Influence of community opening on road traffic

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Abstract: The State Council of our country has put forward the idea of gradually opening up the completed residential quarters and unit compound, which has a different impact on the traffic of the roads around the residential quarters and a reasonable analysis of the index system, and then uses the analytic hierarchy process to study the impact of the opening of the residential quarters on the traffic of the surrounding roads.

1. Introduce
With the population growth and urban development, in order to solve the problem of urban traffic congestion, it is proposed to open and transform the community. People are interested in whether it is conducive to ease the congestion after the transformation. We put forward the following questions to study the impact of community opening on road traffic:

1. Which evaluation index system is selected to analyze the impact on the road traffic around the community.
2. Using the analytic hierarchy process to study whether the opening of the residential area has a dredging effect on the surrounding roads.

2. Problem analysis
For the same road type, the traffic flow is different due to different geographical location. Traffic jams occur more frequently on the roads in the city center or with public facilities than in the suburbs or newly developed residential areas. Now we discuss the community structure and geographical location, and analyze the effect of community opening on road congestion.

According to the different community structure, some communities have wide roads, while some have dense floors and narrow roads, which are not conducive to opening. According to the geographical location of the community, they are divided into four categories: downtown community, urban trunk line community, community group and school district house. These four categories generally belong to the scope of considering opening, open up a few narrow roads to ease traffic congestion.

To sum up: If the community is open due to congestion, the community will contribute to the smooth road after the opening. In order to ensure the effectiveness of the community opening, data is needed to analyze which communities need to be opened, and the traffic congestion problem can be effectively solved through the opening of the community.
2.1. Evaluation index system
Whether the community should be opened or not can be determined by the road traffic around the community, the road structure inside the community and the size of the community.

2.1.1. Some residential areas need to be opened: (1) There are traffic jams around the residential area. If the residential area is closed, the urban road structure will be destroyed and the "capillaries" of the city will be blocked. If the residential area is open, the road area will increase and the vehicle traffic capacity will be improved. (2) In peak road conditions around the community, the traffic flow affects the working speed. The measures of opening the community can effectively alleviate the traffic congestion. (3) In the area near the intersection, when the traffic flow is large, it is not convenient for the traffic operation, and the traffic path needs to be changed.

To sum up: The opening of residential area makes the density of road network sparse. Change the large spacing of roads to small spacing, effectively improve traffic conditions.

2.1.2. Some residential areas do not need to be opened: (1) It belongs to residential area, but the traffic flow is small, which will not cause traffic jam. (2) There is no public service center around the community, due to less passenger flow, congestion is also rare. (3) The area of the residential area is small and the main road is small, which does not affect the traffic situation. (4) Some districts have complex structures and are not easy to open up roads.

To sum up: The impact of opening on the road is small, there is no need to open.

2.2. Analytic hierarchy process
By studying the evaluation index of the community, using the analytic hierarchy process to select the type of open community, studying the traffic environment around the community to analyze the impact of community opening on the road, so as to put forward reasonable suggestions and further optimize the community structure. The following is the hierarchical structure analysis of the reasonable open community design.

![Figure 1 Analytic Hierarchy Process](image)

2.2.1. Construct pairwise comparison matrix among factors at different levels

| Scale | Meaning                                      |
|-------|---------------------------------------------|
| 1     | Indicates that two factors are of equal importance when compared |
| 3     | The former is slightly stronger than the latter |
| 5     | The former is obviously stronger than the latter |
| 7     | The former is much better than the latter    |
| 9     | The former is stronger than the latter absolutely |
2,4,6,8 Represents the intermediate value of the above adjacent judgments reciprocal \[ a_{ji} = 1/a_{ij} \]

This matrix is a judgment matrix \( A \).

Table 2 Judgment Matrix

| \( Z \) | \( B_1 \) | \( B_2 \) | \( B_3 \) |
|---|---|---|---|
| \( B_1 \) | 1 | 1/5 | 3 |
| \( B_2 \) | 5 | 1 | 3 |
| \( B_3 \) | 3 | 1/3 | 1 |

2.2.2. Hierarchical single sort and its consistency test

When calculating the maximum eigenvalue \( \lambda_{\text{max}} \) of judgment matrix \( A \). It is necessary to check the consistency of matrix \( A \).

Consistent indicators

\[ CI = \frac{\lambda_{\text{max}} - n}{n-1} \]  

Random one-time index \( RI \)

| \( n \) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| \( RI \) | 0 | 0 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 |

Consistency ratio \( CR = CI/RI \)

From the solution of judgment matrix \( A \) and formula (1) (2) (3), the solution is obtained:

\[ W = (0.105, 0.633, 0.259)^T, \quad \lambda_{\text{max}} = 3.038, \quad CI = 0.019, \quad CR = 0.033. \]

When \( CR < 0.1 \), the pairwise comparison matrix \( A \) has satisfactory consistency.

The analytic hierarchy process shows that the road congestion and road distribution around the community are two important indicators to study whether the community is open or not.

3. Rationalization suggestions

Based on the study of "the influence of community opening on road traffic", the following conclusions are drawn: not all communities need to be opened, some communities have little influence on traffic, while some communities may not be able to open due to their own structure, and even some communities will increase traffic pressure due to their geographical location. Based on our research and analysis, we put forward some reasonable suggestions.

![Figure 2 Hierarchical System of Rationalization Proposal](image)
1. According to the traffic demand to determine whether the community should be open. Like the city center road, we can consider opening the neighborhood to disperse the traffic flow.

2. The roads can be widened to make the roads more accessible.

3. Adjust the traffic distribution, and build commercial buildings or public facilities in the East and west of the road where traffic congestion is prone to occur, so as to evacuate the traffic flow.

4. According to the situation of the intersection, the problem of traffic jam is that there are too many vehicles, and some vehicles are affected by the vehicles in front when they turn, resulting in the vehicles behind can not pass. We can open the neighborhood near the intersection and open up several forked roads.

5. The traffic department can formulate traffic restriction regulations according to the detection of road conditions during rush hours.

6. We can forecast the road conditions in the next 30 years, promote and accumulate experience, and then gradually implement.

7. To follow the local conditions, the future promotion of block system will follow the principle of first easy then difficult, step by step.

8. The main purpose of community opening is to serve the people, in the process of implementation, we should respect the needs of the people, make the resident's transportation more convenient.

**4. Summary**

This paper mainly studies the impact of the opening of the community on the surrounding roads, adopts the analytic hierarchy process to analyze the road distribution structure and road congestion around the community, then determines which type of community can be opened. Combined with the relevant numbers, it is found that in order to solve the urban traffic congestion, the relevant departments put forward "promoting the block system" has further implementation value. According to local conditions, in the process of promoting the opening of closed community, we need to respect the people's property law. Considering the above factors, we should take flexible measures to truly alleviate traffic congestion.

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