



PLANNING MALAYSIA:

Journal of the Malaysian Institute of Planners

VOLUME 23 ISSUE 6 (2025), Page 981 – 996

ASSESSMENT OF CLIMATE CHANGE AWARENESS AMONG RURAL FOREST COMMUNITIES

**Illyani Ibrahim*, Azizan Abu Samah, Azila Ahmad Sarkawi,
Kamal Solhaimi Fadzil, Syed Muhammad Iqbal Sayad Romli,
M Zainora Asmawi**

*^{1, 3} Department of Urban and Regional Planning,
Kulliyah of Architecture and Environmental Design,
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA*
*²Department of Geography, Faculty of Arts and Social Sciences,
UNIVERSITY OF MALAYA, KUALA LUMPUR, MALAYSIA*

Abstract

This study assesses the awareness of climate change among rural forest communities, focusing on how socio-demographic profiles influence perceptions of climate-related phenomena. Using quantitative data collected from local respondents, the analysis examined the relationships between awareness of climate impacts including heat waves, temperature variations, rainfall changes, and flooding and respondents' characteristics, including gender, religion, education, occupation, and district location. The results revealed that religion and district were the most significant factors influencing awareness of heat waves and temperature changes, while gender and religious education also showed notable effects. In contrast, awareness of rainfall and flooding was relatively uniform across groups, suggesting shared experiences of these recurrent events. The findings suggest that climate change awareness and understanding require enhancement through appropriate content and effective communication channels. Overall, the findings demonstrated a moderate level of awareness of climate change among rural forest communities.

Keywords: Awareness, climate change, rural forest communities, knowledge, perceptions

¹ Corresponding author. Email:

INTRODUCTION

Climate change can be defined as changes in the state of a climate that can be identified (e.g., using a statistical test) by changes in the mean and/or variability of its properties, and that persist for an extended period, typically decades or longer (The Intergovernmental Panel on Climate Change, 2007). According to the IPCC AR6 Summary (2021), the global mean temperature for 2020 was $1.2 \pm 0.1^{\circ}\text{C}$ above the 1850–1900 baseline, making it one of the three warmest years on record. The report also indicated that, with 2020 being one of the three warmest years on record, the past six years (2015–2020) were the six warmest on record. The last five-year (2016–2020) and 10-year (2011–2020) averages were also the warmest on record.

The 26th UN Climate Change Conference (COP26) was held in November 2021 in Glasgow, United Kingdom, to discuss updated climate action plans (United Nations, 2021). To achieve the mission of reducing the global temperature to 1.5°C , 17 Sustainable Development Goals (17 SDGs) were developed to improve the natural environment supporting food production and propose climate action to restore the ecosystem, particularly under SDG13. This study focuses on Target 13.3 of SDG13, which aims to build knowledge and capacity to meet climate change by improving education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning. These global commitments remain crucial as climate change has affected communities at the local scale, including through water scarcity and reduced agricultural production.

Kuala Lumpur, the capital of Malaysia, is one of the country's largest cities and is facing the impact of climate change due to rising carbon emissions (Zawawi, Asmawi, and Zen, 2024). In the Malaysian context, Kuala Lumpur City Hall (KLCH) has published a climate action plan for the Kuala Lumpur Climate Action Plan 2050 (Kuala Lumpur City Hall, 2021). Other related initiatives include Local Agenda 21 (LA21), KLCH Carbon Management Plan 2017–2022, and the Kuala Lumpur Low Carbon Society Blueprint 2030 (KL LCSBP 2030), which also direct better carbon emission strategies. Beyond urban centres, Malaysia's engagement in climate change adaptation programmes has also increased alongside growing public awareness regarding adaptation necessity. At the national level, these programmes include the US Support Programme to the Coral Triangle Initiative to manage coastal and marine resources with biological and economic significance.

Climate change in Malaysia manifests through various events, with rapid urbanisation serving as the key driver. Urbanisation causes the urban heat island effect (UHI), which produces extreme heat, particularly in Kuala Lumpur during the summer months (IPCC, 2022). The loss of green spaces such as parks and forests further exacerbates the UHI effect in the city. Beyond urban impacts,

climate models demonstrate a continuous warming trend for Malaysia, which varies depending on the emissions scenario. While precipitation projections show high variability, projected rainfalls, as well as the intensity of extreme rainfall events, have increased (World Bank Group, 2021).

Given these climate impacts, understanding community awareness and perception becomes crucial for effective adaptation. Awareness serves as an important indicator, as greater awareness among rural communities toward climate change indicates preparedness to face numerous hazards resulting from climate change (Mohamed Shaffril et al., 2015). If people are not aware of the nature of climate change and how it will affect them, they will never be emotionally concerned about the whole issue (Pandve et al., 2011). Understanding community awareness can lead to actual action towards climate change, hence mitigating the problem. Therefore, people would be better equipped with preparedness skills to confront the challenges and threats posed by climate change to their living conditions. Perception is defined as the way in which climate change and variability are regarded, understood, or interpreted by local people. Perception is of particular interest because of its ability to enhance solutions to risky climatic events (Maddison, 2006).

This study examines rural forest communities, who are among the groups most vulnerable to climate change impacts. Their vulnerability stems from direct dependence on natural resources for livelihood, agriculture, and cultural practices. Despite their close relationship with the environment, these communities often have limited access to formal education, scientific information, and policy frameworks related to climate change. This gap in awareness and knowledge can hinder their ability to adapt effectively and participate in sustainable environmental management efforts. Understanding the level of climate change awareness and knowledge within these communities is crucial for designing effective adaptation strategies, community-based education programs, and policy interventions. Such an assessment provides valuable insights into how local perceptions, traditional knowledge, and socio-economic factors influence their understanding of environmental changes. It also helps identify barriers that prevent the dissemination of accurate climate information to rural populations.

Studies examining climate change have been conducted in the context of rural forests. According to Deni et al. (2024), locals were able to identify drought-tolerant native trees and recognise shifts in species distribution. In Turkiye, Sevim & Güven (2025) discovered that although participants had a comparatively high level of general awareness of climate change, this awareness frequently lacked depth with regard to its local ecological effects and practical solutions. In Malawi, Chisale et al. (2022) found that 60% of the respondents in Mchinji and 35% in Mangochim were aware of climate change; they also reported

that they saw more unpredictable rainfall, high temperatures, strong winds, and seasonal changes. In India, Roy et al. (2024) found a decreasing trend in the availability of water for domestic purposes, crop failure, and low agricultural production, reduction in human health, poor livestock health, and a range of other problems due to climate change, which subsequently impacted their livelihood.

Research on climate change in Malaysia has been proliferating, with local studies addressing issues such as rising sea levels (Hamid et al., 2019; Hamid et al., 2018), global warming (Lim et al., 2009; Meng et al., 2005), and air pollution (Aghamohammadi & Isahak, 2018; Mohd Shafie & Mahmud, 2020). Additionally, technological approaches to climate change analysis, including Big Data (Abdullah et al., 2018; Knüsel et al., 2019) and Remote Sensing (Deafalla et al., 2014; Yang et al., 2013), have been explored. However, the focus of these studies remains on the science and numerical analysis of climate statistical analysis; however, the social sciences studies of climate changes, including climate change adaptation of fishermen (Mohamed Shaffril et al., 2015; Shaffril et al., 2020), farmers, palm oil (Abubakar et al., 2021; Paterson & Lima, 2017), and urban communities (Egerer et al., 2021; Mees & Driessen, 2011). Within the local context, there appears to be a lack of studies focusing on rural forest areas, with only one study focusing on the urban regions, which examines perceptions of climate change across different states (Yaacob et al. 2022).

To address the above gap, the current study aims to investigate whether Malaysia's rural forest community has been adequately informed about climate change and their efforts to adapt to it. Understanding community awareness levels and the factors influencing adaptation is essential to achieving the study's objectives. Toward this end, this study seeks to examine the awareness level of those who live in rural forest areas and the effects of selected demographic factors on farmers' adaptation towards climate change impacts.

METHODOLOGY

Design and Setting

The population of Hulu Selangor, Kuala Selangor, and Gombak is approximately 1,068,338; however, the study area is focused on those respondents who live near forest areas. The data collection process was conducted from 1st March 2021 to 31st March 2021. The main method of data collection was a questionnaire survey. Data were collected by trained enumerators. This study employed a non-probability sampling technique, as the respondents were selected based on accessibility and willingness to participate. Although the sample may not fully represent the population, it provides valuable insights into the perspectives and experiences of the target group relevant to the study objectives. A sampling approach was used to randomly and evenly sample 96 respondents throughout the study area. Individuals aged 30 years and above who have lived in their

community for more than ten years as respondents are aware of how climate affects their lifestyle.

The framework of this study focuses on the awareness of the community towards climate change. An inferential multivariate statistical model was run on the survey data to visualise autocorrelations between climate change awareness and knowledge, and other variables (gender, age, job, and start learning religion) for the surveyed households. This study also explored how knowledge about bounded climatic events in the community (awareness) related to data from the literature is critically analysed. The instrument, prepared based on the literature review, comprised five sections: demographics (four questions), perception of the communities on the causes of climate change (eight questions), types of climate changes that have occurred during the past ten (10) years (nine questions), and influence of climate change on their life (seven questions). A basic question regarding climate change was designed because the questionnaire will be distributed to the villagers, which also includes aboriginal people. Table 1 shows the structure of the instrument and response formats.

Table 1: Structure of questionnaire and response formats

Section	Number of items	Option of answer for respondents
Demographic data	8	Open and closed-ended
Awareness	3	Open and closed-ended
	5	5-point Likert scales

Respondents were given open-ended and closed-ended alternatives for the demographic component, and *yes* and *no* responses for the perception of the communities on the causes of climate change, and a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) for the remaining sections. A panel of specialists and a series of instrument development sessions verified the questionnaire. This study also assessed the validity and reliability of the instrument using a reliability test. A Cronbach's alpha is 0.9 was derived, which is above the commonly accepted alpha cut-off value of 0.7, reflecting the instrument's strength and reliability. This study used descriptive statistics, such as frequency, percentage, and mean analysis. However, for inferential analysis, ANOVA was performed to identify any significant differences in the respondents' awareness of climate change among the different groups.

RESULTS AND DISCUSSION

Descriptive analysis of respondents'

This study aims to understand the perception and understanding of rural communities towards climate change. The 43 participants were male (44.8 per cent) and 53 were female (55.2 per cent). The mean score for respondent age is

28.4 years. The focus of the study is on respondents who settled in rural forest regions. Detailed profiles of the participants are presented in Table 2.

Table 2: Detailed frequencies for participants' profiles

Factors	Frequency	Percentages
Male	43	44.8
Female	53	55.2
Total	96	100.0

District	Frequency	Percentage
Gombak	31	32.3
Hulu Selangor	32	33.3
Kuala Selangor	33	34.4
	96	100.0

Started learning religious	Frequency	Percentages
At home	19	19.8
Religious School KAFA	56	58.3
Religious Islamic School	7	7.3
Not related	14	14.6
Total	96	100.0

Job description	Frequency	Percentages
Daily works	45	46.9
Entrepreneur/business	25	26.0
Housewife	2	2.1
Not working	16	16.7
NGO	2	2.1
Government servant	6	6.3
Total	96	100.0

The participants started learning religion at KAFA religious school (58.3%), home (19.8%), none (14.6%), and *pondok* religious school (7.3%). A total of 96 respondents were surveyed; most of them are from Kuala Selangor (34.4 per cent), followed by Hulu Selangor (33.3 per cent), and Gombak (32.3 per cent). More than half of the participants (45 participants) perform daily works (46.9%), and 26 % run businesses (25 participants); and 16.7% are not working. The least number of respondents is constituted by government servants (6.3%) the NGOs (2.1 %).

Communities' awareness of climate change

The first question (Table 3) examined the respondents' awareness of climate change. A total of 95 respondents (97.9 percent) indicated that their understanding of climate change was based on personal experiences. This item formed part of the set of questions assessing community awareness of climate change.

Table 3: Responses on the basis of understanding climate change

I know climate change based on my personal experience	Participants	Percentage
YES	95	(99)
NO	1	(1)

Further questions sought responses on a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The findings (Table 4) indicate that the mean ranged from 1.19 to 3.51. Only social media received a “moderately agree” response (mean = 3.51), indicating that respondents most frequently hear about climate change through platforms such as Facebook, Twitter, or Instagram. Other sources, such as health workers (mean = 1.77) and teachers (mean = 1.57) were reported less often, and traditional media such as newspapers, radio, and television received the lowest mean scores.

Table 4: Types of platforms through which respondents hear about climate change

Platform	Mean	Standard Deviation	Variance
Newspaper	1.19	.392	.154
Social Media	3.51	.466	.217
Radio	1.39	.489	.239
Television	1.22	.416	.173
Health worker	1.77	.423	.179
Teacher	1.57	.497	.247
Imam	1.90	.307	.094
Family	1.53	.502	.252
NGO	1.80	.401	.160

Further analysis recorded a moderate mean score (3.30 – 3.58) in terms of respondents' awareness of the types of climate change (Table 5). Although events such as flooding and heat waves are experienced in these areas, respondents did not appear to associate these events with climate change, which may explain the moderate awareness levels.

Table 5: Awareness of different types of climate change

Climate Change	Mean
Heat waves	3.54
Temperature changes	3.43
Rainfall monsoonal changes	3.42
Frequent flooding	3.58
Deforestation	3.53
Natural disaster	3.30

This finding (Table 5) suggests a necessity to expose the community to more knowledge of climate change. Respondents were most aware of immediate, visible climate impacts such as flooding and heat waves, while broader concepts such as general natural disasters showed slightly lower (but still positive) awareness levels. All scores indicate that the audience has at least basic recognition of these climate change types. Awareness-raising programs are needed to increase community knowledge of climate-resilient development (Asian Development Bank, 2014).

The analysis below (Table 6) shows differences in climate change awareness across respondent profiles. For this analysis, four climate-related phenomena—heat waves, temperature changes, monsoonal rainfall changes, and frequent flooding—were chosen because they are commonly experienced in tropical countries such as Malaysia.

Table 6: Differences in climate change awareness across respondent profiles

Climate changes	F	Significance (<.05)
Heat waves		
-Job	1.925	.113
-Gender	.663	.619
-Religion	9.282	.000*
-Race	.634	.639
-District	2.608	.041*
-Religious education	1.013	.405
-Civic education	1.165	.331
Temperature changes		
-Job	.715	.584
-Gender	2.781	.031*
-Religion	9.347	.000*
-Race	.341	.850
-District	5.469	.001*
-Religious education	2.530	.046
Civic education	1.156	.336
Rainfall monsoonal changes		
-Job	.852	.469
-Gender	.538	.657

Climate changes	F	Significance (<.05)
-Religion	.486	.693
-Race	.233	.873
-District	.709	.549
-Religious education	1.445	.235
Civic education	.618	.605
Frequent flooding		
-Job	1.166	.331
-Gender	.869	.486
-Religion	.177	.950
-Race	.147	.964
-District	6.4	.000*
-Religious education	1.47	.218
Civic education	.163	.957

Findings in Table 6 indicate that the factors influencing awareness vary across the four climate change dimensions: heat waves, temperature changes, rainfall monsoonal changes, and frequent flooding.

For heat waves, significant differences were found by religion ($p = .000$) and district ($p = .041$). This may suggest that religious background and geographical context play a crucial role in shaping perceptions of heat-related climate impacts, either through value system or differences in local climate conditions or exposure to awareness campaigns.

For temperature changes, significant differences were found by gender ($p = .031$), religion ($p = .000$), district ($p = .031$), and religious education ($p = .046$). These patterns may indicate that men and women may perceive or experience temperature-related changes differently and that cultural or religious framing could influence how such changes are perceived, possibly due to differences in daily activities or exposure to outdoor environments. Variation across districts also points to the importance of local climate conditions and accessibility to information.

For rainfall monsoonal changes and frequent flooding, no significant differences were found across the profile variables. This suggests that awareness of these events is relatively uniform among rural forest communities, likely because such climatic events are frequently experienced and directly affect livelihoods, infrastructure, and local economies. Flooding and monsoon changes are tangible and recurrent events, making them universally recognised regardless of gender, religion, or education level.

Overall, the results indicate that religion and district are the most recurrent differentiating factors, with gender and religious education appearing in specific cases. These findings emphasise the need for localised and culturally sensitive climate awareness programs that integrate community beliefs and regional experiences. Policy makers and planners should therefore collaborate

with religious institutions and local district authorities to enhance community-level engagement and adaptive capacity toward climate change.

Table 7 presents the respondents' views on the causes of climate change. Deforestation was most frequently identified as the major cause of climate change 85.4 per cent 'yes'), followed by black smoke from vehicles (82.3 per cent). Industrial activities were the third cited cause (77.1 per cent). Population growth (52.1%) and urbanisation and lifestyle changes (53.1%) were less frequently selected, with a comparatively higher proportion of "Not sure" responses for these items.

Table 7: Respondents' views on the causes of climate change

	Yes (%)	No (%)	Not sure (%)
What are the causes of climate change?			
Deforestation	82 (85.4)	3 (3.1)	11 (11.5)
Industrial	74 (77.1)	9 (9.4)	13 (13.5)
Population growth	50 (52.1)	11 (11.5)	35 (36.5)
Black smoke from vehicle	79 (82.3)	6 (6.2)	11 (11.5)
Release of excessive carbon dioxide by developed countries	65 (67.7)	10 (10.4)	21 (21.9)
Urbanization and changes in lifestyle	51 (53.1)	16 (16.7)	29 (30.2)

Flooding (70.8%) and drought (67.7%) were the most frequently reported events, indicating that such hydrological events are commonly experienced by the respondents. Other major changes reported were forest fires (67.7%), reduction in agricultural yield (58.3%), and increased health costs after extreme weather (57.3%). These responses are consistent with the socioeconomic and environmental consequences of climate variability, particularly for communities dependent on agriculture and natural resources. Moderately reported changes included rainfall trends (54.2%), heavy rains (56.2%), and rivers becoming shallower (56.2%), suggesting that gradual shifts in precipitation patterns and river conditions are being noticed at the local level. Natural disasters (52.1%) received the lowest "Yes" responses, with a relatively higher "No" (24%) and "Not Sure" (24%) responses, which may indicate that respondents interpreted "natural disasters" differently or associated them only with severe, large-scale events. Details are provided in Table 8.

Table 8: Respondents' reported experiences of climate-related events in the past 10 years

Events past 10 years	YES (%)	NO (%)	NOT SURE (%)
Drought	65 (67.7)	13 (13.5)	18 (18.8)
Flooding	68 (70.8)	14 (14.6)	14 (14.6)
Changes in rainfall trend	52 (54.2)	11 (11.5)	33 (32.4)
Reduction of yield of agriculture	56 (58.3)	13 (13.5)	27 (28.1)
Occurrence of forest fires	65 (67.7)	15 (15.6)	16 (16.7)
Increased health costs after extreme weather event	55 (57.3)	15 (15.6)	26 (27.1)
Heavy rains occur	54 (56.2)	15 (15.6)	27 (28.1)
The river becomes shallower	54 (56.2)	13 (13.5)	29 (30.2)
Natural disaster	50 (52.1)	23 (24%)	23 (24)

Overall, the findings suggest that rural forest communities have a high awareness of extreme weather events such as flooding, drought, and forest fires, which are likely to have direct and visible impacts on their livelihoods, agriculture, and health. The increased health expenditure (57.3%) highlights the indirect social and economic burden of climate change, where extreme events contribute to illnesses, stress, and medical costs.

Table 9 presents the respondents' reports of human activities occurring around their settlements. Air and water pollution reported the highest mean score (3.91), followed by open burning (3.56). Other activities reported were illegal waste disposal (3.44), mining (3.28), illegal logging (3.22), and land clearing (3.16). These findings indicate that environmentally impactful activities are present within the vicinity of the respondents' communities. As noted by Shaffril et al. (2013), possessing environmental knowledge is important because it enables communities to understand climate change, its causes and impacts on them, their families, and their communities.

Table 9: Human activities reported around the settlements

If happens around settlements	Mean	Standard Deviation	Variance
Logging	3.06	1.238	1.533
Illegal logging	3.22	1.275	1.625
Land clearing	3.16	1.208	1.460
Hill cutting	3.00	1.223	1.495
Mining	3.28	1.194	1.425
Air and water pollution	3.91	1.164	1.355
Open burning	3.56	1.280	1.638
Illegal waste disposal	3.44	1.221	1.491

Table 10 presents findings on whether climate change has influenced the lifestyle of the rural forest community. Overall, the mean values are above 3.00, indicating that the respondents perceived climate change as having a moderate influence on their lifestyle. However, they did not agree that climate change has led to destruction and loss of property, and loss of life. This may suggest that they feel that they have adapted to certain conditions, such as heat, without recognising these changes as part of the climate change effect. This pattern is aligned with Shaffril et al. (2013), who reported that community awareness and level of knowledge on climate change are only general.

Table 10: Perceived influence of climate change on respondents' lifestyle

What is the influence of climate change on your lifestyle	Mean	Standard Deviation	Variance
Reduction of outdoor activities	3.12	1.078	1.163
Reduction of sources of income	3.49	1.142	1.305
Destruction and loss of property	2.99	1.342	1.800
The disease is transmitted to people around	3.00	1.214	1.474
Loss of life	2.82	1.205	1.453
Changes in lifestyle	3.42	1.158	1.340

Overall, this study reveals limited climate change awareness, likely because respondents have not yet experienced clear, direct impacts on their daily lives. Enhancing awareness requires direct community engagement and stronger collaboration between communities and relevant agencies. Information dissemination strategies should utilize existing local governance structures, such as village chiefs and community leaders, to ensure effective communication.

The National Forestry Policy and Malaysia's National Climate Policy (2024) are two examples of national and regional climate policies that place a strong emphasis on public education, sustainable forest management, and community involvement. However, policy implementation may become top-down and ineffectual without adequate local knowledge. Assessing awareness levels enables policymakers to identify areas where local knowledge and national strategies diverge, enabling focused education campaigns, participatory planning, and capacity-building projects.

CONCLUSION

This study presents several distinctive findings regarding rural communities' level of awareness of climate change. The communities were found to have a moderate level of awareness; however, this awareness remains conceptual (common knowledge) and has not translated into behavioural change. From the perspective of lifestyle, respondents reported that climate change has not altered

their daily practices. The findings indicate that community lifestyles remain similar even during climate-related events.

The rural forest communities were quite conscious of climate change, particularly in relation to obvious and frequent occurrences such as flooding, drought, and forest fires. From these incidents, the effects of climate change were felt directly on the environment and livelihoods, in addition to being understood theoretically. Both cultural and geographic contexts affected how they viewed and reacted to climate issues, as the awareness levels differ significantly by religion, district, gender, and religious education.

Notwithstanding this awareness, the results imply that local knowledge was largely experiential rather than scientific, which could limit adaptive responses. Targeted educational and communication initiatives that integrate climate science into regional knowledge systems should be prioritised. To ensure that local perspectives and experiences inform climate resilience efforts, policies should incorporate rural community-based approaches into national frameworks, such as the National Adaptation Plan and the National Climate Policy (2024). Encouraging inclusive climate education and developing adaptive capacity requires closer collaboration between government agencies, local governments, and religious institutions. Ultimately, attaining sustainable and equitable climate resilience in Malaysia's forested areas depends on empowering rural forest communities via awareness-raising, education, and participatory planning.

ACKNOWLEDGEMENT

We thank the Ministry of Higher Education, Long-Term Research Grant Scheme (Project Code: DP KPT LRGS/1/2016/UTM/01/1/6). Appreciation also goes to the reviewers for their extensive comments on improving the manuscript.

REFERENCES

- Abdullah, M. F., Mat Amin, M. Z., Mohamad, M. F., Mohamad Ideris, M., Zainol, Z., & Yussof, N. Y. (2018). N-HyDAA big data analytics for Malaysia climate change knowledge management. 3(Cc), 10–11. <https://doi.org/10.29007/5b3v>
- Abubakar, A., Ishak, M. Y., & Makmom, A. A. (2021). Impacts of and adaptation to climate change on the oil palm in Malaysia: A systematic review. *Environmental Science and Pollution Research*, 28(39), 54339–54361. <https://doi.org/10.1007/s11356-021-15890-3>
- Aghamohammadi, N., & Isahak, M. (2018). Climate change and air pollution in Malaysia. In *Springer climate* (pp. 241–254). https://doi.org/10.1007/978-3-319-61346-8_15
- Alam, M. M., Shahriar, S. M., Said, J., & Monzur-E-Elahi, M. (2018). Waqf as a tool for rendering social welfare services in the social entrepreneurship context. *Global Journal Al-Thaqafah*, 8, 87–98. <https://doi.org/10.7187/gjatsi2018-06>

- Asian Development Bank. (2014). *Climate change and rural communities in the Greater Mekong Subregion*. <https://www.greatermekong.org/sites/default/files/climate-change-rural-communities-gms.pdf>
- Burton, I., Challenger, B., Huq, S., Klein, R. J. T., Yohe, G., et al. (2018). Adaptation to climate change in the context of sustainable development and equity. In IPCC Chapter (pp. 881–910). [https://doi.org/10.1016/S0168-8278\(88\)80028-X](https://doi.org/10.1016/S0168-8278(88)80028-X)
- Deafalla, T. H. H., Csaplovics, E., & El-Abbas, M. M. (2014). The application of remote sensing for climate change adaptation in Sahel region. In U. Michel & K. Schulz (Eds.), *Earth resources and environmental remote sensing/GIS applications V* (Vol. 9245). <https://doi.org/10.1117/12.2067460>
- Dení, I. G. T., Leonel, L. T., Isela, E. Z., & Moises, M. T. (2024). Integrating local knowledge into public policy instruments for enhancing restoration: A study case from western Mexican tropical dry forest. *Trees, Forests and People*, 18. <https://doi.org/10.1016/j.tfp.2024.100633>
- Egerer, M., Haase, D., McPhearson, T., Frantzeskaki, N., Andersson, E., Nagendra, H., & Ossola, A. (2021). Urban change as an untapped opportunity for climate adaptation. *Urban Sustainability*, 1(1), 22. <https://doi.org/10.1038/s42949-021-00024-y>
- Ehsan, S., Ara Begum, R., Ghani Md Nor, N., & Nizam Abdul Maulud, K. (2019). Current and potential impacts of sea level rise in the coastal areas of Malaysia. *IOP Conference Series: Earth and Environmental Science*, 228(1). <https://doi.org/10.1088/1755-1315/228/1/012023>
- Halton, M. (2018, March 8). Climate change "impacts women more than men." *BBC News*. <https://www.bbc.com/news/science-environment-43294221>
- Hamid, A. I. A., Din, A. H. M., Hwang, C., Khalid, N. F., Tugi, A., & Omar, K. M. (2018). Contemporary sea level rise rates around Malaysia: Altimeter data optimization for assessing coastal impact. *Journal of Asian Earth Sciences*, 166, 247–259. <https://doi.org/10.1016/j.jseaes.2018.07.034>
- Haq, M. A. Al, & Wahab, N. A. (2019). The Maqasid Al Shariah and the sustainability paradigm: Literature review and proposed mutual framework for Asnaf development. *Journal of Accounting and Finance in Emerging Economies*, 5(2), 179–196. <https://doi.org/10.26710/jafee.v5i2.854>
- Intergovernmental Panel on Climate Change (IPCC). (2022). *IPCC sixth assessment report: Impacts, adaptation and vulnerability*. United Nations Environment Programme.
- Knüsel, B., Zumwald, M., Baumberger, C., Hirsch Hadorn, G., Fischer, E. M., Bresch, D. N., & Knutti, R. (2019). Applying big data beyond small problems in climate research. *Nature Climate Change*, 9(3), 196–202. <https://doi.org/10.1038/s41558-019-0404-1>
- Kuala Lumpur City Hall. (2021). *Kuala Lumpur climate action plan 2050*. <https://www.dbkl.gov.my/penerbitan-dan-laporan/laporan-kuala-lumpur-climate-action-plan-klcap2050-klchs-energy-management-plan-2050>
- Lim, H. S., Jafri, M. Z. M., Abdullah, K., & Rajah, J. (2009). A case study of global warming in Penang Island, Malaysia. *IOP Conference Series: Earth and Environmental Science*, 6(1). <https://doi.org/10.1088/1755-1307/6/1/412029>

- Maddison, D. (2006). *The perception of and adaptation to climate change in Africa* (CEEPA Discussion Paper No. 10). Centre for Environmental Economics and Policy in Africa (CEEPA).
- Md. Mahmudul, A. (2012). Climate change adaptation policy in Malaysia: Issues for agricultural sector. *African Journal of Agricultural Research*, 7(9), 1368–1378. <https://doi.org/10.5897/ajarx11.030>
- Mees, H.-L. P., & Driessen, P. P. J. (2011). Adaptation to climate change in urban areas: Climate-greening London, Rotterdam, and Toronto. *Climate Law*, 2, 251–280. <https://doi.org/10.3233/CL-2011-036>
- Meng, W. N., Alejandro, C., & Wahab, A. K. Abd. (2005). A study of global warming in Malaysia. In *Environmental science*.
- Mohamed Shaffril, H. A., D'Silva, J. L., Kamaruddin, N., Omar, S. Z., & Bolong, J. (2015). The coastal community awareness towards the climate change in Malaysia. *International Journal of Climate Change Strategies and Management*, 7(4), 516–533. <https://doi.org/10.1108/IJCCSM-07-2014-0089>
- Mohd Shafie, S. H., & Mahmud, M. (2020). Urban air pollutant from motor vehicle emissions in Kuala Lumpur, Malaysia. *Aerosol and Air Quality Research*, 20(12), 2793–2804. <https://doi.org/10.4209/aaqr.2020.02.0074>
- Pandve, H. T., Chawla, P. S., Fernandez, K., Singru, S. A., Khismatrao, D., & Pawar, S. (2011). Assessment of awareness regarding climate change in an urban community. *Indian Journal of Occupational and Environmental Medicine*, 15(3), 109–112. <https://doi.org/10.4103/0019-5278.93200>
- Paterson, R. R. M., & Lima, N. (2017). Climate change affecting oil palm agronomy, and oil palm cultivation increasing climate change, require amelioration. *Ecology and Evolution*, 8(1), 452–461. <https://doi.org/10.1002/ece3.3610>
- Shaffril, H. A. M., Idris, K., Sahharon, H., Samah, A. A., & Samah, B. A. (2020). Adaptation towards climate change impacts among highland farmers in Malaysia. *Environmental Science and Pollution Research*, 27(20), 25209–25219. <https://doi.org/10.1007/s11356-020-08987-8>
- Shaffril, H. A. M., Samah, B. A., D'Silva, J. L., & Yassin, S. M. (2013). The process of social adaptation towards climate change among Malaysian fishermen. *International Journal of Climate Change Strategies and Management*, 5(1), 38–53. <https://doi.org/10.1108/17568691311299354>
- Sundblad, E. L., Biel, A., & Gärling, T. (2009). Knowledge and confidence in knowledge about climate change among experts, journalists, politicians, and laypersons. *Environment and Behavior*, 41(2), 281–302. <https://doi.org/10.1177/0013916508314998>
- United Nations. (2021). *Climate action*. https://unfccc.int/sites/default/files/resource/UNFCCC_Annual_Report_2021.pdf
- UN Women. (2009). *Women, gender equality and climate change: The need for gender sensitive responses to the effects of climate change*. https://www.un.org/womenwatch/feature/climate_change/downloads/Women_and_Climate_Change_Factsheet.pdf
- World Bank Group. (2021). *Climate risk country profile - Malaysia*. <https://www.sc.com.my/api/documentms/download.ashx?id=23a5715a-31e1-475b-be29-c5968899ec30>

*Illyani Ibrahim, Azizan Abu Samah, Azila Ahmad Sarkawi, Kamal Solhaimi Fadzil, Syed Muhammad Iqbal
Sayad Romli, M Zainora Asmawi*
ASSESSMENT OF CLIMATE CHANGE AWARENESS AMONG RURAL FOREST COMMUNITIES

- World Meteorological Organization. (2021). *State of the global climate 2020* (No. 1264).
- Yang, J., Gong, P., Fu, R., Zhang, M., Chen, J., Liang, S., Xu, B., Shi, J., & Dickinson, R. (2013). The role of satellite remote sensing in climate change studies. *Nature Climate Change*, 3(10), 875–883. <https://doi.org/10.1038/nclimate1908>
- Zawawi, N. H., Asmawi, M. Z., & Zen, I. S. (2024). The performance of Kuala Lumpur's carbon emissions in the context of urban planning. *Planning Malaysia Journal*, 22(1), 334–348.

Received: 3rd June 2025. Accepted: 3rd November 2025