

# Bridging the knowledge divide between public and experts using PGIS for land use planning in Malaysia



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## ARTICLE INFO

### Article history:

Received 23 September 2016

Received in revised form

10 February 2017

Accepted 1 March 2017

### Keywords:

Lay/expert divide

Knowledge gap

Barriers to public participation

Participatory GIS

Malaysia

## ABSTRACT

Ineffective public participation in land-use planning contributes to the lack of communication and understanding between the public and experts, acting as a barrier to successful planning outcomes. In this study, we assess whether Participatory GIS (PGIS) is a suitable method to bridge the communication gap between the public and expert knowledge for planning in the developing country context of Malaysia. Through a mixed methods approach, we investigate whether expert knowledge converges or diverges with the public's perceived knowledge obtained through a PGIS process and assess the potential benefits of PGIS from public and expert planning perspectives. The results indicate more convergence than divergence in knowledge and perspective, indicating that a PGIS process can communicate local knowledge to planning authorities to inform land use and development planning in Malaysia. Both the public and planning experts recognize the potential benefits of PGIS, but successful implementation will require major changes in traditional Malaysian public participation processes.

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## 1. Introduction

Successful planning outcomes are often achieved when a decision-making process utilizes both expert and local knowledge. Insights provided by the public are important for generating successful planning outcomes (Kasemir, Jager, Jaeger, & Gardner, 2003) and can harness “wisdom of crowds” to inform complex land use planning activities (Brown, 2015, p200). However, experts have often viewed local knowledge as inferior and irrelevant due to its apparently subjective, controversial, and unstructured nature (Golobic & Marusic, 2007). Planning has traditionally relied heavily on technical and scientific approaches to find solutions to land use planning problems. As an alternative to this expert approach, Friedmann (1993) promoted a “non-Euclidian planning mode”, a non-engineering and human relations approach wherein planners embrace humility and accept that knowledge offered by the general public is a valid type of knowledge. However, professional planners

have been traditionally skeptical about the public's ability to contribute to land use planning, a basic conflict in knowledge paradigms wherein one body of knowledge is derived from technical and scientific background while the other is generated from everyday living experiences. These different knowledge paradigms can result in poor and ineffective communication, creating a divide between experts and the lay public in land use planning processes.

This knowledge divide affects planning outcomes. Friedmann (1993) recognized that the communication gap between planners and stakeholders was the main reason for the lack of trust in planning and poor acceptance of plans among target groups. With this communication gap, the development and implementation of plans and policies based on expert knowledge excludes local knowledge that can help solve real problems faced by residents. Public dissatisfaction with planning outcomes can result in the public losing interest in future planning processes, further eroding trust in planning authorities and widening the communication gap. Thus, there is a need to bridge the knowledge gap between the public and experts by implementing more effective methods of public participation (Maidin, 2011; Marzuki, 2015). Participatory mapping has emerged as a potential method that can bridge the communication gap by focusing both experts and the public on the

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spatial dimension of planning.

Participatory mapping incorporates local participation to identify and develop spatial information, providing a way to engage local resource-users and stakeholders in data gathering and natural resource management (Craig, Harris, & Weiner, 2002; Dunn, 2007). Early local engagement through participatory mapping can also improve community trust and local buy-in regarding both the validity of the data created and of management actions, integrating local and 'indigenous' knowledge with scientific or 'expert' data (Dunn, 2007). There are various approaches to participatory mapping, from ancient methods like sticks and dirt to the Internet crowd-sourcing and geographical information system (GIS) (Corbett, 2009). Participatory GIS (PGIS) is a contemporary form of participatory mapping that uses GIS technologies.

Similar to PGIS, the term Public Participation GIS (PPGIS) has also been commonly used in the literature. According to Brown and Kyttä (2014), both PPGIS and PGIS support the inclusion and empowerment of individuals and communities that have not been traditionally involved in urban or rural planning. The difference between PPGIS and PGIS is largely due to the global context where the methods have been developed and applied. PPGIS has its origin in developed countries where it focuses on enhancing the participation process with spatially-explicit information to improve the quality of planning and management decisions using digital, internet-based mapping techniques whereas PGIS has been used more in developing countries as a form of community empowerment and the development of social capital using simpler and non-digital mapping technology (Brown & Kyttä, 2014). Furthermore, PPGIS often involves probability sampling of individuals as participants, often through household surveys or interviews, to ensure population representativeness and involvement of the "silent majority" (Brown & Kyttä, 2014, p126). In contrast, PGIS often uses purposive sampling to ensure that key stakeholders such as community leaders are included in the mapping process (Brown & Kyttä, 2014).

Though some scholars argue that the conventional GIS tends to exclude certain groups and knowledge (Obermeyer, 1995), PGIS/PPGIS allows local knowledge from communities to be used in decision-making. It offers "the ability for the process of spatially investigating an issue to yield positive returns in terms of group dynamics, consensus building, and joint planning" (Schlossberg and Shuford, 2005, p 16). Further, PGIS/PPGIS is known as a method for integrating lay knowledge of spatial arrangements into expert knowledge. According to Brown (2012), the integration of lay knowledge from PGIS/PPGIS in conventional planning process is a "normative aspiration for deeper public participation and impact in the planning process" (p. 8). For PGIS/PPGIS to have more impact and implementation potential, experts from planning authorities must be more committed to involving the public in the spatial planning processes (Brown, 2012). However, public participation in spatial planning faces challenges such as low level of public engagement because of the expert-lay divide, often preventing planning agencies from using PGIS/PPGIS (Brown, 2012). This begs the question: does PGIS/PPGIS have the capacity to bridge the gap between expert knowledge and local knowledge?

In this study, we investigate the similarities and differences between two knowledge paradigms by comparing general public and professional planners' views and opinions on two subjects: barriers to public participation and the potential benefits of using PGIS. This study explores whether PGIS has the potential to bridge the knowledge divide between the public and planners by answering the following research questions: 1) *to what extent is the public and expert's knowledge consistent on the general barriers to participation*, and 2) *to what extent is the public and expert's knowledge consistent on the potential benefits of PGIS?*

## 2. Study area and method

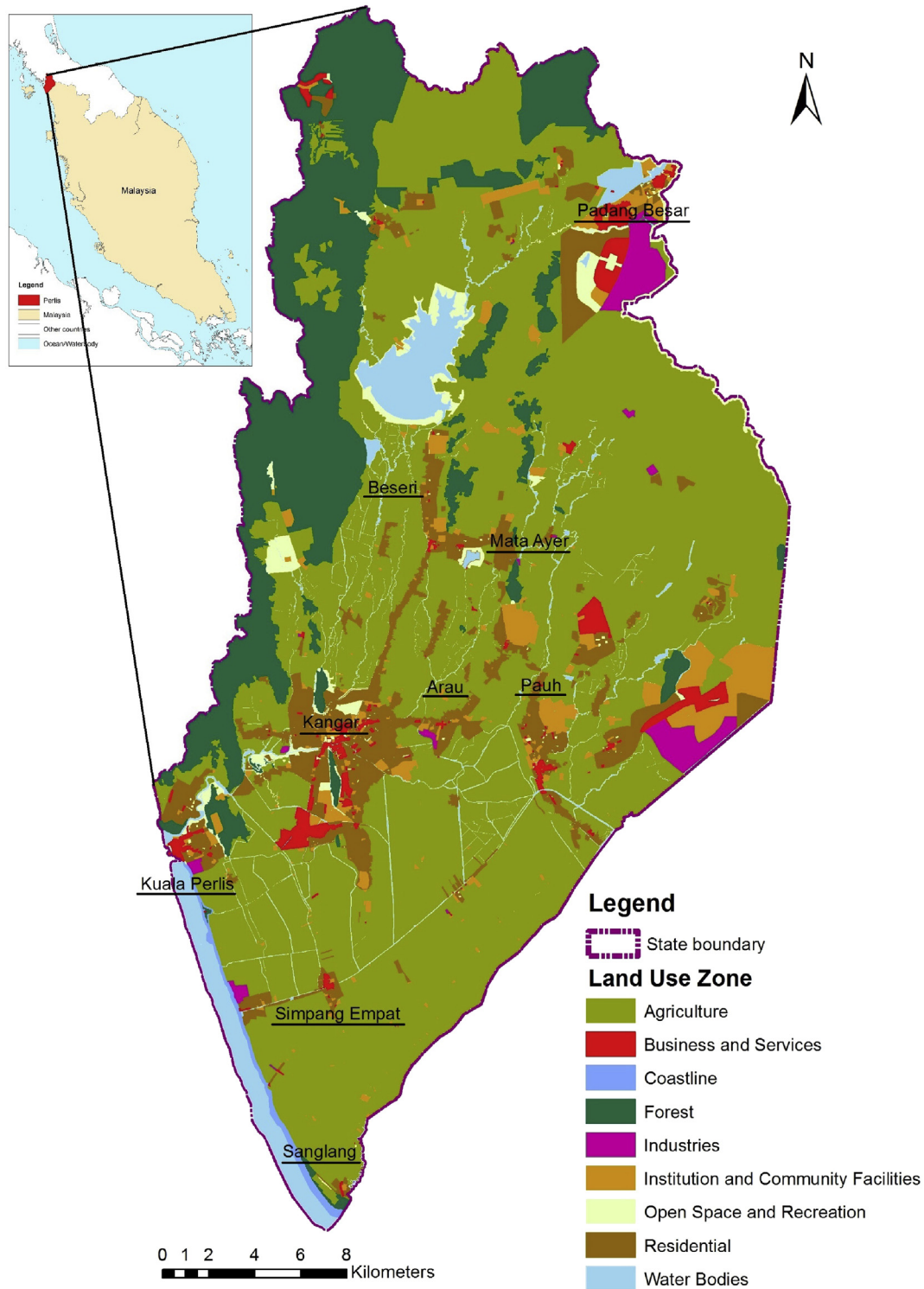
### 2.1. Study context

Our study focuses on the public participation process used in the preparation of the local land use plan for the State of Perlis, Malaysia (Fig. 1). We use the term PGIS hereafter to refer to the participatory mapping methods used in this study given the geographical context and the use of purposive sampling as the primary means for data collection. The State of Perlis is situated in the north of Peninsular Malaysia, comprising an area of 821 km<sup>2</sup> with a population of about 240,000. This state is bordered by the country of Thailand to the north, the State of Kedah to the south, and the Straits of Malacca to the west. The state is zoned for a wide range of land uses, including high density urban areas with commercial, residential, industrial, and community facilities, and non-builtup areas containing forest, agriculture, and water bodies. Current land use in the study area is dominated by agriculture (54,560 hectares) and forestry (12,179 hectares) (Town and Country Planning Department, 2009).

Preparation of the local plan was under the responsibility of three government agencies: the State Town and Country Planning Department, the Northern Zone Project Office (PPZU), and the Kangar Municipal Council. PPZU is responsible for preparing multiple development plans (including the State Structure Plan, Local Plan, and Special Area Plan) for the States of Perlis, Kedah, and Penang. Due to its small size, the State of Perlis falls under the jurisdiction of only one local authority, the Kangar Municipal Council (MPK). The development policies of the local plan were congruent with the Perlis Structure Plan 2030 vision – The City-State of Perlis – to internationalize the State of Perlis through a strong regional economic foundation that offers high quality of life within a sustainable environment (Kangar Municipal Council, 2011).

The Kangar Municipal Local Plan 2009–2020 was prepared according to the Town Planning Act (Act 172). This Act requires public participation involving the local communities prior to the commencement of any Structure Plan or Local Plan. The Act recommends inclusion of an early participation process to seek comments on local issues from residents and other stakeholders. However, the participation approach used during plan preparation was restricted to completing an objection form during a public exhibition and attending a public hearing session, which failed to engage the public effectively (Kangar Municipal Council, 2011). Previous studies show that the low level of public involvement in land use planning in Malaysia was due to the lack of detailed information, lack of public awareness, and limited government initiatives to promote effective participation (Omar & Leh, 2009). Vague legislation and loose enforcement of public participation requirements (Maidin, 2011; Marzuki, Hay, & James, 2012) also contribute to the structural and operational shortcomings of the public participation (Dola & Mijan, 2006; Marzuki et al., 2012; Kaswasmila and Songorwa, 2009). The existing participation approach suggests "tokenism" (Arnstein, 1969, p217) involving limited and one-way communication. We argue that the lay/expert divide is exacerbated by a public participation process that is passive, with limited scope for engagement, and is non-spatial.

As a potential pathway to more effective public participation in Malaysia, this study investigates the similarities and differences between two knowledge paradigms (expert and lay) in public participation by comparing the results from a public survey with planners' perspectives on two subjects: the barriers to more effective public participation and the potential benefits of implementing a PGIS process that provides for spatially-explicit information about current and prospective land use.



**Fig. 1.** The study area and its land uses in Perlis, Malaysia. Names underlined on the figure indicate localities from where participants were recruited.

## 2.2. Research design

The research was designed with three stages of data collection. In the first stage, information on the general barriers to public participation was obtained from the perspective of planning experts through face-to-face interviews. In the second stage, we implemented a PGIS process that included web-based participatory mapping of land uses by study participants (public). The online

PGIS process included text-based survey questions pre- and post the online mapping activity. The mapping activity collected spatial information about place values and land use preferences from the general public; the text-based survey questions assessed opinions by the public on the benefits of PGIS. In the final stage, after collecting the mapping data from the public and comparing these results with land use zones previously developed by planning experts, the PGIS mapping results were presented to the same

planning experts interviewed in Stage 1 to obtain their views and reflection on the potential benefits of PGIS (Fig. 2).

To assess PGIS as a potential mechanism for bridging the knowledge gap between the public and experts, we adopted a mixed-methods convergent parallel design (Creswell & Plano Clark, 2011) that compares quantitative and qualitative data. The convergent parallel design is particularly useful in developing a more complete understanding of a research problem by obtaining different but complementary data for validation. We used two different approaches to address our research questions. As illustrated in Fig. 2, the quantitative and qualitative components of the study were conducted independent of each other, and then brought together to inform interpretation.

### 2.3. Participants

This study utilized a non-probability, purposive sampling approach to recruit study participants given the challenges of implementing probability-based sampling in a developing country context (Brown & Kytä, 2014). As the study aims to explore the consistency of knowledge between lay people and experts, two types of participants were identified: the public and planning experts. Participants representing the public group were limited to Perlis residents, and were recruited using two modes, referred to as "facilitated" and "self-administered". Facilitated respondents were approached by the researcher in public spaces including cafés, restaurants, and at community events in nine locations in the State of Perlis. This includes six urban (Kangar, Kuala Perlis, Arau, Padang Besar, Beseri and Pauh) and three rural (Simpang Empat, Sanglang, and Mata Ayer) localities (see Fig. 1). All Perlis residents aged 18 and over were eligible for participation. This

resulted in 292 participants (out of 400 recruitment contacts). The facilitated group completed the web-based PGIS mapping activities and the pre- and post PGIS surveys in the researcher's presence. This PGIS mode was considered an appropriate method given that a web-based spatial survey is considered a novelty in the study area and administering the PGIS face-to-face allowed the researcher to explain, monitor, and provide technical assistance, especially during the mapping component of the process. The self-administered participants were recruited using social media. A Facebook® page was created containing information about the study with a URL link to the study website. In total, 48 Facebook users accessed the study website and 24 individuals completed the web-based PGIS mapping and pre- and post PGIS survey questions without any direct interaction with the researcher. In total, 316 residents from Perlis participated in the PGIS process between August and November 2014.

Participants representing the expert group were identified based on their positions as planning officers in their respective agencies and their direct involvement in the preparation of the Local Plan. In total, five (5) planning officers were considered as experts in this study: a Senior Planner from the State Town and Country Planning Department, two Planners from the Kangar Municipal Council, and two Senior Planners from the Northern Zone Project Office.

### 2.4. Data collection procedures

#### 2.4.1. Data from the public participants

A participatory mapping website was developed and implemented to capture spatial information related to place values and development preferences from public participants (both facilitated

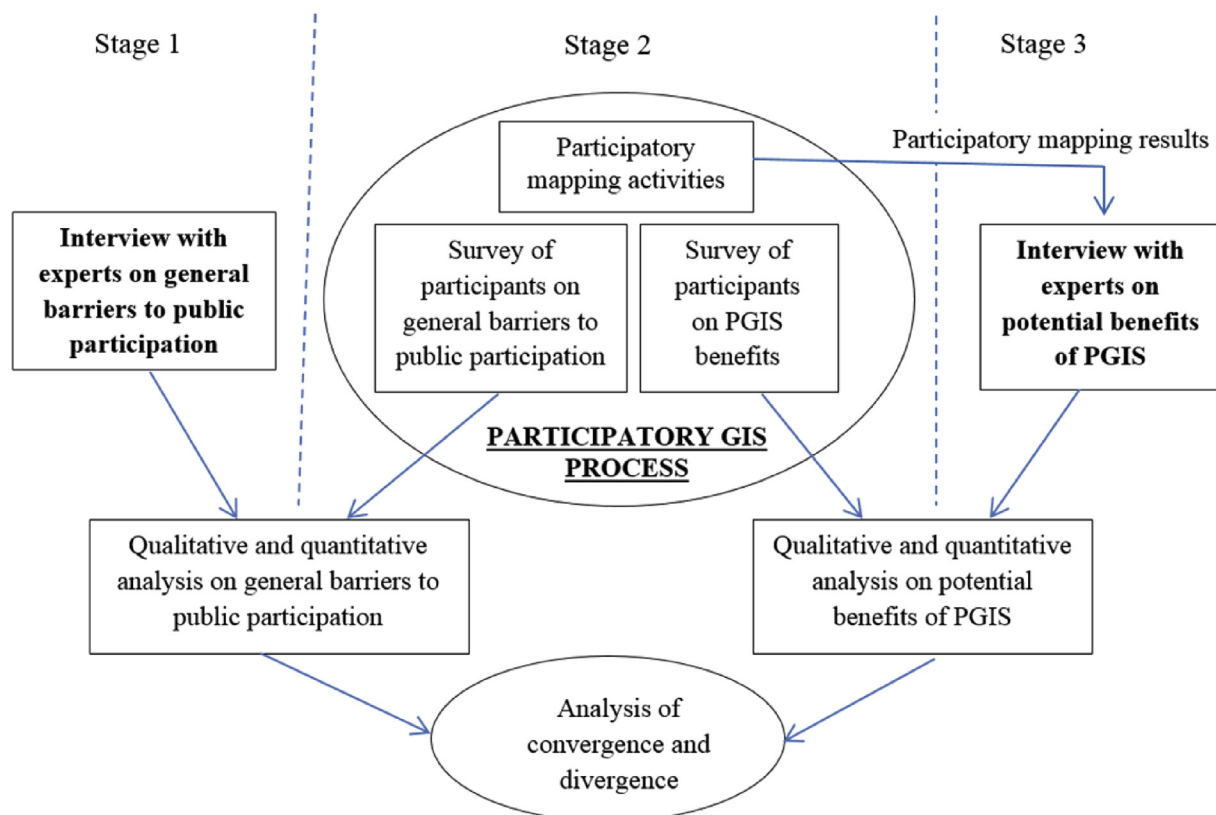


Fig. 2. Research design (adapted from Creswell & Plano Clark, 2011).



and self-administered). For the mapping component, participants were guided on how to use a Google Maps tool to place markers representing place values and development preferences that are similar to existing land use zones in the Local Plan generated by the planners. Participants also completed two text-based surveys, pre- and post the mapping activities. The pre-mapping questions focused on the general barriers to public participation in land use planning in Malaysia from five dimensions: attitudes towards public participation, lack of knowledge by the public, lack of effort to encourage participation from the government authority, trust issues, and exclusion from the participation process (see Table 1 in the Results section for the survey questions). Participants responded whether they agree or disagree with each statement on a five-point Likert scale ranging from strongly agree to strongly disagree. The survey also collected some basic demographic information about the participants including age, gender, educational background and employment status.

The post-mapping survey questions consisted of statements designed to capture participants' perceptions on the potential benefits of PGIS implementation, including its effectiveness, public involvement, quality, contributions as well as anonymity concerns (see Table 3 in the Results section for the survey questions). Participants responded to each statement on a five-point Likert scale ranging from strongly agree to strongly disagree.

#### 2.4.2. Data from the expert interviews

Two sets of interviews were conducted with the five planning officers to identify their perceptions and opinions about public participation for land use planning. The first interview focused on current public participation practices and the identification of barriers that contribute to low participation rates. Open-ended questions were designed to encourage interviewees to describe their experiences in the preparation of the Local Plan and the extent of their involvement in the public participation process. This set of interviews did not refer directly to PGIS. The sequence of questions used during the interviews was as follows:

- What is the current status of public participation in Perlis?
- How would you describe the overall level of public participation?
- What sorts of issues always arise related to public participation?
- What are your thoughts regarding the public's capability to contribute to the preparation of a local plan?
- Do you think current public participation practices educate and inform the public about land use?
- Do you think that the level of public participation in Malaysia is related to trust in government?

The second set of interviews with the same five planning officers was conducted by presenting them with the PGIS mapping data from public participants to compare with land use zones developed by the planners. We began the interview with each planner with the question: *based on the participatory mapping data presented, what are your thoughts on PGIS as a public participation process for land use planning in Malaysia?* To further investigate their views on the potential of PGIS, the planning experts were also asked the following questions:

- What role should PGIS play in the actual decision outcome?
- Do you think the participatory mapping data collected can increase the quality of land use decision-making in Malaysia?
- Do you think with PGIS, the public has the capacity to contribute important knowledge about land use?
- At what stage of planning do you think PGIS would be most beneficial if adopted in Malaysia?

#### 2.5. Data analysis

The survey data from the public participants were analyzed using simple descriptive statistics. These data were summarized in three categories and presented as a percentage of the total number of participants that *Strongly Disagree or Disagree*; *Neither Agree nor Disagree*; and *Agree or Strongly Agree*. Analysis of the participatory mapping data was also conducted to assess the quality of the PGIS data using the criteria of logical consistency with the existing land use zoning. Given that the aim of this paper is to assess whether PGIS offers a suitable mechanism to bridge the communication gap between public and expert knowledge, only a summary of participatory mapping results is included in this paper that was presented to the planners before interviewing them in the third stage. The results indicated that: 1) the mapped spatial attributes (i.e., place values and development preferences) were generally consistent with the expert-driven land use zoning; and 2) the facilitated PGIS results produced better mapping outcomes compared with self-administered PGIS method.

The qualitative interview data from the planners were analyzed and coded into themes and sub-themes. A four-step analysis process was designed to ensure that patterns and themes that emerged from the interview data could be validated. These steps included transcribing the notes from the interviews; coding the data with key words as a way of identifying commonalities and variations; identifying common and variable patterns within each group and across groups; and identifying themes that link to or explain the data (Miles, Huberman, & Saldana, 2014; Patton, 1990).

After analyzing the quantitative survey data from the public participants and the qualitative interview data from the experts, the results were compared and interpreted to identify areas of convergence (similarity) and divergence (difference). Convergence occurred when the interpretation of the quantitative and qualitative results were similar.

### 3. Results

#### 3.1. Knowledge about general barriers to public participation between the public and experts

##### 3.1.1. Survey results from public participants (Quantitative)

A total of 306 individuals participated in the study by placing PGIS markers inside the study area and completing the post-mapping text-based surveys (284 facilitated and 22 self-administered participants). In the facilitated PGIS group, 85% of the participants were between the ages of 21 and 50, and over 90% of the self-administered participants were between the ages of 21 and 40. There was nearly equal distribution between male and female participants in both groups and more than half of the facilitated participants (54%) had a secondary school qualification, while about two-thirds of self-administered participants (66%) had at least a diploma or Bachelor's degree. The largest category of employment for participants were jobs in the public sector.

A majority of participants (from 80% to 98%) agreed or strongly agreed that several factors have acted as barriers to public participation (Table 1). Over 80% of participants acknowledged that the "Don't care" attitude of the public contributes to the low participation rate while about 9% did not agree this attitude was a barrier to public participation. A large portion (74%) of participants agreed that low public participation in land use planning may be due to technical knowledge requirements, a finding reinforced by participant perception that planning authorities do not believe the public has the required knowledge to make good land use decisions (87%). A large majority of participants (92%) agreed that planning authorities do not try hard enough to get the public involved in land

use planning. In terms of trust, about 98% of the participants agreed that the public could be trusted to make good decisions in land use planning, a level of trust that was higher than trust in planning authorities to make good decisions (90%). About 86% of the participants disagreed that land use planning should be done without public involvement.

### 3.1.2. Expert interview results (Qualitative)

Four themes emerged from the expert interview data indicating the existence of barriers to the current public participation process in Perlis. These include: 1) ineffective public participation process; 2) attitude, culture and locational barriers; 3) lack of knowledge and awareness; and 4) political ideologies (Table 2).

**Table 1**

Descriptive statistics on barriers to public participation reported by 316 participants.

	Strongly disagree or Disagree (%)	Neither Agree nor Disagree (%)	Strongly Agree or Agree (%)	Interpretation
<i>Public's attitude</i>				
• People do not participate in land use planning process because they do not care about land use planning outcomes.	9.3	10.6	80.1	Majority has a "Don't Care" attitude that leads to a low participation level.
<i>Lack of knowledge</i>				
• People do not participate in land use planning because it is too technical.	6.1	19.6	74.2	Majority think land use planning is not easy to understand; some were not entirely sure if this is the case.
• The authorities do not think the general public has enough knowledge to make good land use decisions.	7.0	6.4	86.6	Majority think that authorities believe in little knowledge to be gain from the public.
<i>Lack of effort</i>				
• The authorities do not try hard enough to get the public to participate in land use planning.	3.2	4.8	92.0	Majority believe the authorities are not trying to engage the public.
<i>Trust issues</i>				
• I trust the general public to make good decisions about future land use.	0.3	1.3	98.4	Majority are confident that the general public can provide useful information.
• I trust the planning authorities to make good land use decisions.	4.2	5.5	90.3	Majority trust the planners to generate good land use plans.
<i>Exclusion from participation process</i>				
• land use planning should be done by authorities without public participation. <sup>a</sup>	86.5	1.6	11.9	Majority strongly object to the notion of no public participation in land use planning process.

<sup>a</sup> Item is reverse coded.

**Table 2**

Qualitative themes and key responses regarding general barriers to public participation.

Theme	Key response	Interpretation
Ineffective public participation process	"... amongst the state in the north (Perlis, Penang and Kedah), Perlis had the lowest rate of public participation." "Exhibiting [the] zoning plan did not attract people to participate." "The exhibition [was] not at a good time for everyone." "... not even 1% out of the population came to the exhibition." "I would have to blame our ineffective publicity." "the public is reluctant to fill in the object form."	Planners claimed that the current public participation process contributed to low rate of participation, stressing that a more proactive public participation process is needed.
Attitude, culture, and locational barriers	"... culture plays a big role in public participation." "It's not that they oppose development but they want us to ask first ... they want to be recognized and their ideas [to be] appreciated". "high participation occurs more in urban areas with high education level." "Mentality of the people is what drives the success of any participation."	Factors such as people's attitudes, culture, and location barriers have contributed to low participation rate.
Lack of knowledge and awareness	"We need to present them things that they can relate [to] rather than presenting technical stuff." "... mostly personal issue is being brought up." "... all I can say is their awareness is low ... not just for land use planning, but for other programs as well." "People without a higher education level, especially the older generation, are always faced with difficulties in understanding the purpose of public participation."	Limited resources and effort in informing and educating the public to better understand the purpose of the plan and the importance of public participation.
Political ideologies	"If we were to look at geopolitical factors, the Malay dominated areas, though they sometime have strong opinions that tends to be personal related, they generally supported the government projects. However, if in an opposition -dominated areas like in Penang, there will be much that is not [supported]." "We made a publicity for the local plan in areas politically won by the opposition .... they were not interested as it [the local plan] is the government's project." "It's not that they oppose development but they want us to ask first ... they want to be recognized and their ideas appreciated."	Conflicting political ideologies have made the public reluctant to come out and support the development plans.

**3.1.2.1. Ineffectiveness of the current public participation process.** Planner A shared his experience of handling development plans in multiple states and revealed that “amongst the states in the north (Perlis, Penang and Kedah), Perlis had the lowest rate of public participation”. Planner B asserted that “not even 1% of the population [of Perlis] came to the exhibition”. Their experience indicated that the current public participation method in Perlis was not effective and may need to seek other approaches.

Planners acknowledged that the current participation approach failed to attract public interest. Planner C stated that:

*“Exhibiting the zoning plan did not attract people to participate ... the public is reluctant to fill in the feedback form ... I would have to blame our ineffective publicity.”*

Most of the planners believed that weak policies on public participation and a lack of flexibility to adapt to different situations resulted in a process that was conducted merely to fulfill legal requirements. Planner B said that the publicity program to promote the Local Plan was ineffective, especially during the preparation of the plan. Public participation needs to be more flexible and agencies given more options to engage the public and not be restricted by legislation or rigid policies. Planner E also questioned the current public participation policy for its lack of flexibility, especially related to time and venue:

*“We need to go back and plan with the public. Therefore, the participation and its publicity must fulfill the local residents’ needs. For example, if the participation process was conducted in areas where [the] majority are paddy farmers, [then] conduct the participation during the day.”*

Planner D stressed that the limited timeline of four weeks for publicity of the Local Plan also contributed to the low public participation rate stating that, “the exhibition scheduling was not good for everyone”.

The limited budget available for the agencies involved in the preparation of the Local Plan was also reported as a constraint to further explore alternative participation approaches. As Planner B stated:

*“We did it [the plan] to fulfill the public participation policies outlined by the act .... [but] with limited budget for publicity.”*

**3.1.2.2. Attitude, culture and locational barriers.** All planners repeatedly mentioned that local residents’ attitudes were a major challenge when conducting public participation in Perlis. Residents are generally not interested in any development in their area. Local residents would react only when they found that their own land was affected, which is typically after the plan was finalized and accepted by the government. This outcome and response was also identified in another study conducted in Langkawi Island, Malaysia (Marzuki et al., 2012).

In addition, culture and location also play a role in the success or failure of any participation process. In Perlis, 90% of the population are Malay; most are more reserved with introverted personalities compared to other areas that contain more mixed ethnicities like Penang or Selangor. According to Planner B:

*“Culture has a big influence in every aspect when it comes to planning activities with people. Comparing Perlis to other states that I have worked, the culture here is different.”*

However, not all Perlis residents are opposed to participation. As

Planner A stated, “It is not that they oppose development but they want us to ask them first ... they want to be recognized and their ideas appreciated.” The local residents want a participation approach that is more engaging and personal. Residents who live in the city were perceived as more willing to participate compared to village residents, as reported by Planner D.

**3.1.2.3. Lack of knowledge and awareness.** The reason for having a publicity program as part of the participation process is to inform people and create awareness about the development plan. However, the current approach used to publicize the Local Plan is ineffective as participants are asked to comment on proposed plans that they do not fully understand. Planner B raised concerns that the terminology and the technical jargon used in most of the planning documents makes the public lose interest. Planner E also stressed the importance for local residents to understand the plan prepared by planners. According to E:

*“We sometime use vague terms and construct statements that lack clarity. For example, the statement ‘a development policy: developing a prosperous city with a dynamic and complete infrastructure’ could raise more questions than answers, yes?”*

Planner B claimed the lack of a program to inform the public about the planning process is another factor leading to poor knowledge. B believed that a more interactive program with more use of technology would encourage participation, especially if the younger generation were made aware of the importance of being actively involved in land use planning. He also observed that “people without a higher education level, especially the older generation, are always faced with difficulties in understanding the purpose of public participation”. As such, B suggested to consider participants’ level of education to ensure that they understand the purpose of public participation. Planner A suggested the use of more focus groups with local residents and other stakeholders.

**3.1.2.4. Political ideologies.** Most of the planners mentioned the influence of political ideologies as a reason that the public is reluctant to participate. According to Planner B,

*“If we were to look at geopolitical factors, in Malay dominated areas, though people sometime have strong opinions that tend to be personal, they generally support the government projects. However, in an opposition-dominated area like in Penang, there will be much that is not [supported].”*

In contrast, Planner C believed that low participation was more connected to lack of awareness than different ideologies.

*“I don’t think public participation and political beliefs are related ... it is all about awareness from the beginning of the planning process. For example, if people do not know what a Local Plan and its purpose is, they will not go [to the public exhibition]”.*

Nevertheless, political influence can have indirect negative effects on public participation. For example, politics can lead to public cynicism about the planning process. As Planner C reported, it is generally far less difficult to work in areas where the public and government aspirations are aligned than in areas where there are political differences,

*“For example, in a situation where we wanted to develop an area where we know that the residents have different political ideologies than the government, their reaction towards our effort, especially during public exhibition, was disappointing. They tend to have the*

*"I don't care" attitude and labeled all development plans as government projects for their cronies."*

### 3.2. Knowledge on potential benefits of PGIS between the public and experts

#### 3.2.1. Public survey (Quantitative results)

A majority of participants (ranging from 92% to 99%) agreed or strongly agreed that there were potential benefits of PGIS (Table 3). About 92% of participants acknowledged that PGIS is an effective approach compared to traditional participation processes like exhibitions and public hearings. The survey also showed that about 95% of participants agreed or strongly agreed that PGIS is suited to increase public participation in land use planning. No participants disagreed with statements that PGIS could increase the quality of decision-making in land use planning while allowing the public to contribute vital local knowledge. Nearly all participants (99%) think the anonymity feature in PGIS would let them freely express their opinions without revealing personal information.

**Table 3**  
Descriptive statistics on the potential benefits of PGIS reported by 316 participants.

	Strongly disagree or Disagree (%)	Neither (%)	Strongly Agree or agree (%)	Interpretation
<i>Effective approach</i>				
• PGIS is an effective public participation approach compared to traditional participation approach.	0.3	7.7	92	Majority thinks that PGIS is an effective public participation approach.
<i>Increase involvement</i>				
• PGIS is a suitable tool to increase public involvement in land use planning.	0.6	4.9	94.5	Majority thinks PGIS can increase public participation.
<i>Increase quality</i>				
• PGIS could increase the quality of decision-making in land use planning.	—	5.1	94.9	Majority thinks PGIS can increase quality in land use decision-making process.
<i>Contribute and provide knowledge</i>				
• PGIS allows public to contribute vital local knowledge for land use planning.	—	2.3	97.7	Majority thinks PGIS can provide knowledge and assist the public in contributing information related to land use planning.
• PGIS can provide the public with knowledge related to land use.	0.6	2.9	96.5	
<i>Anonymity</i>				
• PGIS allows the public to express their opinions anonymously.	0.3	0	99.6	Majority thinks PGIS allows the public to participate without disclosing personal details.

#### 3.2.2. Experts' interviews (Qualitative results)

Rich narratives were provided by the planners about their views on participatory GIS based on the PGIS outcomes. The four key themes that emerged from the expert interviews were: 1) effectiveness of PGIS approach; 2) value of spatial information from the public; 3) improvement in decision-making; and 4) PGIS implementation in planning process (Table 4).

**3.2.2.1. The effectiveness of PGIS process.** All five planners expressed positive views and identified the effectiveness of PGIS. Planner B considered PGIS as "a very positive effort which has never been done before". Planner E called PGIS "one of the best alternative ways" for public participation. Planner A echoed this, saying that PGIS is "the answer to their questions on how to involve the public especially in preparing land use zoning".

Planner B stated that PGIS aligns well with the planning policy to increase public participation in land use planning. He even expressed how PGIS could benefit his work, especially when conducting public participation and publicity with a limited number of staff.

*"Currently I am working on Tangkak and Pontian Local Plan. We have one month to conduct the publicity. With 5 staff in my unit, we have to go around the whole district for talks. It would have been much better if this approach were introduced much earlier."*

Planners C and D highlighted the main feature of PGIS which is the use of icons that are "easy to understand ... with many people using smartphones nowadays". Planner E believed the use of icons to represent opinions or information was "presentable" and allowed the public to visualize the kind of information they contribute. Planner D also added that people are now leaning towards information technology with a user-friendly, easy-access approach. With PGIS, people can log onto the internet and "participate wherever and whenever". This can free people from time and locational constraints they currently experience in the public exhibition process.

PGIS was assumed to be cost-effective compared to the current process. Planner E emphasized that the integration of PGIS on a web-based platform reduces the logistical cost of the public participation process, adding that "a web-based public participa-

tion process is dynamic in nature, not only eliminating cost issues but also time constraints".

**3.2.2.2. The value of spatial information from the public.** All planners acknowledged that information about place values and development preferences provided valuable spatial information. However, the type of spatial information depends on the context of the study and the study area. Place values identified by the public were considered more valuable to planners compared to development preferences. As Planner B stated,

*"I am more inclined towards values than preferences. When we make plans, we see development in the 10 years to come. We are not only planning for this year but we are also planning for the next 50 years. We must also take into account national development policies, country, and region."*

According to Planner B, it could be problematic to rely on development preferences. People with vested interests could take advantage of their influential positions to dictate development



**Table 4**  
Qualitative themes and key responses by planners on the potentials of PGIS.

Themes	Key response	Interpretation
Effectiveness PGIS approach	"I see it gives a chance [for public to participate] as we were looking for the answer on how to increase public participate." "It is aligned with state planning [policy]." "easy to understand ... with many people using smartphones nowadays."	PGIS creates a new dimension for public participation by providing a user-friendly and flexible approach to contribute information on land use
Value of spatial information from the public	"Both [place values and preference] are equally important but need to depend on the situation and context." "I prefer public to give information based on values and not development preferences." "I think we have to remember that in our planning, we take into account the federal policy, the policy of the state and development policy of the area. So maybe there are some things the general public does not know."	The value and use of PGIS spatial information depends on the context of the issue or project, with spatial public values being more important than development preferences
Improvement in decision-making	"They [the planners] could develop a plan and let people evaluate their knowledge and decision-making skills ... whether they plan for fun or actually follow the principle of planning for the people." "As the agency-in-charge of the area, we need to identify the issue ... only then can we decide on what type of project is suitable for the area based on the public's view."	PGIS implementation can assist in improving the decision-making process.
PGIS implementation in planning process	"PGIS can be used at the early stage ... use for early information inventory." "At that [public exhibition] stage, it will add further complexity if the public were to be given second opportunity comment or object to the draft plan. With the draft considered at the final draft stage, I do not see why we still need the public's opinion ... It will be too complicated."	PGIS approach can be implemented at several stages during the plan preparation process.

projects within their area. Planner B added that while it is important that the public share their subjective values about place and non-specific preferences as local knowledge, "there are some things the general public still does not know".

**3.2.2.3. Improve quality of decision-making.** Planner A and D both considered PGIS a suitable approach to improve the government decision-making process.

*"Absolutely. This is what we want. We want to know how people's preferences compare to ours so as to minimize resistance from people. It [PGIS] acts as a check and balance for implementing sustainable planning to meet social needs."*

Planner D claimed that PGIS could "definitely" improve the early stages of the decision-making process. For example, before the planner decides the zoning type and the nature of the development project, PGIS could assist the planner in identifying important issues from local residents.

*"As the agency-in-charge of the area, we need to identify the issues ... then only can we decide on what type of project suitable for the area based on the public's view."*

Planner C believed that the local knowledge obtained from PGIS could be used to develop zoning plans with less public resistance. PGIS provides an opportunity to access a wider demographic of the public, especially the younger generation.

*"With this [PGIS] method, we can tackle the younger generation ... current approaches are for older adults and no longer suitable, even obsolete. Younger generations are less likely to join and participate ... we [adults] are less creative".*

**3.2.2.4. PGIS implementation in the planning process.** All the planners acknowledged that PGIS has the potential to be used in the early stages of the plan preparation process, especially during the

first discussions with local residents. The planners can utilize PGIS to seek local knowledge to help prepare their draft local plan.

However, there were more diverse views from the planners regarding whether PGIS implementation should be utilized at other stages of the planning process. For instance, Planner C was not keen to implement a PGIS during the public exhibition of the draft plan. According to C:

*"At that [public exhibition] stage, it [PGIS] will add further complexity if the public were to be given a second opportunity to comment or object to the draft plan. With the draft considered at the final draft stage, I do not see why we still need the public's opinion ... it will be too complicated."*

Similarly, Planner E did not see the benefits of offering the public the opportunity to make matters more complicated by using PGIS in the later stages of the planning process. Other planners, however, saw the advantage of having PGIS at multiple stages of participation. For example, Planners A and B suggested that PGIS could be used at two stages: the initial stage and the plan evaluation stage. Planner A said:

*"I would very much prefer if we have public participation for both of the stages. First, we collect to report the issues, problems, and potential. At this stage, people rarely comment on the actual development of the region. The public is more aware than the designer [planner]."*

### 3.3. Convergence and divergence between public and experts

**Table 5** summarizes the convergence (similarity) and divergence (difference) between the public and experts from both the quantitative and qualitative survey results.

In terms of convergence, both the public and the planners believe that the current public participation processes like public briefings, exhibitions, and newspaper notices were not effective. The planners believed that the negative attitudes of the public

**Table 5**

Summary of convergence and divergence between lay and experts.

	Lay knowledge (Quantitative)	Expert knowledge (Qualitative)
Convergence	<ul style="list-style-type: none"> <li>• 80% of the public think that negative attitudes lead to low participation levels</li> <li>• 74% think land use planning is not easy to understand</li> <li>• 97% were confident that the general public could contribute useful information</li> <li>• 86% strongly object to not having public participation for land use planning</li> <li>• 92% think that PGIS is an effective public participation approach</li> <li>• 95% think PGIS can increase public participation</li> <li>• 95% think PGIS can increase quality in land use decision-making processes</li> <li>• 96% think PGIS can provide knowledge and assist the public in contributing information related to land use planning</li> </ul>	<ul style="list-style-type: none"> <li>• Important to identify attitude, culture and region (rural or urban) factors that influence public participation levels</li> <li>• The public lacks knowledge and awareness about public participation and land use planning</li> <li>• Acknowledges public capability to contribute spatial and non-spatial information for decision-making</li> <li>• PGIS creates a new dimension of public participation by providing a user-friendly and flexible approach to contribute information on land use</li> <li>• The use of spatial information relies on the context of the issue or project and is considered vital for planners during plan preparation</li> <li>• PGIS implementation can assist in improving decision-making processes</li> <li>• PGIS approach can be implemented at early or multiple stages during the plan preparation process</li> </ul>
Divergence	<ul style="list-style-type: none"> <li>• over 99% think that PGIS allows them to express their opinions anonymously</li> <li>• 92% believe the authorities lack effort for public engagement</li> <li>• 90% trust the planners to make good land use plans</li> </ul>	<ul style="list-style-type: none"> <li>• Anonymity would lower the validity and reliability of any shared knowledge and opinions</li> <li>• Planners claim that the public lost trust in planners due to conflicting political beliefs and ideologies</li> </ul>

(augmented by lack of information about planning) exacerbated the already low level of public participation due to perceived ineffectiveness. Convergence was observed regarding the potential benefits of PGIS. Planners were aware of the potential benefits if PGIS was implemented as part of the public participation process. Both the public and the planners believe that PGIS could be used to increase public participation and improve the quality of land use decisions.

In terms of divergence, the planners reported that they believe anonymity would lower the integrity of opinions because it would not allow follow-up for further detailed feedback or invitations to the hearing committee meetings. Although we did not ask public participants if anonymity was a concern or barrier to public participation, over 99% of the participants indicated PGIS would allow them to express their opinions anonymously. This suggests potentially conflicting or divergent views regarding the value of anonymity in the participation process. Another divergence concerned trust in the process where 90% of public participants expressed trust in authorities to make good decisions related to land use planning. However the planners believe the public views them as proxies for development interests, resulting in public reluctance to participate, particularly for individuals with conflicting and different political beliefs that support opposition to the government.

#### 4. Discussion

This study assessed the capability of PGIS for bridging the communication gap that contributes to the lay-expert knowledge divide in land use planning. We used a mixed methods approach to investigate the similarities and differences in knowledge paradigms between a lay public and planning experts. Local knowledge about general barriers to public participation and the potential benefits of PGIS were generated through implementation of a PGIS while planning expert perspectives were obtained through two sets of interviews before and after the PGIS process.

Findings from the study revealed general consistency between lay and expert knowledge regarding the barriers to effective participation. Both planners and the public agreed that current participation techniques used by the planning authorities were ineffective, and failed to increase public awareness and

engagement with the planning process. Interviews with the planning experts suggested that indifferent public attitudes, in combination with an inconvenient participatory process dominated by passive plan exhibitions, were key reasons for low participation, especially in Perlis. Survey data from the public also point to the existence of an indifferent public attitude toward the planning process underpinned by a belief that planning authorities do not put sufficient effort into engaging the public.

Most of the planners interviewed acknowledged that the current public participation process needed to improve to provide more opportunities for the public to influence the decision-making process. For its part, the public wanted the planning authorities to provide more information about land use planning. Findings from this research were consistent with the studies by [Tosun \(2000\)](#) and [Marzuki et al. \(2012\)](#) wherein public participation processes in developing countries face structural and operational problems, making it challenging for local residents to effectively communicate their knowledge in the planning process. This study evaluated whether PGIS has the potential to provide an operational alternative to current participatory practices in a developing country context that would provide local knowledge to provide planning authorities with more useful place-based information for decision support.

Our study revealed that planners in Malaysia strongly agree that PGIS could be beneficial as a participation mechanism, especially at the early stage of the local plan preparation process. Early implementation of PGIS enables the effective use of local public knowledge; it also supports the acceptability of the plan by fostering trust among participants ([Innes & Booher, 2004](#)). The importance of using PGIS early in the planning process is reinforced by Finnish planning cases reported by [Kahila-Tani, Broberg, Kyttä, and Tyger \(2016\)](#) which found that participatory GIS methods are often used too late in the planning process. Further, our findings concur with [Kahila-Tani et al. \(2016\)](#) that PGIS/PPGIS can more easily reach younger generations while more traditional public participation methods reach older generations more easily.

Concerning the findings related to the superiority of the knowledge produced via a PGIS approach compared to the knowledge produced in the traditional participation process (i.e., exhibitions), we acknowledge that this finding can be partly attributed to the fact that different information was collected from participants in

the two participation platforms. In PGIS, survey participants mapped their values and development preferences while in traditional exhibition-based participation process they were only able to fill in a form where they could comment on the existing draft of the plan. It appears easier for participants to communicate their experiences and values concerning their current living environment than to provide substantive comment on a plan that was likely rendered in a way that is hard for lay people to understand. Therefore, the effectiveness of public participation would appear strongly related to the type of local knowledge collected, not just the formal mechanism of public participation. PGIS has an advantage over collecting general public comments (often open-ended) because the local knowledge generated is more structured and place-specific, making for easier integration into the land use planning process.

## 5. Conclusion

Effective public participation is a critical element that contributes to successful planning outcomes. In the absence of more effective public participation, excessively technical and bureaucratic procedures will continue to discourage public engagement with land use planning, especially in a developing country context such as Malaysia. One way to overcome this problem is to utilize a different participation approach that challenges the norms of current participatory mechanisms. PGIS has the potential to transform public participation in land use planning from a passive and reactive mode characterized by indifference, to a more active role in the planning process. This study has demonstrated how PGIS can collect and transmit local knowledge to planning experts that appear receptive to using this spatial information in the decision-making process. Toward this end, Malaysian planning authorities should seek opportunities that utilize PGIS in their land use planning efforts, especially in the development of Local Plans where the lay public can express their local knowledge.

The use of PGIS would represent a major paradigm shift in the Malaysian land use planning context. We suggest two important implications if PGIS was adopted as part of a public participation approach in Malaysia: (1) the process would contribute to local empowerment and social cohesion through higher levels of democratic involvement and cooperation between local residents and planning experts; and (2) public acceptance of local development plans would increase because they explicitly include local values. Although this study found that both the public and planning experts found the potential benefits of PGIS to be promising, future studies should evaluate PGIS during the actual preparation of a Malaysian development plan where the putative benefits can be formally assessed.

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