Adapting the Traditional House in Vojvodina to Contemporary Needs. The Porch as the Basic Element of Transformation

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Abstract

Traditional single-family houses account for a considerable part of the total building stock in Vojvodina. The importance of their transformation in the contemporary context is twofold. Primarily, the structure of the house should be transformed to fulfill functional requirements of modern life. At the same time, the transformation should improve the energy performances of the house, as one of the vital concerns.

The study topic was the traditional single-family house in Vojvodina. It is considered a unique architectural phenomenon that developed until the early XX century across the entire province, accounting for nearly 40% of the total building stock of Vojvodina today.

In the first part of the study, the traditional house in Vojvodina was analyzed to establish its main characteristics and the basic house types. The second step of the study considered possibilities for structural transformation in the context of energy efficiency.

The theoretical study shows that the house is flexible and that it could be adapted to meet contemporary needs and requirements. The process of transformation follows the elements of passive design that the house already has, emerging from the interaction between the house and its environment. The basic transformation element is the porch, in the aspect of both functionality and energy efficiency.

1. Introduction

Traditional single-family houses account for a considerable part of the total building stock in Vojvodina. The issue of their transformation is very important in the contemporary context. Traditional Vojvodina houses were built throughout the period between the second half of the eighteenth and the first half of the twentieth century; today, they constitute about 40% of the building stock in the northern Serbian province [1].

The large building stock comprising the traditional Vojvodina houses across the province, with all their types and subtypes, is in relatively poor condition. Although most of the houses are occupied, many of them are not properly maintained so they deteriorate. The inhabitants are motivated neither to save the architectural and cultural heritage nor to live in the countryside at all. The homeowners often resort to demolition, and build new homes without being aware of the quality of the traditional house and the opportunities it offers in terms of extending the living space as well as improving its energy performances.

The research topic discusses the potential for remodeling the houses to meet the modern requirements for functionality and the ensuing improvements in energy performance. As the building stock is large, the issue of rehabilitation and renovation of the houses has a significant potential at the national level. Besides, considering life cycle assessment of materials and buildings, it should be emphasized that the only right decision is to reconstruct the buildings.

2. The paper’s objective, research methods and research questions

The paper’s objective is to analyze possibilities of the traditional Vojvodina house transformation which
would improve functional as well as energy performances of the houses, and manage to maintain the authentic architectural appearance of the house street facade. This would be the contribution to the traditional house integration in contemporary flows. In the most general sense the research tends to strive in promoting the architectural heritage in Vojvodina as a cultural resource in the process of planning sustainable regional development. The research objective is also to give the answer to the general research question: what are the possibilities of traditional Vojvodina house transformations which would adjust the house to the contemporary needs?

The paper preceded the theoretical research of traditional Vojvodina houses, numerous historical analyses were conducted, also analyses of the archive documentation available in numerous institutions as well as in site analyses and collecting of photo documentation. The existing building stock has been examined and typological classifications of houses has been made. Numerous case studies were conducted to analyze the house characteristics, functional structure and building materials. Technical performances were analyzed as well. Afterwards the potentials for remodeling the houses to meet the modern requirements for functionality were discussed. Along with the functional transformation the improvements in house energy performance were analyzed.

3. The traditional Vojvodina house

The architecture of Vojvodina, with its numerous variants, is one of the most commonly encountered forms within the Pannonian geographic and cultural zone. The large territory, the long period of development, and the complex historical and political factors all led to a relative lack of uniformity in terms of the structure of the house and the building materials used. As a result, the numerous types and subtypes increased the diversity in the entire building stock of traditional architecture. The present study discusses the basic type of the three-part house, its features, its development and the historical circumstances in which it was created.

3.1. Vojvodina architecture in view of historical circumstances

Throughout the period from the eighteenth to the mid-twentieth centuries, Vojvodina was the territory that staged intense historical and political events, which left an important mark on every aspect of life, including architecture, and also have defined its primary characteristics [2]. In the eighteenth century, the Pannonian Plain came under the administration of the Austro-Hungarian Empire, an organized system with clearly defined rules governing all spheres of life; they regulated the development of the settlements and of the houses themselves. The Empire carried out an intensive planned settlement policy in the second half of the eighteenth century, resulting in the development of entire settlements. A great number of Vojvodina villages date back to this period. Urban rules were strictly defined: extremely wide street profiles (up to 40 meters), the strict geometric street pattern and buildings set along the street line in a strict rhythm. Such complex historical and political circumstances influenced the development of the house as well. As with urban rules in terms of house construction rules were also clearly defined and all the houses were built in accordance with them.

3.2. The traditional Vojvodina house: its origin and development

The question of the origin of the traditional Vojvodina house, which developed in this region for centuries, is
very complex and theoretically incongruous. Some authors believe that it appeared as a unique combination of German and local architectural traditions [3]. Historical data confirms that the local population lived in rammed earth single-space houses long before the arrival of the Germans in this area [4]. With the arrival of the Turkish administration the whole area was devastated and became sparsely populated during the sixteenth and seventeenth century. Redevelopment of the area began with the arrival of Austro-Hungarian administration at the beginning of the eighteenth century with colonization of the German population [5].

In the beginning, the colonist house developed parallelly with the indigenous architecture; however, due to the intensive admixture of influences, the later stages of the evolution are observed as a unified process that resulted in the development of the unique architecture of the region as the architecture of the concrete place, greatly influencing and being influenced by its surroundings [6].

The development of the house went on chronologically from the simple structure to the highly complex forms of the early XX century. It can be concluded that the structure and the size of the house as well as the ultimate selection of building materials were primarily dependent on the financial status of the farmer, that is, the colonist.

3.3. The traditional Vojvodina house: its basic features, spatial organisation, and building materials

The traditional Vojvodina house designed for occupancy is usually located in villages although it can be found in towns as well. This house belonged to a family whose primary economic activity was agriculture. In the complex process of its evolution, the house underwent transformations in terms of structure and building materials, resulting in the development of numerous types and subtypes.

The development of the three-part house is identified as the basic type in the diverse rural architecture of Vojvodina [7]. A unique blend of colonist and local building traditions [3], this house type prevails across the region and is recognized as the house along the furrow. It is characterized by a regular geometric shape and its three-part structure: the kitchen with the fireplace positioned between two adjacent rooms; the average width of the house is 5–6 m, and its length is 15–18 m (Figure 1).

Considering the form, it clearly demonstrates the characteristic standard elements: a steep pitched roof with the gable wall along the frontage line, two windows in the room, and the longitudinal porch to the yard façade. The house nearly always had a porch, positioned longitudinally along the side of the house, it was a place for daily activities from April to October [8]. It is always a single-storey house, even in its most complex forms, so that communication between the indoor spaces, porch and back yard was the most efficient for the agrarian daily activities.

Such architecture creates a unique, highly distinctive ambience of the settlement: the vast plains, villages stretching along the long straight main street, the strict geometric street pattern, and buildings set along the street line in a strict rhythm. Many settlements in Vojvodina, or some of its parts, are protected as a unique ambience entity and street facades must remain authentic, which makes an additional request in terms of the reconstruction of the houses.

At a later stage, the development of the basic house type gains complexity, at the same time conforming to the established order and geometric characteristics of the base type. The complexity of the structure is invariably achieved by simply adding another room, and the house always develops perpendicularly, so that the floor plan forms the letter L, or in the most complicated forms, the Cyrillic letter Я—the house athwart. The houses with more complex structures first appeared in Vojvodina in the second half of the eighteen century, built by both the local population and the colonists. The house structure developed gradually and sporadically, under the influence of a number of factors and in accordance with the actual needs and economic situation of the family that occupied it.

The building materials used in the loadbearing wall were invariably based on earth or its products. The evolution in the application of building materials was continuous, with the use of rammed earth at the beginning, through unbaked brick to baked brick in the final phases. For rammed earth walls, earth from the site was used as a building material, wall thickness was reaching up to 70cm. Along with the industry and railway development and also with strengthening the financial status of population bricks has started to use massively at the beginning of the twentieth century. Most of the houses from this period with the more complex structure were made of bricks. Brick walls were reaching a thickness of 40 to 50cm. [9] As for roofing, the cheapest and most accessible materials used in the earliest stages were reed and thatch, succeeded by shingle. With the advent
of baked clay brick, ceramic tile came into use as the roofing material [10].

3.4. The porch in the traditional Vojvodina house

The porch in the traditional Vojvodina house was open and roofed, positioned longitudinally along the side of the house perpendicular to the street line. Traditionally, it served as the contact zone between the open space of the yard and the enclosed space of the house, functioning as the entrance zone and potential communication between the rooms (Figures 1 and 2). The porch had wooden or brick columns; usually, it was fully open or, very rarely, enclosed with a low parapet wall. The floor was covered with rammed earth or paved in brick. This was the space where the occupants used to spend the summer months [10].

The form of the porch and its relation to the enclosed part of the house have changed over the centuries and evolved as a distinctive element of the traditional Vojvodina house. At the same time, the structure of the house has evolved, keeping up with the needs of the family who lives in it. Regardless of the complexity of the house structure and the period of building, the porch has developed as a typical element of the studied architecture. As a result, most houses today have this functional and decorative element, which the present study treated as the main element of integrating the traditional Vojvodina house into the contemporary trends of functionality and energy efficiency.

4. The transformation of the traditional Vojvodina house

The environment dominated by traditional architecture is not static; it is subject to change and adaptation to modern trends. As the question of the transformation of the house is very important in the modern context, the present study concentrated on its two key aspects. Firstly, it is necessary to transform the structure of the house to meet the functional requirements of modern life. In addition, the transformation should provide the improvement of the energy performance of the house, as one of the key aspects of modern development.

4.1. The transformation of the house and the aspect of functionality

For a successful transformation of traditional architecture, it is essential to understand the nature of the house, its functions, and its relationship with the environment. The fact that the traditional Vojvodina house was designed for the life of a family whose primary economic activity was agriculture resulted in the development of the house and its curtilage, which in functional terms were adjusted to agricultural activities. The house regularly developed as a single-storey structure to facilitate the functionality of the relationship between the house and its surroundings, and to improve the efficiency of agricultural work.

Nowadays, the occupants of such houses also are usually engaged in agriculture to a greater or lesser extent. The spacious lot is still well suited for agricultural activities. However, the problem of adaptation to the needs of modern life focuses on the house, with two distinct issues regarding the functional aspect of the traditional house in the modern context:

- lack of space; and,
- functional deficiencies: the residential zone (usually the kitchen) is accessed directly from the outside.

The analysis of potential adaptation of the houses in the region suggests the porch as a functional element suitable for the transformation and development of the functional organization of the house and its adaptation to the changing life conditions and lifestyles.

Enclosing the porch would enable better integration of functional units and further extensions to the living space to cater for the family’s needs. It would also remedy the key functional deficiency, as the residential zone would no longer be entered directly from outside. Enclosing the porch provides a unique common area that could serve as a communication area and also as area for daily activities.

First diagram discussed the volumetric scheme of the house transformation which indicates the possibility of the house extension (Figure 3). Lack of spaces is a very distinct problem in the process of adapting the house to the needs of modern life. Within the process of transformation it would be possible to keep the existing spatial organization of the house and upgrade its function. Additional rooms are added linearly in the yard part of the house, following the existing constructive logic and the logic of building materials (Figure 3). The day zone could be extended to integrate with the porch area (Figure 4). The rooms would remain spacious (sizing up to 6 meters). If the need arose, new windows could be opened to the yard or to the neighbor, with a high parapet. The interventions would not disturb the street appearance of the building.

Along with volumetric, the functional transformation of the house is analyzed as well. The diagram shows the functional organization of the floor plan and the options for its transformation (Figure 4). The presented options are proposed for the transformation of a three-part house but developed functional organization schemes also can be applied to multi-part structures, all of which have a porch. The following options were considered on the ground floor plan diagram (Figure 4):
Figure 3. Perspective view of the house transformation
0 – The traditional Vojvodina house (the three-part house with the porch)
I – Glazing the porch of the three-part house
II – Adding a room and a work/living area + glazing the porch of the three-part house
III – Adding a room in the yard section of the house and a work/living area + glazing the porch of the three-part house

Figure 4. Floor plans
I. / II. / III. Review of functional transformation of the house:
closing the porch of the existing house and possibilities of further extension

- intervention: glazing the porch of the three-part house;
- intervention: adding a room and a work/living area + glazing the porch of the three-part house; and
- intervention: adding a room in the yard section of the house and a work/living area + glazing the porch of the three-part house.

As presented the traditional three-part Vojvodina house with the porch gives numerous possibilities functional transformations. Basics principles are discussed, and those could be applied also on other house types. Further on, the opportunity for energy performance improvements would be analyzed.
4.2. The transformation of the house and the aspect of energy

The above options for a functional transformation of the traditional Vojvodina house would also provide the opportunity for significant improvements in its energy performance. It was demonstrated that enclosing the porch could provide such functional organization that would meet the needs of modern life. If this intervention involved the use of appropriate materials, the transformation would also have an important effect on energy efficiency.

As the porch is always positioned along the entire length of the house, its glazing would turn it into a greenhouse, thus enabling the effect of passive solar heating (Figure 5). In addition to significant energy gains, the common enclosed space formed in this way would become very comfortable for living.

Maximum energy gains would be achieved only with an advantageous orientation of the house. It would be necessary that the longitudinal side of the house was along the east-west axis, so that the longitudinal side faced south or southeast [11]. In the traditional Vojvodina house, there would be several possible orientations. Due to the configuration of the porch, and the fact that there would be glazing surfaces on three sides, most houses would have, at least partially, southern orientation of the glazed section of the porch. The proposed model of the transformation would not have a significant effect only in case the longitudinal side of the porch faced north; however, even then the greenhouse would function as an insulated buffer zone. Therefore, if the house was positioned so that the porch faced south (up to 45° dip to the west or east), glazing the porch would achieve the effect of passive solar heating of the house.

During the winter, when the sun shines at a low angle of incidence, sunrays penetrate directly through the glass and heat the interior space. The effect is greater if the thermal mass of the wall or floor further absorbs the heat during the day, as is the case with the traditional Vojvodina house. The massive walls are built of rammed earth or brick (Figure 6) while the porch floor is almost invariably paved in brick (Figure 7). At night, when the air temperature falls, the heated surface emits heat and thus contributes to the comfort of the interior space by maintaining its temperature. This effect could be enhanced by the methods commonly used in modern greenhouses, such as applying the elements of the Trombe wall, or improving heat accumulation with phase change materials.

In the summer, the sun is high in the sky for most of the day so the south side is not directly exposed to sunrays (Figure 5). The pitched roof of the house overhangs the porch by 30 to 50 cm, preventing direct penetration of sunlight in summer, when the sun is high. It would be advisable to ensure adequate protection on the glazed surfaces of the porch to protect the areas exposed to high summer sun from overheating.

So far, several recent studies have shown that the traditional builders sought to implement measures that would improve the energy performance of the house;
these were not mere technical applications but they were derived from the interaction between the house, its environment and the lifestyle of its prospective inhabitants. The massive earthen or brick walls (with thickness up to 60 cm), the ventilated reed roofing, and the double frame windows are just some of the elements that have always characterized the house in farmers’ experiences as preserving freshness in the summer and heat in the winter [12]. In this regard, it should be noted that the house has great potential and that the proposed transformation method is an energy efficiency upgrade. Additionally, further modern methods could be used to enhance building energy performance, such as improving the heating system, heating domestic hot water, or replacing inadequate windows and doors; however, these are not the subject of this study.

5. Conclusion

The theoretical study shows that the house is flexible and that it could be adapted to meet contemporary needs and requirements. The basic transformation element is the porch, in the aspect of both functionality and energy efficiency.

The suggestions for the potential functional transformation of the traditional Vojvodina house were mostly concerned with extending the living space, which could be done by adding rooms to the existing building, and their functional integration with the porch area. At the same time, the functional transformation would be accompanied by the improvement in energy performance that could be achieved with adequate enclosing of the porch, and the resulting passive solar gains.

The research results could be elaborated in the next step of the further researches in order to make a book of references-guide which would cover all the transformation possibilities, and provide general directions for the house functional and energy upgrade, all with the objective to stimulate preservation of the existing building stock.

Considering the possibilities that would transform the traditional Vojvodina house to satisfy the needs of modern life and that would contribute to its improved energy efficiency, the architectural heritage of traditional architecture in Vojvodina becomes an important resource. Thus, the houses transformed to adjust to the development of agriculture, ecological agriculture and rural tourism can become an important impetus to the process of planning for sustainable regional development.
References


The paper is an extract from a research with the title: Energy Performances of The Traditional House in Vojvodina. Research is in progress with the in site measurements and the final result would be the PhD thesis.