# Visual Tree Assessment (VTA) of Tree Health in the Green Belt of Southern Ring Road, Mataram City

Muhamad Rafly Lanang Pamungkas, Andi Tri Lestari, Irwan Mahakam Lesmono Aji

**Abstract**

Green belts play a crucial role in urban green spaces by providing shades, filtering air pollutants, and enhancing city aesthetics.This study aims to evaluate the health condition of trees along the South Ring Road green belt in Mataram City using the Visual Tree Assessment (VTA) method. VTA assesses tree vitality and structural stability based on observable external indicators,tr such as cracks, swellings, and crown asymmetry. A census approach was applied to a total of 1,432 trees. The results revealed that 77% of the trees were categorized as low risk, 21% as moderate risk, and 2% as high to extreme risk. The most common types of defects observed included stem cankers, dead branches, and decay. Recommended management actions include regular pruning, selective felling, the use of biological pesticides, and relocation of severely affected trees. This research provides a valuable foundation for developing effective tree risk management strategies in urban environments.

**Keywords:** Visual Tree Assessment, green belt, tree risk, tree health.

## Introduction

Urban green spaces (UGS) are essential elements in urban spatial planning, serving to maintain ecological balance by preserving natural vegetation including trees, shrubs, and grasses. Trees, as the main components of UGS play a vital role in improving air quality, reducing noise pollution, enhancing urban aesthetics, and providing thermal comfort for city residents. Therefore, maintaining and ensuring the sustainability of urban tree health is of great importance. According to Law No. 26 of 2007 concerning Spatial Planning, Article 29 Paragraph (2), requires that urban areas allocate at least 30% of their total area for green open space (Nasyavina, 2023). Furthermore, the Regulation of the Minister of Public Works No. 5 of 2008 states that urban green space functions not only as an infiltration and conservation zone but also as a balancing element between built and natural environments.

Mataram City, as the capital of West Nusa Tenggara Province (NTB), contains various forms of urban green spaces one of which is the roadside green belt along major roads such as Jalan Langko, Jalan Udayana, Jalan Pejanggik, Jalan Majapahit, and Jalan Lingkar. The green belt of Jalan Lingkar Selatan serves as a vital urban feature that function as the city's "green lung," providing shade, supporting transportation corridors, and offering open spaces close to daily human activities. However, trees in this area face multiple stress factors caused by both environmental and anthropogenic pressures, including road paving, improper pruning, vehicular emissions, noise, and natural events such as strong winds and heavy rainfall. Such pressures gradually decrease tree vitality (Syahraeni et al., 2022). Preliminary observations revealed that Jalan Lingkar Selatan is one of the busiest transportation routes, particularly during rush hours (07:00 and 16:00), increasing the potential risks from unhealthy trees. If not properly managed, declining tree conditions may cause hazards such as falling branches or uprooted trees, potentially damaging infrastructure or threatening human safety (Agung et al., 2019).

Mataram City frequently experiences extreme weather events characterized by strong winds, which often result in tree failures causing property damage and casualties (Latifah et al., 2020). Unstable soil conditions and shallow root systems further reduce tree stability, particularly in large specimens thus increasing the risk of uprooting during strong winds or heavy rain (Arisanti et al., 2022). Moreover, biotic factors such as pest infestations and fungal attacks further deteriorate tree health (Pertiwi, 2019). Given the complexity of these problems, a reliable and systematic assessment method is required to visually identify tree conditions, analyze their health status, and formulate management recommendations for urban green space authorities and related stakeholders.

One relevant and effective approach is the Visual Tree Assessment (VTA) method developed by the International Society of Arboriculture (ISA). VTA is a non-destructive technique for visually evaluating tree health through the identification of external indicators such as cracks, cavities, swellings, and crown asymmetry (Hanum et al., 2020). The method involves three systematic stages: visual observation, potential failure analysis, and the formulation of management or mitigation recommendations (ISA, 2013). The advantages of VTA include practicality, efficiency, and the ability to provide immediate management recommendations such as pruning, crown reduction, or tree replacement. The method has been widely applied in urban areas worldwide and in several major cities in Indonesia, such as Jakarta and

Salatiga (Lestari, 2022). Visual assessment of crown, stem, and root conditions can also serve as a basis for estimating wood quality, since structural damage to trees indicates a decline in wood properties such as specific gravity and mechanical strength (Yuwono *et al*., 2022). However, its application in the green belts of Mataram City remains limited.

Based on the aforementioned background, this study aimed to evaluate the health condition of trees along the Southern Ring Road green belt in Mataram City using the VTA method. Specifically, the study aims to (1) identify tree species along the green belt of Jalan Lingkar Selatan, (2) analyze tree risk categories based on the VTA method, and (3) provide preventive and mitigation recommendations for identified risks. The results of this study are expected to serve as scientific data for the local government and environmental managers in developing targeted tree risk mitigation strategies, thereby enhancing public safety and maintaining the ecological sustainability of urban trees.

## Materials and Methods

### Time and Place of Research

This study was conducted along the green belt of the Southern Ring Road, Mataram City, from August to September 2025. The location of the study area is shown in Figure 1.

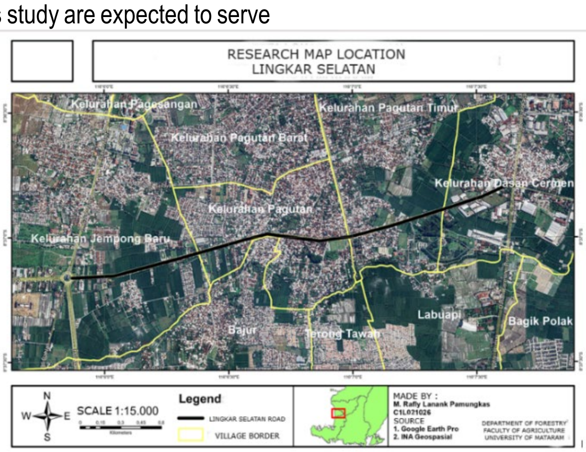


Figure 1. Map of the Research Location (Southern Ring Road Green Belt, Mataram City)

### Research Tools and Objects

The objects of this study were trees growing along the green belt of Jalan Lingkar Selatan. The tools used in this study include a hagameter, camera, laptop, measuring tape, tally sheet, writing instruments and others.

### Methodologies

Tree risk assessment was conducted using the Visual Tree Assessment (VTA) approach developed by the International Society of Arboriculture (ISA). This method focuses on identifying visual indicators of tree risk and damage to evaluate tree stability and safety. An overview of the assessment process is illustrated in Figure 2.

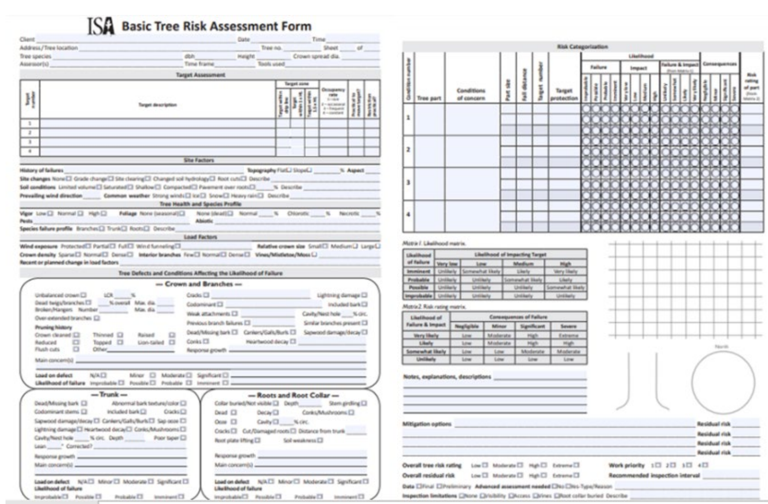


Figure 2. Tree Risk Assessment Form Based on the International Society of Arboriculture (ISA, 2013)

## Data Analysis

a. Identification of Trees Composing the Green Belt
Tree species along the green belt were identified by observing morphological characteristics such as leaf shape, flower structure, and stem characteristics.

b. Risk Categorization of Green Path Trees
Tree risk identification along the Mataram City green belt was carried out using the Visual Tree Assessment (VTA) method. The analysis referred to the Tree Risk Assessment evaluation form developed by the ISA, classifying tree risk levels into four categories, as shown in Tables 1 and 2.

Table 1. Types of Possible Tree Damage and Their Impacts (Matrisx 1)

| Likelihood of Failure | Likelihood of Impacting Target | | | |
|---|---|---|---|---|
| | Very Low | Low | Medium | High |
| Imminent | Unlikely | Somewhat Likely | Likely | Very Likely |
| Probable | Unlikely | Unlikely | Somewhat Likely | Likely |
| Possible | Unlikely | Unlikely | Unlikely | Somewhat Likely |
| Improbable | Unlikely | Unlikely | Unlikely | Unlikely |

Source : *International Society of Arboriculture (ISA)*

Table 2. Likelihood of Tree Damage and Its Impacts (Matrix 2)

| Likelihood of Damage and Its Im[act | Negligible | Minor | Significant | Severe |
|---|---|---|---|---|
| Very Likely | Low | Moderate | High | Extreme |
| Likely | Low | Moderate | High | High |
| Somewhat Likely | Low | Low | Moderate | Moderate |
| Unlikely | Low | Low | Low | Low |

Source : *International Society of Arboriculture (ISA)*

**Recommendations for Prevention and Control of Green Belt Tree Health**

Recommendations for managing the green belt and reducing tree risk levels along the Southern Ring Road were formulated based on an analysis of existing tree damage and risk data combined with a literature review approach. The literature review method was employed to collect information from relevant scientific publications on tree risk management and mitigation practices. By analyzing contributing factors and existing mitigation strategies from other regions, comprehensive recommendations were developed to minimize tree risk levels in the study area.

## Results and Discussion

### Overview of the Research Location

The research was conducted along the Southern Ring Road area in Mataram City, West Nusa Tenggara Province. This road serves as one of the main transportation corridors connecting the eastern and western parts of Mataram City and provides access to suburban areas such as Sekarbela and Pagutan. Administratively, the Southern Ring Road traverses several urban villages, including Pagutan Barat, Karang Genteng, and Jempong Baru. The area is characterized by flat topography with elevations below 50 meters above sea level. Vegetation along the roadside consists mainly of shade trees and shrubs, with several vacant spaces that remain underutilized. Functionally, Jalan Lingkar Selatan acts as a major corridor for transportation and goods distribution and is an integral component of Mataram City's spatial planning.

### Identification of Tree Species Along the Jalan Lingkar Selatan

Identification of tree species along the Southern Ring Road revealed the composition and dominance patterns of vegetation within the green belt. The results showed that the most dominant tree species was Tanjung (*Mimusops elengi*), with 624 individuals, representing 43.58% of the total population. This dominance reflects a planting design that emphasizes a single species, likely due to the desirable traits of *Mimusops elengi*, such as dense canopy, strong rooting system, and high tolerance to urban environmental stress. Other major species included Glodokan tiang (*Polyalthia longifolia*) and Kenari (*Canarium indicum*), with 208 and 207 individuals, respectively, each comprising about 14% of the total trees.These species possess slender crowns and upright growth forms, making them suitable for narrow roadside green belts. The presence of other species such as Kapur naga, Mahogany, Flamboyant, and Trengguli indicates attempts at vegetation diversification, although their proportions remain relatively low. Diversification is essential to minimize ecological risks associated with monoculture planting, such as vulnerability to pests, pathogens, and environmental stress. According to Kusmana and Hikmat (2015), biodiversity in urban vegetation enhances ecological functions and improves landscape resilience to both biotic and abiotic disturbances. The inclusion of multiple species in urban green spaces can enrich ecosystem structure and strengthen urban resilience to climate change and human-induced disturbances. Therefore, continuous implementation of vegetation diversification strategies is necessary in planning and managing urban green spaces, particularly in densely populated areas such as Mataram City.

Table 3. Identified Tree Species Along the Southern Ring Road (Jalan Lingkar Selatan), Mataram City

| No | Local Name | Scientific Name | Total | Frequency (%) |
|---|---|---|---|---|
| 1 | Tanjung | *Mimusops elengi* | 624 | 43.58 |
| 2 | Glodokan tiang | *Polyalthia longifolia* | 208 | 14.53 |
| 3 | Kenari | *Canarium indicum* | 207 | 14.46 |
| 4 | Kapur naga | *Calophyllum soulattri* | 140 | 9.78 |
| 5 | Mahoni | *Swietenia mahagoni* | 54 | 3.77 |
| 6 | Flamboyan | *Delonix regia* | 41 | 2.86 |
| 7 | Trengguli | *Cassia fistula* | 33 | 2.30 |
| 8 | Ketapang | *Terminalia catappa* | 29 | 2.03 |
| 9 | Nangka | *Artocarpus heterophyllus* | 25 | 1.75 |
| 10 | Waru | *Hibiscus tiliaceus* | 18 | 1.26 |
| 11 | Mangga | *Mangifera indica* | 17 | 1.19 |
| 12 | Kersen | *Muntingia calabura* | 10 | 0.70 |
| 13 | Jambu biji | *Psidium guajava* | 4 | 0.28 |
| 14 | Klengkeng | *Dimocarpus longan* | 4 | 0.28 |
| 15 | Trembesi | *Samanea saman* | 4 | 0.28 |
| 16 | Asam Jawa | *Tamarindus indica* | 4 | 0.28 |
| 17 | Matoa | *Pometia pinnata* | 3 | 0.21 |
| 18 | Jambu bol | *Syzygium malaccense* | 2 | 0.14 |
| 19 | Sawo hijau | *Chrysophllum cainito* | 4 | 0.28 |
| 20 | Beringin | *Ficus benjamina* | 1 | 0.07 |
| | Total | | 1.432 | 100.00% |

**Tree Damage Assessment**

The results of the tree health assessment along the green belt of Jalan Lingkar Selatan, Mataram City recorded a total of 5,798 damage cases across 1,432 trees, representing various types of defects. The most frequent damage was trunk canker, with 1,361 cases (23.47%), followed by galls or burls on branches totaling 1,033 cases (17.82%), and dead or missing bark with 560 cases (9.66%). The dominance of damage affecting trunks and branches indicates a substantial compromise of tree structural integrity, which may reduce ecological functionality and increase the likelihood of structural failure. In addition, other major forms of damage included 462 cases (7.97%) of dead branches and 440 cases (7.59%) of root lifting. These findings are consistent with the study by Arisanti et al. (2022), who reported similar physical damage patterns along urban greenways, such as broken branches, trunk injuries, and conditions that pose potential hazards to road users. Collectively, these results reinforce the view that dead branches and trunk-related damage constitute primary structural issues for trees planted in urban green belts. Quantity of Tree Damages/Diseases is illustrated in Figure 4.

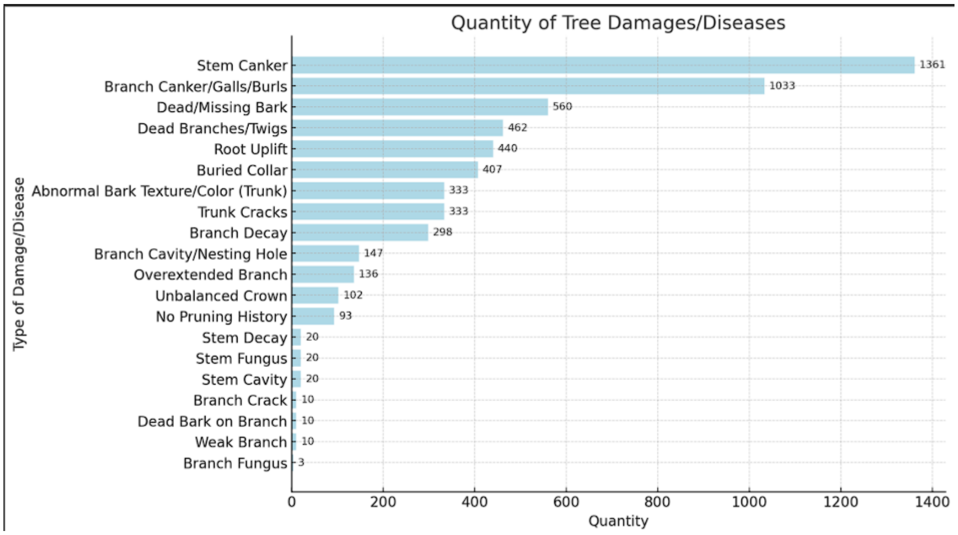


Figure 4. Types of Tree Damage Observed Along the Southern Ring Road Green Belt, Mataram City

Although several damage categories occurred at relatively low frequencies, such as fungal growth on branches (0.05%), branch cracks (0.17%), and dead bark branches (0.17%), these conditions still warrant attention. Even limited occurrences of fungal infection and decay can accelerate the deterioration of tree health if not managed appropriately. Santoso (2020) reported that fungal attacks on stems or branches intensify structural weakening and increase the potential for tree failure, particularly during extreme weather events. Field observations further indicated that trees exhibiting open wounds, decay, or dead branches tend to produce lower-quality wood. This observation supports previous studies showing that the physical condition of standing trees is closely related to fundamental wood properties, including specific gravity and air-dry moisture content (Putro *et al*., 2020).

Types of Damage to Trees on Jalan Lingkar Selatan is ilustrated at Figure 5.


Figure 5. Types of Damage to Trees on Jalan Lingkar Selatan: A.) Canker B.) Brum C.) Dead Branches D.) Hollow Trunks E.) Trunk Cracks F.) Weak Branches G.) Trunk Cavities H.) Termite Houses I.) Dead Bark J.) Trunk Decay K.) Fungi L.) Buried Root Necks M.) Uprooted Roots N.) Gummosis O.) Epiphytes P.) Leaf Pests

Structural defects such as stem cracks, wood decay, cavities, and cankers reduce fiber continuity and the effective cross-sectional area of intact wood (Yang et al., 2017). From a wood science perspective, visual defects identified through Visual Tree Assessment (VTA) are closely associated with the degradation of fundamental mechanical properties of wood. Defects such as internal decay, stem cavities, and extensive canker development reduce residual wall thickness, which is a critical determinant of bending strength and overall stem stability. Previous studies have demonstrated that even moderate levels of decay may result in disproportionate reductions in modulus of elasticity (MOE) and modulus of rupture (MOR), particularly when degradation occurs near the neutral axis of bending (Yang et al., 2017; Jelonek et al., 2020).

Prolonged decay processes and physiological stress also contribute to reductions in wood density and specific gravity. Trees subjected to chronic biotic and abiotic stress tend to form wood with heterogeneous tissue structure and irregular anatomical characteristics, which further diminish mechanical reliability. In this context, VTA indicators such as hollow stems, open wounds, and extensive bark mortality function as practical proxies for internal wood deterioration, allowing practitioners to infer potential mechanical weakening without destructive sampling.

Although VTA does not directly quantify mechanical parameters, its principal strength lies in integrating visual symptoms with established biomechanical principles. Consequently, trees exhibiting multiple structural defects should be regarded as having substantially reduced mechanical performance, even when external dimensions or apparent vigor suggest adequate structural capacity.

**Category Risk Tree**

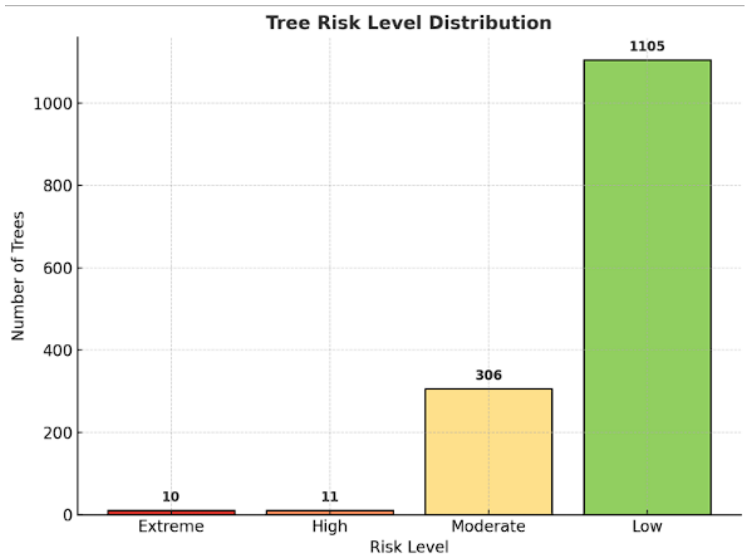


Figure 6. Distribution of Tree Risk Categories Along the Southern Ring Road (Jalan Lingkar Selatan), Mataram City

Tree risk assessment using the Visual Tree Assessment (VTA) method follows a structured procedure that begins with a systematic visual inspection of the tree crown, stem, and root collar to identify structural defects such as cracks, cavities, open wounds, and signs of wood decay that may reduce tree stability (Li *et al.*, 2022). Each identified defect is evaluated using an ordinal rating scale (e.g., low, moderate, and high) to represent the severity of damage and the likelihood of structural failure. The use of standardized rating scales helps ensure consistency and comparability of risk assessments across large tree populations in urban environments (Li *et al.,* 2022).

VTA assessments are typically conducted by evaluators with professional backgrounds in forestry, arboriculture, or urban tree management and with practical experience in recognizing indicators of structural weakness and decay (Smiley et al., 2017). The visual assessment results are then integrated into a VTA risk matrix, which combines the likelihood of tree failure with the potential consequences of failure based on target presence, such as pedestrians, vehicles, or infrastructure, to generate a final risk rating (Smiley et al., 2017; van Haaften et al., 2021). This matrix-based approach allows complex biomechanical and environmental factors to be translated into practical risk categories that support evidence-based decision-making for urban tree management and public safety (Li et al., 2022).

The results of the tree risk assessment along the green belt revealed notable variations in tree risk levels. Based on the analysis, the majority of trees were categorized as low risk, totaling 1,105 individuals (approximately 77%).This finding suggests that most trees remain in relatively safe condition, with minimal potential for structural failure or harm to nearby targets.

A total of 306 trees (around 21%) were classified as medium risk. Trees within this category require increased monitoring and appropriate maintenance, as their risk level could escalate if left unmanaged. In contrast, only 11 trees (about 1%) were identified as belonging to the high-risk category. Although relatively few, these trees should be prioritized for management intervention, as they pose potential hazards to pedestrians, motorists, and surrounding infrastructure.

The most critical classification is the extreme-risk category, comprising 10 trees (approximately 1%). Despite their small proportion, these trees are of serious concern and must be addressed immediately. Trees within this category exhibit a very high likelihood of structural failure, posing an immediate threat to public safety and nearby facilities.

Overall, the distribution of risk levels indicates that tree management practices in the green belt are generally effective, as most trees fall within the low-risk category. However, the presence of trees in the medium, high, and extreme categories necessitates more targeted management strategies. Recommended management actions include routine pruning and maintenance for medium-risk trees; structural evaluation and technical interventions such as branch load reduction or reinforcement for high-risk trees; and selective felling or replacement for extreme-risk trees to minimize potential hazards.

Table 4. Trees Classified Under the Extreme-Risk Category Along the Southern Ring Road (Jalan Lingkar Selatan), Mataram City

| Code | Tree Species | Diameter | Height | Target | Tree Damage | Risk Category |
|---|---|---|---|---|---|---|
| 12A | *Delonix regia* | 26 | 7 | Pedestrians and Drivers | Brum, Cracked Trunk, Nails, Canker, Hollow Main Trunk, Dead Bark, Dead Branches | Extreme |
| 21A | *Delonix regia* | 31 | 6 | Pedestrians and Drivers | Brum, Nails, Canker, Hollow Main Trunk, and Dead Branches on the Crown | Extreme |
| 171A | *Canarium indicum* | 41 | 13 | Pedestrians and Drivers | Brum, Rotten Trunk, Hollow Main Trunk, Canker, Unbalanced Crown, Dead Branches | Extreme |
| 177A | *Canarium indicum* | 25 | 12 | Pedestrians and Drivers | Brum, Rotten Trunk, Hollow Main Trunk, Canker, Unbalanced Crown, Dead Branches | Extreme |
| 1140C | *Delonix regia* | 33 | 8 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker, Dead Branches | Extreme |
| 1179C | *Delonix regia* | 30 | 7 | Pedestrians and Drivers | Brum, Dead Branch, Hollow Main Trunk, Canker, Dead Branch | Extreme |
| 1216C | *Delonix regia* | 34 | 10 | Pedestrians and Drivers | Brum, Nails, Canker, Hollow Main Trunk and Dead Branches on the Crown, Dead Branches | Extreme |
| 1339C | *Canarium indicum* | 30 | 7 | Pedestrians and Drivers | Brum, Canker, Open Wounds, Cracks, Decay, Dead Branches | Extreme |
| 1333C | *Canarium indicum* | 54 | 9 | Pedestrians and Drivers | Brum, Canker, Open Wounds, Cracks, Decay, Dead Branches | Extreme |
| 1318C | *Calophyllum soulattri* | 25 | 5 | Pedestrians and Drivers | Brum, Canker, Open Wounds, Cracks, Decay, Dead Branches | Extreme |

Trees classified under the extreme-risk category consistently exhibited severe wood-related defects, including hollow main trunks, extensive decay, cracks, open wounds, and canker formation. From a biomechanical standpoint, the coexistence of these defects indicates a critical reduction in residual load-bearing capacity. The loss of intact wood fibers and the presence of internal voids substantially weaken bending resistance and increase susceptibility to brittle failure.

In large diameter trees, such as Canarium indicum, internal decay may not be proportionally reflected by external stem dimensions, leading to overestimation of structural strength if wood degradation is not considered. The extreme-risk classification therefore reflects not only the likelihood of failure but also the advanced deterioration of wood mechanical properties, reinforcing the need for immediate management intervention in high-target urban areas.

Table 5. Trees Classified Under the High-Risk Category Along the Southern Ring Road (Jalan Lingkar Selatan), Mataram City

| Code | Tree Species | Diameter | Height | Target | Tree Damages | Risk Category |
|---|---|---|---|---|---|---|
| 67A | *Canarium indicum* | 28 | 12 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker | High |
| 91A | *Canarium indicum* | 54 | 19 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker | High |
| 146A | *Calophyllum soulattri* | 13 | 7 | Pedestrians and Drivers | Brum, Nails, Hollow Main Trunk. | High |
| 162A | *Calophyllum soulattri* | 15 | 8 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker, Trunk Decay | High |
| 175A | *Canarium indicum* | 24 | 9 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker, Nails | High |
| 1151C | *Delonix regia* | 44 | 5 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker | High |
| 1160C | *Delonix regia* | 24 | 5 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker | High |
| 1165C | *Canarium indicum* | 10 | 4 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Dead Branch | High |
| 1187C | *Canarium indicum* | 28 | 10 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Dead Branch | High |
| 1199C | *Canarium indicum* | 32 | 8 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker, Dead Branch | High |
| 1234C | *Canarium indicum* | 15 | 5 | Pedestrians and Drivers | Brum, Hollow Main Trunk, Canker, Open Wounds | High |

Based on Table 5, a total of eleven trees were classified as high-risk. These trees were predominantly of three species: *Canarium indicum*, *Calophyllum soulattri*, and *Delonix regia* In general, the primary causes of high risk among these trees were structural defects in the main trunk, including cavities, cankers, and external loads such as inserted nails. Additionally, symptoms such as trunk rot, dead crown branches, open wounds, and burls were also identified, further increasing the likelihood of structural failure.

The high level of risk in these trees was primarily attributed to the combination of large tree dimensions (diameter and height) and extensive structural damageThe primary potential targets affected by these risks are pedestrians and motorists. This condition is associated with the trees' location along the Southern Ring Road green belt, a zone characterized by high traffic intensity.The presence of high-risk trees in such areas poses safety hazards to road users, particularly during extreme weather events such as strong winds or heavy rainfall.

In addition to structural damage, the presence of nails and open wounds further accelerates the deterioration of tree health. Nails embedded in the trunk may act as entry points for pathogens, while open wounds facilitate fungal infection and internal decay. Under such conditions, the mechanical stability of the trees is compromised, thereby increasing the likelihood of failure or collapse.

**Tree Risk Reduction Recommendations**

Pruning is one of the most commonly applied preventive techniques to address crown imbalance, overgrown branches, and dead twigs. According to Abimanyu et al. (2019), regular pruning improves tree health and reduces the likelihood of damage resulting from disproportionate crown loads. Pruning also reduces crown moisture, thereby minimizing fungal growth and decay potential.

Selective felling should be implemented for trees exhibiting severe structural damage, including extensive trunk cankers, large cracks, or deep trunk cavities Pertiwi et al. (2019) emphasize that tree removal should be based on systematic monitoring results, such as those obtained through the Forest Health Monitoring (FHM) method, to ensure that decisions are objective and data-driven. Proper felling not only reduces the risk of tree failure but also provides space for the regeneration of healthier vegetation.

The application of pesticides particularly biological or plant-based formulations represents an environmentally friendly alternative for disease and pest control. Safe'i et al. (2019) demonstrated that pests and pathogens, such as stem and branch fungi, can be effectively managed using eco-friendly pesticide formulations that do not harm soil microorganisms or induce resistance. The application of pesticides should be tailored to the specific pathogen type and infestation level and conducted exclusively by trained personnel.

Target relocation is an essential mitigation strategy for trees situated near vital infrastructure or densely populated public spaces. Trees exhibiting extensive damage or a history of structural instability should be relocated to safer areas. This process should incorporate proper transplantation techniques to ensure the survival of relocated trees. Abimanyu et al. (2019) recommend that relocation be performed during the tree's dormant phase, accompanied by careful root handling and post-transplant maintenance.

Recommended management actions include routine pruning and maintenance for medium-risk trees; structural evaluation and technical interventions such as branch load reduction or reinforcement for high-risk trees; and selective felling or replacement for extreme-risk trees to minimize potential hazards.

## Conclusions

Based on the results of data analysis and discussion, several conclusions were drawn as follows:

1. Vegetation identification along the green belt of Jalan Lingkar Selatan, Mataram City, revealed the presence of 20 tree species comprising a total of 1,432 individuals. The most dominant species was Tanjung (*Mimusops elengi*) with 624 individuals (43.58%), followed by Glodokan Tiang (*Polyalthia longifolia*) and Kenari (*Canarium indicum*), each representing approximately 14% of the total population.
2. The damage assessment identified a total of 5,798 cases, with the most prevalent types being trunk cankers (23.47%), branch galls or burls (17.82%), and dead or missing bark (9.66%). The high incidence of trunk and branch damage indicates that many trees suffer from structural deficiencies, reducing their ecological and shading functions while increasing the risk of failure. Risk assessment results using the Visual Tree Assessment (VTA) method showed that most trees fell within the low-risk category (77%), followed by medium-risk (21%), while high-risk (1%) and extreme-risk (1%) trees although few still require serious attention due to their potential to cause significant hazards.
3. Recommended management strategies include: (a) regular pruning to remove dead branches, correct crown imbalance, and prevent disease development; (b) the use of environmentally friendly pesticides to control pests and pathogens; (c) selective felling of severely damaged or high-risk trees; and (d) target relocation or establishment of safety zones around extreme-risk trees to minimize potential hazards.


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Muhamad Rafly Lanang Pamungkas, Andi Tri Lestari, Irwan Mahakam Lesmono Aji
Department of Forestry, Faculty of Agriculture, University of Mataram.
Tel. : 0895360583979
E-mail : Lanankpamungkas221@gmail.com