

RESEARCH ARTICLE

Mirke Neighbourhood Panel: Accompanying research for the Solar Decathlon Europe 21/22

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Abstract • The international architecture competition Solar Decathlon Europe was held in Wuppertal in 2022 and focused on sustainable building and living in the city. The student teams participating in the competition developed buildings that would enable climate-friendly living and be tailored to the “Mirke” district in Wuppertal and the individual needs of the residents in this neighborhood. Not only the neighborhood was the focus of the competition, but also the residents of the Mirke district were involved in the project through a neighborhood panel. As part of the Mirke neighborhood panel, three survey waves were conducted between May 2021 and August 2022. The results and insights gained from the neighborhood panel were incorporated into the project and shared with the architectural teams participating in the competition. In addition, the results were shared and discussed with the urban development department of the city of Wuppertal, local initiatives, and other partners in the neighborhood.

Mirke Quartierspanel:

Begleitforschung zum Solar Decathlon Europe 21/22

Zusammenfassung • Der internationale Architekturwettbewerb Solar Decathlon Europe fand 2022 in Wuppertal statt und beschäftigte sich mit nachhaltigem Bauen und Wohnen in der Stadt. Die am Wettbewerb teilnehmenden Studententeams entwickelten Gebäude, die ein klima-

freundliches Wohnen ermöglichen und auf den Wuppertaler Stadtteil „Mirke“ und die individuellen Bedürfnisse der Bewohnerinnen und Bewohner in diesem Quartier zugeschnitten sein sollten. Nicht nur das Quartier stand im Fokus des Wettbewerbs, sondern auch die Bewohnerinnen und Bewohner der Mirke wurden über ein Quartierspanel in das Projekt eingebunden. Im Rahmen des Mirker Quartierspanels wurden zwischen Mai 2021 und August 2022 drei Befragungswellen durchgeführt. Die Ergebnisse und Erkenntnisse aus dem Quartierspanel flossen in das Projekt ein und wurden mit den am Wettbewerb teilnehmenden Architekturteams geteilt. Darüber hinaus wurden die Ergebnisse mit dem Amt für Stadtentwicklung der Stadt Wuppertal, lokalen Initiativen und anderen Partner*innen im Quartier diskutiert.

Keywords • panel survey, neighborhood survey, city development, energy-efficient refurbishment, citizen participation

Introduction

Climate change is one of the greatest challenges of our time. Cities in particular have a key role to play in climate protection (IPCC 2023). According to the recent IPCC report urban areas are home to 4.2 billion people (IPCC 2023, p. 909), the majority of the world’s population. Cities consume about 75 percent of the world’s global primary energy and emit between 50 and 60 percent of the world’s total greenhouse gases (Khor et al. 2022; Kraas et al. 2016). At the same time, cities are particularly hard hit by the consequences of global warming for example, rising temperatures and heat stress, rising sea levels, storm surges, and extreme weather events (IPCC 2022). Also, the growing population faces a shortage of affordable housing (Kraas et al. 2016). By 2030, it is estimated that 250 million new housing units will be needed in the 12 countries that are home to 61 percent of the world’s total population. This leads to an urgent need for action to optimise existing urban structures and raise awareness of sustainable building and renovation.

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This topic is addressed by the Solar Decathlon Europe (SDE), an international student competition about sustainable building and living in the city. It has taken place every two years since 2010. In 2022, the SDE was held in Germany for the first time. The German SDE edition especially focused on the challenges of sustainable energy transitions in urban contexts, while exploring opportunities for the revitalisation of building stock that work toward reducing the carbon footprint. Reusing, evolving, building up and re-defining existing dwellings were the central architectural tasks, whilst resource efficiency, sufficiency, climate protection and closed-life-cycle construction were central themes. Sixteen student teams constructed demonstration units and competed in the SDE 21/22 exhibition area in Wuppertal, Germany. Wuppertal was not only site of the competition, in particular a district of the city was subject of the designs – the Mirke district. This means, the teams of the competition developed buildings that enable climate-friendly living tailored to the district “Mirke” and the individual needs of the residents in this neighbourhood. With its building- and energy-related challenges and also social problems, this district is a typical representation of many urban districts in Europe (Voss and Simon 2023) and therefore provided the ideal environment for the competition.

As part of the SDE 21/22, a neighbourhood panel was being set up as accompanying research and focused on the following research questions:

1. How do the residents perceive the living conditions in their neighbourhood and the development of the neighbourhood?
2. How does the SDE 21/22 affect the neighbourhood residents?
3. What are the residents' expectations from the SDE 21/22 for their neighbourhood and the exhibition area in the future?

Three survey waves were conducted as part of the Mirke neighbourhood panel between May 2021 and August 2022. The results and insights gained through the neighbourhood panel were shared with the architectural teams of the competition. By participating in the Mirke neighbourhood panel, the citizens provided insights into their routines and attitudes and shared their views on local challenges, transformation processes and important future issues.

Design and methods

Panel development and structure

All households (approx. 4,000) in the Mirke neighbourhood received a postal invitation to the neighbourhood panel from the City of Wuppertal in April 2021. A total of 1004 people accepted the invitation and registered for the Mirke neighbourhood panel in the recruitment phase. Just under half (461 people; response rate: 45.9%) took part in the first survey in September 2021. This response rate is slightly higher than average (Wu et al. 2022). In the second survey wave in April 2022, 390 people took part (response rate: 38.8%). In the third survey wave in August



Fig. 1: Meine Mirke Pass.

Source: © SDE 21/22

2022, 376 people took part (response rate: 37.4%). Recruitment, first and second wave were carried out before the SDE 21/22, the third wave was carried out after the event.

The surveys were generally carried out digitally, but could also be completed on paper, if desired. In addition, it was possible to fill out questionnaires at the exhibition area in preparation close to “Nordbahntrasse” and during on-site recruitment activities. This opportunity was offered irregularly on weekday afternoons and at weekends.

Incentives: Incentives were a key element of the survey. More than 100 vouchers for local gastronomy, cultural and leisure time offers were raffled among the participants upon successful registration. In addition, after completing the first survey, the so-called “Meine Mirke Pass” was handed out (figure 1), with which the participant could get three free drinks at local cafés and restaurants in the Mirke neighbourhood as well as other benefits in the region. To create renewed incentives, this offer was extended before the second and third wave.

Communication activities: To increase visibility of the survey, it was accompanied by video, poster, television and print campaigns. Also, results of the first wave were publicly exhibited at three locations in the Mirke neighbourhood: in “Rathausgalerie” on the subject of living, in “Ein Quadratkilometer Bildung” on the subject of neighbourhood life and in “Café Kinderwagen” on the subject of mobility.

Contents of survey waves

The *recruitment survey* asked about aspects such as size of apartment/house, number of living spaces and demographic variables such as gender, age and employment situation. In addition, language preferences (possible options were German, English, Turkish) for completing the surveys were recorded. Also, there was the option of naming desired topics for future surveys.

The contents of the *first survey* wave included the place attachment-scale of Raymond et al. (2010), social cohesion-scale

of Tackenberg et al. (2020) environmental awareness-scale of Geiger and Holzhauser (2020) and renovation approval-scale of Schempp (2013). Other aspects asked were: satisfaction with the living conditions in the Mirke neighbourhood, key factors for the choice of the living environment, personal activities in the neighbourhood, means of transport used, housing constellation and housing space, and attitude towards space sufficiency.

The *second survey* focused on the one hand on mobility and parking, including various future scenarios and solutions for mobility. On the other hand, aspects such as gentrification of the neighbourhood (using the scale of Üblacker and Lukas (2019)), renovation measures carried out and civic engagement (using the scale of BMFSFJ (2017)) were assessed.

The *third survey* was conducted after the main event phase of the competition “Solar Decathlon Europe 21/22” in the Mirke neighbourhood and served both to capture panellists’ evaluation of the event and to post-measure indicators such as place attachment, environmental awareness, mobility behaviour, and work and housing preferences.

Overall, civil society actors in the Mirke neighbourhood were involved in the conception of the panel before starting and during its course.

Results

Weighting of cases

In order to check the representativeness of the participants for the Mirke neighbourhood, the data was compared with official statistics and then weighted (figure 2). By weighting a sample, the sample profile of the study can be approximated to a desired profile, such as the underlying population (Bethlehem 2008). The poststratification weights in the present sample were created using information on age, gender and migration background. The poststratification weights also adjust for unequal selection probabilities (design weights).

Descriptive results

First survey wave [n = 461]

Demographics: The number of male and female participants was almost equally distributed (51.2% male, 47.7% female, 1.0% diverse). 57.9% of the participants were between 16 and 44 years old and 13.3% stated that they were over 65 years old. A majority stated that they were currently unmarried (59.2%). Married or in

a registered partnership are 31.9%. Also, a large majority of participants have either a university education (tertiary level; 48.5%) or a (higher) secondary education (upper secondary level; 40.8%). 62.4% of respondents were employed; a smaller proportion reported being in education or training schemes (17.4%) at the time of the survey. The monthly net household income for the majority of respondents was between 2000€ and 4000€ (37.9%) or between 1000€ and 2000€ (24.0%). 22.7% of the participants had lived in the Mirke neighbourhood for more than 20 years.

Place attachment and environmental awareness: Overall, the participants feel quite connected to the neighbourhood (mean = 2.8; 0 = no place attachment at all; 4 = strongly attached to the Mirke neighbourhood). Also, when asked whether they like living in the Mirke neighbourhood, the majority of participants expressed (very) strong agreement (90.5%). The neighbourhood relations were rather good to very good (“I know some of the neighbours more closely and they help each other out sometimes”, “I maintain friendships with some neighbours”; 67.8%). Also, the majority of respondents rated intercultural co-existence in the neighbourhood (rather good/very good: 76.1%) and social cohesion positively (rather good/very good: 57.6%). Environmental awareness was generally high (mean = 3.0; 0 = not at all environmentally aware; 4 = very aware) among respondents in the Mirke neighbourhood.

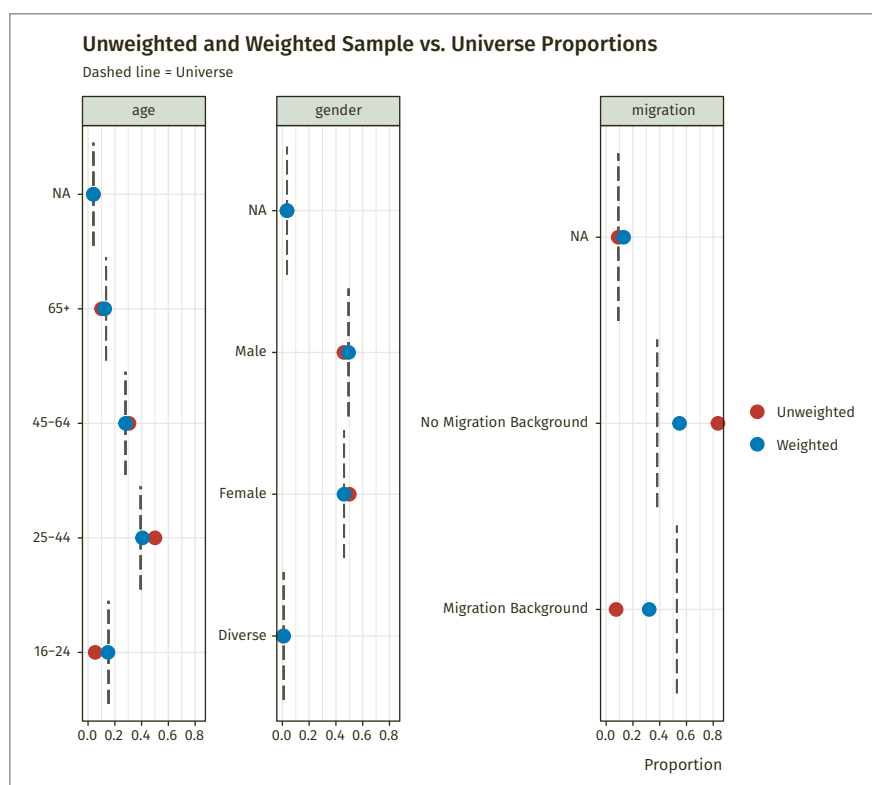


Fig. 2: Weighting of sample after the third wave.

Source: authors' own compilation

Mobility: The majority of participants stated that they have a driving licence themselves (74.0%). In addition, 54.0% say they always have permanent access to a car and 72.4% have at least one car in their household. Only a small proportion of respondents (15.0%) are members of a car-sharing provider. In terms of transport use, car use in the Mirke neighbourhood is relatively balanced: While 45.8% of respondents said they used their car daily or several times a week, 54.2% said they rarely or never relied on their car. Car sharing was again not used by the majority (98.0%). Public transport was used frequently (daily or several times a week) by 40.7% of the participants at the time of the survey. Walking, on the other hand, was much more common: Around 83.7% stated in the survey that they covered distances exclusively on foot every day or several times a week.

Satisfaction with flat size and housing situation: A majority of respondents stated that they currently live in a rented flat (79.3%) and less frequently in a condominium (14.8%). The average number of rooms is 2.9 rooms and the average living space per person is 45.1 sqm. Most of the participants live with one other household member (38.1%) or alone (32.5%). Also, the majority of respondents are (very) satisfied with their housing situation (79.0%). Only a very small proportion stated that they were (very) dissatisfied with their housing situation (3.7%). The majority of the participants felt that the size of the flat was just right (59.9%) and 27.7% tended to feel that it was rather/much too small.

In the first survey, the possibility was given to name desired topics for future surveys. The most frequent mentions related to mobility and parking, which were then integrated as a main topic in the second survey.

Second survey wave [n = 390]

Mobility station, neighbourhood hub and neighbourhood garage: Mobility stations link different means of transport in one place, enabling passengers to choose flexibly between public transport, sharing and the like. 84.1% of respondents rated the idea of a mobility station as good to very good. Also, 62.6% of the people said they could well/very well imagine using a mobility station. In addition to mobility services, neighbourhood hubs integrate, for example, parcel service functions, local supply facilities or bicycle repair modules. At the same time, it can create a new meeting place for local residents. Most respondents rated the idea of a neighbourhood hub (88.8%) and also the idea of a neighbourhood garage (83.8%), which is located near residential houses and apartments and is intended to provide space for all vehicles belonging to the residents of a neighbourhood, as good to very good. When evaluating different scenarios for solving the parking problems in the neighbourhood, the installation of a mobility station and neighbourhood hub was named as the best solution, the installation of a neighbourhood garage as the second-best solution, and the creation of additional free residents' parking in the neighbourhood as the third-best solution.

Energy-related building renovation: The respondents were asked which energetic building refurbishments have been done since 2000. 29.0% declared to have modernised the heating system largely or completely, 24.1% replaced old windows (largely or completely) and insulation was installed by 22.7% (largely or completely). Under 5.0% declared "other" refurbishments, the use of renewable energy for heating or an installation or the renewal of a ventilation system (largely or completely).

Housing and satisfaction with individual housing factors: Most participants have not changed their housing situation since the first survey wave (85.8%) and did not plan to do so (62.0%). Satisfaction with individual factors of housing varied widely among the factors surveyed. Most people were particularly satisfied with their apartment size (86.5% (rather/very) satisfied), their house community (74.1% (rather/very) satisfied), floor plan or room layout (84.6% (rather/very) satisfied), number of rooms (84.7% (rather/very) satisfied), and balcony or terrace (70.0% (rather/very) satisfied). Satisfaction with parking spaces for cars and bicycles, shared areas and the energy condition of the building was rather poor.

Gentrification: Gentrification was surveyed by a scale of 10 questions. The respondents assessed the gentrification tendencies with a mean of 2.1 on a range from 0–4 (0: no perception of gentrification; 4: strong perception of gentrification). Thus, there is an ambiguous result with a slight tendency towards a perception of gentrification.

Civic engagement: 28.9% of the participants stated that they are civically engaged at least once a week. About the same number of participants said they never get involved (31.7%). Most of the participants are active members of a sports club. 30.0% of the participants are passive members of professional associations. 21.0% of the participants specify that they are passive members of a church and other religious communities. In addition, 11.2% of the participants are active in music clubs or theatre groups. Also, 11.2% of the participants are actively involved in an ethnic community.

Third survey wave [n = 376]

Of the participants in the neighbourhood panel, 71.0% attended the SDE 21/22 event between June 10 and June 26 2022, and most of them enjoyed the exhibition area along the "Nordbahntrasse" (90.6% rather/very much liked it). To assess panellists' point of view they were asked to assess statements such as "I will try to transfer ideas from SDE 21/22 into my own life." From the respondents' point of view, the information about the individual buildings was presented in an understandable way (62.4% (rather) agree). Around 70.0% of the respondents stated that hosting the SDE 21/22 in the city of Wuppertal will have a positive benefit for the Mirke neighbourhood and also that they believed the exhibition and event area will remain exciting in the

future (70.4% rather/fully agree). It was communicated beforehand that some of the buildings will be further used in the follow-up project “Living lab NRW”. 76.8% of respondents agreed that the SDE event would be (rather) good for the Mirke neighbourhood and just under half of the respondents (49.2%) think that the SDE event would (rather) positively change the neighbourhood in the long term.

Complementary, the panellists were asked in open-ended questions what they liked about SDE 21/22, what they did not like about it, and what should change accordingly for a repeat of the event. Respondents indicated that they particularly liked the sustainability and future orientation of the event (13.5%), the innovations brought forth (10.9%), the general collaboration of the international university teams (10.4%), and the building concepts presented (10.1%). Negative aspects of the event mentioned were that the total event duration was too short (11.0%), the traffic concept was not sufficient (8.4%) and the waiting times at the houses were too long (7.9%). Related to this, the most frequently mentioned comments were that a longer exhibition duration should be chosen if the event is repeated (15.3%) and that the guided tours through the houses should be changed (9.6%). For example, it was suggested that more guided tours could be offered, that there should be tours in smaller groups, or that advance reservations could be made.

Conclusion

In 2022, the SDE was held in Germany for the first time. Adding new storeys, closing gaps between buildings, and horizontal building extensions were three specific tasks in the field “construction” addressed by the SDE 21/22, consistently taking account of the architectural and technical improvement of existing buildings. Wuppertal was not only the venue for the SDE 21/22, but an important source of inspiration for the ideas that were developed during the competition. The urban profile of the competition, in detail described by Voss and Simon (2023), anchored the competition at the neighbourhood level. It enabled the teams to plan their building projects with actual social contexts – provided by the Mirke neighbourhood panel – and building structures given in reality.

Through the accompanying research with the Mirke neighbourhood panel, which took place in this form for the first time in the context of an SDE, the neighbourhood residents were involved in the SDE 21/22 and its topics. They provided insights into their routines and attitudes and shared their views on local challenges, transformation processes and important future issues.

It has also helped to increase the acceptance of and interest in the event and to create impulses for long-term neighbourhood development. The acceptance of the residents for the event was central because the event took place within the neighbourhood. At the beginning, scepticism could be heard in conversations, but the broad information about the event and the possibility to express opinions and preferences via the panel could have set posi-

tive impulses here. In addition, six demonstrators remain on site and thus leave their mark on it, but also continue to provide the opportunity for research on sustainable building and living with the follow-up project “Living Lab NRW”.

The results of the Mirke neighbourhood panel are relevant for various sides: a) on the scientific side with findings on the conception and management of a neighbourhood panel, b) on the SDE side with information for the student competition teams on the composition of the neighbourhood and the preferences of the residents, and c) on the side of the civil society actors in the neighbourhood, with whom the results were discussed and reflected and who were also involved in the conception of the panel.

Regarding the conception and management of the neighbourhood panel it can be noted that incentives and communication played a key role. The number of residents participating in the neighbourhood panel was slightly above average (Wu et al. 2022) after the recruitment phase, which may indicate a positive effect of the incentives used. Also, the response rate did not decrease problematically over the three survey waves, which can be seen as a possible effect of the incentives, too. At the same time, panellists’ wishes about topics for the future survey were also incorporated, and thus the surveys may have had a thematic relevance for the participants.

Furthermore, transparent communication about the procedure, the results and the underlying objectives of the survey was key. Communication measures included postcards and posters in the neighbourhood, tarpaulins along the “Nordbahntrasse”, coverage on social media channels, e.g. videos on YouTube and Instagram. There was also coverage in the local press and local time on television and direct exchange at on-site events and roundtable discussions. The close cooperation with social institutions in the neighbourhood has also made an important contribution to disseminate information about the project and the survey.

Regarding the SDE competition side, the SDE 21/22 competition showed the building potential and technical feasibility of the journey towards a climate-neutral building stock. The urban profile of the competition found detailed reflection in the competition rules and anchored the competition at the neighbourhood level. It enabled the teams to plan precision drafts with actual social contexts and specific building tasks. Because of the focus on further construction onto the existing urban building stock the urban structural context was important for each of the contributions. It showed that it is necessary for the architectural and energy transformation to go hand in hand, as the existing building stock frequently fails to meet people’s needs and personal requirements. The ideas for existing urban building stock in the neighbourhood could be developed and tested on site in demonstrators.

The neighbourhood panel had a high relevance for the Mirke neighbourhood in general and the civil society actors in this quarter in particular. The surveys and their results were discussed and reflected wherever possible, e.g. through specific evaluations and detailed elaboration of relevant aspects of the results, to adjust their further work. In addition, the findings and

insights gained from the neighbourhood panel were shared with the municipal planning department of the City of Wuppertal.

Furthermore, the area on which the competition took place is located next to the very popular “Nordbahntrasse” as well as in direct vicinity of Utopiastadt, a key player in the district, but had not been developed so far. Through SDE 21/22, the area is ready to be opened up as space to develop with and for the neighbourhood. Further projects and ideas are already planned and discussed in the “Stadtentwicklungssalon” under the heading “Future areas (german: Zukunftsflächen) of the district”.

Funding • The research for this research article was conducted within the project “Solar Decathlon Europe 21/22” and funded by the German Federal Ministry for Economic Affairs and Climate Action.

Competing interests • The authors declare no competing interests.

References

- Bethlehem, Jelke (2008): Weighting. In: Paul Lavrakas (ed.): Encyclopedia of survey research methods. Thousand Oaks, CA: SAGE Publications, pp. 958–960.
- BMFSFJ – Bundesministerium für Familie, Senioren, Frauen und Jugend (2017): Zweiter Bericht über die Entwicklung des bürgerschaftlichen Engagements in der Bundesrepublik Deutschland. Schwerpunktthema “Demografischer Wandel und bürgerschaftliches Engagement. Der Beitrag des Engagements zur lokalen Entwicklung”. Berlin: BMFSFJ. Available online at <https://www.bmfsfj.de/resource/blob/115658/1080633f687d3f9c462a0432401c09d7/zweiter-engagementbericht-bundestagsdrucksache-data.pdf>, last accessed on 04. 09. 2023.
- Geiger, Sonja; Holzhauser, Brigitte (2020): Weiterentwicklung einer Skala zur Messung von zentralen Kenngrößen des Umweltbewusstseins. Dessau-Roßlau: Umweltbundesamt. Available online at https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2021-10-19_texte_25-2020_kenngrößen_umweltbewusstseinweiterentwicklung_2-auflage.pdf, last accessed on 04. 09. 2023.
- IPCC – Intergovernmental Panel on Climate Change (2023): Climate Change 2022. Impacts, adaptation and vulnerability. Contribution of working group II to the sixth assessment report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/9781009325844>
- IPCC – Intergovernmental Panel on Climate Change (2022): Global warming of 1.5°C. IPCC Special report on impacts of global warming of 1.5°C above pre-industrial levels in context of strengthening response to climate change, sustainable development, and efforts to eradicate poverty. Cambridge, UK: Cambridge University Press. <https://doi.org/10.1017/9781009157940>
- Khor, Neil et al. (2022): World Cities Report 2022. Envisaging the future of cities. Nairobi: UN HABITAT. Available online at https://unhabitat.org/sites/default/files/2022/06/wcr_2022.pdf, last accessed on 04. 09. 2023.
- Kraas, Frauke et al. (2016): WBGU Hauptgutachten. Der Umzug der Menschheit. Die transformative Kraft der Städte. Berlin: WBGU. Available online at http://issuu.com/wbgu/docs/wbgu_hg2016-hoch?e=37591641/68732842, last accessed on 04. 09. 2023.
- Raymond, Christopher; Brown, Gregory; Weber, Delene (2010): The measurement of place attachment. Personal, community, and environmental connections. In: Journal of Environmental Psychology 30 (4), pp. 422–434. <https://doi.org/10.1016/j.jenvp.2010.08.002>
- Schempp, Christine (2013): Varianten der Altbauanierung in Berlin-Mitte und deren Auswirkungen auf betroffene Bewohner. Berlin: Technische Universität Berlin. <https://doi.org/10.14279/depositonce-3804>
- Tackenberg, Bo; Lukas, Tim; Marceta, Stella; Fiedrich, Frank; Borgmann, Carolin; Dijkzeul, Dennis (2020): Resilienz durch sozialen Zusammenhalt (ResOrt). Empirischer Ergebnisbericht. Wuppertal: Bergische Universität Wuppertal.
- Üblacker, Jan; Lukas, Tim (2019): Keine Angst, es ist nur Gentrification? Soziale und ökonomische Ängste, Kriminalitätsfurcht und Verdrängungsdruck im Düsseldorfer Bahnhofsviertel. In: sub|urban. zeitschrift für kritische stadtforschung 7 (1/2), pp. 93–114. <https://doi.org/10.36900/suburban.v7i1/2.463>
- Voss, Karsten; Simon, Katharina (2023): Solar Decathlon Europe 21/22. Competition source book. Wuppertal: Bergische Universität Wuppertal. <https://doi.org/10.25926/svtg-e916>
- Wu, Meng-Jia; Zhao, Kelly; Fils-Aime, Francisca (2022): Response rates of online surveys in published research. A meta-analysis. In: Computers in Human Behavior Reports 7, p. 100206. <https://doi.org/10.1016/j.chbr.2022.100206>



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