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# The Effect of Design on User Comfort in the Dseign of Rest Areas and Service Facilities in Kulon Progo Regency

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**ABSTRACT**

High vehicle mobility in 2025 has contributed to an increase in accident rates, with human factors being the dominant cause at 94.7%. Driver fatigue often remains unaddressed because existing Rest and Service Areas (TIP) tend to only provide physical facilities rather than mental recovery. This qualitative study aims to formulate a TIP concept that addresses the psychological needs of toll road users through a biophilic architecture approach. Through literature studies and evaluations of similar facilities, the "Pasanggrahan Rawikara" core concept was developed. This concept integrates natural elements into the design to create a space for mental recovery, reducing stress, and improving driver focus. The implementation of this design in the Kulon Progo Regency area is expected to minimize accidents caused by human fatigue factors.

***Keywords:*** *Rest area, Service Facility, Biophilic, Mental Recovery*

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## INTRODUCTION

Vehicle traffic continues to rise every year not only in terms of passenger traffic but also freight traffic which requires adequate infrastructure to ensure efficient travel. According to data from PT Hutama Karya (Persero), a state-owned enterprise engaged in construction and infrastructure development, including toll roads, buildings, and bridges, vehicle traffic on Hutama Karya's toll roads during the first half of 2025 exceeded 250,000 vehicles daily across all road sections managed by the company. This indicates a 7.6% increase in vehicle volume compared to the previous year, measured over the same time period (Hutama Karya, 2025).

This rise in mobility has also contributed to a higher rate of accidents on the roads. According to the Indonesian National Police, accident causes are categorized into four types: human factors, vehicle factors, road factors, and natural factors.

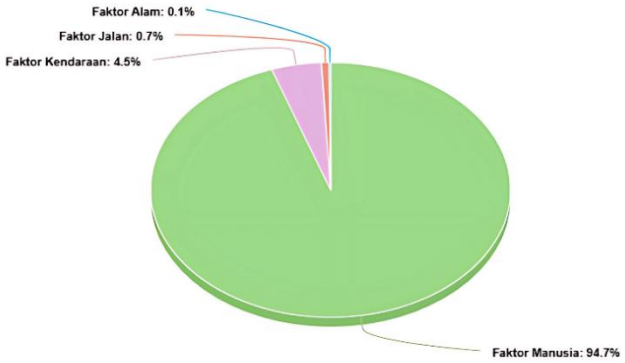



**Figure 1.** Percentage of Accident Causes in 2025
**Source:** Kepolisian Negara Republik Indonesia

Based on the data above, human factors are the leading cause of accidents, accounting for 94.7% of incidents. The government has made efforts to reduce the number of road accidents by constructing rest and service areas.

According to (Aprianto et al., 2021), drivers who do not choose to rest have a higher risk of fatigue, and drivers who visit rest areas only to refuel, withdraw cash, or simply use the restroom are considered to have a higher risk of fatigue because they do not make proper use of the facilities. This indicates that many Rest and Service Areas built are not based on the needs of highway users to restore their mental condition, but merely provide physical rest facilities.

This study aims to formulate a concept for Rest and Service Areas capable of addressing the psychological needs of fatigued highway users during their journey. Additionally, this study reinforces the theory regarding how the built environment influences human psychology. A good adaptation process can help reduce human stress levels caused by the environment and, in turn, aid the recovery process (Ulyana & Levandani, 2025). In the context of toll roads, design is not merely about aesthetics but serves as a tool to reduce drivers' stress levels. The primary concept employed adopts a biophilic approach, which involves creating rest areas.

## METHOD

The method used in this study is qualitative descriptive research, which involves the stages of data collection, data presentation, and data analysis. Qualitative descriptive research is a method that depicts, describes, and presents the subject as it is, based on the situation and conditions at the time the research is conducted (Sugiyono, 2017).

1. Literature Review
   In this stage, data were collected from books, journals, articles, and government regulations relevant to the research object, namely Rest Areas and Service Facilities.
2. Precedent Study
   A precedent study was conducted to gain an understanding of the topic as it relates to similar objects.

3. Observation
   The observation stage involves direct observation and documentation at the research site to analyze existing conditions and situations.
4. Analysis, Synthesis, and Data Presentation
   Analysis is performed by breaking down the issues based on their classification using the data obtained previously. Synthesis is then conducted after the issues have been successfully analyzed to identify appropriate solutions. Finally, the data is presented in the form of graphs, photographs, tables, and descriptions.

## FINDING AND DISCUSSION

## RESEARCH RESULT

### Literature Review

### Definition of Rest and Service Areas (TIP)

Rest and Service Areas (TIP) are rest facilities equipped with various amenities to meet the needs of toll road users, where drivers, passengers, and their vehicles can take a temporary break (Regulation of the Minister of Public Works and Public Housing, 2021).

### Classification of Rest Areas and Service Facilities (TIP)

Technically, toll road TIPs are divided into three categories according to the Minister of Public Works and Public Housing Regulation (2021), namely:

| TIPE A | TIPE B | TIPE C |
|---|---|---|
| • ATM Center yang dilengkapi dengan fasilitas isi ulang kartu tol<br>• Toilet<br>• Klinik kesehatan<br>• Bengkel kendaraan<br>• Kios/Stand makanan/Food Court<br>• Minimarket<br>• Tempat ibadah<br>• SPBU<br>• SPKLU<br>• Rumah makan<br>• Ruang terbuka hijau<br>• Sarana parkir kendaraan<br>• Tempat pengolahan limbah dan daur ulang air<br>• Pemadam kebakaran dan khusus untuk bahan berbahaya dan beracun | • ATM Center yang dilengkapi dengan fasilitas isi ulang kartu tol<br>• Toilet<br>• Kios/Stand Makanan/Food Court<br>• Minimarket<br>• Tempat ibadah<br>• SPBU<br>• SPKLU<br>• Rumah makan<br>• Ruang terbuka hijau<br>• Sarana parkir kendaraan<br>• Tempat pengolahan limbah dan daur ulang air<br>• Pemadam kebakaran dan khusus untuk bahan berbahaya dan beracun | • Toilet<br>• Kios/Stand makanan<br>• Tempat ibadah<br>• Sarana parkir kendaraan<br>• Pemadam kebakaran dan pendukung lainnya yang bersifat sementara |

**Figure 2.** Classification of Rest Areas and Service Facilities (TIP)
**Source:** Minister of Public Works and Public Housing Regulation

**Case Study**

**1. Pendopo Rest Area KM 456, Semarang–Solo Toll Road**

The Pendopo Rest Area KM 456 is located on the Semarang–Solo Toll Road in Baok, Ujung-Ujung, Pabelan District, Semarang Regency, Central Java. This rest area is classified as a Type B intercity facility, with Area A covering 1.1 hectares and Area B covering 2.2 hectares. Its design is unique because it connects two locations via an overpass spanning the Semarang–Solo Toll Road. Additionally, this rest area features a roof design inspired by the traditional Javanese Joglo architecture, hence its name, 'Pendopo.' The concept creates a natural ambiance for users through the incorporation of vegetation and the use of appropriate natural materials.

**Figure 3.** Pendopo Rest Area KM 456
**Source:** astraproperty.co.id, 2026

**Table 1: Design Aspects of Resta Pendopo KM 456**

| NO | Figure | Analysis |
|---|---|---|
| 1 |  | Resta Pendopo takes advantage of natural air circulation through the numerous openings at every corner. Supported by vegetation that creates a microclimate, this well-ventilated environment also helps reduce excessive heat from entering, which could otherwise disrupt the visitor experience. |
| 2 |  | The combination of vegetation and indoor spaces at Resta Pendopo makes it an attractive stop for travelers passing through this rest area. Travelers feeling stressed during their journey can also refresh their minds by taking in the natural scenery in this area. |

| | | |
|---|---|---|
| **3** |  | Resta Pendopo relies on natural daylight that streams in through intentionally created openings throughout nearly the entire building. The light diffuses, creating the sensation of being in the sun without being exposed to direct heat. |
| **4** |  | The primary material used in the construction of Resta Pendopo is wood, as seen in the wooden latticework, the wood-clad roof, and the shading elements. |
| **5** |  | Architecturally, this Rest and Service Area incorporates local architectural elements, specifically the joglo-style roof. The aim is to preserve and showcase local identity to visitors who stop by. |

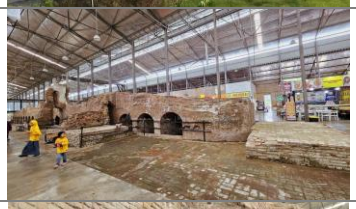
Source: Author's Analysis

**2. Heritage Rest Area at KM 260B on the Pejagan–Pemalang Toll Road**

The Heritage Rest Area at KM 260B is located on the Pejagan–Pemalang Toll Road, specifically at the KM 260B rest area in Cipugur, Banjaratma, Bulakamba District, Brebes Regency, Central Java. This rest area is unique because it is the only one that utilizes a former sugar factory building. Visitors can enjoy a comfortable rest experience thanks to the presence of visible and tangible vegetation elements, which provide sensory stimulation that helps reduce stress for tired travelers.

**Figure 4.** Heritage Rest Area at KM 260B
**Source:** trac.astra.co.id, 2025

**Table 1: Heritage Rest Area at KM 260B**

| NO | Figure | Analysis |
|---|---|---|
| 1 |  | The primary design focus is on the historic sugar mill building. However, the vegetation in this area is quite sufficient, as evidenced by the abundance of trees that provide shade and serve as landmarks along the pathway. |
| 2 |  | This rest area is easily accessible, and there is minimal traffic flow, which enhances user comfort. |
| 3 |  | This building relies on sunlight entering through the roof, which is designed with openings in several sections. This enhances the user experience by reducing travel-related stress. |
| 4 |  | Overall, this rest area preserves the original materials from the sugar factory, namely bricks. The newly constructed buildings, which serve as supporting facilities, also use similar materials to create a sense of unity. |
| 5 |  | The architectural design of this building preserves its original form as a cultural heritage site, ensuring that it continues to reflect the local identity of the site. |

Source: Author's Analysis

**Conclusions from the Literature Review and Previous Studies**

Strategies that incorporate natural elements and experiential design at Rest and Service Areas (TIPs) to reduce stress in fatigued drivers after driving are of critical importance. Providing visitors with unique and more satisfying experiences can encourage drivers to take a break and avoid pushing themselves too hard, thereby reducing the risk of highway accidents caused by human error. Precedent studies indicate that attractive design and meeting user needs are two interrelated elements in the design planning of Rest and Service Areas.

**Characteristics of Tired Drivers**

Tired drivers exhibit behaviors that differ from their usual habits, particularly among long-distance or intercity drivers. Visible signs of fatigue include the driver's body language, such as yawning and feeling drowsy, feeling restless, engaging in light activities to reduce drowsiness, and a decreasing level of attention to the surrounding environment (Zuraida, 2015).

**Object Characteristics**

Based on precedent studies and literature reviews of Rest and Service Areas (TIP), the following characteristics of these facilities were identified based on the most dominant needs of TIP users:

1. Rest Area
   For toll road users to meet their needs. These needs vary, ranging from refueling, refreshment, rest, dining, restroom facilities, prayer, and others.
2. Circulation and Parking Patterns
   At TIPs, a well-designed circulation pattern for both people and vehicles is a crucial requirement. Additionally, the parking areas are designed to avoid disrupting the flow of passing vehicles.
3. Integrated
   TIPs are facilities directly integrated with the toll road. Consequently, the facilities provided encompass all the needs required by toll road users.

**Concept**

According to Vitruvius Pollio (1960), architectural concepts are defined by three requirements (the Vitruvian Trilogy): Function or Utility (Utilitas), Strength or Sturdiness (Firmitas), and Aesthetics or Form (Venustas). Based on the characteristics of the site and the users, the following Basic Concept has been formulated as a guideline for the planning and design of Rest and Service Areas in Kulon Progo Regency, taking into account user needs:

1. Rest and Service Areas
   Rest and Service Areas are places for rest and are equipped with service facilities that can be utilized by toll road users.
2. Mental Recovery
   An aspect that must be considered is the mental recovery of highway users while at the Rest and Service Area to reduce accidents on the highway caused by human factors.
3. Integration with Nature
   The natural elements surrounding the site must be maximized to achieve the function of mental recovery for users of the Rest and Service Area through biophilic design that is integrated with nature.

Based on these aspects, the formulation of the basic concept was carried out by combining these main aspects. The results of this combination are as follows:


**Figure 5.** Formulation of Basic Concepts
**Source:** Author's Analysis

Based on this formulation, the core concept of "Pasanggrahan Rawikara" was developed. Its philosophy stems from the combination of the word "Pasanggrahan," meaning a resting place or temporary shelter, and "Rawikara," which signifies a ray of sunlight that brings enlightenment to weary highway travelers during their journey. In this context, the aim is to create a place where drivers can reflect on their thoughts (cipta), feel the tranquility of nature (rasa), and take a moment to rest (kaTIP).

**Implementation of the Concept**

1. Rest Areas and Services

   Rest areas are provided through the design of parking lots equipped with shade trees, restaurants, auto repair shops, and lodging facilities. Supporting aspects of rest facilities include services, necessitating the provision of facilities such as restrooms, health clinics, gas stations, and electric vehicle charging stations. The Javanese people are familiar with Javanese architecture, in part through the traditional Joglo house. The Joglo is a symbol of Javanese culture and a reflection of Javanese society. According to (Budiwiyanto, 2013) because it is located in the Kulon Progo region, where the majority of the population is Javanese.
2. Mental Well-being and Integration with Nature

   Mental well-being is fostered through designs that adopt Biophilic Architecture, which involves incorporating natural elements into the design. Biophilic design can reduce mental stress, enhance creativity and mental clarity, improve health conditions, and accelerate the healing process. This design creates a connection between nature, human biology, and the built environment so that users can experience it. (Browning et al., 2015). According to Kellert and Calabrese (2015), biophilic design is an approach aimed at creating spaces that are conducive to human well-being as biological organisms in the modern environment by prioritizing functions that support human health, fitness, and well-being through architectural design.

**CONCLUSION**

Intercity toll road users are generally fatigued during their journeys and find the straight, monotonous roads monotonous, lacking any distinct points of interest to look at. Therefore, "Pesanggrahan Rawikara" is the most suitable concept to address the need for Rest and Service Areas along the toll road section located in Kulon Progo Regency. The

application of Biophilic Architecture aims to restore the mental well-being of users who utilize these facilities, allowing them to refocus and continue their journey. Consequently, accidents on the toll road caused by human factors can be minimized.

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