DYNASTEE
NEWSLETTER ISSUE 2024/23

Foreword

From 11 to 18 September, the 10th DYNASTEE Summer School on *Dynamic methods for whole building energy assessment* took place in Almería (Spain). We were happy to welcome participants from different countries and backgrounds to the Summer School, in which six lecturers addressed a variety of topics related to building physics, statistics and modelling techniques. After the Summer School, a seminar on Building Modelling in the Urban Environment took place at the Plataforma Solar de Almería. You'll find articles about both the Summer School and the seminar in this newsletter.

The first working meeting of the new IEA-EBC Annex 94 on *Validation and Verification of In-situ Building Energy Performance Measurement Techniques* will take place in Leuven (Belgium) on 18 and 19 November. Annex 94 will follow up on the work of Annex 58 and Annex 71. As in previous Annexes, DYNASTEE will support the new Annex 94 through dissemination and the organisation of training events, such as the annual Summer School.

Twan Rovers

Dynastee Summer School 2024

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Outcome of the Summer School 2024

By Hans Bloem

From 11 to 18 September, the 10th DYNASTEE Summer School on *Dynamic methods for whole building energy assessment* was organised by INIVE-DYNASTEE and PSA-CIEMAT in collaboration with Solar Energy Research Centre CIESOL in Almería, Spain. Most of the participants were PhD students with building physics and engineering backgrounds. Six lecturers addressed, in 14 presentations, different topics on building physics, mathematics and statistics, application of modelling techniques and the use of two software tools; LORD and CTSM-R.

The aim of the DYNASTEE Summer School is to disseminate the necessary knowledge and tools to achieve reliable in-situ dynamic testing and data analysis methods that can be used to characterize and label the effective energy performance of building components and whole buildings. Participants were provided with several high-quality datasets to gain experience in the application of different static and dynamic methods and models.

Feedback from two participants:

"The summer school DYNASTEE was an excellent opportunity for me to learn more about building energy performance assessment. I particularly appreciated the method of combining lectures with practical exercises, which provided a balanced approach between theory and practice. I deepened my knowledge of data analysis through the in-situ data shared during the courses, as well as the comprehensive set of articles and documentation. Additionally, I gained valuable insights into using statistical methods to evaluate the Heat Transfer Coefficient (HTC) from real experimental data. The introduction to continuous time analysis techniques with CTSM-R further enhanced my understanding of complex building processes. I also appreciated the organization by Maria and Hans, with breaks that facilitated knowledge exchange between participants and instructors. This allowed us to engage with researchers from various institutions. The inclusion of social activities, such as the guided tour of Almería, enriched the experience, providing historical insights about the city, while the dinner offered an enjoyable opportunity to explore the local cuisine. I also keep in mind Hans' key advice: knowing the objective of our study is crucial, as it helps us to find our own method to solve the problem."

Loubna Ait Lahsen is a PhD student at ENTP in Lyon, France.

"The DYNASTEE school was a good training choice at the right time for me. As a PhD student who works on heat transfer through adaptive façade building, it was necessary to understand first how static façade models work, and here comes the role of RC modelling using LORD. Considering that I will use an outdoor test experiment, the presentations that showed the experiment of the Round Robin box and the recommendations regarding measurement method were really helpful for me since I was in the early stages of developing protocols for similar experiment box. Overall, I found the training engaging and interactive, making it an outstanding and valuable learning experience!"

Asmae Moutaoikil, is a PhD student at The Institute of Mechanics and Engineering (I2M) at the Bordeaux University.

Outcome of the URBAN MOME Seminar on Building Modelling in the Urban Environment

By María José Jiménez

The Spanish National Network URBAN MOME organised a seminar in Almería on the 18th and 19th of September, just after the DYNASTEE Summer School was held in the same place. This organisation facilitated the attendance of participants in the Summer School in the URBAN MOME seminar and vice versa. It was hosted by CIESOL and CIEMAT at Plataforma Solar de Almería. The seminar was organized as an event for the exchange of knowledge and collaboration between participants.

The first day consisted of a series of fifteen-minute presentations, each one followed by informal conversations (questions, alternative approaches, collaboration potential, etc.). It started with introductory presentations about the URBAN MOME Network (Towards efficient URBAN environments through MOdelling, MEasurement, and control in the built environment) and its Working Group 3 on Efficient buildings that interact with their environment. After that, a wide variety of key research topics related to Building Modelling in the Urban Environment were discussed. The core of the seminar was dedicated to different modelling approaches, and different applications such as outdoor comfort, comfort control in buildings, prediction of thermal consumption in large commercial buildings, building energy performance assessment at urban level, and models to deploy low cost control systems at urban scale. The seminar also considered other aspects that are relevant to the topics of the working group such as solar radiation processing, outlier detection and Levels of Detail (LOD) for urban modelling.

On the second day of the seminar, the participants visited the Plataforma Solar de Almería. The visit to each test facility was guided by an expert in the corresponding solar technology: Solar Treatment of Water, Thermal Storage, Line-Focus Concentrating Solar Thermal Technologies, Point-Focus Concentrating Solar Thermal Technologies, Solar Furnace, and Energy Efficiency in Buildings. The seminar concluded with a wrap-up session identifying topics and channels for future collaboration in the area.

The URBAN MOME is a Spanish National Network integrated by research groups of CIEMAT, TECNALIA, ITE, IREC, CARTIF and the Universities of Oviedo, Valladolid and Deusto. Additionally, the Universities of Navarra, Sevilla, Almería, and Politechnic of Madrid, Politechnic of Valencia, CIMNE and IETcc-CSIC participate as invited groups. Its general objective of this Network is to create a forum for the exchange of information and knowledge on modelling, measurement and control in the built environment, with the aim of improving the energy efficiency of urban environments. This activity is complemented and enriched by international collaborations in the framework of the DYNASTEE Network, such as the IEA-EBC Annex 94.

Thematic Network URBAN MOME – 2023-2025. Reference: RED2022-134655-T. Funded by the Spanish National Research Agency (Agencia Estatal de investigación, AEI).
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Launch of PREDICT project

NARROWING THE ENERGY PERFORMANCE GAP IN BUILDING ENERGY ASSESSMENT RATINGS

By Aimee Byrne & Ciara Ahern

A central tenet of the Energy Performance of Building Directive (EPBD) is to accurately inform; (i) Building owners, to create a bottom-up consumer-driven demand market for energy efficient buildings, thereby accelerating reduction of energy consumed by European building stocks, and (ii) policy makers, leading to effective top-down interventions.

The directive mandates comparable Energy Performance Certificates (EPCs) for buildings constructed sold or leased across the European Union (EU).

EPCs have become the foremost source of information on energy use in EU building stocks and are a crucial instrument of the EPBD. However, an acknowledged barrier to realising the ambitions of accurately informing the building owner and policy, is the energy performance gap between the EPC rated and actual building energy consumption.

The PREDICT project, which launched mid-2024, funded by the Sustainable Energy Authority of Ireland (SEAI), aims to address this energy performance gap.

'PREDICT' stands for **PR**edicting **E**nergy using **D**ynamic Indicators in a **C**alibrated **T**ool. The means of addressing the energy performance gap between theoretical rated energy and actual energy is through the creation of an adaptive in-use factor (IUF) tool to predict occupied building energy use for both commercial buildings and residential buildings.

Inherent in all EPC methodologies are trade-offs between reproducibility, accuracy, assessor expertise and costs. Since input data is often based on worst-case default and standardised operating conditions; the results outputted by EPC methodologies can only offer an estimation of the actual building energy consumption. This level of standardisation, common across EPC methodologies, allows for a degree of consistency in building assessments but a lack of specificity for individual buildings. Indeed, there can be a major gap between theoretical and actual measured energy consumed in buildings when occupied by real people.

In the project, the relative influence of building energy use parameters will be established by EPC calculation, by use of dynamic simulation models of representative archetype digital twins, informed by measured field data over a weather year. Using parametric analysis, the stochastic influence of occupancy types and profiles will be quantified. The resultant data will be used to create the IUF tool.

This project will use large datasets from SEAI projects to define and validate the IUF based on monitored data, surveys, interviews, and calibrated physics models. The development of an in-use factor will enable the provision of a personalised roadmap for homeowners on how to upgrade their home leading to better informed costs and more realistic payback periods on investment.

EPCs and resultant EPC databases are also used as inputs to national stock models leading to climate policy, meaning that an improved EPC scheme will lead to better, more targeted, policy. In turn, this can feed into standards and guidance for retrofit by identifying key energy performance factors while quantifying the affect of behaviour on energy use and energy ratings. Better information also supports the estimation of required exchequer funding for retrofit and applications for funding from Europe.

The current, and first, phase of the project is the development of a consolidated open access database on Irish housing which will be published in the coming months here: https://zenodo.org/communities/predict/ about. This will be based initially on comprehensive monitored data acquired by existing and past projects led by research team members. Through analysis of the information within distinct databases, PREDICT will generate best practice protocols for the generation of such data in future projects, issuing guidance on how future research projects can follow a standardised best-practice approach.

PREDICT is a 3-year Project funded by the SEAI National Energy Research Development and Demonstration (RD&D) fund grant number 23/RDD/1046.

It is led by TU Dublin partnering with the University of Galway, IES R&D, Tyndall, and collaborating with DCSix Technologies and the Irish Green Building Council as well as multiple other partners through the Commerical Steering Committee including IN2 Engineering, The Office of Public Works, and Building Design Partnership (BDP).

Follow updates on the project on LinkedIn: https://www.linkedin.com/company/seai-predict/.

IBPSA-NVL Event 2024: Building simulation in a changing climate

By Christian Struck

On Monday 2 December 2024, the Dutch-Flemish Chapter of the International Building Performance Simulation Association (IBPSA-NVL), organises a symposium on Building simulation in a changing climate. It will take place at Eindhoven University of Technology (TU/E) in the Netherlands.

Following the general meeting of members from 10:00 to 11:00, a number of speakers will address recent developments in climate data for building simulations from 11:00 to 16:30. Amongst the speakers are Prof. Shady Attia (University of Liège) and Dr. Delphine Ramon (KU Leuven). Dr. Stefan Ligtenberg (Weather Impact NL) will speak about the newly published climate scenario's from the Dutch meteorological institute (KNMI).

Please register using this link or the QR Code below.

ABOUT DYNASTEE

By Hans Bloem

The objective of the DYNASTEE network is to be a global network of excellence on dynamic testing and evaluation of Energy Performance of Buildings. We aim to bring together academic, industry and governmental experts having knowledge on the **test environment and experimental setup** as well as on **data analysis** and **performance prediction** to consolidate, disseminate and further develop the knowledge that has been developed in this field in the past decades.

We make sure that the expertise developed in European research projects over a long period (1986-2004), and more recently the IEA-EBC Annexes 58 and 71 (2010-2022), remains available to the community of builders, designers, industrial developers, scientists and public authorities. The DYNASTEE platform continues to act as an information exchange medium and focuses on training exercises and events (such as the annual Summer School on **Dynamic Methods For Whole Building Energy Assessment**), the development of analysis software and the collection of high quality data.

IEA-EBC Annex 94

The aim of the Annex 94 project is a global collaboration in the EBC-context to develop the necessary knowledge and tools to achieve reliable in-situ **dynamic testing** and **data analysis methods** that can be used to characterize and label the effective **energy performance** of building components and whole buildings. DYNASTEE has been working on these topics for over 30 years and has been training numerous people during workshops, the system identification competition and training events (summer schools).

Summer Schools

In the annual DYNASTEE Summer School, participants are trained in the use of dynamic methodologies to assess thermal characteristics of building components and assess whole building energy performance. The approach is dealing with building physics as well as applied mathematics and statistics. Experience in the past has shown that knowledge of both disciplines is a must in order to be successful for making decisions in the analysis process. In the past 12 years, around 250 people have participated in DYNASTEE Summer Schools.

Datasets

Over the past decades, the network has collected high quality measurement and simulation data. These datasets are used in training exercises and events. The available benchmark high quality data contains:

- Simulated data homogenous wall
- Simulated data from homogenous wall
- In-situ data from homogenous wall
- In-situ data from composition wall
- Data from Round Robin box (research project)
- In-situ data from an air gap building envelope
- Data from a whole building
- Data from a co-heating test experiment

Two tools are promoted by DYNASTEE that will be trained and applied using the aforementioned benchmark data. These are LORD; lumped parameter model and CTSM-R; continuous time model.

See for an extended description on the www.dynastee.info website the document Software techniques applied to thermal performance characteristics.

Summer School 2025

In support of the IEA-EBC Annex 94, DYNASTEE is looking forward to organize a next (11th) physical Summer School in 2025.

Support 2022 – 2026

Industry could be interested in qualified people and support our network. Please contact Aimee.Byrne@TUDublin.ie for more information how to help us further.