Sustainable Development of Urban Regions

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Federal Ministry of Education and Research

FONA Research for Sustainability

Chiang Mai, Thailand

CHARMS

Carrying heritage buildings as part of urban regions into a modern and energy-efficient society

CHARMS aims to improve the indoor comfort of historic wooden houses in Thailand. Against the background of the planning ideal »preservation through use«, concepts for the use of these buildings are developed together with local residents and city administrations. In this way, CHARMS contributes both to increasing the quality of life of the residents and to reducing construction-related CO_2 emissions.

Project Objectives

CHARMS develops an integrated strategy to increase the indoor comfort of historic homes in the city of Chiang Mai. Various stakeholders from the Fraunhofer-Gesellschaft and Chiang Mai University initiated this project in view of the prevailing insufficient air quality in the city and the COVID-19 related increasing importance of the domestic environment as a living and working space.
The project's aim is to improve domestic well-being and public health as well as to preserve architectural heritage and cultural identity by integrating technical and social innovations. For this reason, locally adapted sustainable utilisation concepts for historic wooden houses and neighbourhoods are designed and their implementation is being prepared. The close involvement of local stakeholders in the R&D process ensures local acceptance of the developed solutions and thus a successful project implementation in the long term.

Challenges

Surveys by the project team show that especially young residents of historic wooden houses feel adversely affected either because of high energy costs, poor air quality or insufficient thermal comfort. On the one hand, the problem is due to the fact that the younger generation's demands for indoor comfort differ from those of their parents' generation. On the other hand, the functionality of traditional, indirect cooling systems of historic wooden houses is severely limited due to the changed local microclimate and high air pollution. Residents are therefore increasingly investing in technical cooling systems, which however lead to a higher energy consumption and urban heat islands. Lastly, the impact of municipal initiatives to improve the situation has been limited in the past, partly due to insufficient involvement of local actors and low synergy effects between initiatives.

Addressed Sustainable Development Goals of the United Nations

7 AFFORDABLE AND CLEAN ENERGY

11 SUSTAINABLE CITIES AND COMMUNITIES

17 PARTNERSHIPS FOR THE GOALS

Image provided by Fraunhofer IMW

Research Approach and Methods

CHARMS meets the complex, socio-ecological challenges with its high degree of transdisciplinary. Research methods are integrated across academic disciplines so that researchers and practitioners can work together successfully in the Chiang Mai region of Thailand. The assessment of the suitability of the proposed solutions is carried out by local committees consisting of the local population as well as municipal and civil society decision-makers. Furthermore, a local office permanently strengthens the cooperation. The CHARMS team uses mixed-methods approaches and modern geo-information systems to understand and visualise the challenges and preferences of the local population regarding the future use of historic wooden houses and to translate them into locally acceptable and effective solution concepts.

Focus Topics

- Energy efficient society
- Sustainable utilisation concepts for historic wooden houses
- Increase of indoor comfort
- Improvement of air quality
- Urban quality of life

»Lanna-wooden house is a cultural heritage that reflects the local wisdom of designing and building residents based on nature and reflecting the way of life of Chiang Mai people. Today we have witnessed them being faded away along with the rise of modern development and expansion of the city. CHARMS determines to conserve this local cultural heritage by introducing modern energy efficiency and construction technology to be adapted to maintain a Lanna-wooden house. Passing on the house to young generations, CHARMS offers a solution to carry on this wooden house to modern time as a place for thermal comfortable living and a reminder of the beauty and wisdom of Lanna culture.«

Warathida Chaiyapa

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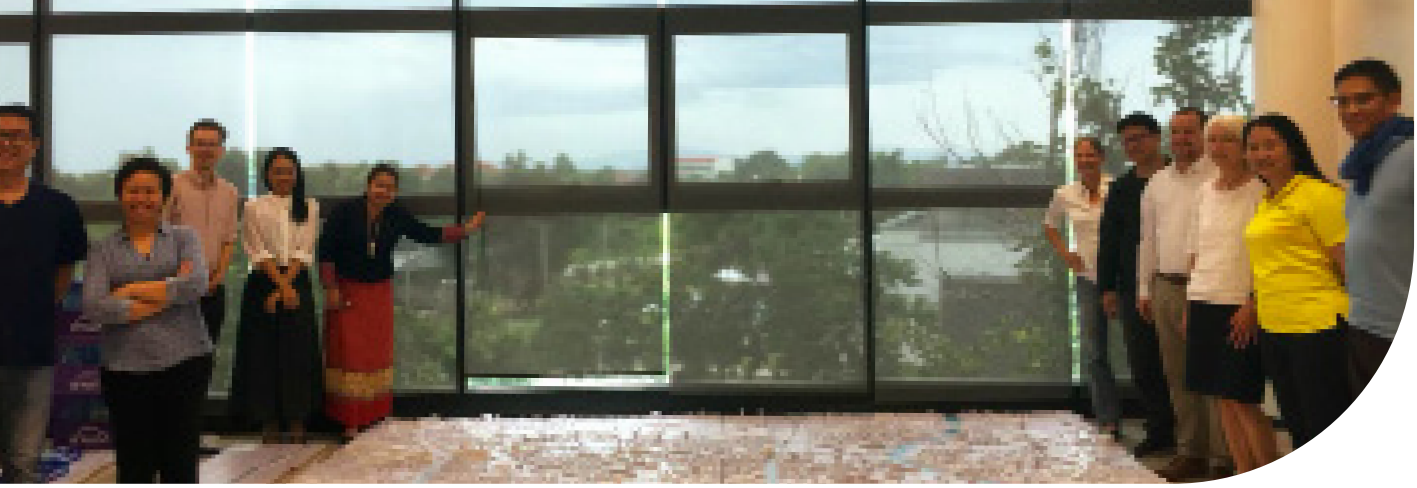

Image provided by Chiang Mai University – SPP

Expected Solutions and Innovations

CHARMS is implemented in three phases. First, urban planning, construction and IT-based solutions will be developed, for example to improve the building envelope and the local microclimate, to adapt traditional cooling systems and to improve communication between the local population and the city administration. At the same time, a catalogue of social innovations for the sustainable use of historic buildings will be developed and transferred into case studies. The integration and evaluation of these technical and social solution approaches will take place in the second phase of the project in close coordination with the local bodies. Finally, in the third phase the implementation of the resulting integrated solution is systematically prepared. This process is accompanied by modelling the local microclimate, conducting social structure analyses and implementing further training activities in the field of sustainable cultural heritage management.

»Sustainable development and the preservation of tangible and intangible cultural heritage cannot be separated. Dynamic changes in lifestyles, the COVID-related increasing importance of the domestic environment as a living and working space, and the CO2 consumption of urban structures require new utilisation concepts for historic, built structures in the Asian city of tomorrow. This is precisely where CHARMS comes in.«

Henrik Beermann

Cooperation Partner

German Partners

- Fraunhofer Institute for Energy Economics and Energy System Technology IEE
- Fraunhofer Institute for Building Physics IBP
- Fraunhofer Institute for Open Communication Systems FOKUS
- Fraunhofer Innovation Network Morgenstadt
- Bable.de

Thai Partners

- School of Public Policy at Chiang Mai University
- Stakeholders of the pilot districts Wat Ket and Wat Lam Chang
- City of Chiang Mai
- Digital Economy Promotion Agency
- German-Thai Chamber of Commerce AHK Bangkok
- Chamber of Commerce Chiang Mai
- UNESCO Bangkok
- The Siam Society
- DAAD Thailand

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