 2. Survey degradation - horizontal plane.

Figure 3. Survey degradation – house facades.
Most of the buildings do not have a foundation like in fact the one studied, where the structural walls are placed on a layer of sand. At other times, the houses were placed on a stone and sand platform over which was made a bed of beaten earth with a thickness of 1 - 1.5 m in which the pillars of the resistance structure were embedded, so that the building was located at a higher level than the ground natural. The function of the house is shaped by the existence of the porch, the living room, the dormitory room but also the guest room. The shape of the building is rectangular, with the placement of wagon-style rooms, usually with two entrances. Sometimes through successive extensions of the house they could get the L shape. The construction technique was made of forks and reeds glued to the ground. The forks were made of oak, which sewed together. Above ground they were tied with horizontal ties. Between the forks he placed on the outside a reed placed vertically and tied with wire on the inside of the walls, after which leashes were beaten and on the inside of the walls to fix the reed. The finish consists of clay plaster, later after their drying other finishes are applied.

Another technology for making houses in this area was “paianta” [6]. The “paianta” as a constructive solution consists in building a wooden structure - slats and balls with a diameter of 10 - 15 cm, after which it is filled inside with “ceamur” (clay mixed with straw). The adobe appears as an alternative to the “paianta”, making clay blocks with straw with dimensions of 35 - 40 cm long, 20 - 25 cm wide and 12 - 15 cm high. For adobe, clay must be cleaned of impurities. Thus, the “ceamur” [6] is poured into the formwork and left to dry for at least 30 days to make the adobe. The finishing of these constructions was done with clay and lime in which the "sineala" was added. Technologically, 3-4 rows of adobe sawing were made, after which a minimum of 1 day was left to dry the joints [7]. Perimetrically, the chips were placed on the side of the wall to achieve a greater wall thickness. At the studied building, two rows of adobe were found, placed so that the thickness of the wall is about 80 cm perimeter. The information on the specific construction details of the building highlights the following aspects:

- the building has identity cuts, a replica of compositions that combine Turkish tradition (“ceamur”) with Russian elements;
- the roof is made of reeds;
- the facade is painted in bright colors with blue or green of Slavic connotation with whitewashed exterior walls;
- the decorations on wooden pediments / eardrums are of Slavic origin;
- the presence of “iljanca” is of Slavic origin;
- composition of the structural material: clay with straw and organic material is of Turkish tradition that has gone from the structure of lumps on wooden skeleton or twig structure to blocks made of clay, Slavic procedure - the adobe that is not tied with wire similar to the area southern Europe, but is relatively free but in a technological weaving taken from the Asian craft.

A characteristic element of the local Lipovan house is the presence of a completely original heating system, “iljanca”. It is an earthen bed built next to the stove and which is heated due to an ingenious installation.

The volume, although simple in composition, is personalized by the space of the porch, delimited by thin painted wooden pillars, which surround the house on one or two sides. Instinctively, the craftsmen found unstudied proportions, but which satisfy the eye. Through the intermediate space of the porch, the transition from the outside to the inside is made, in a subtle and skillful way, this becoming an element of connection between the outside and the inside.

A reed cover is placed over the frame [8], which has two layers of reed: a long layer arranged as an asterial over which the second layer of medium-sized (colored) reed is applied. This layer has a special technology, it is uniform by beating from the bottom to the ridge. This layer will have a thickness of about 25 - 30 cm made by adding successive bundles. The roof ends at the ridge with a ridge protection arrangement also made of reed. The service life of such a roof system is about 20 years unlike pantiles or tiles that have more life service [1]. Regarding the construction elements the roof specific to the Delta is the roof with reed coverings, made in specific techniques (figure 4): German beaten method and Russian beaten method [8].
The architecture of the house attracts through the decoration of the house made of perforated boards. The most decorated parts are the pediments. The constructive system specific in the area for this type of houses is characterized horizontally by bi and tri cellular houses and vertically by one level or two / less common.

The models are specific to villages with Lipovan population and refer to Slavic myths as in figure 5, although today the inhabitants no longer make any connection with them. The sun's rays meet, the siren's tail.

In Romanian houses, the pediments are decorated with geometric, floral, zoomorphic figures.

The floor above the ground floor has a longitudinal beam on which the ridge beam unloads. On the rafters and the longitudinal central beam, unload transversal beams on which slats are beaten and a layer of reed about 40 cm thick is arranged as in figure 6.

“Ceamur” is placed over the reed and this whole system forms the garret/attic. Inside, the ceiling is plastered and whitewashed so that the median longitudinal beam remains visible, which in most cases is made of poplar wood and less often of fir.
Another construction element: the foundation. Most of the buildings do not have a foundation, like the one studied in fact, where the structural walls are placed on a layer of sand. At other times, the houses were placed on a stone and sand platform over which was made a bed of beaten earth with a thickness of 1 - 1.5 m in which the pillars of the resistance structure were embedded, so that the building was located at a higher level than the natural ground.

3. State of degradation and implementing restoration measures

Considering the presented aspects, the case study is the analysis of the technical condition of a construction for restoration with reference to: the structural conception of the building, the degree of degradation, but also the request made by the beneficiary to refurbish the building and introduce it in the tourist circuit, corroborated with the necessary rehabilitation and modernization works, intervention measures were proposed that aimed at reducing the seismic risk, ensuring the resistance and stability requirements characteristic of the function.

The establishment of construction vulnerabilities was analyzed together with:
- required level of performance;
- degree of impairment of the function;
- the real technological possibilities of the location but also of the building and the economic possibilities of the beneficiary.

In this case study, issues related to physical condition, issues relevant to the assessment of the strength and safety of a construction with such a structure, as well as the establishment of restoration solutions were investigated.

During the investigations on site made we could observe and analyze that:
- the heel wall facing north was affected by weather and the presence of stored snow and may not always be removed in time, rain and the lack of gluing / plastering at the base performed continuously annually - led to the weakening of the wall on the lower area with loss effect of its own stability as in figure 7, the yielding with the appearance of the thrusts at the transversal walls that cracked at the upper part, deforms in the area of the doorway, the yielding of the lower window truss in axis 6;
- vertical plane deformations of the axis wall A but slightly and B motivated by the high load of the snow-driven roof but also by the loss of the quality of the reed layer by impregnation with water, yielding, mold, etc.
- the degradation of the roofing led to the degradation of the wooden eaves, but also of the floor beams over the ground floor, which show obvious signs of exceeding the load-bearing capacity, especially the secondary ones;
• degradation of the carpentry due to the lack of ensuring its protection through painting;
• degradation at the base of the plasters with serious damage to the base of the structural walls, washing of the soil both in axis A but also in axis B. In axis A there were even displacements fact for which the restoration of this part considers the application of the anastylosis procedure;
• degradation of the turbocharged wall between axis 1 and axis 2 by local yielding and expulsion of the adobe due to the weight of the roof in the wet state;
• floor degradation and the presence of a strong musty smell.

Figure 7. State of degradation of the walls.

Figure 8. State of degradation of the North-facing wall.

North-facing wall - has deteriorated sharply especially at the base as shown in figure 8. The main data regarding the geometry of the structure from the local material took into account:
• the plan positioning of the structural walls and their dimensions, of the solid and hollow spatulas;
• vertical and horizontal deformability;
• positioning and dimensions in the plane and elevation of the gaps (doors, windows) and
• of low-thickness wall areas (niches);
• positioning in plan and elevation of the structural elements that generate thrusts by local yielding of the structural elements that led to deformability as well as of the elements that can partially take over the thrusts;
• positioning in the plan and dimensions of the main wooden floor elements;
• the weight of the elements structurally corroborated with the lack of foundations.

4. Conclusions
The recommended intervention strategy was a minimal variant that was based on improving the mechanical characteristics of the building, on dismantling and restoring degraded areas, deformed without changing the structural and functional composition of the building, while maintaining its authenticity, rarity and possibly even uniqueness.

The restoration was proposed to be done with original materials and technologies. The authors propose that when this is technically possible, in compliance with the essential requirements under Article 5 of Law 10, to try to restore with traditional materials and technologies but also using new materials compatible with the existing structure but also environmentally friendly. The degraded areas of masonry were dismantled and rebuilt by making masonry according to traditional recipes, by weaving blocks, treatments with waterproofing solutions for elements exposed to the weather, restoring the reed covering on the affected parts, treating the wooden elements of the frame and floor, treating carpentry and wood flooring.

We believe that we can discuss specific and traditional housing in the Dobrogea area as long as we consider the structural system, local materials used, assimilated architecture, including house volumes, materials implementation technologies and tools used specific to the area and fingerprints left by ethnic groups that are found or have existed on the territory of Dobrogea.

The paper develops a restoration concept among vernacular architecture restorers of peasant houses in the Danube Delta, a relatively new and unique concept in approaching the concept of peasant house rehabilitation at the beginning of the XXI century, namely the traditional architecture of the Danube Delta as a system of integrated research, of preserving cultural-historical values, of Romanian traditions with Slavic and Asian influences.

The paper presents a non-traditional intervention that can help to develop a restoration concept among vernacular architecture restorers of peasant houses in the Danube Delta, with principles to take into consideration as a system of integrated research of preserving traditional cultural-historical values.

References
[1] Andreşoiu B, Ioan A, Șerbescu A, Dobrogeanu P and Pârâu S 2012 Pantiles. Traditional houses from Dobrogea, Igloo p 199
[2] Order of Architects of Romania 2016 Architectural guide for framing in the local specifics of the rural environment. Danube Delta Area p 66 http://oar.archi/despre-oar/ghidurile-de-architectura-pentru-incadrarea-in-specificul-local-din-mediul-rural
[3] Order of Architects of Romania 2016 Architectural guide for framing in the local specifics of the rural environment. South Dobrogea area p 71 http://oar.archi/despre-oar/ghidurile-de-architectura-pentru-incadrarea-in-specificul-local-din-mediul-rural
[4] Order of Architects of Romania 2016 Architecture guide for framing in the local specifics of the rural environment. Central Dobrogea Area and Mâcin Mountains p 70, http://oar.archi/despre-oar/ghidurile-de-architectura-pentru-incadrarea-in-specificul-local-din-mediul-rural
[5] Popoiu P 2001 Habitat anthropology in Dobrogea: man - nature – culture Oscar Print Publishing House
[6] Pericleanu BD and Pericleanu M 2019 Contributions to the analysis of building’s durability made of local materials Ovidius University Annals, Construction series 21 p 121-126
[7] Minke G 2006 Building with Earth Springer Publishing House.
[8] Titov I and Chiselev A 2015 Traditional crafts in the Danube Delta. Research report