

Human Involvement in and Response to the Management of the Urban Environment in Addressing Urban Atmospheric Changes in Ipoh, Perak, Malaysia

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Abstract: Humans are urban dwellers who live and conduct their activities in the city. These human activities which use energy, urban morphology and building materials, in addition to the lack of vegetation and bodies of water are the main causes of urban micro-climate changes. These changes are often associated with rapid urbanization including the one taking place in Ipoh. The city of Ipoh has experienced rapid urbanization since the independence and its inhabitants carry out various activities in the ever-expanding urban areas. Long term trends indicate that temperature changes in Ipoh have increased significantly between 1968 and 2010. The battle against urban micro-climate change is closely related to the management of the urban environment and the inhabitants of the city itself. In addressing urban climate change through the management of the urban environment, response from and involvement of the city inhabitants are crucial in containing urban climate change and supporting urban planning and development policies of the city. Currently, the respondents' involvement is still at a poor level. In this study, important aspects pertaining to the community in the questionnaire are urban environment, buildings and housing which are related to managing efforts to contain urban climate change and produce sustainable industrialization and transport system in controlling air pollution. The study found that 44.2% of the urban residents call for development of a garden city in Ipoh while 57.9% of the respondents are satisfied with the reduction of asphalt and cement surfaces in the city and 55.8% are satisfied with the use of solar energy for lighting in the city and residential areas. The 62.1% of the respondents are satisfied with efforts to increase the number of eco-friendly buildings in the city. However, 43.3% of the urban residents are dissatisfied with the incentives and support offered to the industries which are directly involved. Incentives for the use of "green engine" still need to be improved on because only 65.9% of the respondents are satisfied with it. The use of bicycles is not well-received and needs to be improved on, with only 52.4% of the respondents are satisfied with it. Such feedback and responses from respondents who represent the residents of Ipoh are important to local authorities and state government to help them look for the right formula in developing a sustainable and urban livability city.

Key words: Urban atmospheric changes, urban environmental management, urbanization, urban livability city, climate

INTRODUCTION

Rapid urbanization is associated with urban growth and change in the quality of the urban environment. It has become an important study by many researchers. This phenomenon is also associated with the urban heat island effect. The urban heat island is one of the serious problems that occur in the world (Sasaki *et al.*, 2012). Consequently, people living in the city should be

involved in addressing urban atmospheric changes. Then, steps can be taken together in managing the urban environment and containing the urban atmospheric changes. The urban climate alters the living conditions of humans (Yue *et al.*, 2007; Brocklehurst *et al.*, 2012). This has been proven through results of discussions of researches in conferences, campaigns, reports and studies on climate change in the past 20 years (IPCC, 2001; UNFCCC, 2009). Increased urbanization activities which

lead to urban warming have become an increasingly serious problem (Oke, 1987; Quattrochi and Ridd, 1994; Nakagawa, 1996; Rizwan *et al.*, 2008). Many researchers have shown results of their studies including by assessing trends of urban warming via trends of urban temperature changes which prove that urban climate change is taking place across the globe (Chung *et al.*, 2004; Fujibe, 1998; Kato, 1996). As a result, humans in the cities are experiencing and are affected by the changing of urban climate. It is predicted that in the future, >60% of the world population will reside in urban areas.

Humans are urban dwellers who live and conduct their activities in the city. These human activities which use energy, urban morphology and building materials, in addition to the lack of vegetation and bodies of water are the main causes of urban micro-climate changes. These changes are often associated with rapid urbanization including the one taking place in Ipoh. As a city, Ipoh has undergone rapid urbanization where the physical environment of the urban habitat has been covered with buildings, asphalt and cement. These structures are part of the commercial, industrial and business areas which can impact the urban environment and its residents. Rapid urbanization has spread from the city centre to the outskirts of Ipoh such as Seri Iskandar, Chemor, Kampar and Simpang Pulai. Such urbanization has led to changes in temperature in the city of Ipoh.

Human activities which cause air pollution are said to be a contributing factor to the urban climate change. The battle against urban micro-climate change is closely related to the management of the urban environment and the inhabitants of the city itself. The city of Ipoh has experienced rapid urbanization since the independence and its inhabitants carry out various activities in the ever-expanding urban areas. Previous studies have helped us understand the effects of urbanization on temperature changes in Ipoh. The temperatures in Ipoh have recorded significant changes from 1968 to 2000 (Ibrahim *et al.*, 2011). Long term trends indicate that temperature changes in Ipoh have increased significantly between 1968 and 2010. Therefore, assessment of human involvement and community feedback on the management of urban atmospheric changes are crucial to better understand the management of the urban atmosphere.

MATERIALS AND METHODS

This study uses primary data from field work of a questionnaire survey on residents of Ipoh, Perak in April 2011. The study involved 534 selected respondents through stratified random sampling, according to the Ipoh planning development block. The number of respondents

was sufficient based on the number of population of the study (633,160) (Krejcie and Morgan, 1970). Additionally, secondary data are also used in the discussion of urban climate change and the process of urbanization of Ipoh. The analysis is limited to descriptive statistics to show the respondents' awareness of their involvement in and response to the management of the urban atmospheric changes. Descriptive statistics by percentage is used in this study to illustrate the management of urban atmospheric changes.

RESULTS AND DISCUSSION

The results of the survey showed that of the 534 respondents, 280 (52.4%) were male and 254 (47.6%) were female. In addition, 61.8% of the respondents (330) were Malays, 23.4% (125) were Chinese, 13.7% (73) were Indians and 1.1% (6) were of other ethnicities. Based on the distribution of the respondents, the age groups in the study ranged between 18 and 60 years old, with the highest number of respondents aged between 18 and 25 years. The majority of respondents which is 90.4% (485 respondents) have at least secondary education. The study also found that 317 (59.4%) of the respondents were not originally from Ipoh while 217 (40.6%) were born and raised here. In addition, 211 (39.5%) of the respondents live in the city centre and 323 (60.5%) live on the outskirts of Ipoh.

Human involvement in and response to the management of the urban environment: The urban inhabitants adapt to the effects of urban atmospheric changes. Even so, their involvement is very important in understanding the efforts to address the urban climate change. However, the urban residents' involvement in containing these changes is still very poor. The results of analysis found that only 91 respondents (17.0%) have joined or volunteered at environmental organizations while the majority, 443 respondents (83%), have never joined or volunteered at any environmental organizations nor have they participated in any environment-related activities in Ipoh, Perak.

Similarly, only 96 (18.0%) of the respondents have attended workshops, lectures and training on urban climate change and steps to address it while 436 (81.6%) of the respondents have never participated in any of these activities. On top of that 377 respondents (70.6%) have never participated in any activities related to reducing the urban temperature. Only 32 respondents (6.0%) participate in such activities more than once a week, 16 respondents (3.0%) once a week, 17 respondents (3.2%) twice a week, 11 respondents (2.1%) thrice a week

and 81 respondents (15.2%) once a month. This shows that the majority of respondents have never attended workshops, lectures and training on urban climate change and measures to address it (Table 1).

The data of respondents' involvement shows that 58.6% (313) of the respondents are inactive, 9.6% (51) of the respondents are unchanged and 15.5% (83) of the respondents claimed that the lack of activities is the main reason why they are not involved in any activities related to urban climate change. The data shows also that only 30.7% of the respondents expressed that lack of organised urban climate-related activities as the hindrance in getting involved in the management of the urban environment. Besides that 17% of the respondents are not interested in organized activities related to urban climate, 40.3% of the respondents claimed not having time for these activities and 21.3% of the respondents prioritize other activities over activities related to urban climate.

Table 2 shows that the majority of the respondents claimed that lack of organised activities related to urban climate and lack of interest in these activities are hindrances for them to join such activities. Other than that, some of the respondents do not have the time to join activities related to urban climate. Furthermore, 78.7% of the respondents prioritize other activities over activities related to urban climate.

In Table 3, the number of respondents who are involved individually in addressing the urban climate change in the local communities is very low. Only 36.9% of the respondents (the highest percentage) are involved in campaigns to plant flowers, grass or ornamental plants around the house. The <30% of the respondents are involved in other activities. The 71.9% of respondents have never been involved in any tree planting programmes. In addition, 337 respondents have never joined any campaign to plant flowers, grass or ornamental plants around the house. The findings show that the residents still need more encouragement to participate in awareness lectures or workshops on urban climate change. The respondents' involvement in recycling programmes to reduce solid waste is also very low with only 29.6% of the respondents are involved. Furthermore, only 13.1% of the respondents have joined volunteering programmes related to climate change or air quality.

The study also found that 44.2% of respondents who represent the urban residents call for development of a garden city in Ipoh while 57.9% of the respondents are satisfied with the reduction of asphalt and cement surfaces in the city and 55.8% are satisfied with the use of solar energy for lighting in the city and residential areas. The 62.1% of the respondents are satisfied with efforts to

Table 1: Hindrance in getting involved in activities related to urban climate

	Percentage			
	NI	RI	FI	VFI
Are you involved in any programme/survey by the government to contain urban climate change?				
Organizing awareness campaigns and lectures to share information on urban climate change and steps to address it	63.3	27.3	7.9	1.5
Providing guidance and reminders on efforts to control urban climate change to the general public	63.7	26.6	8.1	1.7
Setting up of enquiry and complaint counters by the relevant authorities on problems related to climate change	67.8	21.2	9.4	1.7
Reducing the activities of reclaiming abandoned mining areas which can increase the urban temperature	66.9	22.5	8.6	2.1
Enforcing laws related to land development which can undermine the urban climate	64.8	24.0	10.1	1.1
Monitoring large scale land clearing activities which can contribute to the temperature increase	65.2	23.4	9.2	1.9
Ensuring that the draining systems are well-maintained to reduce the risk of flooding	51.3	31.8	14.0	2.8
What steps should be taken to get you interested to join social activities in this area? Please state	50.7	32.2	14.4	2.6

NI = Never Involved; RI = Rarely Involved; FI = Frequently Involved; VFI = Very Frequent Involved

Table 2: Respondents' involvement in programmes/surveys by the government to contain urban climate change

Hindrances	Yes		No	
	Respondents	Percentage	Respondents	Percentage
Lack of organized activities	164	30.7	370	69.3
Not interested in the organized activities	91	17.0	443	83.0
Lack of time to pursue the activities	215	40.3	318	59.6
Give priority to other activities	114	21.3	420	78.7

Table 3: Respondents who are involved individually in the management of the urban environment in addressing urban climate change in local communities

Programmes	Yes		No	
	Respondents	Percentage	Respondents	Percentage
Organizing tree-planting programmes	150	28.1	384	71.9
Organizing campaigns to plant flowers/grass/ornamental plants around the house	197	36.9	337	63.1
Organizing or participating in awareness lectures/workshops on addressing urban climate change	74	13.9	459	86.0
Joining recycling programmes to reduce solid waste	158	29.6	376	70.4
Joining volunteering programmes related to climate change or air quality	70	13.1	464	86.9

increase the number of eco-friendly buildings in the city. However, 43.3% of the urban residents are dissatisfied with the incentives and support offered to the industries which are directly involved. Incentives for the use of “green engine” still need to be improved on because only 65.9% of the respondents are satisfied with it. The use of bicycles is not well-received and needs to be improved on with only 52.4% of the respondents are satisfied with it.

Human response to the management of urban atmospheric environment: The management of the urban environment and city atmosphere should be accompanied with the management of sustainable urban development which includes sustainable urban, building and housing environments, in controlling the urban climate. The study found that 33.5% of respondents call for the development of a garden city in Ipoh. Similarly, only 45.5% of the respondents are satisfied with item 137 which states that green spaces need to be increased as part of urban reforestation.

In addition, 40.8% of respondents were satisfied and 15% respondents were very satisfied with the increased use of solar energy for lighting in urban and residential areas. The respondents were also happy with the reduction of asphalt and cement surfaces in the city. Furthermore, 44.9% of the respondents were satisfied and 17.2% were very satisfied with efforts to increase green buildings which grow plants on the roof/in the corridors of the buildings, encouraging the development of a green city, green properties, green buildings and green

schools/offices. Recycling and the use of bio-degradable (eco-friendly) materials need to be increased with only 44.4% of respondents were satisfied and 24.3% were very satisfied with them (Table 4).

Sustainable industries can help curb urban climate change. Respondents’ satisfaction level is very important in order to garner support in the creation of these sustainable industries. The 42.7% of the respondents were satisfied and 14.2% were very satisfied with the incentives given to industries which employ green technology to reduce air pollution in Ipoh. In addition, 38.6% of the respondents were satisfied and 12.5% were very satisfied with efforts to encourage the intensive use of human resources instead of industrial machinery so as to reduce emission of pollutants into the air. Moreover, 46.6% of the respondents were satisfied that a garden industrial area needs to be built in the future in Ipoh (Table 5).

The increasing number of vehicles calls for efforts to control air pollution from affecting the urban climate. Respondents’ satisfaction level is taken into account in order to garner support to control air pollution in Ipoh. The findings show that 46.1% of the respondents were satisfied and 14.8% were very satisfied with the incentives given to industries which use unleaded petrol to reduce air pollution. In addition, 48.5% of the respondents were satisfied and 17.4% were very satisfied with efforts to encourage the use of green engines which do not pollute the air and thus do not increase the urban temperature (Table 6).

Table 4: You are satisfied with the management of the sustainable urban, buildings and housing environments, in efforts to control the urban climate

Statements	Percentage				
	VD	D	SD	S	VS
Development of a garden city in Ipoh is needed	3.0	7.7	33.5	41.0	14.8
Urban green spaces need to be increased as part of urban reforestation	1.1	5.6	28.1	45.5	19.7
The use of solar energy for lighting in the city and residential areas needs to be increased	2.6	10.1	31.5	40.8	15.0
Reducing the consumption of electricity in the city needs to be increased	1.7	7.7	25.1	49.8	15.7
The development of urban areas needs to incorporate a recreational lake	1.3	7.5	25.8	47.6	17.8
Increasing the number of eco-friendly drainage system in the city which can absorb water into the ground	1.5	5.6	27.3	44.9	20.6
Reducing asphalt and cement surfaces in the city	1.7	9.2	31.3	38.0	19.9
Increasing the number of green buildings which grow plants on the roof/in the corridors to encourage development of a green city, green properties, green buildings and green schools/offices	1.5	7.5	28.8	44.9	17.2
The use of plastic needs to be reduced in the city	1.7	7.5	25.8	42.9	22.1
Recycling and the use of bio-degradable (eco-friendly) materials need to be increased	0.9	6.4	24.0	44.4	24.3

Table 5: You are satisfied with the management of sustainable industries in efforts to control the urban climate

Statements	Percentage				
	VD	D	SD	S	VS
Incentives for industries which employ green technology to reduce air pollution	1.9	9.7	31.5	42.7	14.2
Encouraging the intensive use of human resources instead of industrial machinery so as to reduce emission of pollutants into the air	1.9	10.5	36.5	38.6	12.5
Encouraging agro-based industries as a sustainable industry	1.7	8.8	29.8	42.5	17.2
A garden industrial area needs to be developed in the future	1.3	9.9	22.3	46.6	19.9

VD: Very Dissatisfied; D: Dissatisfied; SD: Slightly Dissatisfied; S: Satisfied; VS: Very Satisfied

Table 6: You are satisfied with the management of sustainable transportation in efforts to control air pollution and the urban climate

Statements	Percentage				
	VD	D	SD	S	VS
Giving incentives to industries which use unleaded petrol to reduce air pollution	3.4	7.9	27.9	46.1	14.8
Encouraging the use of green engines which do not pollute the air and increase the urban temperature	2.4	6.0	25.7	48.5	17.4
Increasing the types of public transport systems in order to reduce the use of private vehicles	2.2	8.4	31.5	37.3	20.6
Encouraging the use of bicycles as a short-distance mode of transport to go to work in the city	3.7	10.3	33.5	32.0	20.4

VD: Very Dissatisfied; D: Dissatisfied; SD: Slightly Dissatisfied; S: Satisfied; VS: Very Satisfied

CONCLUSION

In addressing the urban climate change, awareness of its existence and effects is very important so that efforts to address the increasing urban temperature can include all parties. Response from respondents who represent the residents of Ipoh is crucial in helping the relevant authorities deal with the problem of urban atmospheric changes. In the face of the poor level of involvement of the respondents, the relevant authorities need to find new ways to get the residents interested in activities to contain urban climate change. The urban climate change compels the residents of Ipoh to adapt to these changes. Even so, the urban residents agreed with the recommendations to create sustainable environment, buildings, housing, industries and transportation in addressing urban air pollution and climate change. The responses from residents who represent the population of Ipoh are important in helping the local authorities and state government create a sustainable city.

REFERENCES

Brocklehurst, A., J. Barlow, C. Halios and S. Upton, 2012. The effect of urban micrometeorology on indoor living condition. Proceedings of the 8th International Conference on Urban Climates, August 6-10, 2012, UCD, Dublin, Ireland.

Chung, U., J. Choi and J.I. Yun, 2004. Urbanization effect on the observed change in mean monthly temperatures between 1951-1980 and 1971-2000 in Korea. *J. Climatic Change*, 66: 127-136.

Fujibe, F., 1998. An Increasing trend of extremely hot days in the inland of the Kanto Plain and its relation to urban effects. *Jap. Prog. Climatol.*, 145: 135-139.

IPCC, 2001. *Climate Change 2001: Impacts, adaption and vulnerability. Summary for Policy Makers, A Report of Working Group 11 of the Intergovernmental Panel on Climate Change*, Intergovernmental Panel on Climate Change, WMO, UNEP.

Ibrahim, M.H., J.M. Jahi and A.S. Hadi, 2011. Trends of urban climatology changes in Ipoh City, Malaysia with special references on the temperature of urban areas. *Social Sci. J.*, 7: 535-538.

Kato, H.A., 1996. A statistical method for separating urban effect trends from observed temperature data and its application to Japanese temperature record. *J. Meteorol. Soc. Japan*, 74: 639-653.

Krejcie, R.V. and D.W. Morgan, 1970. Determining sample size for research activities. *Educ. Psychol. Meas.*, 30: 607-610.

Nakagawa, K., 1996. Recent trends of urban climatology studies in Japan, with special emphasis on the thermal environments of urban areas. *Geograp. Rev. Japan*, 69: 206-224.

Oke, T.R., 1987. *Boundary Layer Climates*. 2nd Edn., Methuen and Co. Inc, New York, pp: 435.

Quattrochi, D.A. and M.K. Ridd, 1994. Measurement and analysis of thermal energy responses from discrete urban surfaces using remote sensing data. *Int. J. Remote Sens.*, 15: 1991-2002.

Rizwan, A.M., Y.C.L. Dennis and C. Liu, 2008. A review on the generation, determination and mitigation of Urban Heat Island. *J. Environ. Sci.*, 20: 120-128.

Sasaki, K., S. Yumino and A. Mochida, 2012. Relation between thermal environments, physiological responses and thermal sensation in outdoor space. Proceedings of the 8th International Conference on Urban Climates, August 6-10, 2012, UCD, Dublin, Ireland.

UNFCCC, 2009. United nations climate change conference, Copenhagen, 7-18 December 2009. United Nations Office at Geneva, Switzerland. http://unfccc.int/meetings/copenhagen_dec_2009/meeting/6295.php.

Yue, W., J. Xu and W. Tan, 2007. The relationship between land surface temperature and NDVI with remote sensing: Application to Shanghai Landsat 7 ETM⁺ data. *Int. J. Remote Sensing*, 28: 3205-3226.