E-B
Environment - Behaviour
Proceedings Journal

AQoL2025Cherating

e-IPH
e-International
Publishing House Ltd.,
United Kingdom

Drainage Adequacy and Response Lag:
Resident perspectives on the 2021 Klang Valley flood

**Foong Sin Lam[1]*, Fung Hoong Lim[1], Jer Vui Lee[1],
Yeok Meng Ngeow[2], Macka Teguen[3], Manuella Wansilabo[3]**
*Corresponding Author

[1] LKC Faculty of Engineering and Science, Universiti Tunku Abdul Rahman, Kajang, Malaysia
[2] Faculty of Education, Universiti Tunku Abdul Rahman, Kajang, Malaysia
[3] CESI, School of Engineering, Nanterre Campus, Nanterre, France

lamfs@utar.edu.my, joseph0328@1utar.my leejv@utar.edu.my, ngeowym@utar.edu.my, macka.teguen@viacesi.fr, mwansilabo@gmail.com
Tel: +603-90860288

Abstract
This study examines the impact of perceptions of drainage adequacy and government responsiveness on flood impact and recovery outcomes in an urban Malaysian community. Using a convergent mixed-methods design, quantitative survey data from 88 flood-affected households were analyzed alongside thematic insights from open-ended responses. Significant associations were found between delayed assistance and public dissatisfaction, and between drainage perceptions and property damage. Qualitative findings reinforced the need for early warnings, improved drainage, and coordinated response systems. The results underscore the importance of timely intervention, infrastructure maintenance, and transparent governance to enhance community resilience and institutional trust in flood-prone environments.

Keywords: Urban Flooding; Drainage Infrastructure; Disaster Response Perception; Mixed-Methods Analysis

---

1.0 Introduction
Urban flooding is now one of Malaysia's most pressing socio-environmental problems, driven by rapid land use change, overstrained drainage and more intense rainfall. Recent floods in Selangor and Penang exposed how blocked culverts and unplanned development magnify damage and sap confidence in relief agencies (Bin-Ismail, 2022). International work shows that perceived responsiveness of aid (Parida et al., 2022; Flores et al., 2024) and perceived drainage adequacy (Pallathadka et al., 2022) both predict satisfaction and loss, while recovery credibility hinges on ongoing dialogue (Foong, 2022). Globally, comparable challenges appear across Southeast Asian megacities such as Bangkok, Jakarta, and Manila, where inadequate drainage and land conversion aggravate flood exposure (Alam et al., 2025). Yet Malaysian neighborhood level evidence remains scarce. This study aims to examine how perceptions of drainage adequacy and institutional responsiveness shape residents' satisfaction, trust, and recovery outcomes during the 2021 Taman Sri Muda flood. The objectives of this study are: (i) To determine whether aid timeliness influences satisfaction; (ii) To assess perceived government effectiveness across response and recovery phases; and (iii) To examine how drainage inadequacy predicts property loss and recovery duration. The post-flood recovery was supported through a joint volunteer effort between Universiti Tunku Abdul Rahman (UTAR) students and the Tzu Chi Foundation, who assisted residents in cleaning homes and disposing of damaged belongings after

severe inundation. This collaboration illustrates how academic–civil partnerships can complement official recovery operations and enhance community morale (Fig. 1).

(a)   (b)

Fig. 1. (a) UTAR students and Tzu Chi Foundation volunteers assisting residents with post-flood cleaning at Taman Sri Muda (2021). (b) Joint UTAR–Tzu Chi volunteer team removing damaged household items and debris after the flood.

2.0 Literature Review

Recent research highlights that residents' perceptions of drainage infrastructure strongly correlate with flood damage. Using multi-city data, Pallathadka et al. (2022) find that poorly maintained culverts and outlets increase household loss exposure. Similarly, Sairam et al. (2025) show that blocked drainage systems worsened both damage and anxiety during the 2021 European floods. These results support tracking perceived drainage adequacy as a predictor of property loss.

Timely emergency aid also drives public satisfaction with government response. Parida et al. (2022) report that Indian states delivering aid within shorter duration see fewer complaints, while Flores et al. (2024) find delayed relief lowers trust in U.S. flood events. These findings justify including aid timing and satisfaction metrics in this study.

In the longer term, recovery efforts influence public trust. Foong (2022) emphasises the role of two-way communication over reconstruction phase, and Charles et al. (2022) show that post-disaster reconstruction projects gained support only with consistent progress updates. This suggests post-disaster communication is critical to perceived credibility.

Studies also link physical loss with satisfaction and recovery time. Chowdury et al. (2024) find that greater property damage lengthens recovery and reduces approval of local authorities - a trend mirrored in Sairam et al. (2025). These patterns support modeling drainage, aid timeliness, and damage as interrelated drivers of satisfaction and recovery outcomes.

Together, these studies emphasise integrating residents' perceptions into flood governance, underscoring the need for transparent, responsive, and community-informed disaster management. While prior studies document these effects internationally, evidence from Malaysia remains limited, justifying the present hypotheses H_1–H_4b.

2.1 Research hypothesis

The study advances five directional hypotheses that connect institutional factors and physical impacts to household outcomes:

H_1 - Timeliness pathway - Households that receive aid sooner are expected to report higher satisfaction with the government response.

H_2 - Phase-comparison pathway - Perceived government effectiveness is hypothesised to decline from the emergency phase to the recovery phase.

H_3 - Infrastructure–loss pathway - Poorer drainage adequacy is expected to correlate positively with the extent of property damage.

H_4a - Damage–satisfaction pathway - Greater property damage is anticipated to reduce satisfaction with the government response.

H_4b - Damage–recovery pathway - Greater property damage is predicted to lengthen household recovery time.

3.0 Methodology

A mixed-methods survey combined quantitative Likert-scale items and qualitative open-ended responses to capture the 2021 Taman Sri Muda flood experience. Purposive sampling targeted residents directly affected by property loss, displacement, or disruption. The final sample (n = 88) met Cohen's (1992) power threshold ($\rho \approx 0.30$, power = 0.80), confirming adequacy for non-parametric tests. Triangulation involved independent theme coding and cross-validation (Cronbach's $\alpha > 0.79$) to enhance reliability.

A bilingual Google Forms questionnaire measured drainage adequacy, aid arrival time, satisfaction, effectiveness recovery, and self-estimated damage on five-point Likert or ordinal scales, followed by open-ended prompts for context. Complementary interviews explored coordination and lived experience, audio-recorded and transcribed verbatim.

Two validated scales anchored the hypotheses. The five-item Flood Damage Factors index (α = .79), based on Malaysian studies of drainage and urbanisation (Mohameda, 2024; Sufian et al., 2022; Bin-Ismail, 2024; Saad et al., 2021), informed H_3–H_4b. The four-item Response and Recovery Satisfaction scale (α = .73), adapted from Ter Huurne and Gutteling (2009), covered H_1–H_4a, with perceived property damage (% loss) linking both constructs.

SPSS analysis began with descriptive statistics and reliability checks. Shapiro–Wilk results indicated non-normality, so χ^2, Wilcoxon, and Spearman tests were applied. Open-ended responses were hand-coded using Braun and Clarke's thematic analysis, then merged with quantitative findings to interpret how technical and institutional factors shaped outcomes.

There are minor limitations. Self-selection bias may be present. The study is also specific to the site. However, systematic triangulation ensures a credible basis for later analysis.

4.0 Results

4.1 Descriptive Overview of Respondents

Eighty-eight flood-affected residents (mean age = 37, range 25–65) participated. Females made up 68%, and most (62%) had completed secondary school, while 27% held tertiary qualifications. About 71% earned less than RM1,000/month, and 78% had lived in Taman Sri Muda for more than five years. The sample was largely young adults, 18–30 years: 68%; 31–50: 30%; >50: 2%. Only 21% were in full-time employment; the rest were unemployed, informal workers, or students. These characteristics highlight the group's economic and social vulnerability, a useful lens for interpreting their views on infrastructure, flood impacts, and government response. The demographic profile of respondents is shown in Table 1.

Table 1: Demographic Profile of Respondents (N = 88)

Characteristic	Category	n (%)
Age group	18–30 years	60 (68.2)
	31–50 years	26 (29.5)
	> 50 years	2 (2.3)
Gender	Female	60 (68.2)
	Male	28 (31.8)
Education level	Secondary school graduate	55 (62.5)
	Tertiary qualification	24 (27.3)
	Primary school or below	9 (10.2)
Household income	< RM 5 000	62 (70.5)
	RM 5 000–10 000	18 (20.5)
	> RM 10 000	8 (9.1)
Years residing in Taman Sri Muda	< 5 years	38 (43.2)
	5–10 years	18 (20.5)
	> 10 years	32 (36.4)
Employment status	Full-time employed	70 (79.5)
	Part-time employed	10 (11.4)
	Self-employed	2 (2.3)

4.2 Reliability & Validity

Cronbach's α indicated good internal consistency: α = 0.792 for the five flood-damage items and α = 0.733 for the four satisfaction items, both above the 0.70 benchmark. Corrected item–total correlations for the flood-damage scale ranged from 0.474 (*rapid urbanization*) to 0.695 (*inadequate flood-control infrastructure*), all exceeding the 0.40 criterion for adequacy. Similarly, the satisfaction scale showed item–total values between 0.427 and 0.640, confirming convergent validity. Ethical clearance was granted by the UTAR Research Ethics Committee.

4.3 Normality test

Shapiro-Wilk diagnostics were run on each composite scale (drainage adequacy, property damage, satisfaction, recovery duration) and on the paired difference scores for the government-effectiveness items. For every variable except recovery duration the test returned $p < 0.05$, indicating significant deviation from a normal distribution. The variables failed the normality assumption, subsequent hypothesis testing relied on non-parametric procedures (χ^2, Wilcoxon signed-rank and Spearman's ρ), which do not require normally distributed data.

4.4 Summary of Findings

Results revealed that aid timeliness was significantly associated with satisfaction (χ^2 = 27.17, $p < 0.001$); government effectiveness declined between response and recovery phases (Z = –5.95, $p < 0.001$); drainage inadequacy correlated with property damage (ρ = 0.329, $p = 0.002$); and greater damage reduced satisfaction (ρ = –0.25) while prolonging recovery (ρ = 0.32). Table 2 summarises the key hypotheses, statistical tests, outcomes, and implications in a concise matrix format to aid clarity. Qualitative analysis revealed four

community roles - mutual aid, rescue, information sharing, and limited involvement - corroborating the quantitative findings. Overall, faster aid, better drainage, and transparent communication emerged as core determinants of institutional trust.

Table 2: Summary of the key hypotheses, statistical tests, outcomes, and implications

Objective / Hypothesis	Statistical Test Used	Result Summary	Interpretation / Policy Implication
H$_1$ – Timeliness Pathway To determine whether faster aid delivery raises resident satisfaction.	Pearson Chi-Square (χ^2 = 27.17, df = 4, p < 0.001)	Significant association between shorter aid wait time and higher satisfaction.	Timely (<72 h) relief delivery is critical for public trust and credibility of institutions.
H$_2$ – Phase Comparison Pathway To assess whether perceived government effectiveness differs between response and recovery phases.	Wilcoxon Signed-Rank (Z = –5.953, p < 0.001)	Significant decline in ratings from response to recovery phase.	Early goodwill fades without sustained communication and clear recovery updates.
H$_3$ – Infrastructure–Loss Pathway To examine whether poorer drainage adequacy correlates with greater property damage.	Spearman's ρ = 0.329, p = 0.002	Moderate positive correlation between drainage inadequacy and damage.	Routine maintenance and community-based monitoring reduce physical losses and anxiety.
H$_4$a – Damage–Satisfaction Pathway To determine whether greater property damage reduces satisfaction with response.	Spearman's ρ = –0.245, p = 0.021	Weak-to-moderate negative relationship.	Material loss depresses trust in authorities and calls for transparent aid allocation.
H$_4$b – Damage–Recovery Pathway To test if greater property damage lengthens household recovery time.	Spearman's ρ = 0.315, p = 0.003	Moderate positive relationship.	Severe loss prolongs recovery; targeted support and drainage upgrades aid resilience.

5.0 Discussion

5.1 Institutional Responsiveness and Timeliness

The χ^2 test confirms that faster aid delivery significantly enhances citizen satisfaction, corroborating studies on institutional credibility and perceived fairness in disaster response (Parida et al., 2022; Flores et al., 2024; Mata et al., 2023). This finding supports resilience and social-capital theories, which posit that the speed of assistance acts as both a symbolic and practical manifestation of state capacity (Bonfanti et al., 2023). When relief becomes visible within the first 72 hours, residents interpret it as evidence of organisational competence and empathy, two attributes that sustain collective efficacy in crises. This "window of legitimacy" aligns with evidence from European and Australian flood contexts showing that early response predicts long-term trust retention (Bang, 2021; Kuller et al., 2021). Beyond logistics, timeliness also influences emotional recovery by signalling procedural justice and institutional care, whereas delayed responses foster perceptions of neglect and weaken future compliance (Petrova, 2022).

5.2 Evolving Trust through Recovery Phases

The Wilcoxon analysis revealed a decline in perceived effectiveness from response to recovery, echoing the "credibility gap" observed in Lismore, Australia (Mortimer et al., 2023) and similar dynamics across South Asia and Latin America (Charles et al., 2022; Rodríguez-Gaviria et al., 2024). This pattern reinforces that trust is dynamic rather than static; goodwill gained during rapid response erodes when transparency and equity are not sustained. Scholars describe this as adaptation fatigue, where citizen expectations surpass institutional capacity (Ferreira et al., 2024). Transforming disaster management from an event-based reaction to a continuous resilience cycle of co-creation and accountability is essential (Abid et al., 2024). Participatory dashboards and open-data recovery maps, as demonstrated in post-earthquake Nepal (Paudel & Soden, 2023) and open-mapping initiatives in Sri Lanka (Zahir et al., 2025), illustrate how locally generated data and volunteer geographic information systems can democratise recovery monitoring and sustain legitimacy through shared visibility and civic ownership.

5.3 Infrastructure Adequacy and Behavioural Dimensions

Drainage adequacy results mirror earlier infrastructure–loss correlations in Malaysia and Europe (Chan et al., 2019; Pallathadka et al., 2022), confirming that technical maintenance and public perception are mutually reinforcing. Residents' reports of blocked drains and littering reveal that structural degradation is inseparable from behavioural neglect. Although this study centred on residents' perceptions of drainage adequacy, complementary work by CESI France interns under the UTAR–CESI internship-based partnership examined coordination structures in a flood pump and detention pond project in Selangor. Their social network mapping supported the interpretation that response delays are not only related to drainage performance but also to the structure of inter-agency communication during project delivery (Wansilabo & Teguen, 2024). Hence, resilience cannot be engineered solely through structural upgrades; it must integrate participatory engagement strategies, public education, and community maintenance programmes (Rosmadi, 2023). Embedding civic reporting apps, citizen-science audits, and community reward schemes, as seen in localised resilience pilots across South Asia, can shift communities from passive beneficiaries to active resilience partners.

5.4 Loss, Equity, and Psychosocial Recovery

Correlations between property damage, satisfaction, and recovery time show that material losses intensify psychological distress and delay recovery, consistent with international evidence on post-disaster equity and mental-health disparities (Flores et al., 2024; Ferreira

et al., 2024). Heavily affected households often face compounded vulnerabilities such as financial exhaustion, displacement, and perceived unfairness in aid allocation. Introducing equity metrics such as need-based targeting, transparent dashboards, and participatory validation processes can alleviate these deficits. Similar governance models in Colombia's neighbourhood recovery programmes improved satisfaction and perceived justice (Rodríguez-Gaviria et al., 2024). Embedding psychosocial outreach within physical reconstruction, as suggested by recent public-health reviews (Flores et al., 2024), can further integrate human well-being into resilience design. The predominance of female respondents (68%) likely reflects women's central roles in household recovery, suggesting that perceptions of empathy and institutional responsiveness may be gender-influenced.

5.5 Regional and Global Policy Implications
The policy implications extend beyond Malaysia. Southeast Asian cities confront shared pressures of urbanisation, fragmented governance, and extreme rainfall (Abid et al., 2024; Rosmadi, 2023). The evidence supports hybrid governance models combining engineering reliability with participatory legitimacy. Routine maintenance cycles, citizen-science monitoring, and mobile early-warning systems exemplify low-cost, trust-building measures. These approaches align with the Sendai Framework Priority 2 on disaster-risk governance and Malaysia's National Water Policy (2012), both advocating decentralised participations. Comparative studies from England, India, and the Philippines confirm that inclusive co-design improves institutional trust and accelerates recovery (Bang, 2021; Mata et al., 2023). Embedding co-production practices within flood management can therefore strengthen adaptive capacity amid climatic uncertainty.

6.0 Conclusion & Recommendations
This mixed-methods study shows that perceived drainage inadequacy, delayed aid, and larger property losses jointly depress public satisfaction with flood-management agencies. The integration of quantitative correlations and qualitative narratives revealed that technical infrastructure weaknesses are amplified by coordination lapses and information gaps, resulting in both material and psychological impacts on affected residents. Limitations include recall bias from self-reported data, potential measurement error, and the site-specific nature of the Taman Sri Muda sample. Future research should employ longitudinal surveys, integrate hydrological modelling, and extend sampling across regions to improve generalisability. Comparative studies across diverse urban basins would also help identify governance patterns that sustain resilience under different institutional capacities. Methodological refinement, including digital timestamp verification of aid delivery, GIS-based drainage mapping, and mobile-based community reporting, can further strengthen validity and replicability. These innovations would allow planners to triangulate citizen perception data with objective environmental indicators, bridging social and engineering perspectives. Policy takeaway: routine drainage maintenance, sub-72-hour aid triggers, and citizen-feedback loops can simultaneously reduce losses, rebuild trust, and establish a foundation for adaptive, community-informed flood governance.

Acknowledgement

Paper Contribution to Related Field of Study
This study offers a dual theoretical contribution. First, it advances the institutional trust cycle model by empirically demonstrating how response speed, transparency, and continuity shape satisfaction trajectories. Second, it operationalises service-ecosystem design within flood governance, highlighting how infrastructure, behaviour, and institutional norms form an integrated resilience system (Bonfanti et al., 2023). Together, these insights clarify why technological efficiency without participatory legitimacy cannot achieve durable confidence. Ultimately, technical effectiveness without transparency cannot secure trust, while citizen engagement without dependable infrastructure cannot ensure safety. Bridging this duality defines the next frontier of flood-resilient governance across Southeast Asia and beyond.

References

Abid, S. K., Sulaiman, N., Al-Wathinani, A. M., & Goniewicz, K. (2024). Community-based flood mitigation in Malaysia: Enhancing public participation and policy effectiveness for sustainable resilience. *Journal of Global Health*, *14*, 04290.

Alam, I., Parvin, G. A., & Kibria, M. G. (2025). Urban Housing, Poverty, and Informal Sector: Asian Dilemma Toward Livable Blue-Green Cities. In *Urban Blue-Green Infrastructure Approach for Food Security and Climate Disaster Resilience* (pp. 141-160). Singapore: Springer Nature Singapore.

Bang, H. N., & Burton, N. C. (2021). Contemporary flood risk perceptions in England: Implications for flood risk management foresight. *Climate Risk Management*, *32*, 100317.

Bonfanti, R. C., Oberti, B., Ravazzoli, E., Rinaldi, A., Ruggieri, S., & Schimmenti, A. (2023). The role of trust in disaster risk reduction: a critical review. *International journal of environmental research and public health*, *21*(1), 29.

Bin-Ismail, M. (2022). Community response to flood disaster: A case study of flooding in Penang, Malaysia (Doctoral dissertation, Durham University). *Durham University.*

Byrne, D. (2022). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality & Quantity,* 56(3), 1391-1412.

Chan, N. W., Ghani, A. A., Samat, N., Hasan, N. N. N., & Tan, M. L. (2019). Integrating structural and non-structural flood management measures for greater effectiveness in flood loss reduction in the Kelantan River basin, Malaysia. In *AWAM International Conference on Civil Engineering* (pp. 1151-1162). Cham: Springer International Publishing.

Charles, S. H., Chang-Richards, A. Y., & Yiu, T. W. (2022). A systematic review of factors affecting post-disaster reconstruction projects resilience. *International Journal of Disaster Resilience in the Built Environment,* 13(1), 113-132.

Chowdhury, J. R., & Parida, Y. (2023). Flood shocks and post-disaster recovery of households: An empirical analysis from rural Odisha, India. *International Journal of Disaster Risk Reduction,* 97, 104070.

Ferreira, Regardt, Timothy Davidson, Fred Buttell, Caroline M. Contillo, Colleen Leddie, Cameron Leahy, Catherine Nunez-Dune et al. "Barriers to equitable disaster recovery: A scoping literature review." *International Journal of Disaster Risk Reduction* 110 (2024): 104628.

Flores, A. B., Sullivan, J. A., Yu, Y., & Friedrich, H. K. (2024). Health disparities in the aftermath of flood events: A review of physical and mental health outcomes in the USA. *Current Environmental Health Reports,* 11(2), 238-254.

Foong, S. L. (2022). Solution-focused coaching for disaster risk reduction and recovery. *Environment–Behaviour Proceedings Journal,* 7(19), 263-269

Kuller, M., Schoenholzer, K., & Lienert, J. (2021). Creating effective flood warnings: A framework from a critical review. *Journal of hydrology*, *602*, 126708.

Mata, P., Cullano, R. A., Tiu, A. M., Gonzales, G., Selerio Jr, E., Maturan, F., ... & Ocampo, L. (2023). Public satisfaction with the government's disaster response during Typhoon Odette (Rai). *International Journal of Disaster Risk Reduction*, *84*, 103483.

Mohameda, M. A., Zamana, A. Q. M., Kajewski, S., & Trigunarsyah, B. (2024). Enhancing flood disaster management in Klang Valley. *Jurnal Kejuruteraan,* 36, 2709-2715.

Mortimer, A., Egbelakin, T., & Sher, W. (2023). Drivers, service gaps and improving disaster management for displaced people: A case study of prolonged displacement following the 2022 floods in Lismore, Australia. In *Handbook of Flood Risk Management and Community Action* (pp. 66-84). Routledge.

Pallathadka, A., Sauer, J., Chang, H., & Grimm, N. B. (2022). Urban flood risk and green infrastructure: Who is exposed to risk and who benefits from investment? *Landscape and Urban Planning,* 223-240.

Parida, Y., Roy Chowdhury, J., Saini, S., & Dash, D. P. (2022). Role of income and government responsiveness in reducing flood-related deaths in Indian states. *Scientific Reports,* 12.

Paudel, S., & Soden, R. (2023). Reimagining Open Data during Disaster Response: Applying a Feminist Lens to Three Open Data Projects in Post-Earthquake Nepal. *Proceedings of the ACM on Human-Computer Interaction*, *7*(CSCW1), 1-25.

Petrova, K. (2022). Floods, communal conflict and the role of local state institutions in Sub-Saharan Africa. *Political Geography*, *92*, 102511.

Rodríguez-Gaviria, E. M., Rivera-Flórez, L. A., & de Albuquerque, J. P. (2024). Enhancing equity of the post-disaster recovery governance through community data generation. *International Journal of Disaster Risk Reduction*, *111*, 104700.

Rosmadi, H. S., Ahmed, M. F., Mokhtar, M. B., & Lim, C. K. (2023). Reviewing challenges of flood risk management in Malaysia. *Water*, *15*(13), 2390.

Saad, M. S. H., Ali, M. I., Razi, P. Z., Ramli, N. I., & Jaya, R. P. (2024). Exploring the factors and impacts of flash-flood vulnerability in various areas of Malaysia: A content analysis. *Disaster in Civil Engineering and Architecture,* 1(1), 55-82.

Sairam, N., Merz, B., Schröter, K., & Harjantee, K. (2025). Health-related quality of life and everyday functioning in the flood-affected population in Germany: A case study of the 2021 floods. *GeoHealth,* 9(6), e2024GH001135.

Sufian, A., Chi, C. J., Azman, H., Aziz, N. A. A., Fen, F. S., & Zamri, A. A. M. (2022). Assessing residents' flood preparedness through adaption of protective behaviour in Melaka, Malaysia. *Environment and Ecology Research*, 10(3), 334-345.

Ter Huurne, E. F. J., & Gutteling, J. M. (2009). Information needs and risk perception as predictors of risk information seeking. *Journal of Risk Research*, 12(6), 847-862.

Wansilabo, M., & Teguen, M. (2024). *Gephi and the Social Network Analysis: International internship report (July–September 2024).* Unpublished internship report, CESI France and Universiti Tunku Abdul Rahman, Malaysia.

Zahir, I. L. M., Suthakaran, S., Zihan, Z. M., Iyoob, A. L., Thanujan, V., & Naksala, S. (2025). Developing the volunteer spatial information using OpenStreetMap for countryside sustainable development in UVA Province, Sri Lanka. In *Digital technologies for sustainability and quality control* (pp. 273-304). IGI Global Scientific Publishing.