

Transformative Approach to Combat Climate Change through Eco-Housing in Bosnia and Herzegovina and Western Balkan region

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Report on 1st workshop in Bosnia and Herzegovina
held on 8 – 12 April 2024



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Cover photo: “Hlinár” Stano Prorok



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Photo source: Pixabay

Background

Construction industry and households have a considerable effect on climate change and pollution. This problem strongly appears in Bosnia and Herzegovina where air pollution is at critical stage. According to the recent report published by the World Green Building Council, buildings and construction sector are currently responsible for 39% of global energy related carbon emissions. The current conventional construction approach, methods and technologies ignore the significant environmental impact of high embodied energy of the building materials, have a poor thermal performance and result in high operational household energy consumption, which contributes to the greenhouse gas emissions and air pollution.

Low-emission natural building materials like straw and clay are abundant and locally available almost everywhere, used in construction they do not generate waste, hence, have a very low ecological footprint. The passive standard method is known for about thirty years. So, the knowledge and the materials for building eco-houses are available, they just have to be used more and good practices transferred to other regions.



Photo source: project website

In West Europe thousands of houses are built of straw, also apartment buildings or schools. In V4 countries there are hundreds of family eco-houses built by enthusiasts, supported by civic associations, which educate both the public and the craftsmen. However, expertise and experience are limited in Bosnia and Herzegovina, and this obstacle is directly addressed through this project supported by the International Visegrad Fund.

The project aims to build practical skills of craftsmen and public awareness on low-emission natural materials and passive standard based on exchange of experience, initiation and strengthening of partnerships in V4 and West Balkan for sustainable impact to local communities in Bosnia and Herzegovina. Czechia, Hungary, Poland and Slovakia have developed own experience in nature-based construction. Through this project the knowledge and skills existing in V4 countries are gathered and made available for widespread usage in Bosnia and Herzegovina.

For any further information, please visit the project website:

<https://sccd-sk.org/projekty/transformational-approach-to-combat-climate-change-through-eco-housing-in-bosnia-and-herzegovina-and-western-balkan-region/>

Introduction

The first project workshop was organized on 8-12 April 2024 in Laktaši, Bosnia and Herzegovina at the place of Center for Economic and Rural Development – CERD, the project partner from Bosnia and Herzegovina. The 2-days workshop with 2 Slovak and 1 Polish trainers focused on the use of low-carbon natural building materials, mainly straw and clay. Based on experience from Slovakia and Poland, the specific resources and opportunities in the region of Laktaši were explored. A survey on local natural building materials, their sources and quality, was done in close cooperation with the local experts and stakeholders.

The potential and requirements were assessed for the use of the local natural building materials for eco-building in general and specifically for the pilot construction of a tiny house for CERD in Laktaši. The tiny house concept is used as an example of low-impact size house with low carbon natural building materials and combination of energy saving passive measures like passive house windows and inner clay surfaces. Building of the first tiny house on the eco-farm of the BiH partner will start on the following 2 project workshops in Bosnia and Herzegovina, to be held in autumn 2024 and spring 2025.

This report presents the results of the assessment and recommendations for further trainings and workshops in Bosnia and Herzegovina and for the design of the tiny house for CERD.



Pic.1. Photos from workshop in CERD, CERD

Using CLAY as construction material for the tiny house



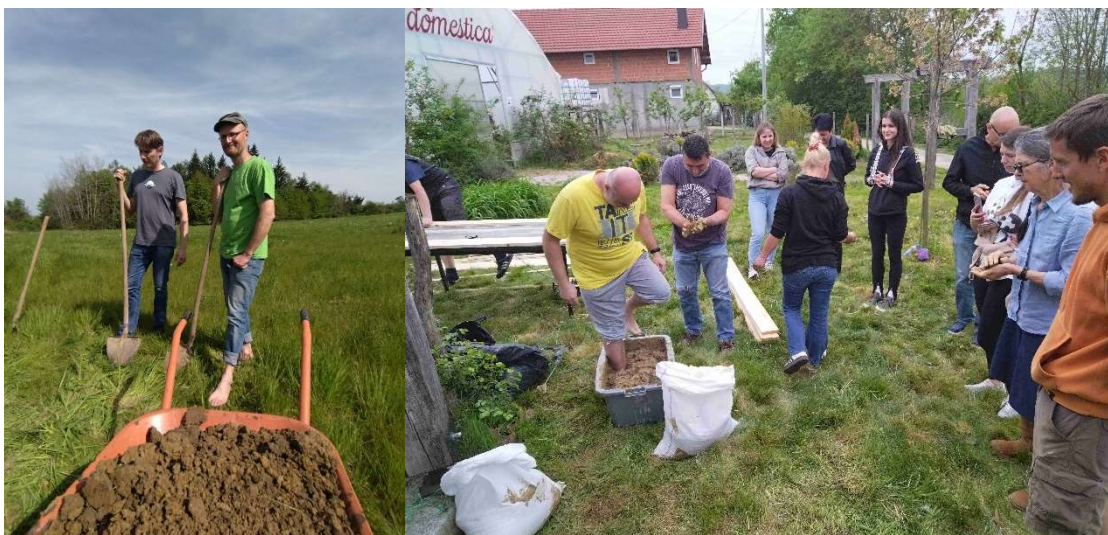
Pic.2: Examining the clay quality on the spot, CERD



We made a probe into the surface of the terrain for an indicative determination of the composition of the soil in the ground in order to evaluate the suitability of the local soil for use for construction purposes. After the removal of the plant cover with a root system consisting of field grasses and herbs, a layer of 20-30 cm of topsoil followed (which is mostly not suitable for use in construction due to the low content of the clay component and the high content of the organic component consisting of plant remains and animal shells). Below this layer was soil with a higher proportion of clay. We first found it by the distinctly different color. The topsoil was dark brown to black, the clay layer light brown to yellow brown.

Subsequently, we did some field tests for a closer evaluation of the proportion of clay, dust and sand in this soil. The tests consisted of observing the stickiness of the soil in the raw state (measure of plasticity and cohesion), in the wet state (test of washing the soil from the hands), sensory discrimination of small fractions between the fingers, smell test. We have evaluated the soil as suitable for use for construction purposes, with the fact that due to the relatively high content of the clay component, it will be necessary to add fillers or reinforcements (sand, gravel, fibers) to the mixture according to the specific use of the mixture, whether for plasters, or earthen floors or other clay elements in construction.

For construction, it will be necessary to secure a place where this soil can be obtained in larger quantities. It can be excavation from foundations or landscaping, or excavation for a pond.



Pic.3: Preparing clay for use, "Hlinár" Stano Prorok

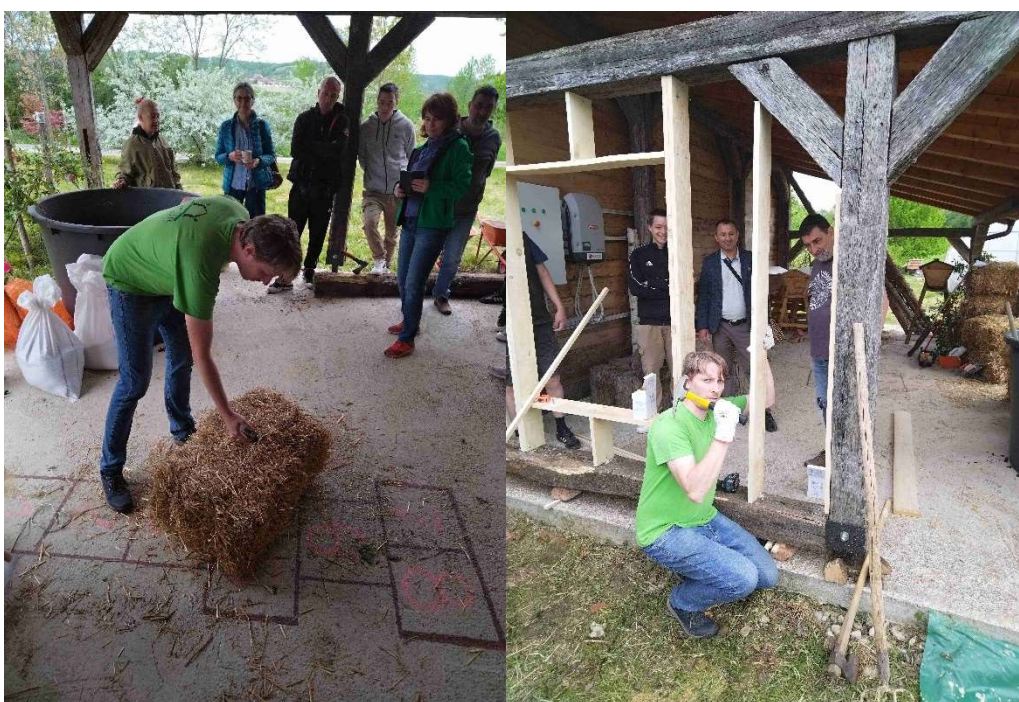
Using STRAW as construction material for the tiny house

During the first visit to the premises of CERD in Laktaši, Miodrag Matavulj, the director of CERD explained the history of the place and how they renovated the old school. We explored the whole property and checked the possibilities to locate the tiny house (terrain, cardinal points, access to infrastructure etc.). We checked the available strawbales, but they were old and the quality was bad. We weighted one bale and its density was around 60 kg/m³, which is not sufficient for construction (at least 80 kg/m³ is needed). Therefore, we had to change the original plan to build with bales and to adapt the use of different techniques, which can be presented on the workshop to the participants. We decided to fill one space between posts in existing shed built from old wood. The idea, the technique and the need for material and tools was discussed and agreed. It was also decided to demonstrate the installation of a window. We measured the existing place for the future wall with the window, then set the width of the wall according to the material available locally.

Foundation for wall was made of local old chestnut-wood beam (left from the renovation of the school's roof) laid on 4 old bricks for ventilation and connected to construction of the shed. Wooden planks as posts were cut and installed. First, we created the opening for the window and then divided the walls to 2 parts, where loose straw was filled by hand (with workshop participants). Each cca. 10 cm we put a bar (2x2cm) from both sides of new construction. The bars hold the straw at place and create good surface for future clay plaster at the same time. That way participants continued to the top of the wall. Afterwards, the new wall was plastered from both sides. We managed to finish half of the wall in one day.



Pic.4. Old chestnut-wood beams, "Hlinár" Stano Prorok



In general, straw is of good quality and available in sufficient quantity. A key factor for strawbalebuilding is the good density, depending on good presses / operators who can press the right quality of bales.

Pic.5. Preparing for the workshop, "Hlinár" Stano Prorok



Pic.6. Participants of the workshop building the strawbale wall, "Hlinár" Stano Prorok



Pic.7. The new strawbale wall with clay plaster, "Hlinár" Stano Prorok

Recommendations for the tiny house design and construction

For the design of the tiny house, concrete column foundation is proposed. As there are no solid rocks in the area, this is the easiest possible solution. For the wooden construction it is proposed to use the old chestnut-wood that is available on the property, using as minimum wood as possible. Strawbales will be used as infill between wooden posts by CUT technique. That way the requested straw density can be secured, as not enough dense bales are available. The outside wall will be plastered with lime plaster, the inside wall with clay plaster from the property. For the roof the recycled tiles can be used, which are also available from old school renovation.

For the next workshop in autumn 2024, it is recommended to build the foundation and the raw wooden construction with roof. Also, it is needed to secure enough strawbales. During the workshop the strawbales with small wooden construction will be filled in the walls, with lime plaster on outside walls. That way the straw construction will be secured from elements for the autumn and winter season and the interior can be finished later.



Pic.8: Illustrative photo of 1 tiny house, Source: NGO ArTUR

About the authors



HLINÁR Stanó Prorok

He is a craftsman who is primarily engaged in working with clay as a building material in all its forms since 2013. He leads workshops on construction sites primary with local materials for laymen and professionals. Lecturer of courses Clay as a building material (ECVET) at NGO ArTUR (association on sustainable architecture). He works on development, production and sale of materials for natural construction, especially clay.

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Moritz Reichert

He is a speaker, an innovator and an entrepreneur with broad and profound knowledge in natural buildings based on wood and straw, with expertise in commercialization of serial production of straw building elements. Founder and owner of Lorenz GmbH. Founder of the Polish construction company “Dobry Dom” specializing in historical renovation and natural construction based in Stankowice.

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