

Andrzej R. Klimek

Research and Innovation Centre Pro-Akademia

9/11 Innowacyjna Street, 95-050 Konstancin Łódzki, Poland, andrzej.klimek@proakademia.eu

PROSPECTS FOR DISSEMINATION OF NEAR-ZERO ENERGY BUILDINGS (nZEBs) IN POLAND: A PERSPECTIVE OF SOCIOCULTURAL THEORIES

Abstract

Near-zero energy buildings (nZEBs) in Poland seem to disseminate more slowly than expected, even though they will inevitably become a standard, as a consequence of European Union regulations. The paper discusses the barriers already identified, demonstrates ones which have not been further known yet, having deeper sociocultural roots, and aims for providing effective solutions of the problem.

Key words

Near-zero energy buildings, passive houses, diffusion of innovations.

Introduction

Popularization of the nearly zero-energy buildings (nZEBs) is crucial for a global carbon dioxide emission mitigation. This issue has been regulated by EU Directive 2010/31/EU, which makes this standard compulsory in the beginning of 2019 and 2021 for public and residential buildings, respectively. In Poland, although passive edifices of many functions, such various as the church in Nowy Targ or a university indoor arena in Cracow [1], have been erected, they are still often identified with single-family detached houses. The housing sector indeed is important in terms of the success of the entire challenge of limiting the global warming but despite much attention, its development seems to be slow. The prospects for the situation after 2021 are not calming as the implementation of the new standards requires a previous dissemination of know-how, which still cannot be observed in Poland. Until 2014 about 30 Passivhaus-standardized buildings have been opened so far in Poland while in Czech Republic – more than 400 [2]. Inclusion of the non-standardized nZEBs into the statistics would not change them a lot. Therefore some authors, such as Płaziak [3], find the tempo of the transformation within the industry insufficient. Thus, the means of its extra stimulation should be searched.

Significant barriers in the development of nZEBs already identified

Due to the fact that passive housing attracts most of the attention in Poland, its development barriers have been already discussed. Those of them which were found most serious will be described below.

The primary of them are difficulties in finding experienced architects, while they are absolutely necessary from investors point of view. The reason is that investors' capability for taking risk the risk of an unsuccessful project is very low, with elevated costs and technical complicatedness as occur in the construction process. It is strictly connected with the fact that the private patrons have limited budgets and are not excessively generous. As a survey shows, for Polish people financial matters are the main factor for choosing a near zero-energy house, followed by the state co-financing of the project option, while its environmental friendliness is at the third place, mentioned by slightly less than a half of all interviewees [4]. Their cost-cutting approach has a consequence in an expectation of schemes intended for multiple replication, sold by means of catalogues [5], further named as 'catalogue houses'. The strategy of multiplying well-proven solutions and offering low prices this way was identified by Coxe et al. as one of three basic strategies of functioning of the architectural firms and called by him 'strong-delivery' [6]. Although it can be as financially profitable as others, the problem is that it is found least prestigious in the entire industry and extremely hard to be brought together with the innovativeness. Due to the fact that most of local architects do not have any practical experience with nZEBs, the latter must be considered as an innovation in Poland. The strong-delivery strategy is not strictly limited to producing 'catalogue schemes', but such an activity is particularly condemned in architectural circles which deprives it virtually any influence on the field [7]. Therefore, despite the fact that Passivhaus standardization matches the clients' expectations, it still fails to solve the problem of the real experience dissemination amongst designers.

Another strategy characterised by Coxe, called 'strong-service', aims for regular providing technically innovative solutions to the client [6]. IARP (Chamber of Architects of the Republic of Poland) estimates that only 2-4% of practicing Polish architects develop their professional skills [8], which would let us classify them to this category. The strong-service firms wages are also way above the accepted level of an average individual client as they are used to base on the corporate ones. The number of 2-4% of all registered architects is close to the probable amount of the architects in Poland working in the strong-service branch as the third strategy, strong-idea, in Polish conditions is statistically ignorable. The whole situation demonstrates a significant mismatch between the realm of investors and designers.

Another problem, which is also about experience and also requires system solutions, is a need for an exceptionally care in planning, running and supervising the construction process, which proves to be difficult. It is important as passive houses with defects, regardless if they were made by the designer or contractor, have little chance to pass the blower-door air-tightness test or to obtain an energy efficiency certificate. The former is necessary only for obtaining a Passivhaus standard, while the latter is essential for the client not only to prove the planned energy savings, but also in commercial terms, regarding future selling of the object. Another point of uncertainty is the fact that in many cases during the occupancy the residents use more heat than it was established for calculation purposes.

For further analyses it is also good to mention that the land plots for passive houses must be really large, having also many additional specific requirements which have been already described in multiple publications [9, 10, 11]. The problem is that local authorities are not used to take them under consideration in the process of spatial planning [12].

Factors and barriers identified in view of sociocultural theories

Including the achievements of sociology of cultural processes into the analyses of the nZEBs development prospects is legitimated by the fact that they are often exploited in marketing, especially the Everett Rogers' diffusion of innovations theory. As it has been already stated, in Polish conditions nZEBs, as well as the entire renewable energy industry, matches all the features of the innovation and the use of the theory generally aims for fitting the new product properly to the needs of client so it can turn out to be very useful. Better understanding of the sociocultural processes leads to finding new barriers, but also dynamic and efficient solutions which tackle them.

Staniszewska describes main assumptions of the theory of Rogers in the following way: „The fact if an innovation would be sustained or suppressed depends on its features such as:

- Comparative advantage – which depends on how an innovation is regarded as better than existing solutions. This feature does not relate to the objective advantages of a given innovation but to its subjective image in eyes of an individual.
- Compatibility – which concerns how much an innovation is regarded as compatible with the values, norms, and needs of the potential adopters present in a given society. The more compatible an innovation is, the faster is a process of its diffusion.
- Complexity – which describes how an innovation is regarded as hard to understand and implement. The higher level of complexity, the lower tempo of its adopting by individuals.
- Testing possibilities – concern how much an innovation can be proven and checked. Sharing a product or a service with potential customers may significantly enhance the tempo of adopting.
- Tangibility – which describes how much the effects of given innovation can be observed in the environment. As they can be noticed easily, people get acquainted with the solution and are more eager to implement it themselves.” [13]

In present situation of nZEBs in Poland the incentives for small clients appear unsatisfactory, even though without them the breakeven point of the investment would be delayed for several years. Thus, their comparative advantage turns out rather vague, as it requires planning the timeframe of more than twenty upcoming years, which brings too many variables and uncertainties. This explains why so many people driven by a conscious calculation, similarly as passive housing investors, paradoxically in the same time choose traditional houses. It would be much better if investors made the same decision convinced by the environmental arguments, of course avoiding any excessive expenses. The problem is that the assertion that

previous economic development was based on the exploitation of free natural resources is still found controversial in Poland, and so is a process of calculating and vindicating the ecological costs, which is absolutely crucial for creating a comparative advantage for nZEBs.

Moving forward to the compatibility, neither ecology or thriftiness is a highly appreciated value in Poland, which would be confessed by the social majority. [14, 15] Currently functioning model, where nZEBs are predominantly single-family passive houses, leads also to further limitations in terms of a lifestyle. It requires living outside big cities, so a dweller in such a house can be either working from home, either working locally and earning above average, either commuting daily to the nearby city center. None of those lifestyles seems to be particularly common in Polish society as there is a clear correlation between the size of the settlement and the average wage [16]. It must be noticed that the latter of those alternatives gains some popularity recently, but the problem is that it is not sustainable. Even regardless of the social capability of the lifestyle adoption, due to the fact that a Passivhaus demands two to three times larger land plot than a standard house, its potential dissemination would eventually lead to an unsustainable growth in a scale of the total amount of built-up areas, with a critical emphasis on the transport network [17]. It is possible in theory, however, such developments would apparently be strongly inhibited by various public bodies which would pay costs of building the new surplus infrastructure. Lifestyle was also an important subject of studies by Pierre Bourdieu, who claimed that the way we live is strongly bound with a distinction, which thoroughly means demonstrating of the social status of individuals, even unintendedly [18]. Hence, it can be presumed that the specifics of passive single-family housing and its strict shape demands do not make it a good material for showing the individuality of the owner, neither predestine it to a role of a status symbol. Of course, some people choosing this form of housing do not feel a need of such a demonstration and this fact can be connected with an aforementioned demand for catalogue passive houses, which have their own limitations. In fact, the form of a nZEB can be shaped loosely, but an extensive nonadherence to the Passivhaus principles leaning towards extravagance causes broad use of active technologies, which is not only expensive, but also inconsistent with the entire idea of sustainability.

As it has been already stated, the Passivhaus standardisation was matching the expectations of clients who need not to distinct themselves but was not very supportive for a potential diffusion of the whole concept among designers, as this group tends to disseminate ideas implemented by authors who have a strong acclaim from peers and critics, such as Renzo Piano or Norman Foster. These star-architects have designed nZEBs quite often lately, but solutions they propose rarely match the Passivhaus standards. Due to such architects' emphasis on tangibility it can be assumed that the new type of building will eventually become popular, but it will probably give the widespread dissemination to a form of nZEB other than Passivhaus. It will also require a long time as the innovation, which is related to global processes and is intended to influence them must be more complex than a new, entirely aesthetical fashion or fad.

All the mentioned reasons show that strong liaisons between current near zero-energy housing and individual investors cause severe problems and build a large development barrier, which would be able to be avoided, if they are replaced by corporate clients in the role of key investors. Housing estates developers proved they can employ strong-service architectural firms, so they are capable of solving the problem of unexperienced designers. Presently such companies are not interested in nZEBs due to their strong orientation on generating income. Therefore, in order to retain their financial liquidity, they aim at minimization of their own expenses, in this case building costs, which entails their lack of strong will to lower the energy bills paid later by their customers. However, creation of a viable system of incentives can change this situation and make them an active subject in the development of nZEBs. Furthermore, generally multi-family housing is per capita more energy-efficient than single-family, so such a solution would presumably bring additional benefits in large scale.

Proposed solutions

Near zero-energy multi-family estates have already been constructed. BedZED (Beddington Zero Energy Development) in London with one hundred flats is a good example. It is worth mentioning as it was designed for tenants with a common approach to the issues of ecology and sustainability and that it had passed an audit after ten years of occupancy, which proved its long-term effectiveness [19].

Basing the entire strategy on such projects would solve several problems described above. The decision if these new edifices would be social or strictly commercial, as presently, is political and does not matter in ecological

terms. Firstly, many land plots of the appropriate sizes have already been possessed by the real estate companies. Their owners would only have to adjust the planned floor area ratio to enhance passive solar heat gains. Apparently it would mean a potential financial loss for them, but a public programme of compensations should be taken under consideration. Such a redistribution of public funds to profit-oriented companies should be good for public realm not only by encouraging nZEBs and thus energy efficiency at large, but also by the fact that such a decrease of a floor area ratio in many cases may increase the quality of urban space. Furthermore, the new strategy would also approach nZEBs to crowded city centers. It would certainly have a positive impact on the discussed innovation tangibility, directly or by means of mass media. It cannot be denied that in urban conditions it would be hard to retain passive solar heat gains on the same level as outside cities. However, entire transport system would be much more sustainable than in a hypothetical case of “passive suburbanization”, so that even compensating the lower gains by means of active technologies would appear to be justified.

Another solution which is completely different, but which also should be proposed, is increasing the innovativeness of the architectural firms by improving their organization and by activities aiming at the consolidation of this currently very fragmented market. Even though it would deprive its accessibility for individual clients, the knowledge transfer within would become more fluent. Increasing people’s awareness of advantages of living in nZEBs should be also maintained, regardless of any finance-driven programmes.

As Płaziak notices, popularization of nZEBs by decreasing their building costs, regardless of their size, could be reached by implementation of new Polish technologies. The research on new building materials is developed in Poland quite well and the problems appear at the stage of tests as specialised laboratories are relatively inaccessible [3]. Unfortunately, it is a symptom of a larger phenomenon, namely insufficient financing of the research and development sector in Poland. Last but not least, creation of a system of incentives for near zero-energy hotels or guesthouses should be considered, as they would eventually enable many citizens to check how a daily life in a nZEB looks like, before deciding on investment.

Summary

The nZEBs dissemination in Poland is not as fast as expected, even though they provide their owners with many benefits. It can be expected that there is a trouble with a further spreading of their idea because of the fact that their examples are not well established in common consciousness. The industry is developed predominantly by small private investors, who can afford hiring only strong-delivery architectural firms, which are featured by a low absorption of new technologies. Moreover, such clients prefer detached single-family houses, which should not be strongly promoted, as a rapid growth of their amount would not be sustainable. Thus, nZEBs should be developed in cooperation with investors who can afford more complex projects and who presently avoid energy efficient constructions because neither ecology or investments with a longer payback period are not among their priorities. Multi-family developments are a prospective segment of the market, as they can be suited easily to the nZEBs standards and they should be a target of future proposed public incentive programs.

References

- [1] A. Dąbrowska, Pasywna hala sportowa wśród traw, <http://www.chronmyklimat.pl/projekty/energooszczedne-4-katy/aktualnosci/pasywna-hala-sportowa-wsrod-traw>, accessed 29 Feb 2016.
- [2] T. Jurczak, Domy pasywne czy energooszczędne? Wkrótce może nie być wyboru, <http://serwisy.gazetaprawna.pl/nieruchomosci/artykuly/821210,domy-pasywne-czy-energooszczedne-wkrotce-moze-nie-byc-wyboru.html>, accessed 29 Feb 2016.
- [3] M. Płaziak, Domy energooszczędne i pasywne jako nieunikniona przyszłość budownictwa w Polsce/Energy-Efficient and Passive Houses as the Inevitable Future of the Construction Industry in Poland, *Prace Komisji Geografii Przemysłu PTG 21 (2013) 173-188*.
- [4] Wiktor, NFOŚiGW: lista 7 banków wybranych do obsługi dofinansowania budownictwa energooszczędnego podana, <https://pvportal.pl/nawosci/4829/nfosigw-lista-7-bankow-wybranych-do-obslugi-dofinansowania-budownictwa-energooszczednego-podana>, accessed 29 Feb 2016.
- [5] A. M. Graczyk, Społeczne i ekonomiczne uwarunkowania transferu wiedzy w zakresie budownictwa pasywnego, *Barometr Regionalny 2 (2014) 111-117*.

- [6] W. Coxe et al., Charting Your Course, *Architectural Technology* 5/6 (1986) 52-58.
- [7] G. Stevens, *The Favored Circle: The Social Foundations of Architectural Distinction*, MIT Press, first ed., Cambridge (Massachusetts)–London, 1998.
- [8] M. Gruszka, Konferencja IARP i MNiSW, <http://www.izbaarchitektow.pl/pokaz.php?id=617>, accessed 29 Feb 2016.
- [9] M. Zimmermann, H.-J. Althaus, A. Haas, Benchmarks for sustainable construction: A contribution to develop a standard, *Energy and Buildings* 37 (11 SPEC. ISS.) (2005) 1147-1157.
- [10] B.N. Winther, A.G. Hestnes, Solar versus green: The analysis of a Norwegian row house, *Solar Energy* 66 (1999) 387-393.
- [11] J. Morrissey, T. Moore, R.E. Horne, Affordable passive solar design in a temperate climate: An experiment in residential building orientation, *Renewable Energy* 36 (2011) 568-577.
- [12] W. Celadyn, Architektura energooszczędna w planowaniu przestrzennym, *Czasopismo Techniczne. Architektura* 18 (2010) 111–120.
- [13] M. Staniszevska, Teoria dyfuzji innowacji Everetta Rogersa i możliwości jej zastosowania w upowszechnianiu odnawialnych źródeł energii, *Acta Innovations* 15 (2015) 45-50.
- [14] R. Boguszewski, Komunikat z badań BS/111/2013: Wartości i normy, Fundacja Centrum Badania Opinii Społecznej, Warszawa, 2013.
- [15] A.D. Hunka, W.T. De Groot, A. Biela, Visions of nature in eastern Europe: A Polish example, *Environmental Values* 4 (2009) 429-452.
- [16] Raport płacowy 2015, Sedlak & Sedlak, Kraków, 2016.
- [17] R. Warsza, Urbanizacja strefy podmiejskiej na przykładzie wybranych gmin łódzkiego obszaru metropolitalnego po roku 1990, Doctoral dissertation, Lodz, 2012.
- [18] P. Bourdieu, *Distinction: A Social Critique of the Judgement of Taste*, Routledge, first ed., London, 1986.
- [19] M. Arczyńska, Ł. Pancewicz, BedZED 10 lat później, *Architektura-Murator* 6 (2011) 28-30.