SOCIAL ASSESSMENT OF THE EFFECT OF CONSTRUCTION OF THE SOUTHERN WARSAW RING ROAD ON THE QUALITY OF LIFE AND RESIDENTIAL REAL ESTATE MARKET IN THE WILANÓW DISTRICT

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ABSTRACT

Every road investment has both positive and negative consequences in spatial, economic, environmental, and social terms. The objective of the article is the social assessment of the effect of construction of the Southern Warsaw Ring Road (WRR) on: (i) the quality of life of the local community, and (ii) the residential real estate market. The analyses employed the method of quantitative analysis with the application of the survey technique. The questionnaire was made publicly available to residents of the Wilanów district in Warsaw. Results obtained in the scope of the study render decision making models of respondents depending on the distance of the place of residence from the WRR. The results reveal that responses given by the group of respondents living nearer the ring road are the most variable, particularly in the context of assessing the effect of the investment on the quality of life, including nuisance related to the express road and plans to change the place of residence. The same group of respondents provided the highest share of responses supporting the claim that housing prices increased due to the construction of the ring road.


1. Introduction

Road networks constitute the basis of transport infrastructure. Coherent and well-developed road infrastructure is one of the primary requirements of regional development and economic growth (Bhatta & Drennan, 2003; Farhadi, 2015; Chen et al., 2021).

Many studies have covered the analysis of the issue of road infrastructure in the scope of sustainable development, including, among others, its effect on climate (Puodziukas et al., 2016; Bles et al., 2016), natural environment (Palander et al., 2020; Palander et al., 2021), spatial planning (Banister, 2012; Arts et al., 2021), land use (Hadi et al., 2021; Lu et al., 2022), and social participation in the decision-making process (Ogryzek et al., 2021; Song et al., 2021). The analyses have concerned the assessment of the effect of road investments on the real estate market (Haider & Miller, 2000; Mika, 2019). The NIMBY (not in my back yard) attitude has also been investigated. Such an attitude is manifested by residents of a given area objecting to a potential location of a transport infrastructure project which they perceive as bothersome in the direct vicinity of their place of residence. At the same time, they express approval for the implementation of this type of investment project, but in a different location (Dear, 1992; Hermansson, 2007). The analyses have predominantly been conducted in the scope of case studies of given investments and local communities (Ogryzek et al., 2021; Bednarek-Szczepańska & Dmochowska-Dudek, 2017). Mental well-being describes a person's...
psychological health and mood. The papers have also analyzed the effect of road infrastructure on the improvement of the quality of life, including physical, mental, and economic well-being (Lee & Sener, 2016). Analyses regarding physical well-being covered, among others, the danger related to collisions (World Health Organization, 2018) as well as respiratory diseases and health issues related to air pollution (Zhang & Batterman, 2013). Road transport is among the sources of air pollution in the city, which results in lowering the occurrence of respiratory diseases (Szopińska et al., 2022).

Some studies have indicated that commute duration is associated with increased stress and diminished life satisfaction (Evans & Wener, 2006; Stutzer & Frey, 2008). Others have pointed to noise pollution as a factor negatively affecting mental well-being (Botteldooren et al., 2011; Hegewald, 2020). Economic well-being reflects one’s financial resources. Increased mobility can improve access to employment (Fan, 2012; Laborda & Sotelsek, 2019; Gibbons et al., 2019) and necessary services, including tourism (Mamirkulova et al., 2020), leading to an improvement in the quality of life.

The study objective is the determination of the social assessment of the effect of the Southern Warsaw Ring Road construction on: (i) the quality of life of the local community, and (ii) the residential real estate market in the Wilanów district of the Capital city of Warsaw. The obtained results indicate that the differences in the scope of answers are influenced primarily by the distance of the place of residence from the WRR.

2. Material and methods

The study was based on the following material:
- thematic studies in the scope of literature review,
- thematic studies regarding the construction of the Southern Warsaw Ring Road (http://siskom.waw.pl/s2.htm),
- data base of topographic objects BDOT10k.

The following research methods were applied:
- review of documents,
- analyses and logical construction,
- quantitative method with the application of the survey technique.

A survey enables active public participation, and is an important tool for measuring the quality of life of residents. The assessment of the effect of the Southern Warsaw Ring Road on the quality of life and residential real estate market by residents of Wilanów was verified by means of the quantitative method with the application of the diagnostic survey technique (Krok, 2015; Szenk-Dziubek & Miśkowiec, 2018). The survey was based on a questionnaire (Apanowicz, 2002) prepared and made available to residents by means of a Google Form. The form was published on various websites of groups of Wilanów residents in the period from 19 January 2022 to 27 February 2022. A total of 111 responses were obtained. Despite the low number of submitted questionnaires, it was determined that the local community is a reliable source of information, and the obtained results are sufficient in the referential scope.

The prepared questionnaire included 16 questions, whereas the first 8 were a fiche summarizing the socio-demographic features of the respondents, i.e. their sex, age education level, marital status, and additional identification in terms of type of housing, rights to the residential property, time of residence in Wilanów, and distance of their place of residence from WRR. The further 8 questions were directly related to the perception of the respondents regarding the effect of the Southern Warsaw Ring Road on the quality of life and residential real estate. The obtained responses were subject to comparative analysis in 3 groups: (i) all respondents, (ii) respondents residing at a distance of less than 300 m from the WRR, (iii) respondents residing at a distance of more than 1000 m from the WRR. It was presumed that the two extreme ranges of distance of place of residence from the ring road, in combination with the average value, will provide the appropriate and sufficient basis for the interpretation of the obtained results.

3. Study area

The Wilanów district is one of 18 districts of Warsaw (Fig. 1). The district occupies an area of 3672.68 ha. As of 31 January 2022, the number of all residents was 41 948, whereas 39 793 persons were registered as permanent residents. Wilanów is a strongly diverse district. According to the municipal information system, it is divided into areas dominated by extensive urbanized as well as non-urbanized land (Fig. 2). The northern part of the district (Wilanów Wysoki, Wilanów Niski, and the northern part of Blonie Wilanowskie) covers areas with the best developed infrastructure and transport connection with the center of Warsaw, and is, consequently, the most densely populated area in the district. Wilanów...
Wysoki and Błonie are dominated by multi-family housing, and Wilanów Niski is dominated by single-family housing. The area of Zawady predominantly includes semi-detached and terraced housing (new multi-family housing investments are currently under way here). The majority of Powsin and Powsinek is occupied by green areas and arable land. Wilanów Królewski is mostly occupied by the palace and park complex of the Palace of Jan III Sobieski and the Morysiński Nature Reserve.

Fig. 1. Location of the Wilanów district against the background of the capital city of Warsaw. Source: https://www.nowemieszkaniawarszawa.apartamenty.pl/

Fig. 2. Areas of the district according to the municipal information system. Source: https://zdm.waw.pl/miejski-system-informacji/obszary-msi/dzielnica-wilanow/

Fig. 3. Road network of the Wilanów district with WRR (WRR – red colour; main roads – orange colour) Source: own elaboration based on data from BDOT10k (wrotamazowsza.pl)

The Wilanów district does not have a dense road network (Fig. 3). The main roads of the district running from north to south are the following streets: Wiertnicza, Przy czółkowa, Łukasza Drewny, Aleja
Rzeczypospolitej, and Aleja Wilanowska. The main artery of the district has become the fragment of the Southern Warsaw Ring Road (red colour) that runs through the middle, providing residents with a direct connection with the Wawer district, owing to the construction of the Southern Bridge. This section is responsible for traffic in the east-west orientation.

Public transport in Wilanów includes only buses, there are no trams or underground lines. The construction of a tram line “Tramwaj na Wilanów” is currently being implemented. It will allow for connecting Wilanów with the city center.

The construction of the Southern Ring Road constituting express road S2 that connects junctions of motorway A2 (Konotopa junction west of Warsaw and Lubelska junction east of Warsaw) considerably improved the connection of Wilanów with the neighboring districts, namely Wawer - through the Southern Bridge, and Ursynów - in the scope of the expansion of Branickiego Street.

The construction of route S2 had already been planned in the 1970’s as a continuation of the east-west A2 motorway. The course of the motorway corridor was approved in the Local Spatial Management Plan of the Mazowieckie Voivodeship in 2004. After protests by residents of the Ursynów district, however, the road category was changed from motorway to express road. The construction of the Southern Warsaw Ring Road was divided into three stretches, each of which was implemented independently.

The western stretch of the route from the Konotopa junction to the Lotnisko junction (Fig. 4) was constructed in the period 2010-2013, and has a length of 10.5 km. The middle fragment of the route (Fig. 5) is the shortest of all the implemented stages, with a length of 4.2 km. It was built in the period 2009-2012, and is therefore the oldest fragment. Together with that stretch, part of the N-S route (S79) was constructed, totalling 4.3 km in length. It provides direct access to the Okęcie airport. The construction of the eastern stretch of the Southern Warsaw Ring Road, from the Pulawska junction to the Lubelska junction (Fig. 6), runs through three districts: Ursynów, Wilanów, and Wawer, and was divided into three tasks. The preparatory works for the implementation of the first task were commenced in early 2017, and the entire eastern stretch was commissioned at the end of 2021. This is the longest stretch of the route, with a length of 18.6 km.

The subject of this study was the effect of the recently constructed stretch within the boundaries of the Wilanów district of the capital city of Warsaw.

4. Empirical results and discussion

4.1. Respondent profile

Most respondents were women, making up 58% of total answers. The research sample was dominated by middle-aged people: 31-40 - accounting for 38%, and 41-50 - accounting for 28% of all answers. Sequentially, young people aged 21-30 accounted for 21% of all answers. 89% of the respondents were people with a higher education. 2% of all answers were provided by persons with only a primary education. The respondents were also asked about their marital status. The answers indicate that 60% of the respondents lived with a partner, 31% were single, i.e. never married, and 9% were divorced. Accounting for 88% of the research sample, most respondents lived in a housing unit of a multifamily building, while 8% of respondents occupied a detached single-family
house. Other options were selected by individual respondents. 88% of the respondents had ownership rights to the property they resided in, and 12% rented the property. The structure of the duration of residence in the Wilanów district was also analyzed. A considerable part of the respondents, i.e. 35%, had been residing in Wilanów for no longer than 5 years. This result is followed by approximately 28% of respondents that had been residing in the district for a period from 6 to 10 years. 21% of respondents had been living in Wilanów for a period between 11 and 20 years. Only 6% of respondents had become residents of the district within 1 year from the survey, i.e. right after the commissioning of the WRR. The survey also covered the distance of the place of residence of respondents from the WRR (Fig. 7). Approximately 81% of the respondents lived at a distance greater than 500 m. 13% of the respondents lived nearest to the analyzed route, at a distance of less than 300 m. The parameter of the distance of the place of residence from the WRR was adopted as the key factor in the analysis of responses regarding the effect of the ring road on the quality of life and the real estate market.

4.2. Effect of WRR on the quality of life – respondents’ assessment

Spatial management, including implemented transport investments, undoubtedly affects the public, social, and private space, and is necessary for their development needs. It therefore affects the residents’ quality of life.

Respondents were asked whether the WRR construction plans influenced their decision on choosing Wilanów as their place of residence (Fig. 8).

Fig. 7. Number of respondents depending on the distance of their place of residence from the WRR. Source: own elaboration.

Fig. 8. Diagram showing the potential influence of WRR construction plans on the choice of Wilanów as the place of residence. Source: own elaboration.
Out of all respondents, 59% responded with “no” or “rather not” and 20% of respondents gave a positive answer (“yes” and “rather yes”). Whereas 21% of respondents were long-term residents of the district that had not made their decision to move to Wilanów dependent on the long-term plans to build the route. Interestingly, in the research group residing nearest to the ring road, i.e. at a distance below 300 m, the answers were mixed. For 64% of the respondents, the investment plans were not important (“no” and “rather not”), whereas for 36% of the respondents they were (“yes”). In the research group residing further than 1000 m from WRR, positive answers accounted for 25% (“yes” and “rather yes”).

The next question aimed at verifying the perception of the potential negative effects related to the construction of the WRR, such as traffic congestion or noise (Fig. 9).

Exactly 63% of all respondents answered “no” or “rather not” and 33% of respondents gave a positive answer (“yes” and “rather yes”). The answers were again strongly divided in the research group residing nearest to the ring road, i.e. at a distance below 300 m. Interestingly, 57% of the respondents experienced no negative effects (“no” and “rather not”), and 36% of respondents did experience them (“yes” 29% and “rather yes” 7%). In the research group residing further than 1000 m from the WRR, positive answers were at a level approximate to that of the previous group of respondents, amounting to 33% (“yes” and “rather yes”). The majority of answers were negative, with the dominant answer “no” at 48% and “rather not” at 18% (66% respondents in total).

Respondents were also asked about potential nuisance caused by the functioning of the WRR such as air pollution, traffic congestion, or noise (Fig.10).
The answers showed relatively uniform distribution throughout the group of respondents, from a level of 15% for the answer “rather yes”, to 24% for answer “no”. Considerable differences in answers appeared in the group of respondents residing at a distance of up to 300 m from the WRR. 43% of the respondents rather did not experience any nuisance, and 43% experienced it (answer “yes”). In the group of respondents residing at a distance of more than 1000 m from WRR, 70% of the respondents experienced no nuisance or noticed no difference.

Respondents were also asked whether the opening of the WRR improved the attractiveness of the area in terms of transport connections (Fig.11). Irrespective of the distance of the place of residence from the ring road, the answers of respondents were practically identical. More than 90% of respondents indicated an increase in the attractiveness of the district in terms of transport connections (answers “yes” and “rather yes”).

It was also analyzed how currently, i.e. after the commissioning of the ring road, residents of the district assess its effect on the broadly defined quality of life (Fig. 12). Most respondents assessed that the WRR had a positive effect on their quality of life. A positive and rather positive answer was given by 50% and 31% of the total number of respondents, respectively, 58% and 30% of respondents residing at a distance of more than 1000 m from the WRR, and 43% and 21% of respondents residing at a distance of less than 300 m from the WRR. A considerable share of respondents residing at a distance of less than 300 m from the ring road also gave rather negative answers – 29%, and distinctly negative ones – 7%. In the group of residents residing more than 1000 m from the WRR, 15% assessed the WRR negatively, and 0% distinctly negatively.
from the WRR, the share was considerably lower, at a level of 5% each.

4.3. Effect of WRR on the real estate market – respondents’ assessment

The analysis also covered the respondents’ assessment in the context of the effect of the constructed ring road on the residential real estate market. The question of whether the WRR investment contributed to an increase in housing prices in the area was asked (Fig. 13).

As many as 25% of all respondents declared no opinion on the subject. The result was analogical in the case of the research group residing at a distance of more than 1000 m from the WRR. In the group of respondents residing nearest to the ring road, the result was at a considerably lower level, i.e. 7%. This group of respondents was also more convinced of an increase in housing prices due to the construction and opening of the WRR, with 29% of “yes” answers and 14% of “rather yes” answers.

Respondents were also asked whether the opening of the WRR would cause the intensification of multi-family housing development in the district (Fig.14).

Answers of the group of respondents residing at a distance of more than 1000 m from the WRR were practically identical as in the case of the answers of the entire group of respondents. No opinion on the subject was declared by 20% and 19% of respondents, respectively. The effect of the WRR on the intensification of multi-family housing development was indicated by 50% of respondents residing the furthest from the WRR (i.e. 28% of answers “rather yes” and 22% of answers “yes”) and 58% of respondents residing nearest to the WRR (i.e. 37% “yes” and 21% “rather yes”).

The survey also covered potential plans of respondents regarding a change of their place of residence due to the construction and opening of the WRR (Fig.15).
In the analyzed research groups, the dominant answer indicated no plans to change the place of residence. The answer “no” was given by 74% of all respondents, 88% of respondents residing at a distance of more than 1000 m from the WRR, and 64% of respondents residing at a distance of less than 300 m from the WRR. What is symptomatic and differentiating is the fact that in the last group of respondents, a change of the place of residence was declared by 36% (29% of “rather yes” answers and 7% of “yes” answers).

Results obtained in the scope of the conducted survey render the decision-making models of respondents depending on the distance of their place of residence from the WRR. The results evidence that answers provided by the group respondents residing nearest to the ring road are the most variable, particularly in the context of the assessment of its effect on the quality of life, including nuisance related to the express road and plans to change their place of residence. At the same time, the same group of respondents provided the highest share of answers supporting the claim that housing prices increased due to the construction of the ring road.

4.4. Discussion

The obtained results regarding the effect of the WRR on the quality of life and the residential real estate market were confronted with the analysis of the social assessment of the effects of the construction of the Żyrardów ring road (Tracz & Michalik, 2013). Żyrardów is a city located in the center of Poland, 45 km from Warsaw and 90 km from Łódź. The number of inhabitants is about 40 thousand. The ring road was built in 2012 and was a key road investment of the city. The road connects to the A2 motorway and is a direct transition to the S8 road connecting Warsaw and Katowice.

The survey among residents of Żyrardów was conducted before and after the commissioning of the ring road. Respondents included among others residents of houses located along the former course of the road and residents of houses located along the designed/constructed ring road. It was therefore considered appropriate for the comparison to cover results of the survey after the commissioning of the route, because an analogical survey was conducted in Wilanów in Warsaw, and to compare answers obtained from residents of houses located along the constructed ring road of Żyrardów with answers obtained from respondents residing up to 300 m from the WRR (Table 1).

### Table 1

<table>
<thead>
<tr>
<th>Żyrardów ring road (answer, % of answers)</th>
<th>Southern Warsaw Ring Road (answer, % of answers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residing near the ring road decreases satisfaction with the place of residence</td>
<td>Assessment of the effect of the investment on the quality of life</td>
</tr>
<tr>
<td>I definitely agree 62.5%</td>
<td>Negative 7%</td>
</tr>
<tr>
<td>I partly agree 25.0%</td>
<td>Rather negative 29%</td>
</tr>
<tr>
<td>I am inclined to disagree with this opinion 12.5%</td>
<td>Rather positive 21%</td>
</tr>
<tr>
<td>I completely disagree 0.0%</td>
<td>Positive 43%</td>
</tr>
</tbody>
</table>
In both cases, the residents resided in the direct vicinity of the ring road. The type of housing, however, deserves attention. In the case of the Żyrardów ring road, the respondents were residents of single-family houses, whereas in the case of Wilanów, most of them lived in multi-family housing, which certainly does affect the obtained results. This is, for example, clearly evident in the lower level of expressed negative opinions of apartment owners regarding the effect of the ring road on the quality of life. In the case of Wilanów, this sentiment was expressed by 36% of respondents, and in Żyrardów 87.5%. A smaller variability in opinions presented by the two analyzed research groups was observed in the assessment of the noise nuisance caused by the ring road. Such nuisance was experienced by 50% of respondents residing near the WRR and 81.3% of those living along the Żyrardów ring road. Answers of respondents regarding the effect of the ring roads on housing prices were more diverse. Approximately 69% of respondents from Żyrardów indicated that prices of their housing had decreased or would decrease, and 25% had no opinion on the subject. Respondents from Wilanów were more divided in their answers. 43% of them indicated that housing prices had increased due to the construction, 22% saw no difference, and 28% of respondents claimed the prices had not increased.

The comparison of results of both surveys evidences that, in the assessment of respondents, the effect of the ring road on the residents’ quality of life and the housing market, including property prices, is substantial. These are also elements usually reported and assessed as key and problematic in the process of social consultations regarding the implementation of road investments (Tracz & Kollbek, 2012). Therefore, it is important that the process itself guarantees the real participation of stakeholders in the decision-making process at every level of the social participation ladder. This human-centered approach is aimed at sustainable spatial and social development and, above all, at taking initiatives and actions that should focus on the local community’s needs (Sajnóg et al., 2022). The above-mentioned approach serves for good governance, constituting a broad concept accounting for various processes in land administration and land management (Sobolewska-Mikulska & Cienciała, 2020). Proposals for model solutions in the area of public participation include, among others, the use of multi-criteria spatial analysis using the analytical hierarchy process (AHP) developed in the environment of geographic information systems (Ogryzek et al., 2021). The application of GIS tools allows for quick and advanced analyses of current needs and the prediction of future ones (Ogryzek et al., 2022).

5. Remarks and conclusions

The survey concerned the social assessment of the effect of the Southern Warsaw Ring Road on two aspects, i.e. the residents’ quality of life and the residential real estate market in Wilanów, Warsaw. For this purpose, a survey was conducted among the residents of the district. The obtained answers were subject to quantitative analysis with consideration of grouping into categories of distance of the place of residence from the WRR. For transparent presentation of the results, comparative analyses of 3 groups of respondents were adopted as key and relevant for the analyzed issue: (i) all respondents, (ii) respondents residing at a distance of less than 300 m from the WRR, (iii) respondents residing at a distance of more than 1000 m from the WRR.

In the scope of questions regarding the effect of the ring road on the quality of life, 36% of respondents residing at a distance of less than 300 m from the ring road declared that plans of its construction contributed to the decision to choose Wilanów as their place of residence, whereas in the vicinity of the ring road, the respondents resided in the direct vicinity of the ring road. The type of housing, however, deserves attention. In the case of the Żyrardów ring road, the respondents were residents of single-family houses, whereas in the case of Wilanów, most of them lived in multi-family housing, which certainly does affect the obtained results. This is, for example, clearly evident in the lower level of expressed negative opinions of apartment owners regarding the effect of the ring road on the quality of life. In the case of Wilanów, this sentiment was expressed by 36% of respondents, and in Żyrardów 87.5%. A smaller variability in opinions presented by the two analyzed research groups was observed in the assessment of the noise nuisance caused by the ring road. Such nuisance was experienced by 50% of respondents residing near the WRR and 81.3% of those living along the Żyrardów ring road. Answers of respondents regarding the effect of the ring roads on housing prices were more diverse. Approximately 69% of respondents from Żyrardów indicated that prices of their housing had decreased or would decrease, and 25% had no opinion on the subject. Respondents from Wilanów were more divided in their answers. 43% of them indicated that housing prices had increased due to the construction, 22% saw no difference, and 28% of respondents claimed the prices had not increased.

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group of all residents, the share was 10% of respondents, and in the group residing the furthest from the WRR, it reached 5%.

In the question regarding the current, i.e. after the commissioning of the ring road, assessment of the effect of the ring road by the residents on the broadly defined quality of life, those residing nearest to the ring road assessed such an effect the most negatively, i.e. 7% reported a negative effect, and 29% - a rather negative effect, with the total number of positive answers at 5% and 10%, respectively.

In the case of the question regarding the effect of the WRR on the residential real estate market, respondents residing nearest to the WRR mostly believed that the investment resulted in an increase in housing prices. Moreover, they clearly expressed their opinion regarding the intensification of multi-family housing development in the area in relation to the opening of the WRR. 37% of respondents answered “yes”, whereas in the remaining groups, the “yes” answer was given by 22% of respondents each. Importantly, in the group of respondents residing nearest to the ring road, the highest share of the respondents declared a plan to change their place of residence due to the construction and opening of the WRR. 29% of “rather yes” answers and 7% of “yes” answers were given, whereas the result was 5% of “rather yes” and 4% of “yes” for all respondents, and analogically 2% and 5% for the group of respondents residing at a distance of more than 1000 m from the WRR, respectively.

The obtained results evidence that the distance of the place of residence from the WRR has an effect on the opinions expressed by respondents. The two analyzed aspects, namely the effect of the ring road on the quality of life and perception of the real estate market and directions of its development, proved to be areas characterized by relatively variable answers. It should be emphasized that the differences are evident in the answers of the following respondents: (i) group residing the nearest against the group residing the furthest from the WRR, and (ii) directly in the scope of the group of respondents residing nearest to the ring road. In the latter case, answers adopted a more extreme distribution more frequently. The only question to which respondents provided identical answers irrespective of the categorization of the distance from the investment was expressing their opinion regarding the improvement of the attractiveness of the district in terms of transport connections due to the opening of WRR. It should finally be emphasized that respondents residing nearest to the ring road assessed their quality of life at the lowest level.

The above observations have a predominantly cognitive value. In the scope of the conducted spatial policy of the city in the context of its sustainable development, this information should provide the basis for undertaking activities and implementing investments mitigating or compensating for the negative effects of the WRR on residents’ quality of life. Social participation, and therefore the voice of society, realigns and allows for the implementation of the objective of the sustainable development of cities, and corresponds with the trend of liveable cities (Sajnóg et al., 2022).

The study can provide the basis for further research on the topic, particularly through comparison of the results with data obtained from a larger research group, and by expanding the scope of analyses to include in-depth interviews.

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