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SNAP+: Photogrammetry in Heritage and Adult Learning

Digital Handbook and E-learning Platform on Heritage Management for students of architecture and heritage management and adult learners

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SNAP+: Preserving the Past, Training for the Future - Photogrammetry in Heritage and Adult Learning

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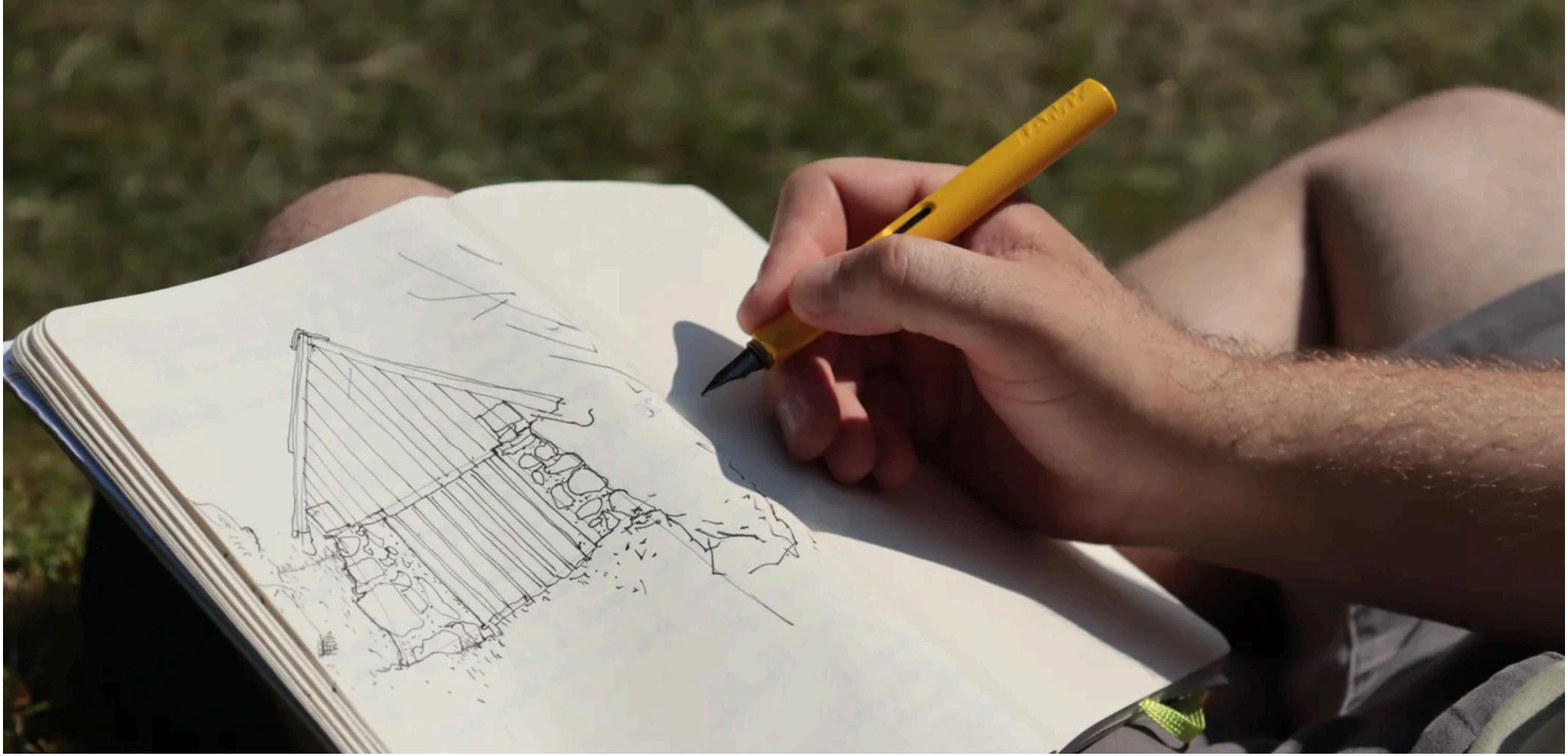
ABSTRACT

This article presents the SNAP+ project (Photogrammetry Aided Surveying in Heritage Management), a KA220-ADU Cooperation Partnership in Adult Education co-funded by the Erasmus+ programme. The project responded to a clear need identified at the European level: the lack of comprehensive, accessible, and high-quality didactic materials on photogrammetry and its wide application in architectural practice and heritage management. Special emphasis was placed on creating digital, illustrated, animated, interactive, and multilingual content tailored for adult learners. The main goal of SNAP+ is to deliver robust online learning resources in photogrammetry, using digital and interactive content to teach best practices in surveying and the effective use of captured data. The project implemented four field surveys in rural or disadvantaged regions across Europe (Portugal, Hungary, Romania, and Slovenia), collecting raw data later transformed into multiple representational products, including interactive 3D models, spherical panoramas, 2D architectural drawings, and BIM models. These outcomes form the core content of a comprehensive Digital Educational Handbook, the project's main learning tool. In addition, an online Educational Platform was developed to host all project results, including interactive quizzes for self-assessment and knowledge reinforcement. SNAP+ enhances the availability of quality learning opportunities for students of architecture and heritage management and adult learners, promoting digital transformation, and supporting pathways for professional reskilling. By bridging technology and heritage, the project helps popularize photogrammetry not only as a documentation tool but also as a viable profession within architecture and heritage fields.

Keywords: Photogrammetry, Heritage Management, Adult Education, Digital Learning, Vernacular Architecture, Erasmus+.



1 Introduction

Europe's architectural heritage, particularly vernacular architecture and smaller historical monuments, faces growing challenges in preservation and documentation. Accurate documentation is essential both for conservation purposes and for effective heritage management. Traditional surveying technologies are often time-consuming and expensive. In this context, photogrammetry has emerged as a highly competitive alternative, offering efficient methods for collecting spatial data and creating realistic representations. However, the SNAP+ project partnership identified a significant gap at the European level: the lack of comprehensive teaching material on photogrammetry and its wide application in architectural practice and heritage management. There was a clear need for educational material for adults that was digital, online, illustrated, animated, interactive and multilingual. To respond to this need, the 'Photogrammetry Aided Surveying in Heritage Management' project, known as SNAP+, was conceived under Action KA220-ADU (Cooperation partnerships in adult education) of the Erasmus+ programme.

The main aim of SNAP+ was to fill this gap by providing high-quality online learning materials on photogrammetry. These materials were designed to be digital, with illustrated content and interactive features, teaching best practice methods in photogrammetry and the effective use of the raw data collected. The survey data, obtained through photogrammetric surveys of selected buildings, are used to illustrate the Digital Manual and to promote the benefits of photogrammetry and the learning materials themselves. The versatility of the outputs processed from the raw data, which range from spherical panoramas and interactive 3D models to 2D architectural drawings and BIM models, demonstrates the wide applicability of photogrammetry.

The project was aligned with the sectoral and horizontal priorities of the Erasmus+ programme. The most relevant sectoral priority was improving the availability of high-quality learning opportunities for adults (ADU). Other relevant priorities included addressing digital transformation by developing digital readiness, resilience and capacity, and creating pathways for upskilling, improving accessibility and increasing participation in adult education. The choice of these priorities and topics remained consistent with the original proposal. SNAP+ sought to be innovative and complementary to other projects. Photogrammetry itself is an innovative subject, given the rapid technological evolution in the area, requiring up-to-date learning materials. The project provided an innovative online Educational Platform with digital, illustrative and interactive solutions, such as interactive spherical panoramas, interactive 3D models, an interactive Digital Manual with responsive design and illustrations, and interactive quizzes. The approach aimed to leverage innovative technical solutions to explain a cutting-edge technological practice, supporting the authentic virtual and digital preservation of heritage monuments at risk. In terms of complementarity, the project drew on the partners' previous experience in activities related to heritage, vernacular architecture, photogrammetry, and the development of digital educational materials. This article details the activities and results of the SNAP+ project and discusses the potential impacts and contributions.

2 Methods

The project partnership consisted of five participating organisations: Portucalense University (Portugal), a higher education institution, acted as the beneficiary and coordinating organisation. The other organisations, classified as non-beneficiaries, included: Institut Vernakularne Arhitekture (Slovenia), a non-governmental organisation/association; Tektum (Romania), a small and medium-sized enterprise; EK Association (Hungary), a non-governmental organisation/association; and Aleron IT Solutions (Hungary), a small and medium-sized enterprise. All partner organisations were actively involved from the start of the project on 1 September 2022 until the completion date on 28 February 2025.

The project was structured into six work packages that covered everything from management to interactive educational results - WP1 (Project Management); WP2 (Events and Meetings), WP3 (Surveys and 3D Representation); WP4 (Educational Platform & Home Page); WP5 (Digital Educational Manual) and WP6 (Educational Quizzes).

The associated partners were crucial in providing a direct link with the target group (adult learners, young adults), offering advice and reviews on the educational content and opening up possibilities for future courses based on the materials. Their participation helped to apply the right strategy concerning the educational content, through feedback gathered via questionnaires and testing of the materials. Members of the target group were directly involved in the realisation of the photogrammetric survey fields.

The project's time management was ensured through a Timeline Plan, which, with a few adjustments, made it possible to achieve the initial objectives. Communication between partners used various channels, including emails, documents shared online, social media/chat, video calls and face-to-face meetings. The quality of the results and activities was monitored periodically to ensure continuous improvement. The SNAP+ project achieved all its original objectives and produced a number of concrete results. All of the outputs are outlined in the topic.

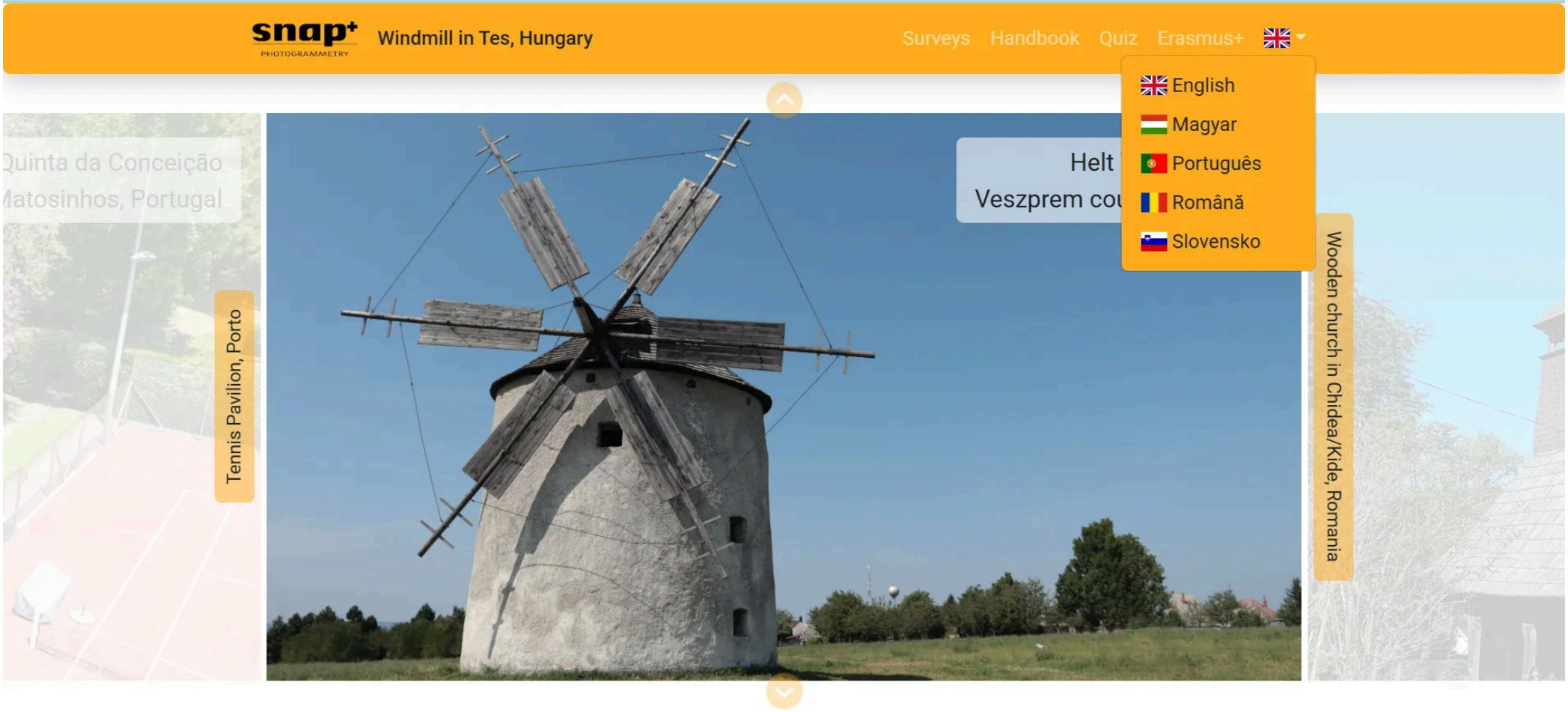
3 Results / Outputs

The project introduced advanced digital pedagogical practices based on emerging technologies such as 3D visualisation and responsive platforms. Digital access has made it possible to reach marginalised groups, offering training with occupational potential.

3.1 The educational platform – the project's homepage

The snap-plus.eu platform centralises all the products, including the educational handbook, videos and graphical representations of the surveys, highlights include intellectual products *Photure*, including 3D models, and interactive panoramas and quizzes aligned with the contents of the manual.

The online Educational Platform, by hosting all the results in an organised and accessible way (without the need for credentials), represents a useful and replicable approach to the digital realisation of learning content. The possibility of exploring the survey results in a structured grid, together with the integration of the Digital Manual and quizzes, creates a cohesive and interactive learning experience. Making the materials available in 5 languages significantly increases their reach and accessibility at European level.



3.2 The Educational Handbook: *Photure*

The manual reaffirms the main objectives of the SNAP+ project: to produce accessible digital educational materials on photogrammetry, with application to heritage documentation, aimed at adult audiences in disadvantaged regions. The Manual (WP5), which is integrated into the educational platform, teaches photogrammetry methodologies applied to the survey of vernacular monuments and smaller buildings. Its content is largely based on examples of best practice recorded through the 4 surveys carried out in the various countries of the consortium.

It subdivided into different sections, starting with **Fundamentals of Photogrammetry**. This chapter offers an in-depth introduction to the definition, history and technical principles of photogrammetry, such as triangulation, point clouds, mesh models and orthophotomaps. The narrative combines technological developments and cultural implications.

The following section deals with the **General Approach: Theory of Contemporary Practice**, with an approach to Field Work and in the studio. Field Work presents a practical orientation component on survey planning, choice of equipment (cameras, drones, calibration targets), lighting and photographic capture. In the Studio (Data Processing) details the use of Metashape software to generate dense point clouds, textured 3D models and orthophotos. It also explains how to export the data to CAD/BIM models and renderings.

Subsequently, the section **Case Studies** presents the four documented monuments: the Tennis Pavilion (Portugal), the Windmill (Hungary), the Wooden Church (Romania) and the Hydraulic Sawmill (Slovenia). Each case is accompanied by a historical and technical description and v isual results.

Finally, a **Comparative Analysis** is developed regarding the case studies according to criteria such as the type of building, the complexity of the survey, the results obtained, and the challenges faced. On **General Considerations**, it highlights the potential of photogrammetry as an educational and professional tool, emphasising its

role in heritage conservation and the development of useful and accessible technical skills. It also includes an extensive list of bibliographical references, reinforcing the scientific basis of the content.

4 Discussion

The SNAP+ project takes an effective and innovative approach to responding to the need for high-quality learning materials on photogrammetry in the field of architecture and heritage management. The integration of practical surveys on real sites as 'Case Studies' in the Educational Manual was a best-practice methodology for developing educational content. By recording the process of the surveys and the elaboration of the data, the project not only provided illustrations for the Manual, but also showed the interactive and representative products achievable through learning.

The impact of the project is expected to manifest itself on several levels. At local and regional level, the dissemination activities and multiplier events have succeeded in attracting people from local communities and increasing interest in photogrammetry and the preservation of architectural and cultural heritage. At national and European level, the project is expected to contribute to raising awareness and support for photogrammetric surveys in heritage management. By unifying topics and structures of digital educational materials, SNAP+ can be seen as a step towards a common European curriculum in the field.

The impact on partners has also been positive. Institutions linked to architecture and heritage can now incorporate the practices taught in the materials into their daily work. The success of the project encourages further co-operation between the partners for future developments and projects. For adult learners and trainers, the materials have proved extremely useful, serving as essential tools for initial and continued learning in photogrammetry. In the long term, it is hoped that the project will help popularise photogrammetry as a viable profession that can provide lifelong occupations, especially for students in the field and people with fewer opportunities.

The project also addressed retraining and social inclusion. By providing easily accessible learning materials aimed at adults and young adults, the project offers a route to acquiring useful knowledge and skills for a new profession or to complement their current practices. The participation of adult learners in the survey camps, facilitated by the associated partners, demonstrates the project's practical and inclusive approach. The certificates issued to these participants recognise their learning and contribution. Although the dissemination potential has not yet been fully exploited, with additional publications planned, the results of the dissemination activities have been assessed as satisfactory (7/10).

The sustainability of the project's results after the end of EU funding has been planned. Activities include the maintenance of the website and educational platform, maintaining hosting and domain registrations. The Digital Handbook will be kept open for future editions if necessary. There are plans to continually extend the list of spherical panoramas with new surveys across Europe. The partnership intends to build new collaborations with other educational institutions to integrate the materials into their own training programmes. Social media will be kept active with updates, and marketing campaigns will be carried out to promote the results, especially to adult education institutions, vocational training and universities. The consortium plans to keep the educational platform online indefinitely.

5 Conclusion

The SNAP+ project thus aims to provide high-quality online learning materials on photogrammetry applied to architecture and heritage management. By creating a comprehensive Digital Educational Manual, supported by practical and interactive survey results (spherical panoramas, 3D models) and complemented by self-assessment questionnaires, the project offers a valuable resource for adult learners and professionals in the field.

The project achieved its original objectives in the sense of contributing to the priorities of the Erasmus+ programme. The innovative approach, which combines theory with practical case studies based on real surveys and presents the content in a digital, interactive and multilingual way, makes the materials accessible and appealing. Overcoming time management challenges at the start of the project demonstrates the partnership's ability to adapt and achieve the planned results. The quality of the products, confirmed by feedback from associated partners and the target group, validates the methodology and the joint effort of the transnational partnership.

SNAP+ is not just a set of products; it represents a replicable model for the development of digital educational content in technical fields. The sustainability plans ensure that the results will remain accessible and can be expanded in the future.

Project Details:

SNAP+ | Photogrammetry Aided Surveying in Heritage Management (2022-2025)Erasmus+ KA2 - Cooperation partnerships in adult education [2022-1-PT01-KA220-ADU-000087890]

Co-ordinator:

Portucalense University (Portugal)

Partners:

Aleron IT Solutions (Hungary)

EK Association (Hungary)

Institut Vernakularne Arhitekture (Slovenia)

Tektum Architecture (Romania)

Project Outputs:

Homepage: https://snap-plus.eu/

Educational Handbook: https://snap-plus.eu/handbook

Educational Quiz: https://snap-plus.eu/quiz

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(1)

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