

## INTRODUCTION TO RESEARCH PROJECT

# CAMaRSEC: Climate-adapted Material Research for the Socio-economic Context in Vietnam

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**Abstract:** As a result of the rapid economic development in Vietnam, lifestyles and the needs of residents have been changing in new building typologies. Materials, constructions, and supply systems that were not previously common, are now used. This development leads to far-reaching issues with structures and building physics, especially under the demanding local climatic conditions. These get in the way of energy-efficient and sustainable construction.

The German-Vietnamese CAMaRSEC project is a project within the CLIENT II program "International Partnerships for Sustainable Innovations" funded by the German Ministry of Education and Research (BMBF). CAMaRSEC supports the implementation and further development of energy-efficient, resource-efficient and sustainable construction practices. Based on interdisciplinary problem analysis and fundamental research, effective infrastructures for research, characteristic value determination, training, education and the transfer of scientific results into Vietnamese construction and planning practices are developed.

**Keywords:** Vietnam, sustainable building materials, building energy efficiency, socio-economic context

As demands for comfort and convenience change, the indoor climate in the buildings changes, too. This is accompanied by the fact that materials are exposed to new climatic indoor conditions, while the outside climate is extremely warm and humid. At present, the materials and building systems used in the Vietnamese construction industry change. As example, unfired bricks such as concrete and cellular concrete blocks are promoted as a replacement material for the construction of modern residential towers.<sup>1</sup> This is done to reduce the energy demand as well as the environmental impacts of producing and consuming farmland for clay extraction. However, such new materials require both adapted technologies and processing as well as the integration into building design to work as a permanent and sustainable replacement for the construction methods established in the market. In particular, the moisture properties of new materials are substantial in this context.<sup>2</sup> A failure of these new building techniques, such as cracks in the plaster or moisture ingress, will bring the new construction practice into disrepute. At present, there is insufficient knowledge in the Vietnamese construction industry regarding the physical building properties and regarding the ability to use these materials. CAMaRSEC therefore addresses issues that hamper the effective application of the necessary tools for energy-efficient and resource-efficient construction in Vietnam and, in particular, the successful application of the new National Technical Code for Building Energy Efficiency.<sup>3</sup>

### Inspection Aspects and Project Goals

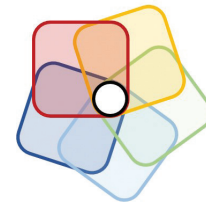
The project examines the issues from five perspectives, jointly illustrating the life cycle contexts of new residential buildings: living context, integrated design, technical fundamentals, quality of execution, and use of resources. All these topics are designed to establish an effective governance framework to promote sustainable construction

in Vietnam. In order to achieve this, CAMaRSEC works with a transdisciplinary German-Vietnamese consortium. The German partners are: University of Stuttgart, Fraunhofer Institute for Building Physics, University of Hamburg, Bau Bildung Sachsen e.V. and TAURUS Instruments AG. The Vietnamese partners are: Vietnam Institute

of Building Materials, National University of Civil Engineering, Ton Duc Thang University and College of Urban Works and Construction.

Currently, extensive socio-economic surveys and engineering audits of the building physical performance are conducted in parallel.

The climatic conditions in terms of



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residential context  
integrated design  
technical foundation  
construction quality  
resource utilization  
governance

construction practices and the current construction practices themselves will also be analysed. Based on this interdisciplinary problem analysis and fundamental research, a core result of the project will be the development of a building physics research infrastructure for scientific materials research and the determination of building material characteristics. Specifically, an implementation plan for a building physics laboratory and an outdoor testing area for material weathering will be created. This will support the introduction of an advanced regulatory framework for energy-efficient and sustainable construction practices. In addition, skill building measures will be implemented in different phases of the building life cycle.

### **A Contribution to Sustainable Construction**

CAMaRSEC promotes the effective implementation and further development of construction standards and will therefore effectively contribute to energy-efficient, resource-efficient and generally sustainable construction practices in Vietnam. A survey will be conducted among 500 households in Hanoi and among 500 households in Ho Chi Minh City, mainly apartments in modern high-rise buildings. The aim of the household survey will be to analyse the living context, living conditions and lifestyles in new residential high-rise buildings. The survey covers demographic, social and economic data and apartment-specific characteristics, the perception of the living contexts, detailed questions on behavioural patterns, as well as the recordings of energy consumptions and costs. The project activities are closely linked with plans for setting up building physics test facilities by the project partner

Vietnamese Institute for Materials, linked to plans from the National University of Civil Engineering and Ton Duc Thang University for the development of study programmes for energy-efficient and sustainable building as well as linked to the development of training of construction workers through the College of Urban Works Construction.

CAMaRSEC also contributes to complementary projects of other actors (e.g. UNDP, IFC, GIZ) for the introduction of resource-efficient construction methods and the implementation of the new national energy standard.

CAMaRSEC therefore opens up great potential for far-reaching effects. The project contributes, in a practice-oriented approach, to the global energy and resource transition in the construction industry beyond Vietnam in the tropical region with its continuously rapid socio-economic development.

### **First Insights**

Since a new building energy standard was introduced in Vietnam, calculation tools, checklists and other support for architects and engineers are currently developed.<sup>3</sup> The Ministry of Construction (MoC) of Vietnam compiled a list of "energy-saving materials" that currently consists of around 1200 relevant materials. However, the values of essential properties for energy saving and other building physical assessments are missing and not available from local sources in Vietnam. Through a strategic implementation plan for research and testing facilities, the CAMaRSEC project will develop locally adapted measures, to determine the relevant material properties for the use in the Vietnamese construction industry. The project partner Vietnamese Institute for Building Materials (VIBM) cur-

rently plans to set up a laboratory for testing building physics properties, supported by MoC.

VIBM also develops a labelling system and catalogue of property criteria for building materials to be included in the list of MoC's building materials. In addition, VIBM has a test area outside of Hanoi, which is to be expanded to a similar test facility like the one operated by the project partner Fraunhofer IBP in Holzkirchen, Germany.

CAMaRSEC's research includes transdisciplinary measures of awareness rising and capacity building. By thus, the project contributes to the implementation of sustainable building practice.

### **Acknowledgement**

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### **Endnotes**

<sup>1</sup> Homepage: <https://www.bmbf-client.de/projekte/camarsec> The research project is funded by the "CLIENT II - International Partnerships for Sustainable Innovations" in the framework programme FONA - Research for Sustainable Development of the Federal Ministry of Education and Research (BMBF).

<sup>2</sup> UNDP, "Promotion of Non-Fired Brick Production (NFB) Production and Utilization in Viet Nam", 2015-2019 (online, accessed 09.09.2019) [http://www.vn.undp.org/content/vietnam/en/home/operations/projects/environment\\_climatechange/non-fired-bricks-project.html](http://www.vn.undp.org/content/vietnam/en/home/operations/projects/environment_climatechange/non-fired-bricks-project.html)

<sup>3</sup> Socialist Republic of Vietnam, QCVN 09: 2017 / BXD "National Technical Code for Building Energy Efficiency", Hanoi 2017.

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