The ALDREN Building Renovation Passport for Non-Residential buildings:

a modular digital instrument to support the Renovation Wave

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Building renovation is therefore central to the post-COVID 19 economic recovery and was specifically referred to in the recovery plan published by the EC on 27 May 2020. The ALDREN project aims at avoiding the risk of lock-in effects by developing ALDREN Building Renovation Passport and testing its respective protocols on non-residential buildings pilots.

The Renovation Wave and the ALDREN outcomes challenge

Europe faces a momentous challenge in view of the full decarbonization by 2050 as stated in the European Green Deal and the renovation wave initiative will address current low decarbonization rates of around 1% across the EU and tackle the underlying barriers for improving the energy efficiency of the EU building stock. Currently, roughly 75% of the building stock is energy inefficient, yet almost 80% of today's buildings will still be in use in 2050. The ALDREN goal is to avoid the lock-in effect and to the deep renovation of non-residential buildings, providing a tailored Building Renovation Passport for non-residential buildings to undertake into account homeowners' needs, desires and financial risks. At the same time, the lockdown made even more evident

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the need to have a building stock climate - resilient, climate-proof, comfortable, safe and adaptive to the owners' needs. If we consider all those aspects in a unique greater picture, it derives the urgent need to set up a long-term renovation plan with modular, flexible and comprehensible instruments. In this framework, the ALDREN project proposes the ALDREN Building Renovation Passport (BRP) as a solution to boost the Renovation Wave. The H2020 ALDREN project began in November 2017, before the introduction of the Building Renovation Passports were mentioned in the Energy Performance of Buildings Directive (EU 2018/844), but it is fully in line with the EPBD context. Deep renovation is a complex process that involves a complete overhaul of the energy performance of a building. Most people are aware that better insulation of walls, roofs and basement will lower the energy consumption of the building. However, many people are not aware hot to plan renovation, which measures adopt, when and how much does the intervention cost. In this context, the ALDREN project has the goal of encouraging property owners to undertake renovation of existing buildings using a clear, robust, and comparable method providing a tailored renovation roadmap for non-residential buildings, which can be carried out in one stage or in multiple steps over several years: the so-called ALDREN BRP.

Key factors at a glance of the ALDREN BRP

Choosing to introduce the BRP as a tool to inform, motivate and incite building owners and investors to undertake energy renovation, is a manner by which governments can bring tangible support to consumers, boosting from one hand the energy renovation rates and depths, but also taking care of their comfort and consequently reducing their overall health costs. The ALDREN BRP for **non-residential buildings** – in particular for **office and hotel typologies** – has been developed starting from a deep analysis on the available knowledge and the lessons learned from previous experiences to be a **coherent element in a common EU solution,** but at the same time to become a useful and dynamic instrument to increase data accessibility and to create more transparency along the whole renovation path with big data interoperability.

The ALDREN BRP core concept consists in the dual element of the passport: the ALDREN BuildLog and the ALDREN RenoMap, which make the passport a sort of complementary tool to the EPC with the aim to increase owners' awareness about the current technical energy performance status of their building and support them for its regular daily operation, coupled with a tailored made renovation roadmap which provide an assessment of three main KPIs represented in **Figure 1**.

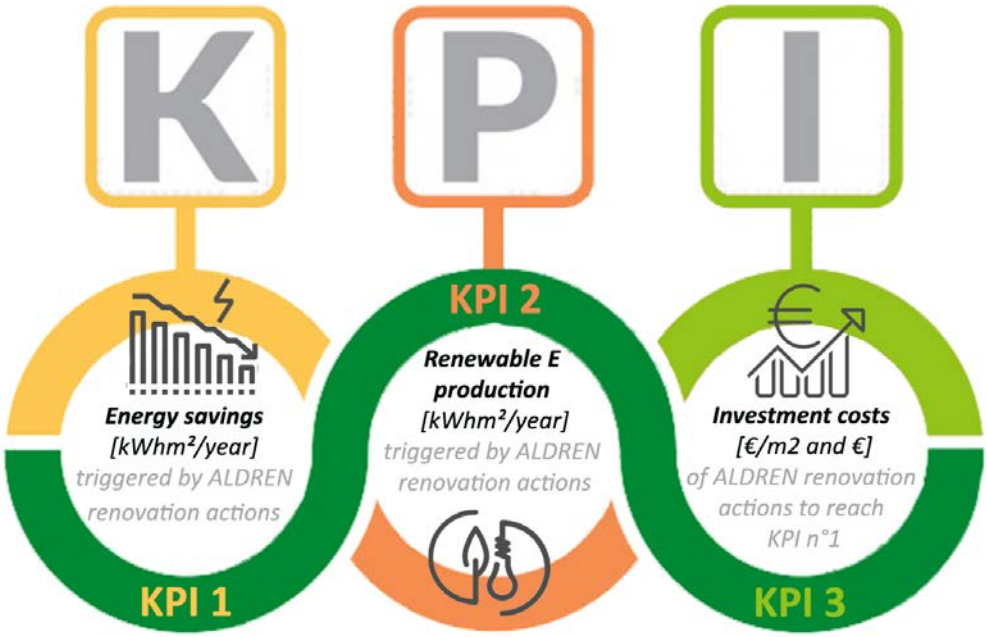

Figure 1. Key Performance Indicators calculated by the ALDREN BRP.

The whole ALDREN approach foreseen different calculation protocols for each of the modules in which the ALDREN BRP is structured and rendered in a unique instrument. The main characteristics and success factors of the ALDREN BRP are summarized in **Table 1**. One of the most important features to remark is its flexible and modularity structured based on 8 modules correlated but also independent by each other (**Figure 2**). The ALDREN auditor in fact will compose the ALDREN BRP fulfilling only the modules requested by the owner.

According to the ALDREN Alliance and stakeholders' community suggestions, in fact, the owner is one of the most important actor to be considered along the building value chain and considering that for non-residential buildings (hotel - office) could be represented by different target groups with different knowledge background, the ALDREN BRP has been developed in two versions to facilitate the use and the data comprehension: a digital version comprehensive of all data collected, calculated or evaluated during the ALDREN BRP preparation and a paper version which could provide both core and overall indicators according to the reader (owner or public authorities or auditor).

Table 1. *ALDREN BRP success factors.*

PRINCIPLES	**COMPLIANCY** Digital - paper instrument, complementary to the EPC and structured into 2 main elements: BuildLog and RenoMap.	**HARMONIZATION** Harmonized procedure for building data gathering through the time, with a common language in a cost-effective renovation long-term plan.
TARGET	**BUILDING TYPOLOGY** - Data sets for non- residential buildings (hotels/offices). - BRP structure suitable also for residential= BuildLog + RenoMap	**ENERGY TARGET** - Follow the ALDREN protocols steps for BRP creation. - Collect users willing and use them for the RenoMap creation.
USERS	**OWNER/ INVESTOR** - Refer to a unique instrument. - Comprehension of real current state of the building. - Awareness on the renovation actions feasibility.	**ALDREN AUDITOR** - Refer to the ALDREN protocols guidance for the BRP creation based on step by step procedure. - Collect users willing and use them for the RenoMap creation.

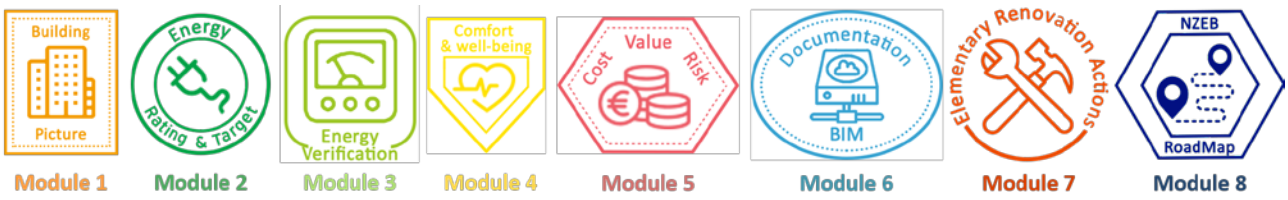

Figure 2. Structure representation of the digital worksheet version of the ALDREN BRP.

Figure 3 illustrates the structure and the options available for both versions.

The creation of the ALDREN BRP will follow a step by step procedure as represented in **Figure 4** which will lead to the creation of a tailored made BuildLog and RenoMap easily update through the time.

Building Logbook: current ongoing initiatives and the ALDREN BuildLog

Across EU there are different buildings logbook ongoing initiatives such as: the Woningpas in Belgium, the Gëbaudepass in Germany, the Carnet numérique du lodgement in France, Fascicolo del fabbricato in Italy and CASA+ in Portugal. In order to promote their common implementation, under the EU Green Deal, the EC stated the need to develop a framework which can harmonize all these initiatives and it funded a study, the B-LOG project, to create a European-wide definition and concept of a buildings' digital logbook, carrying out an overview of relevant initiatives, conduct a gap analysis and produce 3-4 key recommendations for implementation by the end of 2020. The ALDREN consortium is contributing to this project joining the stakeholder community as a win - win solution: from one hand sharing lessons learned from the ALDREN Building Logbook experience and from the other achieving the ALDREN principles of compliancy and harmonization with other EU initiatives and directives. Th B-Log project, as first result, has individuated a common agreed definition for the building logbook: a digital repository where a building's main properties (ownership, building design, materials used, structures, installations, systems, adaptations, investment, operational and maintenance costs, health and safety, performance indicators, certifications, etc.) can be compiled and updated when necessary throughout the life of the building, granting an easily accessible and comparable overview of a specific building. the comparative analysis on the in-place initiatives on logbook highlighted moreover that they are all still facing with many barriers for further implementation or harmonization like: costs implications, privacy and data management, fragmented regional approach, static nature of the building logbook, administrative burden and access to information.

Over the life cycle of buildings and at different stages, a lot of valuable data and information are generated and gathered (e.g. design, construction, operation, renovation, maintenance) and with different objectives or reasons (e.g. regulatory compliance, cost management, operation and management, insurance, finance). However, this information is largely not organized and managed in a systematic way. Some information only benefits few market players; sometimes information has to be re-created several times and often almost none stays in the hands of property owners. Information is spread over many places and tools for safely storing, digitizing and updating information are largely missing [1]. The ALDREN BuildLog for those reasons has been structured into 6 modules with specific and respective protocols to follow for their fulfillment independent from one to another but at the same time they could share data, in order to optimize the information collection process. The BuildLog could facilitate access to structured information about how the building was originally designed, what changes have been made and what is its actual performance service level and planned maintenance.

The RenoMap

The optimized embedding of energy performance actions in the refurbishment processes of non-residential buildings is a central goal of the ALDREN project. Completing the logbook, the ALDREN BRP also integrates a renovation roadmap (RenoMap) module. This tool and the related methodology allow the building owners to plan long term strategies for the renovation of their building following the ambitious energy performance requirement toward 2050 NZEB buildings objectives.

As a part of the ALDREN BRP, the RenoMap provides the necessary overview and long-term perspective to enhance the management of non-residential buildings. Renovation and upgrading processes have to be integrated among many operating constraints, also considering financial views as building valuation and rental management. Many questions arise when a refurbishment project is considered. What is the priority considering energy performance improvements? How to stage the renovation actions? What will be the investment cost and the financial impacts? How to be in line with existing and coming regulations? Are the changes going to improve comfort and functional qualities in the building?

The RenoMap aims at replying to these questions among others. It integrates the other developments and methodologies from the ALDREN project, using the proposed performance indicators related to standard and actual energy performance, financial valuation and indoor environment quality.

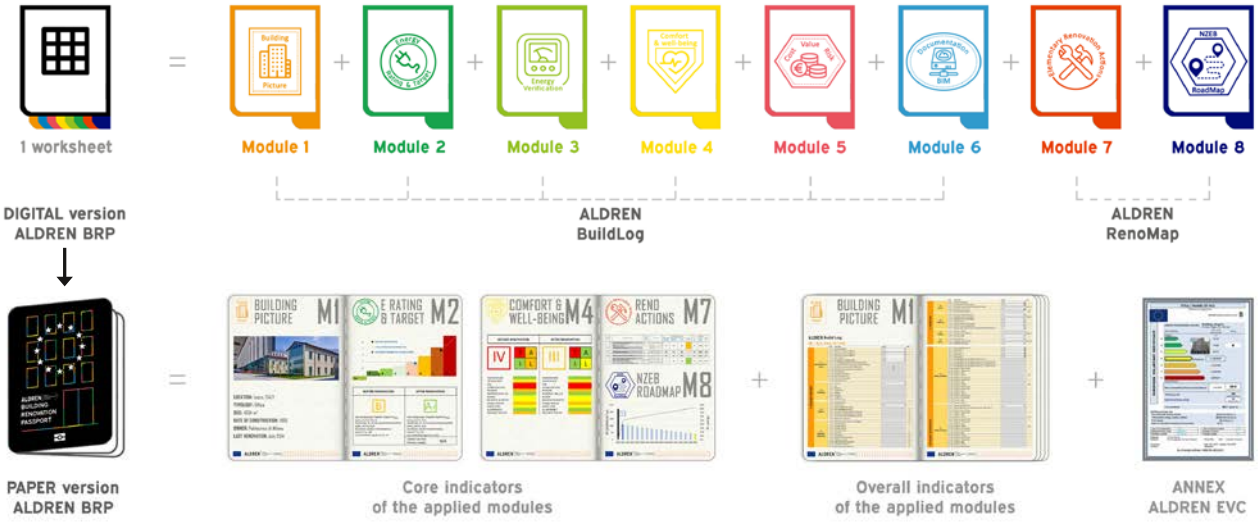

Figure 3. Representation of the ALDREN BRP digital and paper version content.

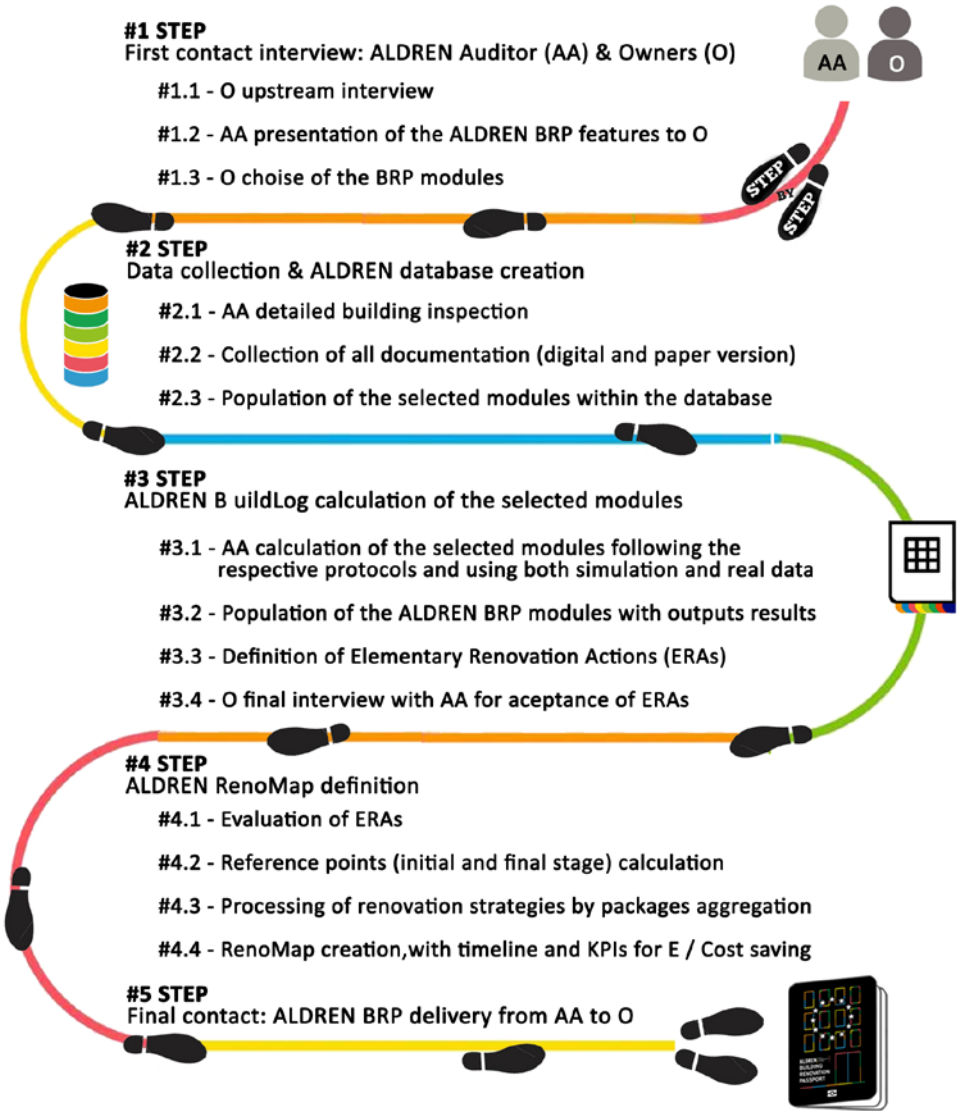

Figure 4. Steps diagram for the ALDREN BRP creation.

The proposed approach is easily implementable to support the owners' choices during the decision phase of an initiated renovation project. The RenoMap aims at reaching different objectives, both related to the coming project and the building lifetime:

- Providing a complete overview of the NZEB compliant elementary renovation actions (ERAs) which could be implemented on the building.
- Setting and evaluating a complete building renovation potential considering the application of all ERAs.
- Identifying primary packages of renovation actions to implement in the initiated project, considering components degradation, owners priorities, return on investment, energy performance and technical interactions.
- Setting a long-term plan and organizing the renovation packages according to technical requirements and opportunities (tenants replacement...)
- Evaluating performance indicators of the potential intermediate renovated states to provide the building owner the information to shape the initiated renovation project by integrating more or less renovation packages.

The tool is divided in two modules, the evaluation table of elementary renovation actions and the step-by-step renovation roadmap. The first part is based on information collected during the energy audit and the owner interview. The definition and evaluation of ERAs is based on annexes providing support concerning NZEB level compliancy and qualitative performance levels of building components.

0 : Not concerned,
1 : low emergency
2 : High emergency

-1 : No change	0 : unknown
0 : neutral	1 : long term
2 : Clear will for change	2 : ASAP
	... : Specific opportunity

- : no opportunity
* : weak opportunity
** : interesting opportunity
*** : high opportunity

Obsolescence (1a/4)		Owner will (1b)		levels		Economics (2)		Energy efficiency (3)	verify IEQ & interactions (1-4)
						cf. Table A			cf. Table B
Priority	Period (yr)	Decision	Time or opportunity			Investment cost (k€)	typical return on investment	Upgrade of the component	

Figure 5. Qualitative indicators to evaluate Elementary Renovation Actions in the 1st RenoMap module.

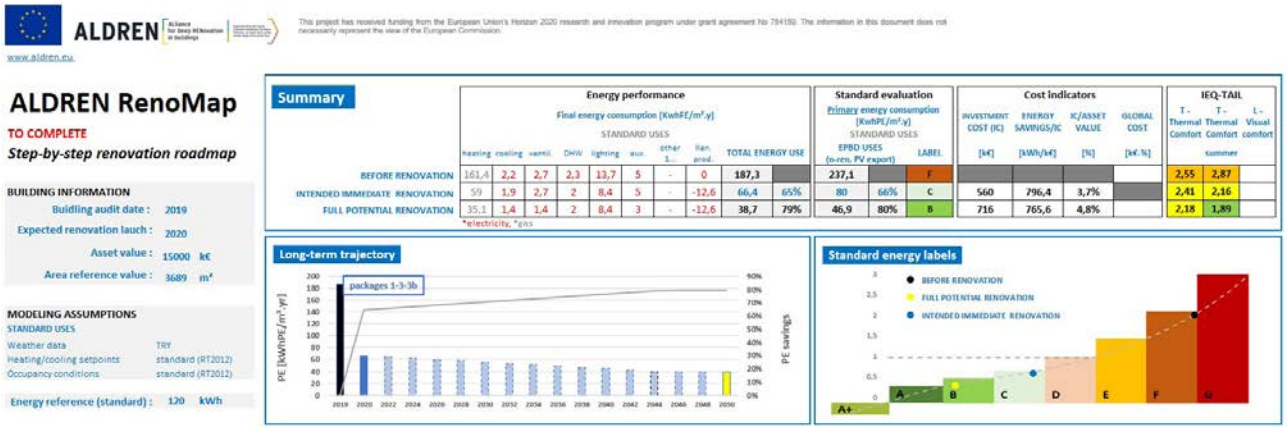

Figure 6. Summary board of the 2nd RenoMap module – Step-by-step renovation roadmap.

The second module consolidates advanced information. Energy simulations and ALDREN methodologies must be conducted to evaluate current and fully renovated building states. The gathering of packages following strategy guidance aims at accompanying the building owner in the decision-making process.

Conclusions

The ALDREN project has the goal of encouraging building renovation using a clear, robust, and comparable method providing a tailored renovation roadmap, which can be carried out in one stage or in multiple steps over a long-term vision: the so-called ALDREN BRP. The implementation and use of ALDREN BRP will support and improve the following aspects:

- reduction of administrative burden for owners and professionals;
- reduction of the need to recreate information over the life cycle of the building;
- avoid of the lock-in effect and reduction of information asymmetries along the building supply chain;
- identification of more realistic operation and maintenance costs of the renovation actions;
- common taxonomy and languages from the different actor of the value chain;
- improvement of cost management, facilitating decision-making and building operation and maintenance, and assessing mortgage and insurance-related risks;
- improved energy and environmental performance and user comfort. ■

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