



Enhancing community participation in smart safety zones: A mixed-methods study of crime prevention in Phuket, Thailand

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ABSTRACT

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Crime prevention in smart cities relies on integrated community engagement supported by efficient surveillance systems. Despite significant investments in smart policing infrastructure, there is a lack of empirical evidence concerning the impact of demographic factors on community participation in technology-driven crime prevention frameworks. Based on community policing theory and crime triangle theory, this research examines guidelines aimed at enhancing the effectiveness of community involvement in proactive crime prevention and suppression within the Smart Safety Zone 4.0 project in Phuket Province, Thailand. A mixed-methods approach was applied, with 400 respondents representing police, civilians, local government, businesses, and media. Quantitative data were analyzed through descriptive statistics and one-way ANOVA, while qualitative data were obtained from in-depth interviews with 15 selected informants. Findings show that the project effectively incorporated AI technologies, CCTV surveillance equipment, and community policing networks, leading to increased public participation (mean = 4.02, S.D. = 0.753), especially in awareness-raising and collaborative initiatives. Age and married status were significant determinants of involvement ($p < 0.05$), but gender, education, employment, and income were not. Key challenges included budget restrictions, poor public understanding, and incomplete technical integration. The "Big 6" collaboration model provides a structure for different groups to work together for crime prevention. The outcomes contribute to policy development for smart city safety governance, especially in tourism-dependent economies aiming for sustainable, technology-driven community security systems.

Contribution/Originality: This research integrates a smart governance framework and community policing theory to examine demographic factors influencing participation in AI-enabled crime prevention. It presents the Big 6 collaboration as an effective governance model and offers policy-driven evidence linking technology integration with community engagement.

1. INTRODUCTION

Global crime prevention strategies are shifting from active law enforcement models to integrated governance approaches that combine digital technologies with active community engagement. This transformation, associated with the global smart city movement, supports data-driven administration, inter-agency coordination, and community involvement to enhance urban safety and service delivery (Kitchin & Moore-Cherry, 2021; Meijer & Bolívar, 2016). This transition aligns with the 20-year national strategy and Thailand 4.0 Policy, which highlights the importance of smart city innovation and development within the public sector. According to the United Nations

(2016), it was important for smart sustainable cities to incorporate technological infrastructure along with governance mechanisms to enhance resilience in the long-term societal.

In conjunction with this national policy framework, the Royal Thai Police initiated the Smart Safety Zone 4.0 program to shift from reactive policing to proactive citizen-focused prevention of crime (Royal Thai Police, 2022). The projects integrate various systems such as artificial intelligence (AI), CCTV surveillance, and digital communication platforms; however, Nam & Pardo (2011) suggest that technological investments alone don't guarantee enhanced public safety in the absence of ongoing community involvement and institutional trust. Previous research on smart policing focused on surveillance technologies, predictive analysis, and operational efficiency, but there is still limited empirical research examining the impact of demographic characteristics on participation in the smart policing framework, especially in urban economies that rely on tourism, where public safety has become a significant economic factor.

Phuket province presents as an essential case of study. Thailand, known as a premier tourism destination, generates over 300 billion baht annually; hence, ensuring public safety becomes important for economic sustainability and the preservation of its international reputation. The Smart Safety Zone 4.0 project resulted in a significant reduction in reported crimes, showing measurable operational success (Bangkok Post, 2022). Nevertheless, a thorough assessment of community engagement patterns, demographic factors, and stakeholder collaboration mechanisms influencing participation remains poorly explored. Understanding these aspects is crucial for advancing smart safety initiatives from mere technological implementation to effective public governance.

This research investigated the structures of governance and implementation methods of the Smart Safety Zone 4.0 project in Phuket, assessing community engagement and related issues, as well as analyzing the demographic factors influencing participation in proactive crime prevention. It provides evidence-based guidelines to enhance multi-stakeholder collaboration, offers insights for tourism-dependent economies aiming for sustainable, technology-enabled safety systems, and contributes to public policy scholarship on smart governance.

2. THEORETICAL FRAMEWORK

2.1. *Theory of Community Policing and Smart Governance Framework*

The theory of community policing highlights the importance of cooperation between law enforcement agencies and the community in tackling local safety issues (Kappeler, Gaines, & Schaefer, 2020).

Hence, this approach, focusing on problem solving, citizen engagement, and cooperation, increased public trust rather than relying solely on enforcement proactively. In public administration research, this collaboration exemplifies the principle of co-production, where public services are delivered collaboratively by state institutions and citizens (Sicilia, Guarini, Sancino, Andreani, & Ruffini, 2016).

Smart governance enhances this framework through the incorporation of digital technologies into urban management and the government service system (Sarker, Wu, & Hossin, 2018). Smart governance makes use of information and communication technologies (ICT), digital platforms, and real-time data systems to improve administrative efficiency and responsiveness (Lin, 2018). In policing contexts, the integration of AI-based surveillance, CCTV, and digital communication tools is increasingly utilised to enhance proactive strategies in crime prevention.

As mentioned by Zou, Mao, Yan, Liu, and Duan (2023), the mere implementation of technology does not ensure enhanced governance results. Effective smart policing relies on citizen engagement, institutional trust, and an inclusive governance framework. Integrating community policing principles with smart governance systems establishes a theoretical framework for analysing participation dynamics in technology-enabled crime prevention initiatives.

2.2. Demographic Influence on Community Participation

Socioeconomic and demographic traits have an impact on public involvement in governance. According to civic engagement theory, levels of community involvement are influenced by personal characteristics like age, education, marital status, and job duties (Grillo, Teixeira, & Wilson, 2010). These elements have an impact on perceived civic duty, social capital, and community attachment, all of which have an impact on involvement in public safety programs.

Age differences frequently indicate differences in risk perception, technological familiarity, and patterns of community engagement. Research indicates that younger individuals tend to exhibit greater engagement in technology-mediated initiatives, whereas older adults are more inclined to depend on conventional types of participation (Kebede, Ozolins, Holst, & Galvin, 2022; Tams, Thatcher, & Grover, 2018). Marital status and the structure of households may enhance community attachment, thereby potentially increasing the willingness to participate in neighbourhood safety initiatives.

Moreover, the level of education and occupational status are frequently linked to political efficacy and awareness of public policy initiatives, potentially increasing participation (Solhaug, 2006). Previous research findings concerning gender and income exhibit inconsistency across various contexts. Although there was research on civic engagement, there is still inadequate empirical research investigating the impact of demographic variables on participation in the AI smart policing framework, specifically in urban areas that rely on tourism.

2.3. Summary of Gap

The existing literature offers significant insights into the theory of community policing and frameworks of smart governance systems. Previous studies have examined the impact of digital technologies on surveillance, administrative, and capabilities efficiency (Atobishi, Moh'd Abu Bakir, & Nosratabadi, 2024), and research on civic engagement highlighted that demographic factors determine public participation (Shamai, Abya, & Ebrahimi, 2015). Nevertheless, these literatures are frequently analysed separately, thus leading to limited integration between the technology-driven policing models and demographic participation dynamics.

Moreover, studies investigating the impact of demographic characteristics on community participation in AI-enabled smart policing initiatives is notable underdeveloped, especially in urban economies reliant on tourism (Cina, Elbasi, Elmazi, & AlArnaout, 2025). Many studies on smart policing prioritise technological efficacy over participatory governance frameworks (Ishrat, Khan, Faisal, & Ansari, 2025; Kaiser, 2024). Addressing this gap is important for formulating targeted policy strategies that improve community engagement and enhance the sustainability of technology-supported systems of crime prevention.

2.4. Research Hypotheses

This study proposed that (1) the implementation methods integrated with the Smart Safety Zone 4.0 project increased the levels of public participation; (2) public engagement in proactive crime prevention achieves significant levels; and (3) demographic variables such as age, gender, marital status, education levels, occupation, household size, income, and community roles affect participation levels among various population groups.

3. METHODOLOGY

3.1. Methodological Design

This research applied a mixed methods approach, integrating quantitative and qualitative methods to investigate community involvement in the Smart Safety Zone 4.0 project located in Phuket province. The quantitative methods utilized a cross-sectional survey to evaluate levels of community participation, implementation strategies, and demographic variables influencing community involvement in crime prevention. Moreover, the qualitative methods focused on group discussions, documentary research, in-depth interviews, and developing enhancement strategies. The mixed methods enabled triangulation of findings and provided an extensive understanding of the subject. This

research was conducted within the jurisdiction of Phuket Provincial Police Station, chosen for its high satisfaction ratings under the Region 8 Command and its effectiveness in proactive crime prevention efforts. The study duration was over six months, from June to November 2023.

3.2. Sample Design

The target market within the Smart Safety Zone 4.0 project included local administrative organization members, government business representatives, executives from private and government sectors, law enforcement officers, media professionals, and community leaders. For quantitative research, the sample size was calculated using (Cochran, 1977) with a population proportion (P) of 0.5, a standard normal value (Z) of 1.96, and a margin of error (e) of 0.5, resulting in a total of 385 respondents. To account for potential incomplete responses, the final sample size was set at 400. Multi-stage sampling relied on voluntary selection to involve the "Big 6" stakeholder groups, which include police officers, citizens, local administrative officials, private sector representatives, government agencies, and media, by sharing project information across different organizations and communities. For the qualitative component, targeted sampling selected 15 key respondents from diverse stakeholder viewpoints, each with at least three years of experience with Smart Safety Zone 4.0 or smart city activities from 2017 to 2024. Key informants included researchers, senior and operational police officers, politicians, local executives, corporate representatives, media personnel, community leaders, and tourists who used the project services.

3.3. Data Collection and Instruments

The quantitative data collection used a structured questionnaire divided into four sections: socio-demographic information of respondents (9 questions), Smart Safety Zone 4.0 models for implementation (12 questions using 5-point rating scales), the public's engagement in proactive crime prevention (48 questions using 5-point rating scales), and suggestions for improvement (2 open-ended questions). The questionnaire was validated by three experts. For content validity, it achieved an Index of Item-Objective Congruence (IOC) of 0.80, within the acceptable range of 0.66 to 1.00, as stated by Rovinelli and Hambleton (1977). Reliability testing through a pilot study with 30 respondents resulted in a Cronbach's alpha of 0.85, exceeding the minimum threshold of 0.70 (Cronbach, 1951). Additionally, the qualitative data collection involved reviewing rules, laws, and publications from 2012 to 2022, conducting two-hour focus groups, and in-depth interviews with informants using unstructured conversation formats. Qualitative instruments underwent expert validation to ensure accuracy and appropriateness, with improvements made based on expert recommendations.

3.4. Data Analysis

Quantitative data analysis utilized descriptive statistics such as means, standard deviations, frequencies, and percentages to differentiate between implementation levels and participation patterns. Inferential statistical analysis employed t-tests and one-way ANOVA (F-tests) to investigate relationships between demographic factors and levels of public participation. Qualitative data analysis used content analysis approaches to carefully examine documentary sources, interview transcripts, and focus group discussions. Data synthesis combined information from multiple sources to derive integrated mixed-methods conclusions.

4. RESULTS

4.1. Descriptive Statistics

This mixed-methods study examined community engagement in the Smart Safety Zone 4.0 project through quantitative analysis of 400 survey responses and qualitative analysis via in-depth interviews with 15 key informants. All distributed questionnaires were received and considered complete, resulting in a 100% response rate from stakeholders within the jurisdiction of the Phuket Metropolitan Police Station.

Table 1. The socio-demographic of respondents (n = 400).

Variables	Category	Frequency	Percentage
Gender	Male	239	59.8
	Female	151	37.8
	Gender diverse (N/A)	10	2.4
Age Groups	Below 21 years	18	4.5
	22-30 years	104	26.0
	31-40 years	81	20.2
	41-50 years	75	18.8
	51-60 years	112	28.0
	Over 60 years	10	2.50
Education Level	Secondary/Vocational	94	23.5
	Bachelor's degree	231	57.8
	Postgraduate degree	38	9.5
	Other	37	9.2
Occupation	Government employee	217	54.3
	Private sector employee	67	16.7
	State enterprise employee	56	14.0
	Business owner	35	8.8
	Other	25	6.2
Monthly Income (THB)	Below 10,000	50	12.5
	10,001-30,000	213	53.3
	30,001-50,000	123	30.8
	Above 50,001	14	3.4

Table 1 shows 59.8% of the respondents were predominantly male and possessed high educational qualifications, with 57.8% of participants holding bachelor's degrees. The age distribution was dominated in the 51–60-year group (28.0%) and the 22–30-year group (26.0%). Government employees represented the main occupational category at 54.3%, while middle-income earners, defined as those earning between 10,001 and 30,000 THB, made up the majority at 53.3%.

4.2. Assessment of Smart Safety Zone 4.0 Implementation

The assessment of Smart Safety Zone 4.0 implementation revealed a consistently high level of effectiveness throughout each of the analysed dimensions ($M = 4.02$, $SD = 0.753$).

Table 2. The assessment of smart safety zone 4.0 implementation effectiveness (n = 400).

Implementation Dimension	Mean	SD	Assessment Level
Project Establishment	4.04	0.770	High
- Cooperation and support from agencies	3.98	0.886	High
- Stakeholder identification	4.08	0.889	High
- Resource mobilization	4.13	0.806	High
- Communication and public relations	3.99	0.905	High
Project Mobilization	3.94	0.853	High
- Plan Clear and Comprehensive	4.05	0.916	High
- Resources and budget	3.73	1.035	High
- Application and technology	4.06	0.921	High
Project Implementation	4.03	0.801	High
- Efficiency Implementing	4.11	0.872	High
- Collaboration between Government and Citizens	3.99	0.905	High
- Success in reducing crime	4.00	0.864	High
Project Evaluation	4.06	0.822	High
- Effective monitoring	4.10	0.889	High
- Clarity and accuracy of success	4.03	0.867	High
- Overall summary	4.02	0.753	High

Table 2 demonstrates a consistently high level of implementation effectiveness across all dimensions of Smart Safety Zone 4.0 ($M = 4.02$, $SD = 0.753$). Agency cooperation and support received the highest individual rating ($M = 4.13$), indicating effective collaboration among the "Big 6" stakeholders: police, citizens, local government, private sector, government organizations, and media. Technology component performance was robust ($M = 4.08$), with CCTV system effectiveness rated at ($M = 4.06$). The lowest score was for resource allocation ($M = 3.73$), reflecting ongoing budget disputes and the need for continuous focus from funding agencies and project administrators.

4.3. Community Participation Levels and Demographic Influences

The demographic analysis was conducted with eight variables to identify factors influencing community participation in crime prevention activities within the Smart Safety Zone 4.0.

Table 3. The demographic factors influencing the community participation in the prevention of crime ($n = 400$).

Demographic Variable	Groups Compared	F/t-value	p-value	Effect Size (η^2)	Means (M)	Post-hoc Results
Age Groups	Under 21, 22-30, 31-40, 41-50, 51-60, 61+	$F = 5.772$	0.000**	0.067	4.30, 4.10, 4.07, 3.97, 3.96, 3.07	Under 21 > 41-50, 51-60, 61+, 22-30, 31-40 > 61+
Marital Status	Single, Married, Divorced	$F = 3.180$	0.043*	0.024	4.09, 4.00, 3.75	Single > Divorced
Gender	Male, Female, Gender diverse	$F = 2.766$	0.064	0.014	4.07, 3.91, 4.06	No significant difference
Education Level	Secondary, Diploma, Bachelor, Postgraduate	$F = 2.429$	0.065	0.012	3.98, 4.09, 4.05, 3.76	No significant difference
Occupation	Government, State enterprise, Private, Self-employed, Agriculture, Fishing, Local government, Other	$F = 1.638$	0.112	0.016	4.07, 3.99, 3.92, 3.85, 3.79, 4.08, 4.19, 3.51	No significant difference
Income Level	<10K, 10-30K, 30-50K, >50K THB	$F = 0.255$	0.858	0.002	4.01, 4.03, 3.99, 3.89	No significant difference
Family Size	1,2, 3,4, 5,6, 7+ members	$F = 0.521$	0.761	0.004	4.00, 4.03, 3.95, 4.07, 3.97, 4.01	No significant difference
Community Position	Leader versus Non-leader	$t = 0.834$	0.411	0.002	4.02, 3.90	No significant difference

Note: *Significant at $p < 0.05$, **Significant at $p < 0.01$.

Effect Size Interpretation (Cohen's Criteria):

- $\eta^2 = 0.01-0.05$: Small effect.
- $\eta^2 = 0.06-0.13$: Medium effect.
- $\eta^2 = > 0.14$: Large effect.

Table 3 indicates that age and marital status had a significant impact on involvement from communities in crime prevention activities. Age, indicating ($\eta^2 = 0.067$), was the most notable effect, with younger respondents showing greater participation compared to older groups. A decreasing trend in participation was detected with advancing age, with high levels for individuals under 21 ($M = 4.30$) and lower levels among those over 61 ($M = 3.07$). Interestingly, single respondents showed greater participation compared to divorced individuals, indicating that familial circumstances influenced participation levels. Conversely, demographics such as education, gender, income, and occupation showed no significant effects, indicating that effective technologically driven methods of involvement effectively crossed limitations in conventional socioeconomic factors.

Moreover, the mean participation scores for each subgroup were also presented to facilitate interpretation of differences across demographic categories. The analysis of demographic factors revealed that age and marital status significantly influenced ($p < 0.05$) community participation in the prevention of crime. Higher participation levels ($M = 4.30$) were demonstrated by younger respondents; meanwhile, lower participation levels ($M = 3.07$) were demonstrated by older respondents. Similarly, single individuals exhibited higher participation ($M = 4.09$) compared to divorced respondents ($M = 3.75$), suggesting that family status influences engagement in crime prevention activities. In contrast, other demographic variables such as gender, income, education level, community position, and family size reported no statistically significant differences ($p > 0.05$), signifying that technology-driven mechanisms may surpass the traditional socioeconomic barriers.

Table 4. The limits and challenges for public collaboration with law enforcement in crime prevention ($n = 400$).

Problems and Obstacles	Agree	%	Disagree	%
Police-Community Relations				
Citizens exhibit unfavorable perceptions of the police	124	31.0	276	69.0
Police are neither proactive nor responsible in serving the people.	43	10.8	357	89.3
Primary Barriers to Participation				
Citizens have less awareness of the roles and responsibilities of police in crime prevention.	213	53.3	187	46.8
Citizens are busy with work and family, hence leaving no time for cooperation.	178	44.5	222	55.5
Citizens lack awareness and understanding regarding crime prevention.	174	43.5	226	56.5

4.4. Barriers to Police-Community Cooperation

Table 4 showing favourable police community relations as 69.0% of respondents disagree with the theory that community show negative attitudes toward police, with 89.3% against the concept that police are not responsive towards public needs. Nonetheless, main challenges to public participation are still present. The main issues identified as limited understanding among citizens regarding the roles of police in crime prevention, with a 53.3% agreement percentage. This followed by respondents' responsibilities for family any job at 44.5% and a lack of sufficient knowledge about crime prevention at 43.5%. The findings reported even though trust in police is existed, barriers such as time information, constrains and gaps could prevent the community involvement in crime prevention efforts.

4.5. Qualitative Findings

Three main themes were established from the qualitative analysis of in-depth interviews and focus group discussions: (1) the integrated network approach, which emphasizes "Big 6" collaborative networks; (2) the difficulties associated with technology integration, such as financial limitations and technical complexity; and (3) community engagement tactics that call for proactive outreach and culturally sensitive communication techniques. Inter-agency integration was regularly ranked as the top priority in enhancement proposals from stakeholders, followed by improved collaboration tactics as a crucial secondary goal, and the development of good police attitudes as a fundamental basis for long-term project improvement.

5. DISCUSSION

5.1. Key Findings Interpretation

This mixed-methods research effectively accomplished three objectives and explored ten hypotheses related to implementing Smart Safety Zone 4.0 in Phuket Province. The study analyzed: (1) models and methods of implementation, (2) public engagement and challenges in effective crime prevention, and (3) strategies for improving participation efficiency through technology integration.

As a framework for multi-stakeholder crime prevention partnerships, the "Big 6" collaborative model is validated by its continuously excellent implementation effectiveness ($M = 4.02$, $SD = 0.753$). Community Policing Theory is

supported by the highest scores for collaboration between agencies ($M = 4.13$), which show effective cooperation among police, citizens, local government, the private sector, the government, and the media (Ratchakaew & Yupas, 2023).

Hypothesis testing indicated notable demographic influences on participation. The notable differences in participation based on age ($F = 5.772$, $p = 0.000$) indicate critical implications for the development of engagement strategies. Younger participants exhibited higher engagement levels ($M = 4.30$ for those under 21 years) in contrast to older participants ($M = 3.07$ for those over 61 years), thereby rejecting Hypothesis 4 and affirming age as a predictor of participation. Single participants exhibited significantly greater engagement compared to divorced individuals ($F = 3.180$, $p = 0.043$), thereby rejecting Hypothesis 5 and supporting the applicability of Crime Triangle Theory (Cohen & Felson, 1979) in community policing contexts.

Moreover, the hypotheses for numbers 3, 6, 7, 8, 9, and 10 proved that education, gender, occupation, family size, community background, and income do not affect community involvement. These findings contrast with conventional expectations that effective participation strategies surpass demographic barriers. Persistent communication barriers include 53.5% misunderstanding of the roles of police and 45.3% insufficient knowledge of crime prevention. Therefore, this suggests that technological solutions should be combined with social engagement strategies.

5.2. Previous Study Comparison

These findings aligned with research by Jermrod (2019) focusing on citizen engagement in Nakhon Si Ayutthaya, indicating that educated populations exhibit increased safety engagement when given appropriate platforms. The involvement trends accompanied by age manifest the findings from international smart city research by Tutak and Brodny (2023) that strengthen the link between technology and community engagement. However, the lack of gender-based involvement differences challenges existing in the literature of community policing (Skogan & Hartnett, 1999), showing that technology could remove conventional gender barriers. The increased levels of trust in police (89.3% had rejected the perceptions of lack of responsiveness), in contrast to previous literature on challenges to police legitimacy, highlight the presence of contextual factors with a tourism-driven economy in Phuket.

5.3. Study Limitations

The generalizability of the results is affected by three methodological limitations. The emphasis on Phuket province was categorized by its cultural diversity and tourism-dependent economy, limiting the significance of other provinces in Thailand that have distinct economic frameworks. Moreover, the cross-sectional design evaluates manners during project implementation, resulting in novelty effects with increased satisfaction scores. The purposive sampling method may include stakeholders with prior community engagement experience, which leads to an overestimation of the general population's willingness to participate.

5.4. Practical Implications

The results provide evidence-based recommendations for the expansion of Smart Safety Zone 4.0 throughout Thailand. Law enforcement agencies have to focus on addressing knowledge gaps via targeted communication initiatives, while also leveraging existing trust foundations. The "Big 6" collaborative model offers a comparable framework for multi-stakeholder crime prevention collaboration, which is particularly beneficial for resource-limited implementations involving age-stratified engagement strategies.

6. CONCLUSION AND POLICY IMPLEMENTATION

In summary, this research analyzed the dynamics of implementation and participation in the Smart Safety Zone 4.0 project in Phuket province through a mixed-methods approach. The findings demonstrate improved participation levels and efficient coordination among multiple stakeholders via the 'Big 6' collaborative network. Age and marital

status significantly impacted participation, with younger individuals showing higher engagement. While perceptions of police responsiveness are favorable, significant knowledge gaps regarding crime prevention duties and obligations still exist. Furthermore, policy should focus on civic capacity-building rather than infrastructure development in technology-enabled policing. In partnership with local universities and vocational institutes, police agencies could provide older citizens with targeted digital literacy seminars to boost interaction with AI-enabled reporting tools. Campaigns aimed at clarifying community understanding, including multilingual infographics, partnerships within the tourism sector, and applications for mobile devices, must be implemented to address misconceptions about police responsibilities. Provincial authorities are supposed to institutionalize stakeholder coordination by implementing quarterly multi-sector forums within the "Big 6" framework to maintain involvement and mechanisms for feedback.

Future research should employ longitudinal designs to assess sustainability and behavioral changes over time. Comparative analyses among provinces with different economic frameworks would improve generalizability. Furthermore, comprehensive cost-benefit assessments of AI surveillance and digital integration are essential for evaluating resource efficiency and guiding national policy decisions regarding investments in smart safety.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

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