Gerhard Dell
Christiane Egger *Editors*

World Sustainable Energy Days Next 2014

Conference Proceedings

Springer Vieweg

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Foreword from the Editors

The World Sustainable Energy Days are one of Europe's largest annual conferences on energy efficiency and renewable energy and offer a unique combination of events on sustainable energy. The conference, which is organised by the Energy Agency of Upper Austria (OÖ Energiesparverband), is held in Wels in February or March of each year. It attracts more than 700 experts from over 50 countries every year.

A part of the conference is dedicated to young energy researchers. Outstanding young scientists from around the globe present their work in the fields of biomass and energy efficiency. Twenty of the "World Sustainable Energy Days Next 2014" young researchers' presentations are published in this book. The conference was held from 26–27 February 2014.

The papers were selected by a high-level scientific committee for oral presentation. From two main fields—biomass and energy efficiency in buildings—these contributions offer an insight into the research work and the scientific findings and developments of young researchers from all over the world. They also communicate results, trends and opinions that will concern and influence the world's energy experts and policy makers over the next decades.

The conference is organised by the OÖ Energiesparverband, the Energy Agency of Upper Austria. This agency was set up by the regional government to promote energy efficiency, renewable energy sources and innovative energy technologies. Its main target groups are households, public bodies (e.g. municipalities) and businesses. The energy agency is active on the local, regional, national, EU and international levels through numerous projects and programmes. The OÖ Energiesparverband supports the regional government in the development and implementation of regional energy programmes. One of its primary fields of action is comprehensive information and awareness raising activities on sustainable energy production and use. This also includes the organisation of conferences and events, e.g. the World Sustainable Energy Days.

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Linz, June 2014 Gerhard Dell and Christiane Egger

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Part I

World Sustainable Energy Days Next Conference 2014: Energy Efficiency in Buildings

Robust Building Data: A Driver for Policy Development

1

Sophie Shnapp

If you cannot measure it, you cannot improve it.

Abstract

As the energy performance of buildings is central to any effective strategy designed to mitigate climate change, the building community needs better access to building performance data to improve current policies. This chapter presents the results of research examining the current data quality, data collection best practices and data gaps at the global level based on a desktop survey of ex-post studies and a data quality matrix prepared in collaboration with a group of global experts and modellers.

1.1 The Importance of Building Performance Data

As buildings account for around a third of the global final energy use and 30% of global energy-related carbon emissions, it is clear that this sector has the potential to bestow huge energy savings [1]. For this reason, the Global Buildings Performance Network's (GBPN) mission is to significantly reduce greenhouse gas (GHG) emissions associated with building energy use.

The GBPN work in four priority regions—China, the European Union (EU), India and the United States of America (USA)—together representing around 65% of the global final building energy use in 2005 [1]. The GBPN facilitates this action through regional hubs and partners in the four priority regions. The regional hubs and partners provide the

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most up-to-date knowledge and data on building energy policies to decision makers within their region.

It is estimated that by 2050, if we follow the current policy trends, the energy use from the building sector will increase by around a half of 2005 levels [1]. However, if the current best practices were to become a standard practice, it is possible to reduce global building final energy use by one third of 2005 levels [1].

To build and renovate buildings that are energy efficient and sustainable, participants in the building sector must trust the data used to calculate the energy savings. To gain the confidence of policy makers, builders, architects and all building sector stakeholders, the data must be both available (and storable) and credible (verifiable and transparent). Solid data cases provide known facts that can be used to influence the decision makers; therefore, it is essential that consensus be reached on the basis of credible data collection and its analysis. There is a need for a credible baseline and data series. The baseline is crucial for measuring impact and to oversee if objectives are being achieved.

The quality of data around the world varies considerably; there are large data gaps, weaknesses and inaccessibility that preclude accuracy in modelling. This report presents a unique attempt to assess the quality of data of building types in each of the GBPN's regions. The main aim of the report is to identify the omissions (or "white spots") in the data that prevent modelling and estimation of energy efficiency potentials in buildings. This will assist in the design of measures to improve the quality of data collection and in designing new policies that support a development towards low energy use in buildings. Strategies for overcoming these gaps are provided through advice and reasoned opinions from international experts.

1.2 Methodology

This project has collected information on the quality of data that relates to the energy performance of buildings; the parameters considered for this study were floor area, number of buildings, energy use, heating, cooling, hot water, lighting/appliances, age profile, retrofit rates, urban/rural split, new building energy use, yearly construction, fuel mix, ownership (private/public) and tenure.

All data and information from this report were sourced directly from the GBPN's hubs, partners, regional and global experts and modellers in the four regions and gathered in a data collection matrix. The structure of the matrix consisted of building types down the left-hand column and performance data along the top row. The GBPN's hubs and experts filled in the matrix by scoring each of the parameters with a quality rating between 0 and 5; see Table 1.1. At least two unconnected parties, one global and one regional, filled in each region's data quality matrix.

Table 1.1 Weighting: accuracy descriptions

Weighting	To what degree are the data that you have used accurate?
5	Data source accurate and fully reliable—official verified document or more than one independent source giving similar information
4	Good, trusted data source, i.e.an official document
3	Data generally available, but from mixed sources
2	Partial data—data available not very accurate
1	Weak data—little available data/not accurate
0	No evidence—guess

1.3 Data Quality Findings

The data quality matrices of the four regions give an accurate perspective of how strong or weak the current data quality is. As expected, the quality of data varies significantly between regions although there are some recurring trends. These results gathered in the matrix are presented in a graph below.

The graphed data quality "spider webs" in Figs. 1.1 and 1.2 show the data quality of the four GBPN regions with the different requested parameters for both residential and commercial and public buildings. Generally, the USA has the higher scoring data quality for most of the parameters, followed by the EU and then China and India.

1.3.1 Regional Comparison

At a first glance (Fig. 1.3), it is clear that there are not enough available data in all four regions for accurately modelling building energy performance. It is also clear that the quality of data differs vastly across the regions.

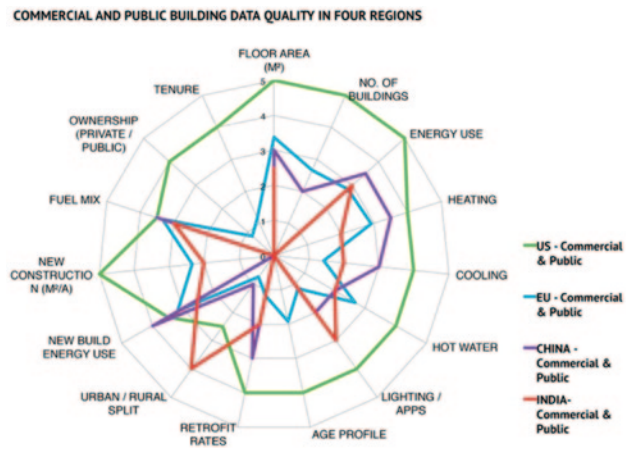

Fig. 1.1 Data quality of four GBPN regions—commercial and public buildings

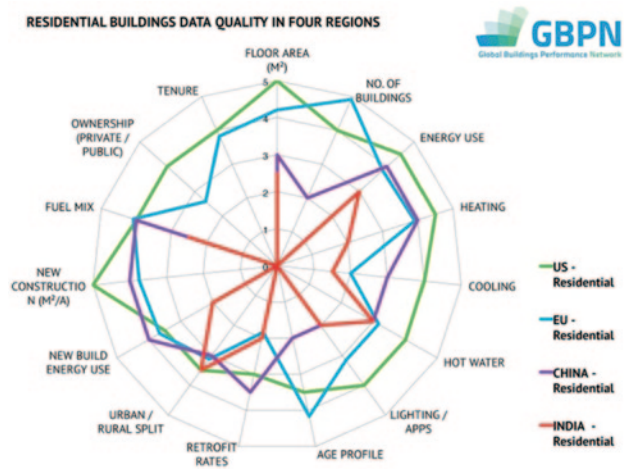

Fig. 1.2 Data quality of four GBPN regions—residential buildings

On average, the residential stock scored a rating of 0.5 higher than the commercial building stock (therefore it is 10% more available and accurate than the commercial and residential building stock). When comparing the two graphs, the commercial graph presented more data gaps than the residential.

No region could be considered as having exceptional data as there were significant gaps and weakness found in each region's data set, even after allowing for fields that were not actively investigated by the modellers and experts to be discounted. Figure 1.3 demonstrates the difference of the data qualities in the four regions.

1.3.1.1 Data in China

The residential building data in China scores on average 0.75 times higher than the commercial and public data. China's building performance data averages at around 2.5 in the valuation of the experts, which implies that there are either partial or available data, yet they are not always reliable.

The commercial and public building stock has the lower scoring data compared to the residential data in all the parameters except for seven that are equal. A total of 6 out of the 15 parameters for the residential data are between 3.5 and 5, meaning that on average around a third of the data are deemed as being from a reliable and trustworthy source. The commercial and public building data have four parameters that fall into the "accurate/reliable" weighting category, this means a quarter of the data were weighted as being accurate. The rest of the data are not found to be accurate or even available.

1.3.1.2 Data in the EU

Unlike the USA, the EU does not have official data on the building sector as a whole region and the quality of data varies significantly between the different states; therefore, the EU results are taken from an average of six of the member states—two countries that