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NIP.196608221997022001
Departemen PWK FT.Undip

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Departemen PWK FT.Undip

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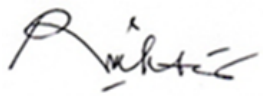

Dr. Ir. Rina Kurniati, M.T.
NIP. 196608221997022001
Departemen PWK FT.Undip

Reviewer 2,

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**Document type**
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# Understanding Student Travel Behaviour in Semarang City

Manullang O.R. ; Tyas W.P.; Anas N.; Aji F.N.

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[a] Urban and Regional Planning Department, Diponegoro University, Tembalang, Semarang, 50275, Indonesia



## Abstract

The highest movement in Semarang City is dominated by motorcycles, which reached 79% of the number of vehicles. Highest percentage movement use motorcycle caused the highest percentage accident by motorcycle users, which reached 66% and 9% involving high school students. This happens because of the dependence of motorcycles usage in fulfilling the needs of movement in the city of Semarang. Understanding student travel behavior based on their activities is used to know travel needs and the cause of dependence on motorcycle usage. Analysis method in this study use network analysis to compare the potential accessibility and actual accessibility to known why motorcycle chosen by students as the main mode. In addition, phenomenology analysis is used to explain the intent and reasons the data produced by network analysis. The analysis result indicates that the high use of motorcycles by high school students in the Semarang city due to the absence of other effective and efficient modes in fulfilling the movement needs. Even, the student which can potentially use public

transport preferred to use a motorcycle. This mode is more effective and efficient because of its flexibility and lower costs. 

Author keywords

Motorcycle; Network analysis; Student; Travel Behavior

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# 2nd Geoplanning-International Conference on Geomatics and Planning

# *PREFACE*

The 2nd Geoplanning - International Conference was held on 9-10th September, 2017 in Solo, Central Java, Indonesia. Geoplanning is an international conference covering research and development in the field of applied geomatic's technologies for spatial planning, including GIS, Remote Sensing, and Satellite Image Processing. More than 132 abstract were submitted and after an initial review 80 papers were presented. Through peer review process, 50 papers were accepted for publication in the Geoplanning Conference Proceeding.

The present volume is highlighting major issue of Sustainable Development with focusing topic on "Geomatic's Application for Disaster Management and Spatial Planning." Furthermore, the topic was divided into four themes;

Theme 1: Disaster Modelling & Management

Theme 2: Infrastructure and Settlement

Theme 3: RS-GIS for Spatial Modelling

Theme 4: Urban and Regional Planning

We would like to thank all the reviewers for their time and effort in reviewing the documents. The published papers have passed the process of improvement accommodating the discussion during the conference as well as the reviewers' comments who have guided any necessary improvement. Finally, we would like to thanks to all of the proceeding team who have dedicated their constant support and countless time to bring these scratches into a book.

Chair Committee of Geoplanning

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# Sensitive Land Use Planning, Malinao, Albay, Philippines

# Sensitive Land Use Planning, Malinao, Albay, Philippines

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**Abstract.** This paper reviews the hazard zone as defined in the zoning ordinance of the Local Government of Malinao. The zonification was completed in accordance with the approved Comprehensive Land Use Plan stipulating the allowed use and regulations of zones to control future land development. This paper brings together an examination of human exposure as well as spatial situations and conditions of their houses within the hazard zone playing with flood risks. *The* purposive selection sample households were based on characteristics of people residing within it, in which the site concurs with the flood forecasted frequent every 5, 25 and 100 years turned to be significant to better understanding 'risks computing' were variables retrieved from the intersecting spaces fused to get the complex interrelationship of the sets of flood hazard, vulnerability and exposure of inhabitants and their place of residence weighted against capability of individual family or household to withstand effects of flooding. The Risk Quotient Object and Field Bases Model were tested in specific location in Malinao. The sample households' individual risk location quotient varies from high to a very high risk distributions ranging from 8 to 125 numerical values. As Malinao stays on to experience flood hazards, changing climate and other natural calamities, the need to understand the six elements of disaster risk computing at household level is becoming crucial in risk reduction meeting the targets and priorities for action as specified in the Sendai Framework.

**Keywords:** Zoning, Exposure, Risk Computing, Risk Quotient, Household

## 1. Introduction

The prevailing principle of the Habitat I which was held in Vancouver in 1976 provides importance to water for life and adopt programs for the sanitary disposal of waste water. Similarly the prevailing principles of the Habitat II which was held in Istambul in 1996 arrest the deterioration of global human settlements conditions and ultimately creates the conditions for achieving improvements in the living environment of all the people on sustainable basis. In October 2016, the Habitat III held in Quito, the prevailing principles focus on Housing [1] and Sustainable Urban Development to adopt a New Urban Agenda. This work is seen significant in regulating the use of the land and activities in hazard zones particularly those families within the immediate vicinity of rivers and other waterbodies as well as providing guidance to the residents at risk and decision making in land management, land use planning and monitoring local developments [2,3].

# Modeling the Dynamic Interrelations between Mobility, Utility, and Land Asking Price

IOP Conf. Series: Earth and Environmental Science **123** (2018) 012019 doi:10.1088/1755-1315/123/1/012019

# Modeling the Dynamic Interrelations between Mobility, Utility, and Land Asking Price

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**Abstract.** Limited and insufficient information about the dynamic interrelation among mobility, utility, and land price is the main reason to conduct this research. Several studies, with several approaches, and several variables have been conducted so far in order to model the land price. However, most of these models appear to generate primarily static land prices. Thus, a research is required to compare, design, and validate different models which calculate and/or compare the inter-relational changes of mobility, utility, and land price. The applied method is a combination of analysis of literature review, expert interview, and statistical analysis. The result is newly improved mathematical model which have been validated and is suitable for the case study location. This improved model consists of 12 appropriate variables. This model can be implemented in the Salatiga city as the case study location in order to arrange better land use planning to mitigate the uncontrolled urban growth.

**Keywords:** Modeling, Land asking price, Urban growth, Salatiga City

## 1. Introduction

Regarding the future interest, planning a city should consider sustainable development. The challenge is to linking economic activities, social issues, and environmental impacts. One way to achieve sustainable development is by using land use planning to control economic and social activities, so as a result, allocation of land should fit particular uses. Land use is very important as a benchmark for parceling mechanisms, also as a benchmark for zoning the urban environments. Zoning has a function to evaluate the environmental consequences, as well as to support the future decision making in order to mitigate the negative effects of urban development [1].

Urban development is influenced by population growth and rapid urbanization process. These cause urban sprawl which leads to unsustainable practices that cause ecological, social and environmental problems [2]. Furthermore, population growth triggers a rapid land use change particularly converting farmland into housing areas. The increase of population is equal to the increasing demand for housing. While, a high density of housing areas evokes new issues, like the probability of hazards, such as fire hazards, an increasing need of water, and the high impacts of houses on ecosystem function [3]. Moreover, high population density and the establishment of new settlements may entail serious problems in water supply, energy provision, and utilities [4]. Similar findings by Mohammady [5] show that the expansion of urban areas results in a lack of infrastructure, increase of environmental pollution, and limits urban services. Eventually, unplanned urban growth

# Modelling Multi Hazard Mapping in Semarang City Using GIS-Fuzzy Method



IOP Conf. Series: Earth and Environmental Science **123** (2018) 012002 doi:10.1088/1755-1315/123/1/012002

# Modelling Multi Hazard Mapping in Semarang City Using GIS-Fuzzy Method

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**Abstract.** One important aspect of disaster mitigation planning is hazard mapping. Hazard mapping can provide spatial information on the distribution of locations that are threatened by disaster. Semarang City as the capital of Central Java Province is one of the cities with high natural disaster intensity. Frequent natural disasters Semarang city is tidal flood, floods, landslides, and droughts. Therefore, Semarang City needs spatial information by doing multi hazard mapping to support disaster mitigation planning in Semarang City. Multi Hazards map modelling can be derived from parameters such as slope maps, rainfall, land use, and soil types. This modelling is done by using GIS method with scoring and overlay technique. However, the accuracy of modelling would be better if the GIS method is combined with Fuzzy Logic techniques to provide a good classification in determining disaster threats. The Fuzzy-GIS method will build a multi hazards map of Semarang city can deliver results with good accuracy and with appropriate threat class spread so as to provide disaster information for disaster mitigation planning of Semarang city. from the multi-hazard modelling using GIS-Fuzzy can be known type of membership that has a good accuracy is the type of membership Gauss with RMSE of 0.404 the smallest of the other membership and VAF value of 72.909% of the largest of the other membership.

## 1. Introduction

Geographically Semarang City is bordered by Java seas in the north, as well as topographical condition of its territory consisting of hilly area, lowland and coastal area. It indicates the existence of various slope and bulge that causes Semarang City area has the potential to be vulnerable to the threat of natural disaster. Semarang city also is one of the major cities in Indonesia that is prone to natural disasters. Frequent natural disasters Semarang city is tidal flood, floods, landslides, and droughts [1]. The disaster has made a loss of economic aspects to fatalities. With this natural condition, the city has been long experiencing with potential multi hazards risks [2].

Geographical information about the disasters is urgently needed in the development of disaster mitigation plans. The presentation of spatial disaster threats is very beneficial because people can directly recognize the conditions of disaster-prone areas. Therefore it is necessary to make a potential map of disaster prone areas. One important aspect of disaster mitigation planning is to conduct hazard mapping. Multi hazard mapping is a map-making activity that represents negative impacts that may result in material and non-material losses in a region in the event of a disaster [3].

# Understanding Student Travel Behaviour in Semarang City

*by* Okto Manullang

IOP Conference Series: Earth and Environmental Science



# Understanding Student Travel Behaviour in Semarang City

# Understanding Student Travel Behaviour in Semarang City

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**Abstract.** The highest movement in Semarang City is dominated by motorcycles, which reached 79% of the number of vehicles. Highest percentage movement use motorcycle caused the highest percentage accident by motorcycle users, which reached 66% and 9% involving high school students. This happens because of the dependence of motorcycles usage in fulfilling the needs of movement in the city of Semarang. Understanding student travel behavior based on their activities is used to know travel needs and the cause of dependence on motorcycle usage. Analysis method in this study use network analysis to compare the potential accessibility and actual accessibility **to** known why motorcycle chosen by students as the main mode. In addition, phenomenology analysis is used to explain the intent and reasons the data produced by network analysis. The analysis result indicates that the high use of motorcycles by high school students in the Semarang city due to the absence of other effective and efficient modes in fulfilling the movement needs. Even, the student which can potentially use public transport preferred to use a motorcycle. This mode is more effective and efficient because of its flexibility and lower costs.

**Keyword**: Motorcycle, Network analysis, Student, Travel Behavior

## 1. Introduction

In doing their activities, human has to travel, in other words, the need or desire to engage in an activity in different locations will illustrate travel pattern [1]. In addition to work activities, school activity is one of the highest contributors movement in the city [2]. To fulfill the needs of the school, students need to move from origin (home) to the destination (school) both motorized and non-motorized. Motorized movement in Semarang City is dominated by motorcycles, it can be seen from the population which reaches 79% of the total vehicles in Semarang City [3]. The dominance of motorcycle use is in line with the percentage of accident numbers involving this mode, which reaches 66% of 5,378 incidents in 2012-2014. These incidents have involved 9% of Senior High School students [4].

Students tend to use motorcycle because of the limitation in their movement [5]. The dependence of the motorcycle occurred on students based on three main points [6], are (1) the shape and structure of the city accompanied by the inability of the public transportation system provides the needs of the movement, and causing the dependence of private vehicles, (2) motorcycle has the highest utility than other modes because of more effective and more efficient for students, so that it is suitable for student's activities, and (3) the contract of transportation culture implemented by providing parking infrastructure in school tend to attract new motorcycle users. The dependency will increase while

teenager considered motorcycle usage as a lifestyle for traveling in a term to fulfill their social status [7]. Safety driving has not been a concern for motorcycle users, especially for students rider in Semarang City. Students use motorcycles with the permission of their parents, even though the student does not have a driver's license. All these factors aggravate transit culture. The lack of service of public transportation with existing travel demand cause motorcycles chosen as primary mode [6]. This study aims to understand travel pattern, travel behavior and causes of the dependence of high school students in motorcycle users. This study is expected can be the basis for recommending urban transportation policies that match with characteristics and needs of student, so it can be an effective and efficient solution and eliminate dependence on motorcycle usage.

## 2. Literature

At first, transportation approach was based on four stages modeling, but it was considered to be deficient in describing demand because it considered each trip was not related to other trip conducted by individuals because of the aggregate assumption [1]. Four stages modeling only accumulate the demand, while the movement is very complex where there is a trip chain from the origin to the destination [1]. According to Kitamura [8], there are some measurable indicators in travel behavior, there are:

a. Travel Distance
b. Travel Time
c. Travel Cost
d. Travel Frequency
e. Mode Use

The activity-based concept is a new development to analyze travel behavior, this concept will have a long series to understand the participation of a set activity. Indicators used in this concept such as area based measures, distance based measures, count based measures and duration based measures have all been used to derive travel patterns [9,10]. This research is focused on motorcycle users the mode use is not considered as an indicator. Measurable indicators that are used in this study is travel distance, travel time, and travel frequency.

In addition to work activity, educational activity is one of the highest trip generators [2]. Students' trip pattern has a fundamental difference between "heading towards" trip and "return" trip from school [7]. "Heading to school" trip has a simple pattern with fixed destination and arrival time while "return" trip has various complex patterns because of the various activities after school. The return trip from school has three trip patterns:

a. Immediate Return, the return trip from school after the last class straight to go home. Students from the suburbs are likely to have this pattern because of the public transport in their home requires them to go home during the peak hours. Besides, first year students are also likely to have this pattern.
b. Stay and Return, the return trip that is made after a certain period of time of staying at school for in school-activities. Besides immediate return pattern, first year students are also likely to have this pattern.
c. Indirect Return, the return trip made any time after the last class but have another destination before coming back home. This pattern is purposed to fulfill recreation, shopping, and extra lesson needs. Students in downtown are likely to have this pattern because they have more alternative modes and better operational time. Generally, senior year students will have this pattern because of the needs of an extra lesson or part time working.

## 3. Method

The method of data analysis used in this study was network analysis using ArcGIS and phenomenology analysis. Network Analysis (NA) collectively is a macro transportation modeling to see the relationship between objects connected by the transportation that forming travel pattern. Measures of accessibility from these transport models can be classified into potential accessibility and actual accessibility [10]. Network analysis used to analyze potential accessibility of various modes. Potential accessibility in this study is limited to walk, public transports using, and motorcycles using potential. The result of potential accessibility will be compared to actual accessibility so that the public transport route potential will come as the result.

Motorcycle potential accessibility was analyzed by choosing the fastest route with closest facility tools. Network dataset used in this study is the minimum speed in every road distinguished by the hierarchy. The minimum speed standard is according to SNI (Indonesian National Standard) 03-6967-2003 about general requirements of network system and street geometric assuming that each road in the same hierarchy will have the same speed.

**Table 1.** Minimum Speed Based on Roads Hierarchy

| Hierarchy | Minimum Speed (Km/hour) |
|---|---|
| Primer Artery | 60 |
| Primer Collector | 40 |
| Primer Local | 20 |
| Secondary Artery | 30 |
| Secondary Collector | 20 |
| Secondary Local | 10 |

*Source: SNI 03-6967-2003 tentang Persyaratan Umum Sistem Jaringan dan Geometrik Jalan Perumahan*

Potential of walking and -of transit accessibility were analyzed by using service area tools measured from the school location and BRT Trans Semarang's Shelter distribution. According to SNI 03-6967-2003 about general requirements of network system and street geometric, people in Indonesia only made it walk 400 meters in a hot weather, for shopping activities and carrying some goods they only made it walk 300 meters. According to that, service area distance from school to shelter is about 300 to 400 meters. Actual accessibility obtained by visualizing students trip chain based on their travel diary. Phenomenology approach as qualitative method used to understand the complexity of the travel behavior and the reason of students dependency of motorcycle usage in Semarang City.

## 4. Result and Discussion

### *4.1. Potential Accessibility*

Potential accessibility on foot and public transport was analyzed by using service area tools measured from the point of the school location and the distribution of shelters with walk distance about 300 m and 400 m from that point. Potential accessibility by walking to school and public transportation based on normal walking distance can be seen in Figure 1. Based on the results of the service area analysis, only 1% of respondents have the potential to walk with common mileage. 19.6% of respondents have the potential to use public transportation BRT Trans Semarang. While 79,4% others have to use private vehicle to reach school. Potential accessibility of motor vehicle users is estimated based on the shortest route to the school, the distribution of the route can be seen in Figure 2.

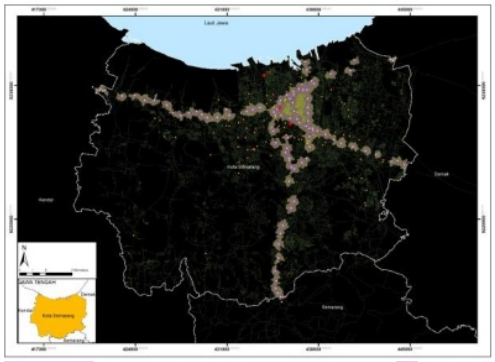

**Figure 1.** Walkability Potential Access of school and BRT shelter

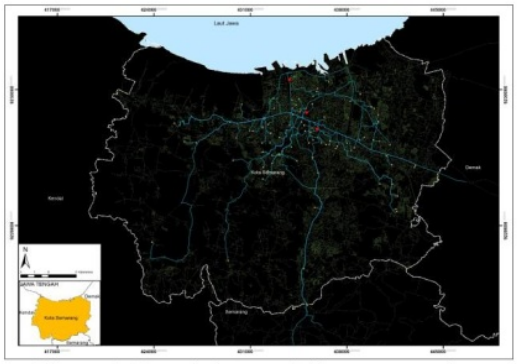

**Figure 2.** Potential accessibility motorcycle

*4.2. Actual Accessibility*

Actual accessibility of motorcycles in this study can be classified into three types of travel patterns, namely immediate return, stay and return and indirect return. Based on the visualization of trip chain data, the student's travel pattern has a fundamental difference between " to " and 'back' 'trips from' 'school. The " toward " school trip has a simple pattern with the goal and the arrival fixed time, this pattern is always through the shortest route to get to school. Meanwhile, the journey back from school has a variety of complex patterns because more activities take place after school.

Immediate Return and Stay and Return travel patterns have the same frequency, distance, travel time and travel route. The difference between these patterns is the type of activity and duration activity. 49.5% of students have immediate return pattern, in general, these students are first-year students or students who are not actively participating in the organization or extracurricular. 15.5% of students have stayed and return patterns, in general, these students actively participate in school organization or extracurricular that conducted in schools. Actual accessibility immediate return and stay and return pattern have the same route with potential accessibility because it has one travel destination so the route is the shortest route.

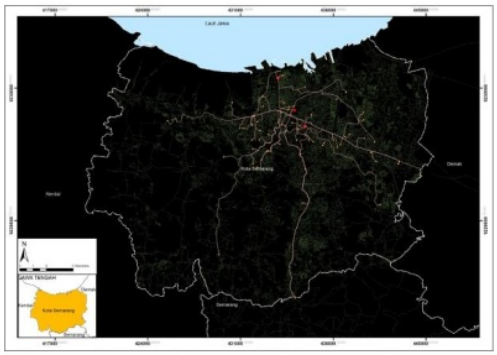

**Figure 3.** Actual Accessibility immediate return and stay and return pattern

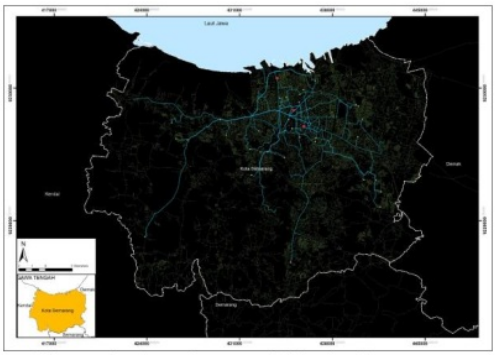

**Figure 4.** Actual accessibility indirect return pattern

Based on the results of travel diary questionnaire, 35% of students have Indirect Return patterns. Indirect return patterns occur on the way home, while the journey to school has a simple pattern that is the fastest and shortest route because it has only one destination. Indirect patterns occur due to the

need for course activities, part-time work, extracurricular activities, organizational activities, hang out, shopping and other activities after school.

Potential accessibility and actual accessibility of high school student's motorcycle users in Semarang have differences. Actual accessibility has a more complex route than potential accessibility, the difference in routes can be seen in Figure 6. Potential accessibility only predicts the route of the student trip directly to the destination so that this route only has a match with the travel pattern immediate return and stay and return.

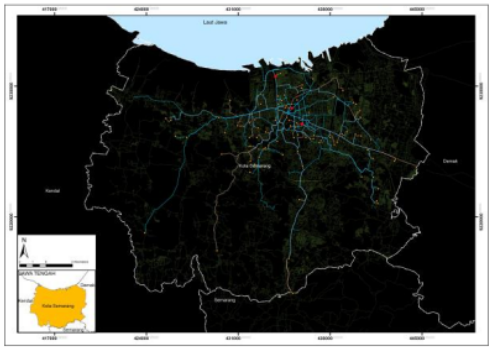

**Figure 5.** Actual accessibility motorcycle

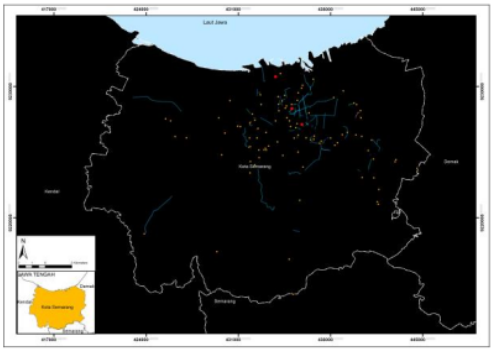

**Figure 6.** Different potential accessibility and actual accessibility motorcycle

Based on the results of questionnaires and depth interviews of students motorcycle users in Semarang City, students decided to use motorcycles because motorcycles are considered more flexible in determining routes and travel time and more efficient in cost. In addition, the absence of public transportation and family members who can lead the students makes the reason for parents to initiate their children to use a motorcycle even though they do not have not a driver's license, even 88.9% of respondents do not have a driver's license. Most students learn driving techniques at the age of 12-15 years when the physical conditions are met. Although the student's origin location has another potential accessibility mode, the student still keeps the motorcycle as the main mode of movement. Another mode of use occurs when compulsion can not use a motorcycle as it has not been allowed by parents to carry motorcycles, motorcycles are damaged, and when the school establishes policies only two- and three-years student that are allowed to take the motor to school. The average daily travel frequency conducted by the learner is 3.55 or about 4 trips per day with average travel cost is Rp.18.762,89 per week or approximately Rp.3.752.58 per day. When compared to travel expenses using BRT Trans Semarang then the required daily cost is Rp.4.000,00 per day or Rp.20.000,00 per week.

## 5. Conclusion

The high use of motorcycles by high school students in Semarang City due to the absence of other modes of choice are considered more effective and efficient in traveling. In fact, students who have the potential for accessibility to use public transport modes still make the main choice motorcycles in movement. Motorcycles become the most effective and efficient mode because it is more flexible in determining the route and travel time. Even not significant, the costs incurred will be cheaper than public transport. Hence, the provision of transportation system should be based on user activity, not only on the main activity but also consider the supporting activities. The provision of public transport must be matched with the needs of users and become the first choice to trip.

## 6. Acknowledgement

The authors are grateful for the funding of DIPA FT Undip 2017 from Engineering Faculty of Diponegoro University. It is a support and would enrich research of travel behavior in the developing country.

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