

„Preliminary studies of selected materials, technologies, buildings and their management systems in terms of compatibility, impact on the quality of life and sustainability to clarify the solving problems“

## Introduction

This is a report on project activity No 3 “Preliminary studies of selected materials, technologies, buildings and their management systems in terms of compatibility, impact on the quality of life and sustainability to clarify the solving problems” (next activity after activity No 2) which was implemented during a period of 9 months from 1 July 2017 till 31 March 2018.

The main goal of this project activity is to identify and make preliminary analysis for possible sustainable materials, constructive solutions, building systems and their management software that in principle can be used in nZEB in a temperate climate zone with high relative humidity, including Latvia. The preliminary studies done in activity No 3 are useful for next steps - testing of relevant physical characteristics of materials and constructions in laboratory (Activity No 4) and also in real exploitation conditions (test buildings). To achieve the set goal the scientific and technic literature was studied as well as other information sources including materials on the internet, also seminars, conferences and exhibitions were attended, as well as conversations were held with professionals and branch professionals. To examine the existing experience several buildings in Latvia were visited which are build according to nZEB requirements. For example, it is planned to follow in depth the provision of energy efficiency of business support centre SALA (Aloja) and Business park in Riga also carrying out a range of support and monitoring activities. In the future research it is planned to focus on the problems of public nZEB because already from 2019 the public buildings in Latvia should be built according to nZEB requirements on energy efficiency set out in the EU Parliament directive 2012/27/ES which are described in detail in Regulation of the Cabinet of Ministers from 2013 No 383 about energy certification of buildings. To work out the possible solutions in this project period several project sketches were developed and discussed for this type of buildings. They will be developed concretely, and their energy efficiency analysis planned in future phases of work.

In Chapter 1 of the report possible local and innovative materials (including phase change materials (PCM)) and structural solutions for nZEB are reflected and analysed. Chapter 2 is devoted to the analysis of potentially usable heating, ventilation and cooling systems (HAVAC) which include both passive solutions (for example PCM) and usage of different assessable renewable resources which is mandatory for nZEB. Management systems of smart buildings (BMS) and alternatives for its software are analysed in Chapter 3. The problems of design and installation of HAVAC systems are described in Chapter 4. This topic is very closely to different aspects of thermal comfort - corresponding problems are reflected in Chapter 5. In Chapter 6 the additional aspects important to ensuring good environment quality for people's lives and the sustainability of building structures are characterised. The possible solutions of these problems in this Chapter are described too. This aspect is closely connected also with monitoring and management of collected data - the possible solutions for necessary sensors, data collection and accumulation are examined in Chapter 7. For correct estimation of energy consumption in nZEB for heating, ventilation and cooling more precise calculation software is necessary. Possible alternatives are characterized in Chapter 8 and in house created tool *Heatmod* (in accordance with EU standards and Latvian regulations) were for future development preselected.

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It must be noted that the used information sources are indicated at the end of each chapter therefore they can repeat in several chapters. The report is prepared in English to ensure that also foreign experts can get acquainted with it.