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EXAMINING PERSPECTIVE ON PAYMENT ECOSYSTEM SERVICES: A CASE STUDY OF MELAKA AMONG GENERATION Z

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Abstract:

Payment for Ecosystem Services (PES) is a market-based environmental policy instrument that provides financial incentives to individuals or organizations for managing land and natural resources in ways that generate ecological benefits, such as water purification, biodiversity conservation, and carbon sequestration. Despite the increasing implementation of PES initiatives worldwide, limited empirical studies have examined how younger generations, particularly Generation Z, perceive and respond to such environmental policy mechanisms. Therefore, this study aims to examine the affective, cognitive, and behavioural attributes of Generation Z toward Payment for Ecosystem Services initiatives. A quantitative research design was employed using a structured survey instrument adapted from previously validated studies to ensure reliability and measurement accuracy. Data were collected from Generation Z respondents in Melaka and analysed using statistical techniques to assess the relationships between affective, cognitive, and behavioural dimensions and overall perceptions of PES. The findings indicate that Generation Z demonstrates varying levels of awareness and attitudes toward PES, with affective and cognitive attributes significantly influencing their behavioural intentions to

support ecosystem conservation initiatives. These results contribute to the understanding of youth perspectives on environmental economic instruments and provide insights for policymakers in designing more effective PES awareness and engagement strategies.

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Payment for Ecosystem Services (PES), Generation Z, Environmental Attitudes



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Introduction

Payment for Ecosystem Services (PES) has emerged as an important policy instrument that provides financial incentives to individuals or communities for managing land and natural resources in ways that generate ecological benefits. These benefits include services such as water purification, soil conservation, biodiversity protection, and carbon sequestration (Salman et al., 2018). Unlike traditional regulatory approaches that rely primarily on restrictions and enforcement, PES introduces market-based incentives that encourage landowners and stakeholders to adopt environmentally sustainable practices. In this mechanism, beneficiaries of ecosystem services such as governments, private organizations, or water utilities provide payments to those responsible for maintaining or enhancing these ecological functions (Wunder et al., 2020). As a result, conservation efforts become integrated into economic systems rather than being treated solely as regulatory or voluntary initiatives.

The importance of PES has grown significantly in recent years as governments and international organizations seek innovative mechanisms to address environmental degradation and biodiversity loss. Market-based conservation approaches are increasingly recognized as effective tools for achieving global sustainability targets, including those outlined in the Kunming–Montreal Global Biodiversity Framework (Pascual et al., 2023). By linking economic incentives with environmental stewardship, PES mechanisms aim to promote both ecological protection and sustainable development (Börner et al., 2017).

However, financial incentives alone are insufficient to ensure the successful implementation of PES programs. Public awareness, trust, and participation are equally critical to the effectiveness and long-term sustainability of such initiatives. Previous studies have highlighted that PES programs often encounter implementation challenges when local communities lack understanding or support for these mechanisms (Alpizar et al., 2020). Consequently, education, environmental awareness, and community engagement play essential roles in shaping public acceptance of PES initiatives.

In this context, the younger generation has become increasingly important in shaping future environmental governance and sustainability practices. Generation Z, typically defined as individuals born between the mid-1990s and early 2010s, represents the first generation to grow up in an era characterized by rapid digitalization and widespread exposure to environmental information through digital media platforms (Djafarova & Fouts, 2022). Many studies suggest that Generation Z demonstrates relatively high levels of concern about environmental issues due to their exposure to climate change discourse, pollution challenges, and sustainability campaigns (Timm & Despoudi, 2024). Although they may not yet hold significant land ownership or policy-making authority, their consumption patterns, social influence, and digital engagement can significantly shape environmental attitudes and behaviours within society.

Despite the increasing relevance of PES as a policy instrument, empirical research examining public perception of PES particularly among younger generations remains limited in Malaysia. Existing studies in the Malaysian context have primarily focused on general environmental behaviours such as recycling practices, energy conservation, or climate change awareness (Mei et al., 2016; Tan et al., 2022). Comparatively fewer studies have investigated public attitudes toward market-based environmental instruments such as PES. This gap is particularly significant in rapidly developing regions where environmental pressures are intensifying.

Melaka represents a relevant case for examining these issues due to the increasing environmental challenges associated with urban expansion, industrial activities, and river pollution. Rapid development has placed significant pressure on local ecosystems and natural resources, highlighting the need for innovative conservation strategies that involve both economic and social participation (Department of Environment Malaysia, 2021). However, the level of awareness and acceptance of PES among younger populations in the region remains largely unexplored.

Given these circumstances, understanding how Generation Z perceives PES mechanisms is crucial for designing effective environmental policies that align with the values and expectations of future stakeholders. The success of market-based conservation initiatives will depend not only on economic incentives but also on the willingness of younger generations to support and engage with such mechanisms.

Therefore, this study aims to examine Generation Z's perceptions of Payment for Ecosystem Services in Melaka by analyzing the influence of environmental knowledge, green lifestyle practices, and environmental awareness on their attitudes toward PES initiatives. By identifying the key factors that shape young people's perceptions of PES, the study provides valuable insights for policymakers and environmental planners in designing more effective and inclusive conservation strategies.

Literature Review

Environmental Attitude Theory

This study is grounded in Environmental Attitude Theory (EAT), which provides a conceptual framework for understanding how individuals develop attitudes and behaviours toward environmental issues. According to Kaiser and Byrka (2017), environmental attitudes are generally conceptualized through three interrelated components: cognitive, affective, and behavioural dimensions. The cognitive component refers to individuals' knowledge and beliefs

regarding environmental issues, the affective component reflects emotional responses and concern for environmental protection, while the behavioural component represents the actions or behavioural intentions individuals demonstrate toward environmental conservation.

The Environmental Attitude Theory has been widely applied in environmental research to explain public support for environmental policies and pro-environmental behavior. Studies have shown that individuals who possess higher levels of environmental knowledge and stronger emotional attachment to nature are more likely to demonstrate positive environmental behaviours and support conservation initiatives (Gifford & Nilsson, 2014; He et al., 2023). In the context of Payment for Ecosystem Services (PES), this theoretical framework suggests that individuals who understand the importance of ecosystem services and develop positive emotional attitudes toward environmental protection are more likely to support PES mechanisms.

Payment for Ecosystem Services and Public Perception

Payment for Ecosystem Services (PES) is a market-based environmental policy mechanism that provides financial incentives to individuals or communities who manage ecosystems in ways that generate environmental benefits. These benefits include services such as water purification, biodiversity conservation, and carbon sequestration (Wunder et al., 2020). The effectiveness of PES programs depends not only on financial incentives but also on public acceptance and trust in the institutions responsible for implementing these mechanisms.

Public perception plays a critical role in determining the long-term sustainability of PES initiatives. Individuals' perspectives toward PES may include their beliefs about the fairness, effectiveness, and transparency of the system. Previous research indicates that support for PES programs is often influenced by individuals' environmental values, perceptions of institutional trust, and their understanding of how PES mechanisms operate (Blundo-Canto et al., 2018). When stakeholders perceive PES as fair and beneficial for environmental conservation, they are more likely to support and participate in such initiatives.

Despite the growing implementation of PES globally, empirical studies examining public perception of PES remain limited in many developing countries, including Malaysia. Most environmental studies in Malaysia have focused on general environmental awareness and sustainable behaviours such as recycling or energy conservation (Mei et al., 2016; Tan et al., 2022). Consequently, there is limited understanding of how younger generations perceive more complex environmental policy instruments such as PES.

Environmental Knowledge and Perception toward PES

Environmental knowledge represents the cognitive component of environmental attitudes and refers to individuals' understanding of environmental issues, ecosystem services, and environmental policy mechanisms. Knowledge plays an important role in shaping individuals' perceptions of environmental initiatives. Individuals who possess higher levels of environmental knowledge are generally more likely to recognize the importance of ecosystem services and support conservation policies (Arbiol et al., 2016).

In the context of PES, knowledge regarding how ecosystem services contribute to human well-being and how PES mechanism's function can significantly influence individuals' attitudes toward such programs. However, younger generations may have varying levels of understanding of complex policy instruments like PES, as much of their environmental information is obtained through digital media and educational institutions (Timm & Despoudi, 2024). Limited knowledge about the operational mechanisms of PES may lead to scepticism or uncertainty regarding the effectiveness and transparency of such programs.

Green Lifestyle and Environmental Support

A green lifestyle reflects the behavioural dimension of environmental attitudes and refers to the extent to which individuals engage in environmentally responsible practices in their daily lives. These practices may include recycling, reducing energy consumption, purchasing environmentally friendly products, and supporting sustainable consumption patterns. Previous research suggests that individuals who actively adopt sustainable lifestyles tend to demonstrate stronger support for environmental policies and conservation initiatives (Whitburn et al., 2020). Among younger generations, sustainable consumption and environmentally responsible behaviours are often associated with personal values and social identity. Generation Z, in particular, has been identified as a generation that is highly exposed to environmental discourse and sustainability campaigns through digital platforms (Djafarova & Fouts, 2022). As a result, individuals who already practice environmentally responsible behaviours may be more receptive to market-based conservation mechanisms such as PES.

Environmental Awareness and Attitudes toward PES

Environmental awareness refers to the degree to which individuals recognize environmental problems and understand the importance of protecting natural resources. Higher levels of environmental awareness are often associated with stronger pro-environmental attitudes and greater support for environmental policies. Individuals who are aware of environmental degradation and the consequences of ecosystem loss are more likely to support initiatives aimed at promoting environmental sustainability.

For Generation Z, environmental awareness is often shaped by exposure to global environmental issues such as climate change, biodiversity loss, and pollution. This heightened awareness may influence their perceptions of innovative policy mechanisms such as PES. Understanding how environmental awareness contributes to attitudes toward PES is therefore essential for developing effective environmental communication strategies and policy initiatives.

Research Framework

Based on Environmental Attitude Theory, this study examines environmental perspective toward PES as the dependent variable, representing Generation Z's overall perception of the fairness, effectiveness, and credibility of PES programs. The independent variables examined in this study include environmental knowledge, green lifestyle practices, and environmental awareness. These variables are expected to influence how Generation Z perceives and supports PES initiatives.

By examining the relationships between these variables, this study aims to provide empirical insights into the factors that shape young people's attitudes toward market-based environmental policies. The findings are expected to contribute to the limited body of research on PES perception in Malaysia and provide valuable guidance for policymakers seeking to design conservation strategies that resonate with younger generations.

H0: There is no relationship between Knowledge and Perspective Towards Payment Ecosystem Services.

H1: There is a relationship between Knowledge and Perspective Towards Payment Ecosystem Services.

H0: There is no relationship between Green Lifestyle and Perspective Towards Payment Ecosystem Services.

H1: There is a relationship between Green Lifestyle and Perspective Towards Payment Ecosystem Services.

H0: There is no relationship between Environmental Awareness and Perspective Towards Payment Ecosystem Services.

H1: There is a relationship between Environmental and Perspective Towards Payment Ecosystem Services

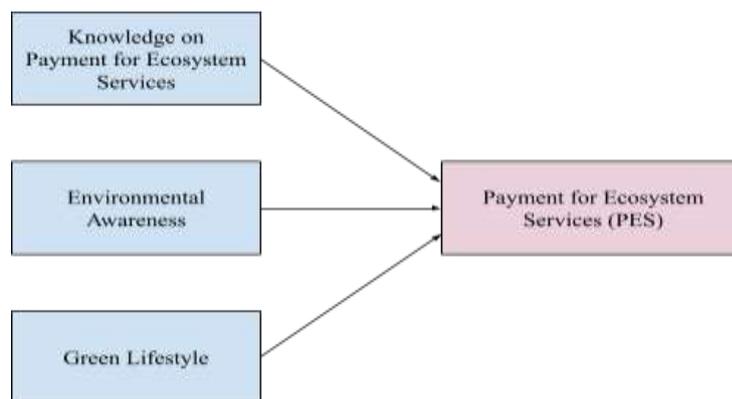


Figure 1: Conceptual Framework

Methodology

Research Design

This study employed a quantitative research design to examine Generation Z's perceptions of Payment for Ecosystem Services (PES) in Melaka. A structured questionnaire survey was used to collect primary data from respondents. The quantitative approach was considered appropriate as it allows the examination of relationships between multiple variables and facilitates statistical analysis of factors influencing environmental perspectives toward PES.

Sampling and Data Collection

A convenience sampling technique was adopted in this study. The target population consisted of individuals belonging to Generation Z, typically defined as those born between 1997 and 2012, who reside in the state of Melaka, Malaysia. The study focused on respondents aged 18 to 28 years, as this age group represents young adults who are actively engaged in education, employment, and social activities.

Participants were recruited through various accessible channels, including universities, youth organizations, community groups, and online platforms such as social media. Convenience sampling was selected due to practical constraints related to time, accessibility, and resource availability, which are common considerations in social science research (Etikan et al., 2016). Although this sampling technique limits generalizability compared to probability sampling methods, efforts were made to reach a diverse group of respondents by distributing the survey through multiple digital and institutional networks.

The data collection process was conducted over a one-month period using an online survey questionnaire. The survey link was distributed through academic networks and social media platforms to reach a broader segment of Generation Z residents in Melaka. Participation was voluntary, and respondents were informed about the purpose of the study before providing their consent to participate.

Sample Size Determination

Several methodological guidelines were considered when determining the appropriate sample size for this study. Johanson and Brooks (2010) recommend a minimum sample size of 30 respondents for pilot research, while Roscoe (1975) suggests that sample sizes greater than 30 are generally adequate for statistical analysis in behavioural research. Furthermore, Green (1991) proposes that the minimum sample size required for multiple regression analysis can be calculated using the formula:

$$N \geq 50 + 8m$$

where m represents the number of independent variables. Since this study includes three independent variables (environmental knowledge, green lifestyle, and environmental awareness), the minimum recommended sample size was 74 respondents.

To enhance the reliability and robustness of the analysis, the study collected data from 326 respondents, which substantially exceeds the minimum requirement suggested in the literature. The larger sample size improves the statistical power of the analysis and strengthens the credibility of the research findings.

Measurement Instrument

Data were collected using a structured questionnaire consisting of items adapted from previously validated instruments in environmental attitude and environmental behaviour research. The measurement items were primarily adapted from the work of Kshetrimayum et al. (2020) and other related studies examining environmental awareness, green lifestyle practices, and perceptions of ecosystem services. The questionnaire included sections measuring:

Environmental knowledge, Green lifestyle practices, Environmental awareness Perspectives toward Payment for Ecosystem Services (PES). All constructs were measured using a Likert-scale format, allowing respondents to indicate their level of agreement with each statement. To ensure the validity and reliability of the measurement instrument, reliability and normality tests were conducted. According to Sekaran and Bougie (2013), a Cronbach's alpha value of 0.60 or higher indicates acceptable reliability for social science research. In addition, data normality was assessed using skewness and kurtosis values. As suggested by Kline (2005), skewness

values within the range of -3 to $+3$ and kurtosis values between -10 and $+10$ indicate an acceptable level of normal distribution.

The results of these tests confirmed that all constructs satisfied the required reliability and normality criteria. The detailed results are presented in Table 1.

Table 1: Measurement of Variables, Normality Test, And Reliability Test Results

Variables	Items	Skewness	Kurtosis	Cronbach's Alpha
Knowledge	B1. I have heard the term "Payment for Ecosystem Services (PES)" before.	-1.012	0.476	0.958
	B2. I understand how Payment for Ecosystem Services works (who pays, who receives and the conditions).			
	B3. I am aware of any Payment for Ecosystem Services initiatives or conservation payments being discussed or implemented in Malaysia.			
	B4. I understand how Payment for Ecosystem Services could help reduce deforestation and protect biodiversity.			
	B5. I find it easy to access accurate information about Payment for Ecosystem Services (e.g., online, news, university).			
	B6. I believe I have enough knowledge to decide whether I support or oppose a Payment for Ecosystem Services program.			
Green Lifestyle	C1. I regularly practice recycling in my daily life.	0.935	1.897	0.911
	C2. I try to reduce waste by reusing or repurposing items whenever possible.			
	C3. I bring my own bags, bottles or containers to reduce plastic usage.			
	C4. I prefer to buy environmentally friendly or sustainable products.			
	C5. I conserve water and electricity at home to reduce environmental impact.			
	C6. I participate in environmental activities such as clean-up programs or tree planting.			

C7. I encourage my friends or family members to adopt eco-friendly practices.

C8. I choose public transformation, walking, or cycling instead of driving when possible.

Environment

al Awareness D1. I am aware of the current environmental issues affecting Malaysia. -1.671 3.539 0.964

D2. I understand how pollution and deforestation impact ecosystems.

D3. I know that human activities contribute to environmental degradation.

D4. I believe that environmental protection is important for future generations.

D5. I am aware of the importance of conserving water, forests, and biodiversity.

D6. I keep myself informed about environmental issues through media or social platforms.

D7. I believe environmental education can help improve public awareness.

D8. I am aware of government or community programs related to environmental conservation.

<p>Perspective for Payment for Ecosystem Services</p>	<p>E1. I support the implementation of Payment for Ecosystem Services programs in Melaka.</p> <p>E2. I believe Payment for Ecosystem Services is a fair way to reward communities who protect ecosystems.</p> <p>E3. I think Payment for Ecosystem Services would be effective in improving local environmental outcomes (e.g., water quality, biodiversity).</p>	<p>-1.444 3.963 0.957</p>
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Data Analysis

The collected data were analyzed using several statistical techniques. First, descriptive analysis was conducted to summarize the demographic characteristics of respondents and to assess the overall level of Generation Z's perspectives toward PES. Next, Pearson correlation analysis was employed to examine the relationships between environmental knowledge, green lifestyle, environmental awareness, and perceptions toward PES. This analysis helps determine the strength and direction of associations among the study variables. Finally, multiple regression analysis was conducted to identify the most significant predictors influencing Generation Z's perspectives toward Payment for Ecosystem Services. This technique allows the evaluation of the relative contribution of each independent variable in explaining variations in the dependent variable.

Discussion

This study provides empirical insights into Generation Z's perceptions of Payment for Ecosystem Services (PES) in Melaka by examining the influence of environmental knowledge, green lifestyle practices, and environmental awareness. The findings indicate that Generation Z generally holds a moderately positive perception toward PES, suggesting that younger individuals are receptive to market-based environmental policy instruments when they are perceived as transparent and beneficial to environmental conservation. These findings highlight the importance of understanding how cognitive, affective, and behavioural factors jointly shape environmental policy acceptance among younger generations.

important finding of this study is that environmental knowledge plays a crucial role in shaping perceptions toward PES. Respondents who demonstrated higher levels of knowledge about environmental issues and ecosystem services were more likely to perceive PES as a fair and beneficial policy mechanism. This finding supports the cognitive dimension of Environmental Attitude Theory, which suggests that individuals' beliefs and knowledge significantly influence their environmental attitudes and evaluations of conservation initiatives (Milfont & Duckitt, 2010). Similar findings were reported by Arbiol et al. (2016), who observed that environmental knowledge significantly influences public support for conservation policies in Malaysia. For Generation Z, who often receive environmental information through digital platforms, the challenge lies in distinguishing credible environmental initiatives from superficial environmental claims or "greenwashing."

The findings also reveal that green lifestyle practices significantly influence Generation Z's perception of PES. Individuals who actively engage in environmentally responsible behaviours, such as reducing waste, using public transportation, and purchasing sustainable products, tend to demonstrate stronger support for PES initiatives. This finding is consistent with the concept of behavioural spillover, where individuals who practice sustainable behaviours are more likely to support broader environmental policies (Whitburn et al., 2020). Among Generation Z, sustainable consumption patterns and environmentally responsible behaviours often reflect personal values and social identity.

Consequently, PES initiatives may be perceived not only as policy instruments but also as mechanisms that reinforce environmentally responsible lifestyles (Djafarova & Fooks, 2022). Environmental awareness also contributes to positive perceptions of PES. The results suggest that individuals who demonstrate higher levels of concern for environmental issues, including climate change and ecosystem degradation, are more likely to support conservation initiatives such as PES. This finding aligns with the affective dimension of Environmental Attitude Theory, which emphasizes the role of emotional attachment and concern for nature in shaping environmental attitudes. Previous studies have also shown that environmental concern can significantly influence public willingness to support environmental policies and conservation programs (Gifford & Nilsson, 2014).

The findings of this study are also consistent with earlier research examining public acceptance of environmental economic instruments. For example, Krishnan et al. (2018) found that public willingness to pay for watershed protection in the Langat Basin was strongly influenced by respondents' understanding of ecosystem services and their perceived benefits. Similarly, the present study suggests that Generation Z's support for PES is influenced by their level of knowledge, lifestyle practices, and environmental awareness.

From a policy perspective, the findings highlight several practical implications for improving the effectiveness of PES initiatives. First, environmental education and digital communication strategies should be strengthened to enhance young people's understanding of PES mechanisms and ecosystem services. Educational campaigns delivered through digital platforms, including social media, videos, and interactive content, may help translate complex policy concepts into accessible information for younger audiences.

Second, PES initiatives could be integrated with green lifestyle programs and youth engagement activities. Encouraging environmentally responsible behaviours among young people may indirectly increase their acceptance of broader conservation policies. Programs that connect everyday sustainable practices with ecosystem conservation initiatives may strengthen the relationship between individual behavior and environmental policy support.

Third, improving institutional transparency and public trust is essential for the successful implementation of PES programs. Transparent governance mechanisms, including publicly accessible information on environmental projects and funding allocation, may enhance public confidence in PES systems. Previous research has highlighted that institutional trust plays a critical role in shaping public support for environmental policies (Arbiol et al., 2016).

Overall, the findings of this study contribute to the existing literature by demonstrating that environmental knowledge, green lifestyle practices, and environmental awareness collectively influence Generation Z's attitudes toward PES. These results further support the applicability

of Environmental Attitude Theory in explaining public perceptions of market-based environmental policy instruments.

Conclusion

Payment for Ecosystem Services (PES) represents an increasingly important market-based instrument for promoting environmental conservation by aligning economic incentives with ecosystem protection. Understanding public perceptions of such policy mechanisms is particularly important, as societal support plays a critical role in determining their long-term effectiveness.

This study examined the influence of environmental knowledge, green lifestyle practices, and environmental awareness on Generation Z's perceptions of PES in Melaka. The findings reveal that all three factors significantly influence young people's attitudes toward PES. In particular, individuals with greater environmental knowledge, stronger environmentally responsible lifestyles, and higher levels of environmental awareness tend to demonstrate more positive perceptions toward PES initiatives.

The study contributes to the existing literature by applying Environmental Attitude Theory to examine public perceptions of PES within the context of Malaysian youth. The findings highlight that cognitive understanding, behavioural practices, and emotional concern for the environment collectively shape young people's acceptance of market-based conservation policies.

Despite these contributions, several limitations should be acknowledged. First, the study focused exclusively on Generation Z respondents in Melaka, which may limit the generalizability of the findings to other regions or demographic groups in Malaysia. Second, the use of self-administered questionnaires may introduce response bias, as respondents may provide socially desirable answers rather than accurately reflecting their true attitudes.

Future research could expand the scope of the study by including respondents from multiple states in Malaysia to improve generalizability. Additionally, employing a mixed-method research approach, incorporating both quantitative surveys and qualitative interviews, may provide deeper insights into the motivations and perceptions of younger generations toward PES. Future studies may also explore additional variables, such as institutional trust, perceived fairness, and willingness to pay, to further understand the factors influencing public acceptance of market-based environmental policies.

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Ethics Statement: This study was conducted in accordance with ethical research standards. All procedures involving human participants were reviewed and approved by the Universiti Teknologi Mara Review Ethics Committee, approval number FERC/02/2025. Informed consent was obtained from all participants prior to data collection. Participation was voluntary, and respondents were assured of confidentiality and anonymity. The data collected were used solely for academic purposes.

Author Contribution Statement: We confirm that the contributions to the research project as follows: Anis Maisarah Yang Amri and Alysha Wafiyyah Ayub conceived the presented idea and led the data collection. Anis Maisarah Yang Amri verified the analytical methods. Anis Maisarah Yang Amri, Alysha Wafiyyah Ayub, Devika Krishnan and Suziana Hassan led the manuscript writing. All auditors discussed the results and contributed to the final manuscript.

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