

EVALUATION OF ROAD HUMPS ON RESIDENTIAL
STREETS WITH DIFFERENT TRAFFIC
CHARACTERISTICS

BY

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ABSTRACT

An issue in regards to traffic calming in Malaysia is the lack of standardization in the guidelines and on-site implementation. Previous studies have noted the benefit of installing humps with higher dimensions, indicating that they result in higher speed reductions. However, such installations have resulted in concerns on increased noise levels, discomfort and difficulty in movement for the disabled. In addition, experiments involving 3D or illusion humps in Malaysia and overseas have found that the virtual illusion of humps can still result in speed reductions. The studies that note the benefit of higher humps are typically set at sites with similar geometric and functional characteristics, but many residential roads in Malaysian urban areas differ greatly in their characteristics. In addition, Malaysian hump guidelines are usually blanket guidelines with specific dimensions that do not take site differences into context. Thus a research gap that this study sought to fill is that it studies the effect of humps of varying dimensions on noise and vehicle speeds in different localities, which have different geometrical and functional characteristics. The research also sought to study the residents' perception on the existing road humps in their residential areas and whether they have improved the living environment by reducing traffic noise, volume and vehicle speeds. The three areas selected for this research were Keramat, Setiawangsa, and Putrajaya, and in each area, two residential roads were selected to be assessed. The data were collected using traffic volume survey, inventory survey, speed and noise level surveys and a questionnaire survey that elicited responses from 478 respondents. The road humps were also evaluated based on criteria including land use, road and traffic characteristics in a scoring framework. A low hump height at areas with high traffic volume or high percentage of heavy vehicles was likely to result in minimal changes in noise levels, and residents disagreeing or feeling unsure with the humps' effectiveness. However, it is concluded that the humps in this study largely did not result in noise level changes that were perceptible to the human ear. The perceptions were mostly influenced by the existing traffic noise, which was influenced by the traffic volume and composition. It was also found that in different localities, hump dimensions alone do not account for the evaluation of a hump's effectiveness. The selected humps were effective in reducing vehicle speeds, but the humps of similar height/ width ratios at different areas resulted in statistically significantly different speed reductions due to the influence of the road gradient, traffic volume and proximity to intersections. 1980s/1990s residential developments or newer planned/ gated ones characterized by narrow to medium width roads, low to medium traffic volume and road gradients can still benefit from road humps of height/ width ratio of 0.017 to 0.018. The scoring framework also indicated that the proximity to a feature that affects traffic flow can also affect the effectiveness of different humps along the same road, even with both humps being in the same traffic calming segment and having similar dimensions. This research contributes by providing a method of evaluating road humps in different localities, and it can be used to improve the local authority guidelines for installing road humps based on the geometrical and functional characteristics of the areas.

خلاصة البحث

تتمثل إحدى المشكلات المتعلقة بتهدة حركة المرور في ماليزيا في الافتقار إلى التوحيد القياسي في الإرشادات والتنفيذ في الموقع. لقد أشارت الدراسات السابقة إلى فائدة تثبيت حدبات بأبعاد أعلى، مما يشير إلى أنها تؤدي إلى تخفيضات أعلى في السرعة. ومع ذلك، فقد أدت مثل هذه التركيبات إلى مخاوف بشأن زيادة مستويات الضوضاء وعدم الراحة وصعوبة الحركة للمعاقين. بالإضافة إلى ذلك، فقد وجدت التجارب التي تنطوي على الحدبات ثلاثية الأبعاد أو الوهمية في ماليزيا وخارجها أن الوهم الافتراضي للحدبات لا يزال من الممكن أن يؤدي إلى خفض السرعة. عادة ما يتم تعيين الدراسات التي تشير إلى فائدة الحدبات العالية في مواقع ذات خصائص هندسية ووظيفية مماثلة، لكن العديد من الطرق السكنية في المناطق الحضرية الماليزية تختلف اختلافاً كبيراً في خصائصها. بالإضافة إلى ذلك، عادةً ما تكون إرشادات الحدبة الماليزية إرشادات شاملة ذات أبعاد محددة لا تأخذ اختلافات الموقع في السياق. وبالتالي، فإن الفجوة البحثية التي سعت هذه الدراسة إلى سدها هي أنها تدرس تأثير الحدب ذات الأبعاد المختلفة على الضوضاء وسرعات المركبات في مواقع مختلفة، والتي لها خصائص هندسية ووظيفية مختلفة. كما سعى البحث أيضاً إلى دراسة تصور السكان حول مطبات الطرق الموجودة في مناطقهم السكنية وما إذا كانوا قد قاموا بتحسين البيئة المعيشية من خلال تقليل الضوضاء المرورية وحجم وسرعة المركبات. كانت المناطق الثلاث التي تم اختيارها لهذا البحث هي Keramat و Setiawangsa و Putrajaya، وفي كل منطقة، تم اختيار طريقين سكنيين ليتم تقييمهما. تم جمع البيانات باستخدام مسح حجم حركة المرور، ومسح المخزون، ومسوحات السرعة ومستوى الضوضاء، واستبيان استقصائي أثار ردوداً من 478 مستجيباً. وتم تقييم مطبات الطريق أيضاً بناءً على معايير تشمل استخدام الأراضي وخصائص الطرق والمرور في إطار عمل التقييم. من المحتمل أن يؤدي ارتفاع الحدبة المنخفض في المناطق ذات الكثافة المرورية العالية أو نسبة عالية من المركبات الثقيلة إلى تغييرات طفيفة في مستويات الضوضاء، ويعارض السكان أو يشعرون بعدم اليقين بشأن فعالية الحدب. ومع ذلك، فقد خلص إلى أن الحدب في هذه الدراسة إلى حد كبير لم ينتج عنها تغييرات في مستوى الضوضاء التي كانت محسوسة للأذن البشرية. تأثرت التصورات

في الغالب بضوضاء حركة المرور الحالية، والتي تأثرت بحجم حركة المرور وتكوينها. وقد وجد أيضًا أنه في المواقع المختلفة، لا تأخذ أبعاد الحدبة وحدها في الحسبان تقييم فعالية السنام. كانت الحدبات المختارة فعالة في تقليل سرعات المركبات، لكن الحدبات ذات نسب الارتفاع/العرض المماثلة في مناطق مختلفة أدت إلى انخفاضات مختلفة بشكل كبير إحصائيًا في السرعة بسبب تأثير انحدار الطريق وحجم حركة المرور والقرب من التقاطعات. في الثمانينيات والتسعينيات من القرن الماضي، لا تزال التطورات السكنية أو الجديدة المخطط لها/المسورة التي تتميز بطرق ضيقة إلى متوسطة العرض، وحجم حركة المرور المنخفضة إلى المتوسطة، ومنحدرات الطرق يمكن أن تستفيد من معدلات ارتفاع/عرض الطرق من 0.017 إلى 0.018. كما أشار إطار عمل الدرجات أيضًا إلى أن القرب من الميزة التي تؤثر على تدفق حركة المرور يمكن أن يؤثر أيضًا على فعالية الحدبات المختلفة على طول الطريق نفسه، حتى مع وجود كلا الحدبتين في نفس الجزء المهدئ لحركة المرور ولهما أبعاد متشابهة. يساهم هذا البحث من خلال توفير طريقة لتقييم حدبات الطرق في مناطق مختلفة، ويمكن استخدامه لتحسين إرشادات السلطة المحلية لتركيب مطبات الطرق بناءً على الخصائص الهندسية والوظيفية للمناطق.

APPROVAL PAGE

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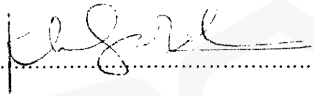
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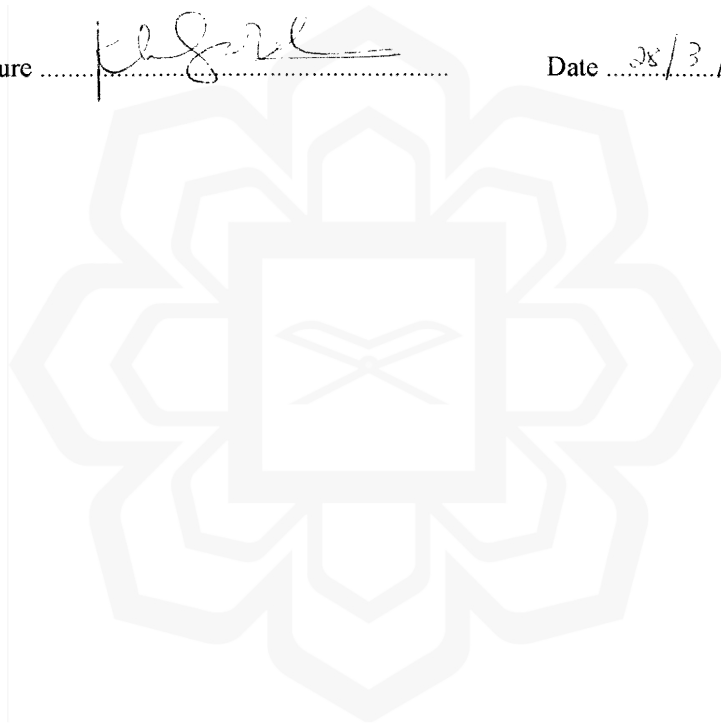
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DECLARATION

I hereby declare that this thesis is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Khairun Sarah Radhiah binti Bachok

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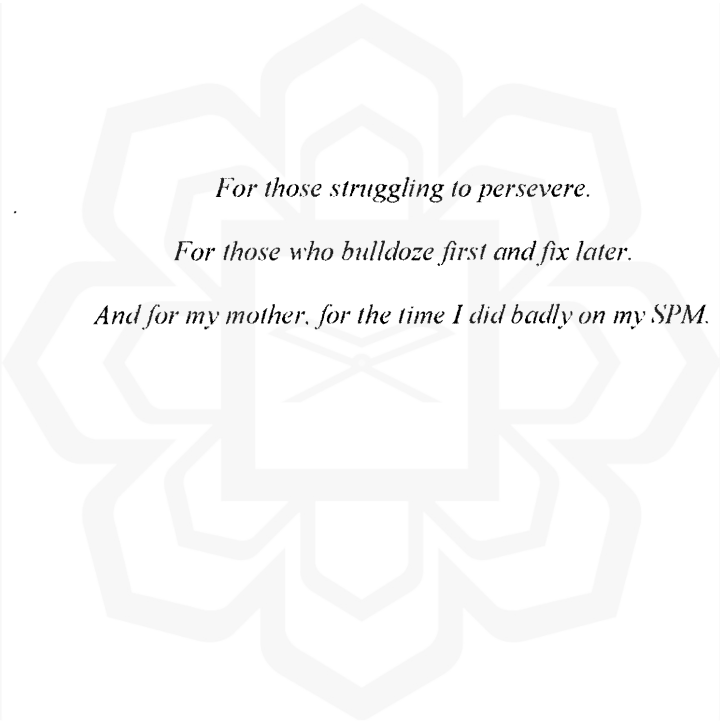
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For those struggling to persevere.

For those who bulldoze first and fix later.

And for my mother, for the time I did badly on my SPM.

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In the name of Allah, the Most Beneficent, the Most Merciful. All praise and thanks to Allah Subhanahu Wa Ta'ala, lord of the Universe and all that exists. Prayers and peace be upon His Prophet Muhammad Sallahu Alaihi Wasallam, the last messenger for all humankind.

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