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Exploring the effect of procedural fairness on the social license to operate of resource development projects: A meta-analysis

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Declaration of interests

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ABSTRACT

Research indicates that fairness in procedures plays a crucial role in how positively communities view resource development projects. This study conducts a meta-analysis, which involves analyzing existing research findings on this topic, to investigate the impact of procedural fairness on community acceptance of such projects, known as the Social License to Operate (SLO). The analysis pools data from 10 separate studies published between 2008 and 2022. The results reveal two main points: firstly, ensuring fairness in procedures significantly enhances community acceptance of resource development projects; secondly, the level of economic development in a country influences how procedural fairness affects SLO, with differences observed between developed and developing countries. However, the type of industry, whether mining or non-mining, does not significantly alter this effect. These findings contribute significantly to our understanding of how procedural fairness relates to SLO and offer guidance to resource development companies. By prioritizing fairness in procedures, these companies can potentially improve their chances of gaining community acceptance for their projects.

Keywords: Procedural fairness; Social license to operate; Meta-analysis; Resource development projects; Moderating effect; Economic development.

1. Introduction

In the 1990s, a string of environmental incidents and conflicts between mining projects and nearby communities caused public trust in such endeavors to decline (Moffat et al., 2016). This downturn stemmed from concerns over the projects' potential negative effects on local residents' quality of life (Schively, 2007) and the unequal sharing of benefits (Ogwang et al., 2018; Reeder et al., 2022). Consequently, the concept of Social License to Operate (SLO), which evaluates the relationship between communities and projects, gained prominence in academic discussions (Joyce and Thomson, 2000).

For resource development companies to establish a positive reputation, compete effectively in the market (Hurst et al., 2020), and ensure the continuous operation of their projects (Stuart et al., 2023), they must secure ongoing approval from local communities. As highlighted by Besley (2010), the degree of citizen involvement in decision making significantly influences the acceptance of project decisions. Moreover, even if citizens disagree with the final decision, they may still accept it if they perceive the decision-making process as fair. Therefore, ensuring fairness in procedures can elevate the level of SLO for resource development projects.

Procedural fairness ensures that individuals have equal rights and opportunities in activities or obtaining resources, aligning with moral and legal principles (Bair, 2017). Diantini et al. (2020) have investigated how procedural fairness influences obtaining SLOs in resource development projects. They found it is crucial for communities to participate in decision making and that it is a basic requirement for gaining SLO.

Moffat and Zhang (2014) devised a model showing that procedural fairness, by encouraging trust, plays a significant role in regulating SLO. They discovered that not only does procedural fairness positively predict trust, but it is also the most influential factor in building trust. Similarly, Mercer-Mapstone et al. (2018) concluded from previous studies that procedural fairness directly predicts community acceptance of projects. Even when trust is not a factor, procedural fairness remains linked to SLO. These findings emphasize the vital importance of procedural fairness in the process of acquiring SLO and its close association with community trust and acceptance.

While numerous studies have suggested that procedural fairness positively impacts the SLO in resource development projects (Solomon et al., 2008; Diantini et al., 2020), these findings are fragmented and limited by small sample sizes and representativeness. As a result, the overall effect of procedural fairness on SLO has not been conclusively confirmed through large-scale empirical data.

However, meta-analysis presents a valuable solution by consolidating data from multiple small-scale studies, overcoming issues related to sample size and representativeness (Glass, 1976). This approach enhances the credibility of the evidence and yields more comprehensive results compared to individual studies (Habib Ahmed, 2016). Additionally, meta-analysis opens new avenues for large-scale empirical research into the relationship between procedural fairness and SLO, offering innovative perspectives and methodologies.

Building on these considerations, this paper conducts a thorough examination of both domestic and international studies, investigating how procedural fairness influences the SLO. It goes further by conducting a meta-analysis using pertinent research data to search deeper into this relationship, aiming to provide more comprehensive, precise, and dependable research findings, aiming to resolve discrepancies in previous empirical research and elucidate the overall link between procedural fairness and SLO.

Furthermore, this study effectively illustrates the role of procedural fairness in the dynamic process of acquiring SLO. It not only offers insights for developing new strategies to enhance SLO levels, but also demonstrates both theoretical significance and practical relevance.

2. Literature review

2.1. Social license to operate

The term "social license" was coined by Jim Cooney (Hitch and Barakos, 2021), a Canadian mining executive, in 1997 during a World Bank meeting to describe the relationship between mining companies and local communities (Cooney, 2017). Since then, it has gained global recognition and is used across various industries, including oil and gas (Prno, 2013; Luke, 2017; Luke and Emmanouil, 2019), forestry (de Jong and Humphreys, 2016; Wang, 2019), aquaculture (Sinner et al., 2020), and agriculture (Baumber et al., 2022). Moreover, significant research on this topic has been conducted in Western countries such as Australia, Canada, and the United States.

Despite extensive use, different descriptions have been provided of the term "social license", and a unified concept remains elusive. Leeuwerik et al. (2021) view social license as an ongoing process involving project initiators, governments, and stakeholders seeking approval for resource development activities to build trust and gain legitimacy within the local community. Cruz et al. (2020) argue that it reflects the opinions and feelings of local communities and stakeholders toward the project company. Prno and Scott Slocombe (2012) describe it as a shared objective for the local community and the project company, with a set of rules to meet the expectations of both parties. Therefore, SLO is both a process and an outcome (Mercer-Mapstone et al., 2017; Stuart et al., 2023).

Despite these varied definitions, social license is generally understood as the continuous acceptance or approval of a company's projects or activities by the local community and other stakeholders (Thomson and Joyce, 2008; Parsons et al., 2014; Stuart et al., 2023). As the range of stakeholders has expanded, social license has evolved from focusing solely on the local community to encompassing a broader social group (Dare et al., 2014). For Europe, it was even suggested that a societal component needs consideration (Lesser et al., 2021; Poelzer et al., 2022). Therefore, it reflects public acceptance of the project.

Unlike formal statutory licenses, the SLO is typically granted to project companies by the community and stakeholders, lacking legal binding. Therefore, due to its informal and intangible nature, SLO cannot be regulated by explicit legal provisions (Franks and Cohen, 2012). Instead, it is often seen as an unwritten social agreement between project firms and local residents (Idemudia, 2007; Lacey and Lamont, 2014).

Moreover, SLO is dynamic (Hurst et al., 2020), resembling a complex process involving social value negotiations, regulatory updates, and stakeholder demands. Consequently, SLOs can adapt flexibly to these changes (Nelsen and Scoble, 2006), reflecting these complex processes to some extent. With the growing emphasis on sustainable development and increased citizen involvement in government decisions, project companies are expected by the government to proactively obtain, maintain, and enhance SLO, despite the absence of specific legal regulations mandating its implementation (Barreiro-Deymonnaz, 2013).

The acquisition and upkeep of SLO are influenced by various interactive and dynamic factors. Even projects initially supported by local communities may risk losing SLO due to uncertain and complex processes (Smits et al., 2016). Therefore, obtaining and maintaining SLO is seen as an ongoing effort, with its influencing factors extensively studied.

Firstly, previous research has shown that numerous factors, such as procedural fairness, distribution fairness, confidence in governance, trust, communication quality, adaptability, and social and cultural background, can directly or indirectly affect a project's SLO (Moffat and Zhang, 2014; Kelly et al., 2019; Lesser et al., 2021).

Secondly, from a decision-making perspective, Mercer-Mapstone et al. (2018) argued that the fairness of the decision-making process in resource development significantly impacts a project's SLO. In essence, a community's acceptance of a project hinges on their ability to participate in decision making and have veto power (Tyler, 2000). This finding has been confirmed in various industries, including mining, sustainable energy, and recycled water (Huijts et al., 2012; Ross et al., 2014; Zhang and Moffat, 2015).

However, over the last 20 years, research has heavily concentrated on SLO, delving into its definition, influencing factors, and practical applications (Nelsen and Scoble, 2006; Corscadden et al., 2012; Boutilier, 2014). As such, there is still a need for additional research to investigate the influence of procedural fairness on SLO.

2.2. Procedural fairness

The notion of "procedural fairness" was initially introduced by Thibaut and Walker in 1975 to explore how trial procedures in moot courts affect litigants' perceptions of fairness. Their study reveals a positive link between the fairness of trial proceedings and litigants' satisfaction. Litigants prioritize the fairness of the decision-making process over the actual decision outcome (Thibaut and Walker 1975). Therefore, even if the decision does not meet their expectations, they are more likely to accept it if the process is perceived as fair.

Besley (2010) defines procedural fairness as individuals' perception of having a reasonable voice in decision making. Active participation and respectful treatment by decision makers are key aspects of a fair decision-making process. Procedural fairness has been extensively studied in organizational fairness, economics, and psychology (Fehr and

Schmidt, 1999; Bolton et al., 2003; Bos et al., 2014), which is crucial for its practical application.

From an organizational fairness perspective, procedural fairness is viewed to achieve favorable outcomes (Brockner, 2002). This means that the more individuals perceive decision-making processes as fair, the more accepting they are of the decision outcome (Folger and Cropanzano, 1998). Economically, procedural fairness is preferred for addressing economic issues as it allows individuals to evaluate the safety and improvement of their long-term economic interests (Colquitt et al., 2001). Psychologically, according to the group value model (Lind and Tyler, 1988), procedural fairness fulfills community members' needs for self-esteem, self-identity, and fair cooperation (Tan and Yusof, 2014).

Over the years, research has consistently shown a positive relationship between procedural fairness and social acceptance across various industries such as mining, nuclear power, genetically modified crops, carbon capture and storage (CCS), and sustainable energy technologies (Besley, 2010; Terwel et al., 2010; Huijts et al., 2012; Siegrist et al., 2012; Zhang et al., 2015). As communities increasingly engage in decision-making processes for mining and other projects, the design and implementation of fair procedures have become crucial for promoting fair participation, resolving conflicts, and achieving positive negotiation outcomes (Colvin et al., 2015; Gross, 2007; Lacey et al., 2016; Amaro et al., 2021).

Several studies have highlighted the pivotal role of procedural fairness in obtaining a SLO (Solomon et al., 2008; Moffat and Zhang, 2014; Diantini et al., 2020). Moreover, procedural fairness has emerged as a significant trend in current research. However, there is currently a lack of systematic research on whether and to what extent procedural fairness can directly influence a project's SLO. Building on these previous studies, the present study aims to comprehensively analyze the positive correlation between procedural fairness and SLO.

3. Research design

Meta-analysis, a method commonly used in fields such as psychology, medicine, and education, has been employed to systematically combine research findings on the impact of procedural fairness on SLO. The objective is to address inconsistencies in previous studies and enhance the statistical strength of the original results. This study followed a series of steps: a comprehensive literature search, data collection, application of inclusion and exclusion criteria, identification and screening of relevant studies, effect size calculation, literature coding, and result analysis.

3.1.Data collection

To conduct the literature search from 2008 to 2022, two steps were followed:

Step one: Databases such as Scopus, Web of Science, and EBSCO, known for their extensive and high-quality scientific resources, were used. Searches were performed using such keywords as "social license to operation," "social license to operate," "social license," "social licence," "social sanction," or "social permission" (Stronge et al., 2024; Ranängen and Lindman, 2018), along with terms such as "procedural fairness," "procedural justice," "fairness," or "justice" (Baumber et al., 2021; Heffron et al., 2021). The search formula used was TS= ("social license*" OR "social licence*" OR "social sanction" OR "social permission") AND TS= ("fairness*" OR "justice*" OR "procedural fairness*" OR "procedural justice*").

Step two: To ensure thoroughness and prevent any oversights, authors in the research field were searched one by one against the references in published review articles to identify their relevant published research results.

After the initial search, a total of 368 English articles were obtained.

3.2. Inclusion and exclusion criteria

To ensure the compatibility between literature content and research objectives, inclusion and exclusion criteria for literature screening were established based on suggestions by Card (2012). The criteria were as follows:

1. Duplicate literature and studies were excluded, considering the same research published in different journals, stages, or formats as one.
2. Literature types such as books, cases, conference proceedings, reports, and theses were excluded. If the sample size from these sources was inadequate, suitable samples were chosen.
3. Literature not focusing on the relationship between SLO and procedural fairness was excluded.
4. Only empirical research was considered, excluding non-empirical studies such as theoretical papers, reviews, and case analyses.
5. Samples had to originate from independent research. When multiple articles used the same dataset, only those with higher journal impact factors were chosen.
6. Selected literature must have a clear sample size sufficient to provide correlation coefficients on the effect of procedural fairness on SLO and r-family coefficients that can be converted into correlation coefficients.

3.3. Identification and screening process

In our initial search, we found a total of 368 articles. After removing duplicate articles, the number decreased to 220. Fig. 1 shows the distribution of literature obtained each year from 2008 to 2022. To ensure the screening process's quality, five research articles were randomly chosen from the identified records for calibration before conducting the comprehensive screening. The literature was then screened according to the established inclusion and exclusion criteria. Ultimately, 10 articles were identified that met the requirements. Fig. 2 presents a flowchart illustrating the process of literature identification, screening, and inclusion.

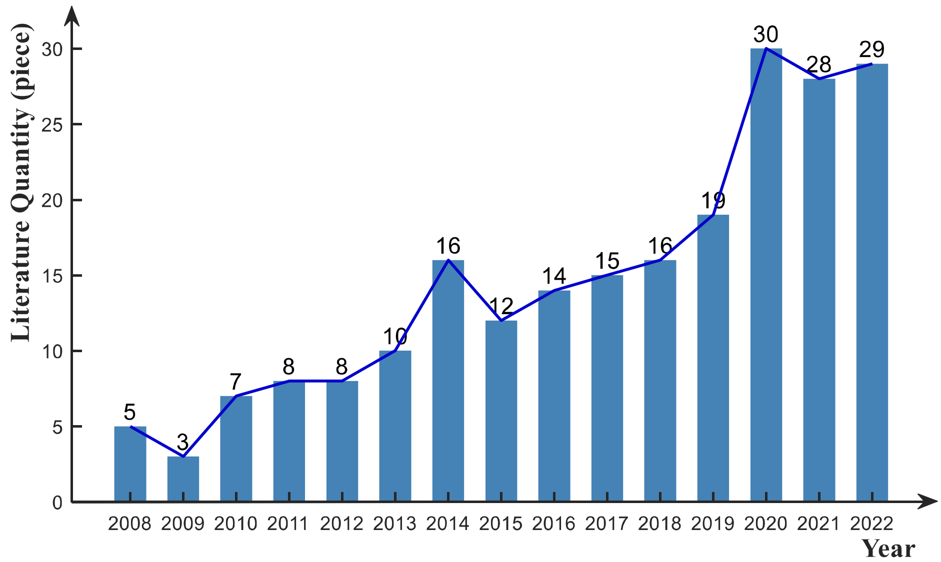


Fig. 1. The number and trend of relevant literature retrieved from 2008 to 2022

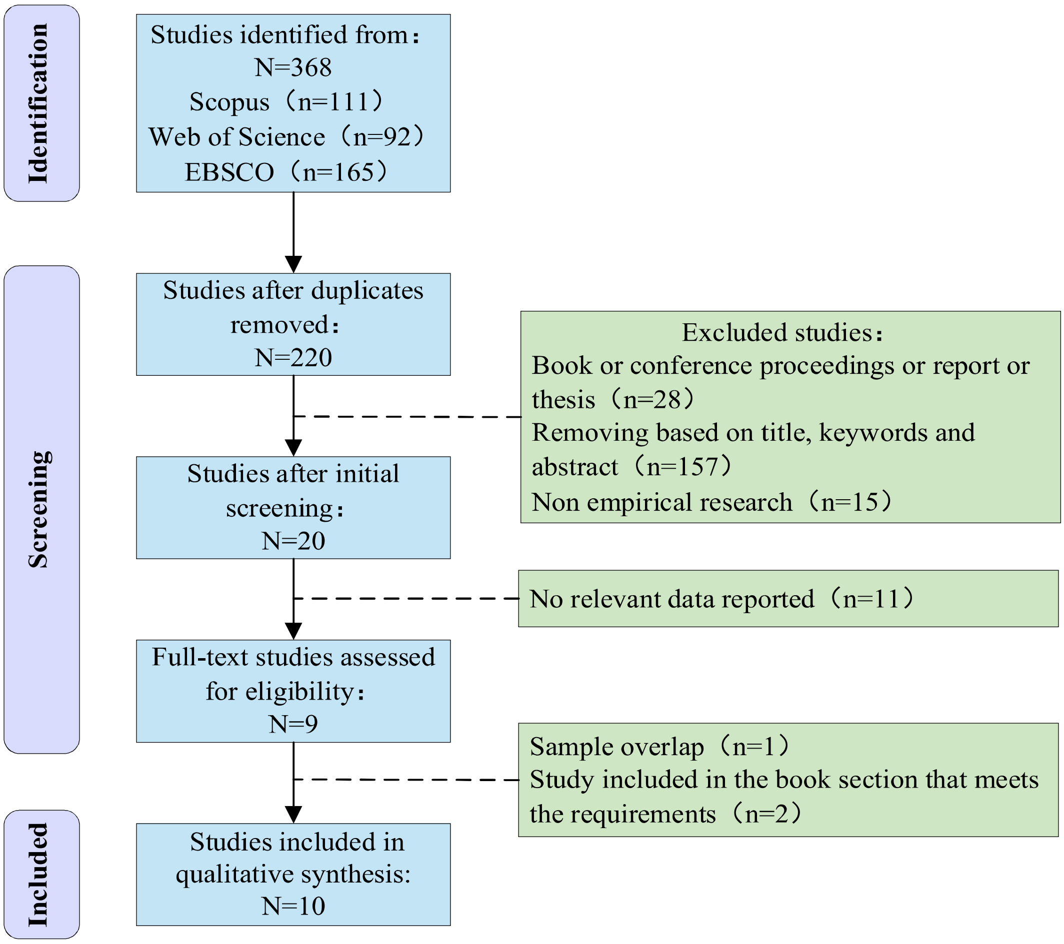


Fig. 2. Flow diagram outlining the literature search process

3.4. Calculation of effect sizes

In the social sciences, meta-analysis commonly uses the r-value as an effect size when studies are based on correlations between variables (Card, 2012). When conducting a meta-analysis using r-values, two analytical procedures are often used: one proposed by Hedges and Olkin in 1985, which estimates both fixed-effect models and random-effects models (Hedges and Olkin, 1985), and another proposed by Hunter and Schmidt in 1990, which only estimates random-effects models (Hunter and Schmidt, 1990). The latter method, which uses sample size as weights and including native effect sizes for fundamental rectification integration analysis, is advantageous for correcting effect measurement errors and statistical illusions, making it more common in management. Hence, this latter method was used.

The correlation coefficient r was used as the indicator of effect size. In the coding process, if the included literature does not provide the correlation coefficient r value but reports other values, it can be converted using the following formula suggested by Borenstein et al. (2009): $r = \sqrt{\frac{F}{F+df_e}}$（F − distribution）; $r = \sqrt{\frac{\chi^2}{\chi^2+N}}$（$\chi^2$ distribution）; $r = \beta \times 0.98 + 0.05\ (\beta \geq 0)$; $r = \beta \times 0.98 - 0.05\ (\beta < 0)\ (\beta \in (-0.5，0.5))$. Once the conversion is done, we can proceed to encode it.

3.5. Literature coding

The extraction and encoding of literature information play a crucial role in the meta-analysis process. The literature coding followed the recommended steps by Lipsey and Wilson (2000) closely. Coding included details such as author names, publication years, sample sizes, correlation coefficients, participant source countries, and industries, as outlined in Table 1. Effect sizes were extracted according to the principle that each independent sample was coded once or separately if a paper reported multiple independent samples simultaneously (Lipsey and Wilson, 2000). After completing the literature coding process, a total of 13 effect sizes were obtained and analyzed using Comprehensive Meta-Analysis Version 3.3 software.

Table 1
The original studies incorporated in the meta-analysis

Effect sizes number	Reference number	Study name	Sample	Effect size (r)	Country	Industry
1	1	Zhang et al., 2015	5121	0.44	Australia	Mining
2		Zhang et al., 2015	5122	0.21	China	Mining
3		Zhang et al., 2015	1598	0.26	Chile	Mining
4	2	Moffat and Zhang, 2014	123	0.64	Australia	Mining
5		Moffat and Zhang, 2014	142	0.52	Australia	Mining

6	3	Mercer-Mapstone et al., 2018	560	0.50	Australia	Mining
7	4	Jartti et al., 2020	1067	0.35	Finland	Mining
8	5	Walton and McCrea, 2020	400	0.79	Australia	Coal seam gas (CSG)
9	6	Diantini et al., 2020	346	0.40	Ecuador	Oil
10	7	Cruz et al., 2021	190	0.38	Brazil	Mining
11	8	Pichler, Fürtner et al., 2022	40	0.35	Slovakia	Mining
12	9	Cruz, 2021	400	0.39	Brazil	Forestry
13	10	França Pimenta, Demajorovic et al., 2021	279	0.10	Brazil	Mining

Note. The study samples were both male and female and all adults.

4. Results

In meta-analysis research, conducting a heterogeneity test before analyzing main and moderated effects is essential (Borenstein et al., 2010). This test assesses the level of heterogeneity and determines the appropriate effect model (fixed-effect or random-effects) for the study, setting the foundation for the entire analysis. Given that meta-analysis relies heavily on published studies, the results are influenced by publication bias, making it crucial to test for publication bias prior to examining main and moderating effects (Cheung and Vijayakumar, 2016). The subsequent tests for main and moderating effects are performed only if the heterogeneity and publication bias test results meet the requirements for meta-analysis. Consequently, this study followed a systematic and methodical approach, conducting tests in the following order: heterogeneity, publication bias, main effects, and moderating effects.

4.1.Heterogeneity test

When selecting a model, Borenstein et al. (2009) suggest that if the samples in a meta-analysis vary, indicating that these differences may affect the experimental results – meaning the results are influenced not only by random errors but also by sample variations

– then using a random-effects model is more appropriate in such cases. Of the 10 final research articles identified, participants come from various age groups (young, middle-aged, and elderly) and possess different educational levels (ranging from junior high school or below to graduate or above). They also come from both developed and developing countries and cover both mining and non-mining industries. The research literature chosen for meta-analysis involves diverse participants, and factors such as age, education level, place of origin, and industry may affect the impact of procedural fairness on SLO. Therefore, the random-effects model is deemed suitable. To further confirm the model selection, a heterogeneity test was conducted on the included effect sizes, which supported the rationale for using a random-effects model in this meta-analysis.

Heterogeneity in meta-analysis refers to the variability of the included literature (Sebri and Dachraoui, 2021). When there are multiple moderators, it leads to some level of heterogeneity, which can be evaluated using the Q test and N test. The Q test assesses the significance of heterogeneity with the P value, where a P value less than 0.05 indicates significant heterogeneity. The I^2 test provides the I^2 value and, when it exceeds 75%, it suggests a high level of heterogeneity. Additionally, the higher the I^2 value, the greater the heterogeneity. A random-effects model is suitable for meta-analysis when the Q test shows significant heterogeneity and the I^2 test indicates high heterogeneity. Conversely, if heterogeneity is low and there are numerous unrelated factors, a fixed-effect model can be used for meta-analysis.

According to the test results in Table 2, the Q value was 457.170, with a p-value less than 0.001, indicating significant heterogeneity of the effect sizes. Additionally, the I^2 value was 97.375%, exceeding the threshold of 75% for high heterogeneity, indicating a high degree of heterogeneity. This implies that 97.375% of the observed variation in the effect of procedural fairness on SLO stems from actual differences in effect sizes in this relationship. In contrast, only 2.675% of the observed variation is due to random errors. Therefore, based on the results of the heterogeneity test, a random-effects model, which is more suitable, was chosen for further analysis.

Table 2
Heterogeneity test results for effect sizes

Q	**d.f.**	**p**	**I^2 (%)**	**σ^2**
457.170	12	<0.001	97.375	0.038

4.2. Publication bias test

Publication bias occurs when literature with findings that align with mainstream beliefs is more likely to be published, leading to an incomplete representation of the overall research status in the field (Sebri and Dachraoui, 2021). Initially, the funnel plot under the random-effects model is used to visually assess whether publication bias exists. In this plot, the horizontal axis represents Fisher's Z value, while the vertical axis represents the corresponding standard error. As depicted in Fig. 3, most effect sizes are concentrated at the top of the funnel and evenly distributed on both sides of the total effect size. This distribution indicates a low likelihood of publication bias. However, funnel plots can only provide an initial assessment of publication bias subjectively and cannot accurately test the symmetry of the graphs. Therefore, qualitative analysis is necessary for a more precise evaluation. Accordingly, Rosenthal's fail-safe number (N_{fs}), Egger's linear regression test, and Begg's rank correlation test was used to determine the presence of publication bias (refer to Table 3).

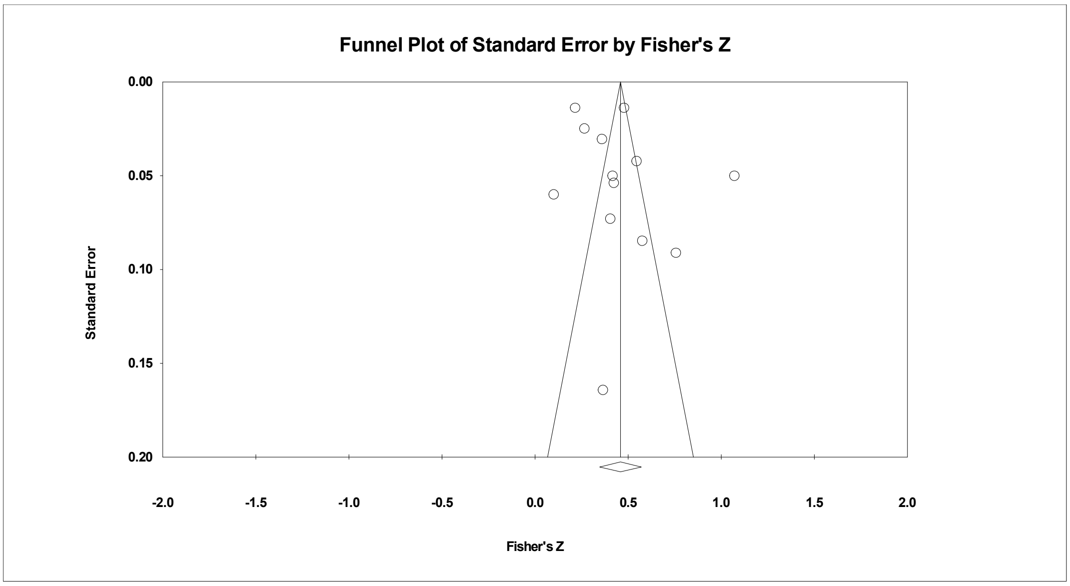


Fig. 3. Funnel plot of effect sizes in the meta-analysis

Table 3
The publication bias test in the meta-analysis

k	N_{fs}	Egger					Begg	
		Intercept	SE	LL	UL	p	Kendall's tau	p
13	5614	3.12586	2.81731	-3.075	9.32673	0.29087	0.14103	0.50216

Note. LL and UL represent the lower and upper limits of the 95% CI for Egger's linear regression test.

Rosenthal's fail-safe number, introduced by Rosenthal in 1979, signifies the minimum count of unpublished studies with weak correlation results required to overturn meta-analysis findings (Rosenthal, 1979). When Rosenthal's fail-safe number surpasses 5k+10 (where k is the number of effect sizes), it suggests no significant publication bias issue. Moreover, a higher Rosenthal's fail-safe number indicates a lower likelihood of publication bias and greater stability in meta-analysis outcomes (Orwin, 1983). Table 3 shows that Rosenthal's fail-safe number is 5614, far exceeding the criterion of (5k+10) =75. Thus, discovering 5614 unpublished studies with weak correlation results would be necessary to render the statistical results insignificant. Consequently, there is no significant publication bias.

Egger's linear regression, initially proposed by Egger and his collaborators in 1997 in BMJ, uses linear regression to test for publication bias in meta-analysis (Egger et al., 1997). The criterion for Egger's linear regression test is that when p>0.05, no publication bias is present. As seen in Table 3, Egger's linear regression yields p=0.29087>0.05, indicating no publication bias.

Begg's rank correlation test, introduced by Begg and Mazumdar in 1994 in Biometrics, assesses publication bias by examining whether Kendall's tau approaches 0 and if p>0.05. Table 3 illustrates that Kendall's tau of Begg's rank correlation test is 0.14103, close to 0. Additionally, p=0.50216>0.05, indicating non-significant results. Consequently, Begg's rank correlation test also indicates no publication bias.

In conclusion, the selected literature for meta-analysis shows no publication bias.

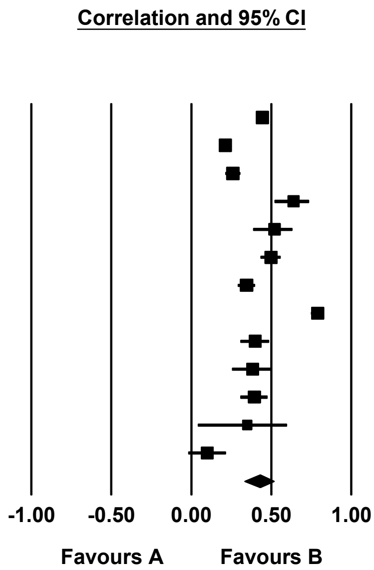
4.3. Main effect test

This meta-analysis involved 10 studies with 13 independent effect sizes concerning procedural fairness and SLO, including 15,388 participants. Using a random-effects model to gauge the impact of procedural fairness on SLO, Fig. 4 shows the forest plot illustrating the overall relationship between the two. The findings indicated a correlation coefficient of 0.429 (p<0.001), with a Z-value of 8.033 and a 95% confidence interval of [0.333, 0.516], which excludes zero. The main effect test results from the meta-analysis demonstrated a significant positive correlation between procedural fairness and SLO. This provides additional evidence that upholding procedural fairness in project decision-making processes can heighten citizen involvement, fostering a sense that their input is valued, thereby aiding project companies in obtaining SLO for the project.

Meta Analysis

Study name	Correlation	Lower limit	Upper limit	Z-Value	p-Value
Zhang1（2015）	0.445	0.423	0.467	34.226	0.000
Zhang2（2015）	0.213	0.187	0.239	15.476	0.000
Zhang3（2015）	0.260	0.214	0.305	10.628	0.000
Zhang1（2014）	0.640	0.522	0.734	8.305	0.000
Zhang2（2014）	0.520	0.389	0.631	6.795	0.000
Lucy（2018）	0.498	0.433	0.558	12.901	0.000
Tuija（2020）	0.345	0.291	0.397	11.740	0.000
Andrea（2020）	0.790	0.750	0.824	21.348	0.000
Albert（2020）	0.400	0.308	0.485	7.846	0.000
Thiago1（2021）	0.384	0.256	0.499	5.535	0.000
Thiago2（2021）	0.395	0.308	0.474	8.313	0.000
Pichler（2022）	0.350	0.043	0.596	2.223	0.026
Adriano（2021）	0.101	-0.017	0.215	1.677	0.094
	0.429	0.333	0.516	8.033	0.000

Statistics for each study



Meta Analysis

Fig. 4. Forest plot of procedural fairness and SLO using random-effects model

4.4. Moderating effect test

Of the 10 selected research papers, it is evident that the statistical data regarding the economic development status of the countries and the types of industries are independent and comprehensive. Hence, these factors can serve as moderators. The effect of the economic development status of the participants' countries (classified as developed or developing) was investigated, and whether the types of industries (mining or non-mining) moderate the impact of procedural fairness on SLO.

Table 4 shows the results of the moderation effect testing, revealing the following outcomes:

1. The economic development status of the participants' countries significantly influences the impact of procedural fairness on SLO. The analysis revealed a Q value (between groups) of 6.419, with $p=0.011<0.05$, indicating a notably higher correlation

coefficient of procedural fairness on SLO in developed countries compared to developing ones.

2. However, the moderating effect of industry types on the relationship between procedural fairness and SLO is not significant. The analysis results showed a Q value (between groups) of 0.740, with p=0.390>0.05, suggesting that different industry types have a relatively minor impact on the relationship between procedural fairness and SLO.

In summary, the moderation test results from the meta-analysis indicate that the economic development status of the country plays a more significant role in the impact of procedural fairness on SLO. The effect of procedural fairness on SLO is significant across all countries, with a stronger correlation observed in developed countries compared to developing ones. However, when categorizing industry types into mining and non-mining sectors, the effect of procedural fairness on SLO is not significant. This suggests that the influence of procedural fairness on SLO may not vary based on the industry type.

Table 4
Moderating effects analysis of the effect of procedural fairness on SLO

Moderators	**Effect size**		**95% CI**		**Q test**	
	k	r	LL	UL	Q	p
Country					6.419	0.011
Developed country	8	0.504	0.386	0.606		
Developing country	5	0.300	0.188	0.404		
Industry					0.740	0.390
Mining industry	10	0.382	0.294	0.464		
Non-mining industry	3	0.558	0.120	0.814		

5. Discussion

This meta-analysis seeks to consolidate findings regarding the impact of procedural fairness on the SLO in resource development projects. Furthermore, it explores potential moderators, such as the economic development status of the country and the industry type, within this relationship. The results affirm that procedural fairness indeed exerts a significant positive influence on SLO, aligning with numerous contemporary research studies (Zhang et al., 2015; Cruz et al., 2020; Cruz et al., 2021).

This analysis highlights procedural fairness' direct effect on the SLO of resource development projects. Put simply, irrespective of potential mediation by other factors, the fairness perceived in the decision-making process correlates with community acceptance or approval of a project's SLO (Mercer-Mapstone et al., 2018; Diantini et al., 2020). Notably, when procedural fairness is evident during decision making, it encourages greater public acceptance of decision outcomes, even among marginalized groups (Lind and Tyler, 1988; Gross, 2007). Conversely, as highlighted by Haider (2001), instances where communities and stakeholders perceive unfair treatment, lack of consideration for their opinions, or transparency in the process are absent, leading to a sense of voicelessness in decision making (Witt et al., 2018). In such cases, projects may struggle to secure SLO or face its withdrawal post-approval (Luke, 2017). Hence, procedural fairness emerges as a pivotal determinant in securing SLO.

Certainly, while numerous studies like those by Lacey et al. (2017), Walton and McCrea (2020), and Jartti et al. (2020) suggest that procedural fairness has a modest direct impact on SLO, it primarily functions as an indirect influencer, often operating through trust. Trust serves as a central component in the SLO framework, mediating the effects of procedural fairness, distributive fairness, and confidence in governance on SLO acceptance or approval (Moffat and Zhang, 2014).

Various factors can modulate or impede the relationship between procedural fairness and SLO in resource development projects. A significant discovery is the notable correlation between procedural fairness's impact on SLO across different countries and the economic development status of those countries. For instance, in such developed regions as Australia and certain European countries, procedural fairness holds greater sway over local SLO. Conversely, this influence diminishes significantly in developing nations such as China, Ecuador, and Brazil. This discrepancy can be attributed to several factors. Firstly, developed countries had earlier and swifter economic growth, boasting a more solid economic foundation and robust welfare mechanisms. Litmanen et al. (2016) assert that this economic stability serves as a prerequisite for establishing SLO frameworks.

On the other hand, in developed countries, citizens typically have a stronger connection to projects (Poelzer et al., 2020) and are more environmentally and morally aware. Consequently, project companies in these countries often find it easier to establish rapport with local communities during negotiations for SLO, while ensuring minimal environmental impact (Dauda, 2022). Conversely, in developing countries, where living standards are not as high, citizens prioritize distributive fairness over procedural fairness. They are more concerned with the fair allocation of project benefits within society (Zhang et al., 2015). When people perceive benefits as fairly distributed, they are more inclined to grant SLO to the project. This could be because many vulnerable groups reside in developing countries, and they rely on equalization or redistribution policies for access to social resources. This insight could pave the way for future research in this area.

In this meta-analysis, we also examined industry type as another factor for analysis. Recent studies have suggested that industries such as oil and gas (Richert et al., 2015), and with negative externalities, such as waste-to-energy (WTE) (He et al., 2023), typically have lower SLO compared to mining and forestry. However, our analysis found that industry type did not significantly influence the overall effect of procedural fairness on SLO. This implies that, regardless of the industry, the impact of procedural fairness on SLO remains consistent. Three potential reasons were proposed to explain the lack of significant moderation by industry type. Firstly, industry type may not have a significant impact on the relationship between procedural fairness and SLO, indicating consistent meta-analysis effect sizes across different industries. Secondly, detecting the moderating effect of industry type may require more variability in the data. There is still limited empirical research on the effect of procedural fairness on SLO, with most studies focusing on the mining industry. Lastly, simply categorizing industries into mining and non-mining may not be sufficient. For instance, within non-mining industries, there are both projects with strong negative externalities, such as WTE (Xu et al., 2023), and those with weak negative externalities, like aquaculture (Sinner et al., 2020). Thus, it may be necessary to categorize mining and non-mining industries into specific sectors, such as forestry, natural gas, oil, WTE, agriculture, aquaculture, etc., to better analyze the moderating effects.

Previous studies (Bastian et al., 2015; Jenkins, 2014; Arthur-Holmes et al., 2023) have suggested that individual characteristics, such as gender, age, and education level, may influence the effects of procedural fairness on the SLO of resource development projects. However, due to incomplete information on these individual characteristics, this study was unable to analyze them comprehensively, and research on these factors was not conducted. Future research with a broader and more comprehensive dataset could provide clearer insights into the relationship between procedural fairness and SLO by including these individual characteristics in the analysis.

6. Conclusions

This study aims to shed light on the overall effect of procedural fairness on SLO in resource development projects. Through meta-analysis, we systematically examined how procedural fairness influences SLO by combining and analyzing relevant literature. The research findings reveal the following:

1. Procedural fairness significantly enhances the SLO level of resource development projects. Adhering to procedural fairness in project decision-making processes encourages citizen participation, thereby improving the project company's ability to obtain SLO.
2. The economic development status of a country (developed vs. developing) significantly influences the impact of procedural fairness on SLO. Procedural fairness has a more pronounced effect on SLO in developed countries compared to developing ones. However, the type of industry (mining vs. non-mining) does not significantly affect the impact of procedural fairness on SLO. This means that adhering to procedural fairness positively influences SLO regardless of whether the project belongs to the mining or non-mining sector.

These significant findings help reconcile discrepancies in previous research and address gaps in sample diversity and scale. Moreover, they deepen the understanding of the underlying mechanisms through which procedural fairness promotes SLO, clarifying why previous studies have produced varied conclusions regarding its effects.

The study's principal limitation lies in its relatively small sample size utilized for the meta-analysis. This inadequacy becomes particularly pronounced when examining moderating factors such as a country's economic development status and the types of industries involved, where the sample size is both limited and unevenly distributed, thereby affecting the robustness of the analysis outcomes. Another notable constraint pertains to the exclusive reliance on English-language literature for the meta-analysis, potentially constraining the generalizability of the findings beyond English-speaking contexts. To mitigate this limitation, future research endeavors could encompass studies published in other languages to enhance the global relevance and applicability of the findings.

Author statement

TBA.

Data availability statement

Data will be made available on request.

Declaration of competing interest

The authors declare that they do not have any competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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