ASSOCIATION BETWEEN WALKABILITY INDEX AND PEDESTRIANS' PERSPECTIVE IN REDUCING EXPOSURE OF SCHOOLCHILDREN TO GROUND LEVEL OZONE

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by

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LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ANOVA	Analysis of variance
ANN	Artificial neural network
AT	Ambient temperature
CA	Cluster analysis
CG	Cluster Group
CO	Carbon monoxide
CO_2	Carbon dioxide
DoE	Department of Environment (Malaysia)
FFBP	Feedforward Backpropagation
GUI	Graphical user interface
GWI	Global Walkability Index
hv	Radiant energy
HNO_3	Nitric acid
HO_2	Hydroperoxyl
HIDOT	State of Hawaii, Department of Transportation (USA)
IA	Index of agreement
IAQ	Indoor air quality
IRDA	Iskandar Regional Development Authority (Malaysia)
JKR	Jabatan Kerja Raya (Malaysia)
KMO	Kaiser-Meyer-Olkin
LACDPW	Los Angeles County Department of Public Works (USA)
MnDOT	Minnesota Department of Transportation (USA)
MoE	Ministry of Education (Malaysia)

MOT	Ministry of Transport (Malaysia)
MOW	Ministry of Works (Malaysia)
NAE	Normalised absolute error
NO_2	Nitrogen dioxide
O_2	Oxygen
O_3	Ozone
PA	Prediction accuracy
PAN	Peroxyacetylnitrate
PCA	Principal component analysis
PCs	Principal components
PI	Performance Indicator
PM_{10}	Particulate matter with aerodynamic diameter less than 10 micron
R	Correlation coefficient
R^2	Coefficient of determination
RH	Relative Humidity
RMSE	Root mean square error
RO_2	Peroxy radicals
SCDOT	South Carolina Department of Transportation (USA)
SPSS	Statistical Package for the Social Science
TVOC	Total volatile organic compounds
uicontrol	User interface control
VOCs	Volatile organic compounds
WD	Wind direction
WS	Wind speed

HUBUNG KAIT DI ANTARA INDEKS KEBOLEHJALANAN DAN SUDUT PANDANG PEJALAN KAKI DALAM MENGURANGKAN PENDEDAHAN DI KALANGAN PELAJAR SEKOLAH TERHADAP OZON PARAS TANAH

ABSTRAK

Ozon paras tanah (O_3) adalah satu pencemar gas yang mana memberi kesan ketara kepada kesihatan manusia dan alam sekitar. Pendedahan kepada pencemar ini dan prapenandanya adalah lebih bahaya kepada kanak-kanak jika dibandingkan dengan orang dewasa. Prapenanda O_3 kebanyakkannya dikeluarkan daripada ekzos kenderaan. Perjalanan tidak bermotor telah menjadi pilihan dalam menyelesaikan masalah ini. Oleh itu, kajian ini tertumpu kepada kanak-kanak sekolah dan tujuannya adalah untuk menilai adanya kemudahan dan keadaan sedia ada kemudahan pejalan kaki dengan membangunkan indeks kebolehlaluan. Sudut pandang dan sikap pejalan kaki juga diambil kira untuk mendapatkan persepsi terhadap kemudahan pejalan kaki yang telah disediakan dan sikap mereka dalam mengubah mod sedia ada kepada berjalan kaki. Kepekatan O_3 ambien dan prapenandanya juga diselidik untuk melihat tahap pendedahan semasa bagi pencemar-pencemar ini terhadap kanak-kanak sekolah. Berdasarkan indeks kebolehlaluan bagi semua 22 buah sekolah terpilih, SPP merekodkan indeks tertinggi sementara SPC, SBJ, SSA, dan STK merekodkan indeks terendah. Perhatian yang lebih telah diberikan terhadap reka bentuk geometri kemudahan pejalan kaki di kawasan bandar jika dibandingkan dengan kawasan pinggir bandar dan luar bandar disebabkan jumlah trafik yang tinggi. Daripada analisa satu-hala ANOVA dan t-test bebas, skor responden terhadap elemen kemudahan laluan pejalan kaki dan tahap persetujuan dengan masalah persekitaran,

kesedaran dan potensi dalam mengubah mod sedia ada kepada berjalan kaki adalah berkaitan dengan jenis responden, bangsa dan jantina. Walau bagaimanapun, faktor jarak perjalanan tidak mempengaruhi skor dan tahap persetujuan responden. Semasa menilai kepekatan ambien, kebanyakan pencemar-pencemar terutamanya prapenanda O_3 adalah lebih tinggi di SST disebabkan sumber antropogenik berdekatan kawasan tersebut manakala kepekatan O_3 adalah lebih tinggi di SSH (32.48 ± 15.97 ppb). Akhirnya, model FFBP telah dibangunkan dan ia menunjukkan bahawa SSN mempunyai model FFBP terbaik dengan ukuran ketepatan yang paling tinggi dan ukuran ralat yang rendah. Kesimpulannya, indeks kebolehlaluan yang lebih tinggi dijangkakan dalam meningkatkan kesanggupan kanak-kanak sekolah untuk berjalan kaki ke sekolah tanpa mengambil kira jarak perjalanan dari rumah ke sekolah. Reka bentuk geometri kemudahan laluan pejalan kaki dan ukuran keselamatan berdekatan sekolah didapati menjadi isu yang sangat penting yang perlu dilihat dalam menggalakkan mereka mengubah mod sedia ada kepada berjalan kaki. Justeru, ia dapat mengurangkan pendedahan O_3 dan prapenandanya terhadap kanak-kanak sekolah. Bagi pembangunan alat ramalan yang baru untuk mengukur kepekatan di masa hadapan berhampiran empat kawasan sekolah diharap dapat membantu pihak berkuasa tempatan bagi memantau dan meramal pendedahan kepada kepekatan O_3 terhadap kanak-kanak sekolah dengan adanya parameter-parameter bebas.

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ABSTRACT

Ground level ozone (O_3) is one of the gaseous pollutants that significantly affects human health and environment. Exposure to this pollutant and its precursors is more severe to children than adult due to lower breathing height. O_3 precursors are mainly emitted from vehicle exhausts. Non-motorized travel has become an option in solving these problems. Therefore, this research is focus on school children and the aims are to assess availability and current condition of the facilities by developing the walkability index. Pedestrians' perspectives and attitudes were also considered to gain their perceptions on provided pedestrian facilities and their attitudes in changing current mode to walking. Ambient O_3 concentrations and its precursors were also investigated to observe the current level of exposure of these pollutants to school children. Based on the walkability index for all 22 selected schools, SPP recorded the highest index which is nine while SPC, SBJ, SSA, and STK recorded the lowest which are one. Much attention has been given in terms of geometric designs of pedestrian facilities in urban area compared to sub-urban and rural area due to high traffic volume. From the analysis of one-way ANOVA and independent t-test, respondents' score on the elements of the pedestrian facilities and level of agreement with environmental problems, awareness and potential in changing the current mode to walking were related to types of respondents, race and gender. Nevertheless, factor of travel distance did not influence the given score and level of agreement by