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Refurbishment in educational buildings – methodological approach for high performance integrated school refurbishment actions

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Abstract

Every year governments of the European Member States invest several billion Euros in maintenance and upkeep of their schools. With 17% of non-residential buildings in the European Union being educational buildings, there is a substantial opportunity for setting examples of integrated refurbishment actions, which address functional and energy-related aspects in a joint view.

Currently these potentials are not fully exploited. The reasons for the few numbers of truly holistic school refurbishment projects can be found in the limited budgets, the political and institutional framework conditions as well as the lack of innovative and holistic building refurbishment concepts. The assumption for research was that refurbishment in educational buildings focuses mostly on single measures in respect of maintenance and adaptation of the building structure. Energy efficiency measures are only selectively considered and functional changes are rarely implemented in existing buildings.

This paper summarizes the results of the research project SchulRen+ [5] that analyzed school buildings in an integrated approach: Considering structural, functional and energy-related aspects in a joint view – the project reveals high performance refurbishment actions that have the potential for the development of ‘Nearly Zero Energy’ or ‘Plus Energy’ buildings.

Based on the example of the school building stock of the city of Vienna, a nationally funded project analyzed these constraints with the goal of providing workable solutions for integrated school refurbishments. In an interdisciplinary approach, stakeholders from the city municipality, schools as well as building professionals provided input for the development of a methodology for replicable energy- and functionally optimized school refurbishment concepts. Structural, functional and energy relevant framework conditions were summarized and

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synergetic potentials of comprehensive school refurbishments were highlighted. Following the requirements of the stakeholders, different scenarios (light, intermediate, advanced) were subsequently tested in terms of functionality, energy efficiency and life cycle costs. For one case study a typical end of 19th century building was selected - similar building types can be found across central Europe. It demonstrated the required changes in prospective school refurbishment projects. The emphasis was on the energetic optimization in synergy with the optimization of the functional room concepts in order to give justice to the changed requirements in new teaching types and methods. The case study resulted in concrete recommendations for decision support and showed how portfolio management and a holistic refurbishment approach could be undertaken for larger educational building stocks.

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Keywords: School buildings; refurbishment; refurbishment concepts; energy efficiency

1. Introduction

A large proportion of the buildings, which we will use over the next century, have already been built. Many of these existing buildings are still in need of refurbishment in order to increase internal comfort and to meet the challenging climate goals. Refurbishment quotas are therefore often used in governmental strategies but are not always met. Austria has set itself a refurbishment rate of 3% relating to the entire building stock until the year 2020 but is currently only at 1% [1]. Especially public buildings could therefore be frontrunners and best practice examples in order to increase refurbishment rates. Schools have in the domain of public buildings an even more prominent role: they are frequented by pupils, teachers and parents and can therefore act as substantial multipliers in the awareness for energy efficiency. Regarding energy efficiency measures targeting the building stock it has to be mentioned that public buildings owned by the Austrian central government are subject to energy savings according to Energy Efficiency Directive (EED) [2] and the respective national legislation (EEffG) [3], while there is no such obligation for public buildings owned by the regional governments and municipalities. In Austria, specific types of schools are owned by the central government, by regional governments or by municipalities. Vienna is a regional government and a municipality at the same time and is therefore in charge of a high number of schools. While ownership of schools is different, challenges are the same.

Usually, school building refurbishments are based on individual measures focusing on the upkeep of the building. The buildings stock is updated in terms of safety, fire regulations, accessibility and functionality. An overall integrated approach including improved energy efficiency measures combined with adapted functionality does not play a significant role. Bringing the safety measures to the state of the art is mostly the prevailing cause for action.

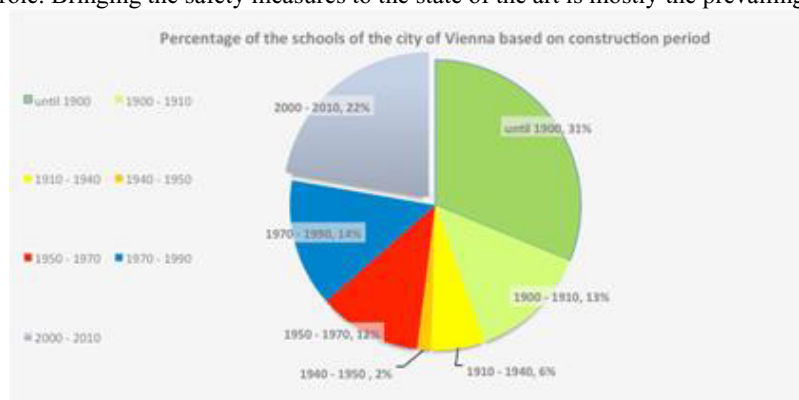


Fig. 1. Percentage of schools of the city of Vienna based on the construction period [4]

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