Improving Living Conditions in Mass Housing of the Prefabrication Era: The User’s Point of View

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Abstract. Maintenance of the housing stock of the mass prefabrication era poses a particular challenge due to the scale of the task. Prefabricated blocks of flats are the home of almost 50% of inhabitants of Polish cities - a home that is still in good technical condition and still desirable (good location, shortage of flats in the market). However, in the light of the present-day performance requirements, this housing stock calls for improvements, necessary to prevent loss of value and increase in maintenance cost. In the course of programming the estate modernization, the planner needs not only to select technically and economically justified measures, but also to assure they are approved by the owners of the apartments. The residents are rarely aware of what is technically possible in terms of retrofitting buildings and the estate infrastructure. Moreover, they may be unaware of what kind of long-term consequences are to be expected if improvements are implemented, and what if they are not. As observed in practice, a constructive dialogue between the housing estate management and the residents occurs rarely. Therefore, in order to examine the user’s point of view, the author designed and implemented an extensive survey project. The surveys are intended to be conducted every five years in consultation with the estate manager. They allow not only to passively observe the evolution of user preferences towards particular improvement proposals (changes in preferences caused by changing needs as well as a result of implemented modernization and renovation activities), but also to stimulate interest in upgrading the housing environment (e.g. improving accessibility, switching to renewable energy sources). The article presents the results and conclusions of two cycles of surveys in one of housing estates in Lublin, south-eastern Poland. Such results may provide the estate manager with useful input for retrofitting projects.

1. Introduction
Poland's mass housing stock from the times of prefabrication has already reached the age of 50 and, although still valued in the residential property market, is starting to show the signs of obsolescence and technical wear and tear [1, 2]. The problem concerns entire housing estates in practically every town and city [2, 3]. Worn-out piping and wiring call for repairs and modernization as in any type of old buildings, but there occur problems specific to the structures of big precast concrete elements, such as untight and corroding joints [4, 5, 6] that, apart from posing risk to the structural safety and energy performance [7], affect the appeal of the buildings and the estates [8, 9]. Recently, Nowogońska [10] undertook to provide a method of forecasting the development of buildings’ and components’ aging to facilitate planning repairs according to urgency; however, she focused on traditional types of structures (brickwork), and not prefabricated ones. The specific “needs” of old precast buildings only
slowly start to attract attention of the researchers and engineers: so far, there occurred no spectacular failure of a precast building, and the stock is not considered a problematic asset yet.

Evolution of Polish construction and environment protection laws as well as the building code require that the energy performance of the existing stock is to be gradually improved. In the case of prefabricated housing blocks, the practical solutions should not be limited to installing further layers of insulation [11, 12], as this, in some precast panel systems, may cause structural damage to the façade elements not designed to carry additional loads. Other solutions are called for, preferably combined with functional improvements. Inspiration can be found in award-winning building modernization projects, such as the Tour Bois le Prêtre in Paris [13]: by installing large glazed loggias in a tower block, the building’s energy consumption dropped by 60%, the usable area of flats was increased, and the formerly dull and warn façade got a new attractive look [11].

Today, the residents expect a higher living standard than nineteen-seventies. They can easily juxtapose the deficiencies of their existing dwellings (accessibility problems, electric systems not designed to the loads caused by the growing number of appliances, wasteful water management, summer overheating etc.) with the state-of-the-art solutions in the market that, if wisely applied in the old housing stock, would directly translate into lower the maintenance cost [14].

Opinions of the residents (direct users), who most often are no experts in technology and construction, should be accounted for in planning maintenance and improvement of the estate. Especially in the case of Polish estates, where the residents are most frequently flat owners, no capital project can be undertaken without their consent. The residents are the best source of information of what is actually needed and what is perceived important.

Therefore, the aim of research was to provide insight into demographic structure of the estate’s residents and their opinion on the housing estate and infrastructure in terms of functionality and energy performance of buildings. Further, the researcher wanted to learn on the resident’s preferences on the potential methods of reducing consumption of energy and overall impact on the environment, as well as on the residents’ willingness to pay extra (or contribute own work) for improvements. The results were used to analyse how the resident’s expectations changed over time and with the repair/improvement measures actually undertaken in the estate between the consecutive surveys.

2. Methods

The paper adopts selected elements of the author’s PEARS methodology [15], namely the direct interview with residents in their flats using the Paper and Pen approach where the survey is conducted face to face, and the interviewer reads the questions and records the answers in the standard form. This method allows the user to obtain answers to a large number of questions of a high level of complexity. Another advantage of this method is the possibility to control the structure of the sample. Weaknesses of this method are: no possibility to use multimedia materials, no anonymity of the respondent, and long time devoted to collecting input.

The survey was conducted twice, in 2009 and 2014, in a housing estate in Lublin, Poland (Osiedle Karola Szymanowskiego, SM Czechów) on the basis of the same questionnaire prepared specifically for the survey in this particular estate. The interviews were agreed with the estate management and announced in advance. Trained interviewees (able to explain the questions if necessary) approached the respondents at home during one week in the mornings and in the afternoons to assure that the number of respondents is high enough to provide statistically significant results. The answers were collected from one adult person per flat. The questionnaire comprised 19 questions of different character (open-ended, closed-ended); the questionnaire form was presented in [15].

In both surveys, the sample (number of respondents) was no less than 18% of the population (population size equals the number of flats in the estate). Statistical tests were performed by means of IBM SPSS Statistics. To compare frequency of answers in consecutive surveys (2009 and 2014), the chi-squared test ($\chi^2$) was used. Means were compared by means of the Student $t$-test (two groups) and analysis of variance (ANOVA) with Bonferroni’s post-hoc test was performed if the number of groups were greater. Association between variables was measured, depending on the type of variables, by
Cramer’s phi (\(\phi\)) or Spearman rank correlation (\(rs\)) [17]. In all statistical analyses, a confidence interval of 95% has been assumed, which means that the significance of differences occurs when the statistics "p" reaches values below 0.05.

3. Results

3.1. The respondents
The surveys of 2009 and 2014 provided answers from, respectively, 246 and 163 respondents. Their age structure is presented in Table 1. As the samples were large, some conclusions on demographic changes can be drawn: the structures of 2009 and 2014 are significantly different (\(\chi^2[3, n = 404] = 15.54; p = 0.001; \phi = 0.196\)). The population of the estate seems to have aged: the number of people over 65 grew in a statistically significant way, whereas the drop of the share of middle-aged people (46-65) from 46.9% to 33.5% in 2014 was not statistically significant. The level of education in the samples of 2009 and 2019 was not significantly different (\(\chi^2[2, n = 391] = 1.54; p = 0.463; \phi = 0.063\)) (Table 2). Similarly, in the consecutive surveys, the share of economically active respondents was not significantly different (\(\chi^2[3, n = 241] = 5.72; p = 0.052; \phi = 0.179\)) as the number of the oldest (and retired) was greater (table 3 a, b.). Some respondents refused to disclose their age, education or economic activity status, thus the totals in the tables differ from the total number of respondents.

### Table 1. Age of the respondents.

| Survey year | 18-25 | 26-45 | 46-65 | > 65 | Total |
|-------------|-------|-------|-------|------|-------|
| 2009        | 30 (12.3%) | 62 (25.5%) | 114 (46.9%) | 37 (15.2%) | 243 (100%) |
| 2014        | 23 (14.3%) | 35 (21.7%) | 54 (33.5%) | 49 (30.4%) | 161 (100%) |

### Table 2. Education level of the respondents.

| Survey year | Vocational | Upper secondary | Bachelor or higher | Total |
|-------------|------------|-----------------|--------------------|-------|
| 2009        | 49 (20.6%) | 98 (41.2%)      | 91 (38.2%)         | 243 (100%) |
| 2014        | 24 (15.7%) | 65 (42.5%)      | 64 (41.8%)         | 161 (100%) |

### Table 3. Economic activity: a) the number and share of economically active, b) the number and share of economically inactive according to age group.

#### a)

| Survey year | 18-25 | 26-45 | 46-65 | > 65 | Total |
|-------------|-------|-------|-------|------|-------|
| 2009        | 9 (11.1%) | 55 (56.8%) | 42 (37.4%) | 0 (0.0%) | 106 (100%) |
| 2014        | 7 (14.9%) | 27 (57.4%) | 12 (25.5%) | 1 (2.1%) | 47 (100%) |

#### b)

| Survey year | 18-25 | 26-45 | 46-65 | > 65 | Total |
|-------------|-------|-------|-------|------|-------|
| 2009        | 21 (15.7%) | 7 (5.2%) | 70 (52.2%) | 36 (26.9%) | 134 (100%) |
| 2014        | 14 (13.1%) | 8 (7.5%) | 40 (37.4%) | 45 (42.1%) | 107 (100%) |

3.2. The opinions
The first group of questions concerned deficiencies in the estate’s infrastructure and facilities. Table 4 lists the pinions on the quality/presence of physical equipment f spaces between buildings, and Table 5 provides insight into perceived deficiencies in local amenities related with culture, integration in the neighborhood, and local commerce.

As for results on missing elements of the estate and infrastructure, in both stages of the survey the participants listed (on average) almost identical number of deficiencies (2.81 in 2009 and 2.84 in 2014; these differences are not statistically significant, \(t(n=407) = -0.141; p = 0.888\)). However, significant differences in opinions expressed in 2009 and 2014 were observed with regard to:
• maintenance of the greens; the number of indications for this problem decreased from 42.3%
  to 30.1% ($\chi^2[1, n = 409] = 6.25; p = 0.012; \phi = -0.124$)
• need for recreational equipment; increase from 35.4% to 47.2% ($\chi^2[1, n = 409] = 5.75; p = 0.016; \phi = 0.119$)

Differences at the verge of statistical significance concerned:
• Need to modernize playgrounds (increase),
• Need to install new benches (increase),
• Need to resurface sports grounds (decrease).

Table 4. “What is worth doing to the infrastructure of the estate?”

| Survey year | Add parking space | Improve maintenance of greens | Add benches | Add garbage cans | Add recreation equipment | Modernize playgrounds | Resurface sports field |
|-------------|-------------------|-------------------------------|-------------|------------------|-------------------------|-----------------------|------------------------|
| 2009        | number            | 159                           | 104         | 101              | 95                      | 87                    | 87                     | 59                     |
|             | %                 | 64.6%                         | 42.3%       | 41.1%            | 38.6%                   | 35.4%                 | 35.4%                  | 24.0%                  |
| 2014        | number            | 98                            | 49          | 82               | 55                      | 77                    | 73                     | 27                     |
|             | %                 | 60.1%                         | 30.1%       | 50.3%            | 33.7%                   | 47.2%                 | 44.8%                  | 16.6%                  |
|             | $\chi^2$          | 0.854                         | 6.248       | 3.393            | 1.003                   | 5.754                 | 3.652                  | 3.250                  |
|             | $p$               | 0.355                         | 0.012       | 0.065            | 0.316                   | 0.016                 | 0.056                  | 0.071                  |

Table 5. “What amenities should be introduced in the estate?”

| Survey year | Children’s center | Youth center | Seniors center | Estate’s “central market square” | Barbeque facilities | Water feature |
|-------------|-------------------|--------------|----------------|----------------------------------|--------------------|---------------|
| 2009        | number            | 91           | 44             | 78                               | 55                 | 47            | 72            |
|             | %                 | 37.0%        | 17.9%          | 31.7%                            | 22.4%              | 19.1%         | 29.3%         |
| 2014        | number            | 62           | 58             | 57                               | 42                 | 45            | 46            |
|             | %                 | 38.0%        | 35.6%          | 35.0%                            | 25.8%              | 27.6%         | 28.2%         |
|             | $\chi^2$          | 0.046        | 16.402         | 0.472                            | 0.630              | 4.065         | 0.052         |
|             | $p$               | 0.831        | < 0.001        | 0.492                            | 0.427              | 0.044         | 0.819         |

In 2014, the perceived needs related with missing infrastructure of social integration increased:
the absence of a youth centre was reported by a significantly higher percentage of the respondents.
The children’s centre and the seniors centre were still missed the most.

Another question concerned satisfaction with the general aesthetics of the estate – the share of
satisfied residents grew significantly from 75.5% in 2009 to 85.7% in 2014 ($\chi^2[1, n = 380] = 5.72; p =
0.017; \phi = -0.123$), thus the efforts of the estate managers was appreciated.

The general opinion on the functionality of buildings stayed unchanged: typically, the inhabitants
were satisfied with it and pointed to (on average) less than one improvement from the list. However,
the proportions between postulated functionality-improvements changed (Table 6): more residents saw
benefits in adding an extra storey to their building or converting the attics into flats (as some buildings
had some common access washing rooms located in the top storey, not in use any more). Similarly,
more residents would welcome a lift that would take them from the ground level (if the buildings are
equipped with a lift, it serves the ground floor level, and the ground floor is typically located half a
storey above the ground, accessible by one flight of stairs). The need for buffer porches at the entrance
to the buildings and glazing loggias/balconies dropped significantly.

Table 6. “What improvements to the building would make sense?”

| Survey year | Add a storey | Add buffer porches | Add a lift serving ground level | Glaze balconies |
|-------------|--------------|---------------------|--------------------------------|-----------------|
| 2009        | number       | 15                  | 53                             | 23              | 93              |
|             | %            | 6.1%                | 21.5%                          | 9.3%            | 37.8%           |
| 2014        | number       | 20                  | 12                             | 51              | 39              |
|             | %            | 12.3%               | 7.4%                           | 31.3%           | 23.9%           |
|             | $\chi^2$     | 4.773               | 14.754                         | 31.841          | 8.639           |
|             | $p$          | 0.029               | < 0.001                        | < 0.001         | 0.003           |

Similarly, the general opinion on the functionality of flats did not change significantly, and the residents pointed, on average, to less than two improvements from the list. The idea of installing motion sensors to switch on the light in the staircases lost on popularity, whereas modernization of wiring and plumbing became more urgent. Also the existing system of natural ventilation was reported to be insufficient by more residents (Table 7).

Table 7. “What improvements to flats are needed?”

| Survey year | Install motion sensors | Improve electrical system | Improve plumbing | Improve individual gas meters | Switch from natural to mechanical ventilation | Install air conditioning system | Increase flat area by the expense of corridors | Increase flat area by extensions |
|-------------|------------------------|---------------------------|------------------|-----------------------------|---------------------------------------------|-------------------------------|----------------------------------------|---------------------------------|
| 2009        | number                 | 145                       | 47               | 32                          | 86                                         | 26                           | 27                                      | 20                              | 28                              |
|             | %                      | 58.9%                     | 19.1%            | 13.0%                       | 35.0%                                      | 10.6%                        | 11.0%                                  | 8.1%                            | 11.4%                           |
| 2014        | number                 | 42                        | 46               | 39                          | 51                                         | 45                           | 35                                      | 17                              | 10                              |
|             | %                      | 25.8%                     | 28.2%            | 23.9%                       | 31.3%                                      | 27.6%                        | 21.5%                                  | 10.4%                           | 6.1%                            |
|             | $\chi^2$               | 43.482                    | 4.637            | 8.147                       | 0.593                                      | 19.839                       | 8.399                                   | 0.630                           | 3.203                           |
|             | $p$                    | < 0.001                   | 0.031            | 0.004                       | 0.441                                      | 0.000                        | 0.004                                  | 0.427                           | 0.074                           |

Table 8. “What should be done towards reducing environmental impact of the estate?”

| Survey year | Insulate basement ceilings | Insulate external walls | Insulate roofs | Replace windows | Glaze balconies | Add controllers to heating system | Install renewable energy systems | Utilize grey water |
|-------------|-----------------------------|-------------------------|----------------|-----------------|-----------------|----------------------------------|----------------------------------|-------------------|
| 2009        | number                      | 62                      | 75             | 39              | 45              | 74                               | 99                               | 96                | 153               |
|             | %                           | 25.2%                   | 30.5%          | 15.9%           | 18.3%           | 30.1%                           | 40.2%                           | 39.0%             | 62.2%             |
| 2014        | number                      | 31                      | 16             | 25              | 12              | 33                               | 62                               | 87                | 85                |
|             | %                           | 19.0%                   | 9.8%           | 15.3%           | 7.4%            | 20.2%                           | 38.0%                           | 53.4%             | 52.1%             |
|             | $\chi^2$                    | 2,865                   | 24,218         | .020            | 9,766           | 4,910                            | 1,672                            | 8,165             | 4,068             |
|             | $p$                         | < 0.001                 | 0.031          | 0.004           | 0.441           | 0.000                            | 0.004                            | 0.427             | 0.074             |
The respondents were asked about potential improvements of energy performance of their buildings (Table 8). Their general interest in such improvement dropped significantly. In particular, after completion of the facade insulation project, less of them believed in benefits of further insulation. Similarly, as most of the windows were already replaced with modern and tight ones, less people pointed to replacement of joinery as a source of energy savings. The idea of glazing balconies and loggias for solar gains also lost on popularity, though nothing had been done to the balconies yet (apart from minor repairs). The idea of using grey water was also less popular in 2014 than in 2009. The only growth of interest was related with installation of active systems to utilize renewable energy.

As for the perceived “most urgent” improvements, their average number per respondent did not change significantly between 2009 and 2014, and was about 2.5. The changes in most urgent interventions are presented in Figure 1, the statistically significant ones concerned only the following items: wall insulation (urgency dropped; \( \chi^2[1, n = 409] = 29.38; p < 0.001; \phi = -0.268 \)), glazing balconies (urgency dropped \( \chi^2[1, n = 409] = 9.12; p = 0.003; \phi = -0.149 \)), modernization of the plumbing system (urgency grew, \( \chi^2[1, n = 409] = 10.09; p = 0.001; \phi = 0.163 \)).

![Figure 1. Changes in “most urgent” needs](image)

3.3. Willingness to contribute work and money to improvements

The question related to the willingness to contribute in kind or in cash to modernization of the estate and buildings were asked in two ways. First, the residents were asked whether they would be willing to physically participate in the revitalisation works of the housing estate. The results of the analysis show that in 2014 more residents were willing to directly offer their work than in 2009 (increase from 26.4 to 36.2%, \( \chi^2[1, n = 375] = 4.15; p = 0.042; \phi = 0.105 \)). The other question concerned willingness to pay an extra amount of money; here no significant change was observed, and about a quarter of respondents would agree to spend toward improvements.

The relationship with the willingness to contribute and the number of needed improvements was checked by means of Spearman rang correlation. Those willing to pay more, put forward more ideas for enhancement of the estate, flats and buildings (\( rs = 0.184; p < 0.001 \)), though this observation does not hold for the number of “urgent improvements”.

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Moreover, a relationship with overall satisfaction with the estate management and the number of needed improvements was checked: the more needs, the lower the satisfaction, and the results in 2009 and 2014 proved similar.

4. Summary, discussion and conclusions
The research confirms the merits of surveys to check opinion and obtain feedback on the efforts of the estate management. Information gathered this way is required to properly define objectives of facility management plans and estate regeneration.

The survey concerned the existing general needs that, in the opinion of the inhabitants, were expected to be satisfied without indicating the exact time horizon, and the needs considered “urgent”. The survey was intended to be conducted in regular intervals to capture changes of the resident’s expectations over time and against actions actually taken by the estate management.

In the case of this particular object of research (the Karol Szymanowski Estate in Lublin), the most significant changes in perceived deficiencies of the estate’s infrastructure and amenities over the period of analysis concerned missing recreational equipment, benches, and equipment of playgrounds for children – as more residents noticed these deficiencies, the estate manager was provided with a clear signal how to improve the infrastructure to user satisfaction. Similarly, as more residents pointed to missing youth center and facilities for outdoor meetings (barbecue), and a large number of residents still demanded a children’s club and senior center, this could give a spur to starting new business activity or non-profit initiatives in the community.

As the number of residents thinking of a more comfortable access to the buildings (lifts serving the ground level) is growing, and more people understand the benefits of adding an extra floor to the existing buildings and selling flats to pay for a new lift, this might indicate that the residents could be convinced to agree on some capital projects in the estates. The survey pointed to a number of issues worth considering in the estate management plans: the number of senior residents grew, so improvements for the elderly should be considered first, and solving the accessibility problem (providing lifts) might be costly.

More inhabitants pointed to inefficient ventilation and the need to install mechanical ventilation or air conditioning, thus the problem of summer overheating or air flow problems due to making the envelopes airtight in the course of insulation works becomes more urgent. More people would welcome modernization of electrical wiring and water supply and sewage systems, thus obsolescence of these system became an issue.

The building’s envelopes had already been insulated, thus the inhabitants’ demand for further insulating the building dropped, but the possibility of installing modern systems using renewable energy came to their minds more often. The interest in glazing balconies dropped.

As for the most urgent needs, more residents expected that walls in the common access areas were refreshed (aesthetics was put on the first place). Installation of lifts slightly dropped on popularity (though still one fourth of the inhabitants declared it as urgent need). Modernization of the building’s systems kept being considered urgent, though the growing number of respondents calling for replacement of piping might indicate these systems reach the end of useful life.

The share of residents willing to pay extra for improvements proved stable (over 20%), however, with more and more improvements perceived as needed, and growing obsolescence of the building’s systems, negotiations with the residents (being mostly flat owners) should start now to agree on the best plans to prevent depreciation of the estate’s assets.

The prefabricated housing blocks are still structurally sound, and the estates similar to the object of research are home to hundreds of thousands. With the shortage of affordable housing, neglecting the estates would mean significant losses. Conducting regular surveys helps manage estates in an informed way.
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References

[1] A. Ostańska, „Aktualne potrzeby mieszkańców podstawą programowania rewitalizacji osiedli budynków prefabrykowanych,” Przegląd Budowlany, vol. 3, pp. 38-40, 2018.

[2] A. Ostańska, Improving condition of prefab multifamily housing stock: user perspective assessed via direct survey. IOP Conference Series : Materials Science and Engineering, vol. 471, 2019.

[3] J. M. Chmielewski, M. Mirecka, Modernizacja osiedli mieszkaniowych, Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej, 2001.

[4] W. Ligeza, M. Płachecki, „Uszkodzenia złączy w ścianach oślnowych budynków wielkopyłowych,” Inżynieria i Budownictwo, vol. 4-5, pp. 204-208, 2000.

[5] J. Sobczak-Piąsta, „Metoda badania jakości betonu w elementach konstrukcyjnych budynków wielkopyłowych,” Materiały Budowlane, vol. 8, pp. 37-38, 2017.

[6] Instrukcja zabezpieczania przed korozją zbrojenia złączy w budynkach mieszkalnych z elementów wielkowymiarowych. Praca PR-5, gr-02, temat M2.01.02.8.1 Opracowanie COBPO W-wa 1982r. Warszawa: Instytut Techniki Budowlanej, 1971.

[7] L. Runkiewicz, „Błëdy i uszkodzenia w budownictwie wielkopyłowym,” Błëdy i uszkodzenia budowlane oraz ich usuwanie. Warszawa: WEKA, 2002.

[8] S. Fic, M. Szelag, A. Szewczak, „Problemy eksploatacyjne budynków wielkopyłowych na przykładzie obiektów na terenie Lubelszczyzny,” Budownictwo i Architektura, vol. 13, no. 3, pp. 7-14, 2014.

[9] M. Szpytma, „Rewitalizacja osiedli z wielkiej płyty. Implementacja rozwiązań europejskich do warunków polskich,” Budownictwo i Architektura, vol. 13, no. 3, pp. 341-348, 2014.

[10] B. Nowogóńska, Diagnoza w procesie starzenia budynków mieszkalnych wykonanych w technologii tradycyjnej. Komitet Inżynierii Lądowej i Wodnej PAN, Studia z zakresu inżynierii, nr 96, Warszawa, s. 1-145, 2017.

[11] E. Radziszewska-Zielina, E. Strzelecka, „Systemy ociepleń w ocenie klienta”, Izolacje. Budownictwo, przemysł, ekologia”, vol.1 , pp. 33-37, 2005.

[12] A. Ostańska, Wielka płyta: analiza skuteczności podwyższania efektywności energetycznej: Termomodernizacja, termografia, wytyczne naprawcze. Warszawa: PWN, 2016.

[13] Druot F, Lacaton A.,Vasal J. P., „Transformation of Tour Bois le Prêtre,” in: Small Scale Big Change. New Architecture of Social Engagement, New York: The Museum of Modern Art, pp. 103-112, 2010.

[14] A. E. Ostańska, Programowanie rewitalizacji osiedli mieszkaniowych z zastosowaniem modelu PEARs, Lublin: Komitet Inżynierii Lądowej i Wodnej PAN, s 169, 2018. ISBN 978-83-939534-4-8

[15] A. Ostanska, “Thermal imaging for detection of defects in envelopes of buildings in use: qualitative and quantitative analysis of building energy performance,” Periodica Polytechnica - Civil Engineering, pp. 1-8, 2018.

[16] A. D. Aczel, Complete Business Statistics, 7th Ed., New York: Tata McGraw-Hill, 2012.