



Research article

Resilient green infrastructure: Navigating environmental resistance for sustainable development, social mobility in climate change policy

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ABSTRACT

This study explores the complex dynamics of environmental resistance, policy stability, skill development, and green initiatives in light of the growing worldwide concerns about climate change. COP27 and the G20 Summit show that as microcosm of the global discourse, provides a unique opportunity to study it. This research sought to thoroughly investigate, the links among green infrastructure, green technological innovation, policy stability, skill development, and their combined effects on social mobility and climate change (Case-1), it also discusses the global talk on climate change in COP27 and G20 (Case-2). In Case-1 data were analyzed through the use of structural equation modeling (SEM) by adopting a quantitative approach, and in Case-2 data were analyzed using theme analysis by applying a qualitative approach. Using a mixed-method research approach, the study surveyed 375 locals living close to the CPEC corridor quantitatively and interviewed ten important stakeholders, including elected officials, environmental activists, and community leaders, qualitatively. The survey highlighted the complex perspectives and experiences of citizens with green programs and environmental legislation in the CPEC zone. The study revealed the perceptions and experiences of residents regarding green initiatives and environmental policies within the CPEC region. Key stakeholders provided valuable insights into policy formulation and ongoing environmental sustainability efforts. The analysis unveiled intricate relationships between green infrastructure, technological innovation, policy stability, skill development, and their collective impact on climate change and social mobility. Notably, the study identified a critical research gap in understanding these dynamics within regions undergoing substantial economic development. Policy formulation and continuing environmental sustainability efforts were aided by key stakeholders' ideas. Green infrastructure, technological innovation, policy stability, skill development, and their overall influence on climate change and social mobility were all examined. Notably, the study found a critical research vacuum in understanding these processes inside rapidly developing economies. Policymakers, environmental groups, and communities managing the fine line between economic success and environmental responsibility will find great value in the findings. This study is unique because it examines issues on climate change from a local perspective in a region that is rapidly developing economically, it also adds value to the climate change challenges on the global level. This study presents a substantial theoretical contribution by examining the intricate interactions among environmental

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opposition, policy stability, skill development, and green initiatives within the CPEC against the backdrop of global climate change concerns.

1. Introduction

The 27th Conference of the Parties (COP27) is a watershed moment in the worldwide fight to combat climate change. The rising environmental concerns that cross national boundaries are driving the urgency. The COP provides a forum for governments to discuss and devise strategies to prevent the negative effects of climate change [1]. Climate change is critical because of the wide-ranging effects it poses for ecosystems, economies, and the well-being of current and future generations [2]. COP27 decisions are crucial in creating international policies that lead individual states in their pursuit of sustainable development and environmental stewardship [3]. The SDGs-13 emphasizes how urgent action against climate change and its effects is required. The realization that climate change increases already-existing vulnerabilities and risks advancements made in other areas of sustainable development is what gives rise to the urgency [4]. In addition to improving environmental well-being, achieving SDGs-13 is crucial for building resilience, lowering inequality, and guaranteeing the general sustainability of human civilizations [5].

The dropping consequences of climate change on food security, water resources, and the overall stability of ecosystems highlight the necessity of this goal [6]. The fact that the world community has committed to SDGs-13 shows that it recognizes the urgency of taking action on climate change. The complex web of relationships that exists between green infrastructure, green technological innovation, policy stability, and skill development is critical in determining their collective impact on SDGs (climate change and social mobility) [7]. Green infrastructure and technological innovation are critical in establishing sustainable habits, lowering carbon footprints, and encouraging environmentally friendly solutions [8]. Policy stability is critical for creating a climate suitable for the implementation of green projects, assuring consistency and effectiveness [9]. Individuals are empowered to actively contribute to sustainable practices when their skills are developed by the demands of a green economy [10]. The connection between these aspects is critical not only for tackling climate change but also for social mobility. A solid policy framework that encourages green initiatives and the development of essential skills can result in the creation of green jobs, boosting economic growth while also promoting environmental sustainability [11]. In contrast, insufficient policy stability or skill development may impede the successful implementation of green programs, potentially increasing climate concerns and hindering social mobility.

The interrelated dynamics of environmental resistance, skill development, policy stability, and green initiatives have all been examined in several studies [12–14]. Research by Beasy et al., and Yan et al., among others, has shown the connections between green infrastructure, innovation in technology, policy stability, and skill development [15,16]. However, there is still a lot to learn about these dynamics in areas that are experiencing rapid economic growth while simultaneously prioritizing environmental sustainability, as the CPEC demonstrates. Although international talks at conferences such as COP27 and the G20 Summit have paved the way for tackling climate change, few studies have explored how these talks have materialized locally, especially in areas where environmental concerns and economic development initiatives collide [17]. The particular context of CPEC poses a specific research gap, as it represents a microcosm of the problems and opportunities faced by countries attempting to reconcile economic success with environmental stewardship. This study intends to address that gap by providing a nuanced understanding of the linked dynamics within the CPEC corridor. The study attempts to achieve the following objectives by using a mixed-method research design with Case-1 (which includes a quantitative approach and questionnaire) and Case-2 includes (qualitative interviews and themes analysis).

Case-1. To examine the relationships between green infrastructure, green technological innovation, policy stability, skill development, and their collective impact on climate change (SDGs-13) and social mobility within the CPEC perspective.

Case-2. To explore the perceptions and experiences of residents regarding green initiatives and environmental policies, considering the localized impact of global discussions-COP27 on climate change and the G20 summit.

The quantitative study (Case-1) plays a pivotal role in advancing our comprehension of climate change impacts and progress toward sustainable development goals (SDGs-13). By employing robust data analysis, the research offers a clear portrait of the evolving climate landscape and the effectiveness of initiatives aimed at climate action. Its significance extends to global policymaking, especially in the context of upcoming international events like COP 27. The empirical evidence presented in this study becomes a crucial tool for policymakers, allowing them to make informed decisions on mitigation and adaptation strategies. Furthermore, the focus on SDGs-13 underscores the study's commitment to the broader framework of sustainable development, providing a quantitative benchmark for evaluating worldwide efforts in addressing climate change and fostering a more sustainable future. Case 2 presents the qualitative theme enriches the discourse on sustainable development by unraveling the intricate dynamics of rapid economic growth and environmental concerns. The study's thematic analysis delves into the challenges and opportunities inherent in the interplay between green initiatives, policy stability, skill development, and environmental resistance. Its importance resonates not only with local stakeholders but also on the international stage, especially in forums like COP 27 and G20. The nuanced insights generated by this qualitative exploration provide a valuable guide for policymakers, community leaders, and environmental activists grappling with the delicate balance between economic development and ecological preservation. The results will be crucial in helping policymakers, particularly those in areas with comparable development paths, to design policies that strike a balance between environmental protection and economic growth. Environmental activists, community leaders, and practitioners can benefit greatly from the insights of the study into the interwoven dynamics of green initiatives, policy stability, skill development, and environmental resistance.

Stakeholders can match their advocacy efforts, community engagement tactics, and skill development projects with the concepts of environmental sustainability by comprehending the unique obstacles present in the CPEC setting.

2. Literature review

The integration of green infrastructure into legislative frameworks has been shown to enhance policy stability, fostering long-term sustainability and flexibility in governance systems [18]. Coombes & Viles, emphasize that aligning economic and environmental goals through investments in green infrastructure not only supports economic stability but also strengthens policy stability, ensuring a robust framework for future generations [19]. The implementation of green practices, as highlighted by Eckerberg et al. necessitates a competent workforce capable of sustaining environmentally friendly solutions, prompting the critical need for investments in green education and training programs [20]. Kalnbalkite et al. underscores the opportunities for skill diversity and specialization in the green sector, urging governments and educational institutions to adapt curricula to include green-focused training programs, thus preparing the workforce for a sustainable future [21]. Green technology innovation has become pivotal amid rising environmental concerns, influencing legislative frameworks and workforce skill development [2]. The literature review explores the intricate connections between policy frameworks, technology breakthroughs, and workforce demands, emphasizing the multidimensional impact of green technological innovation on policy stability and skill development [19]. Amin et al. demonstrate that integrating green technological innovation into policy frameworks enhances stability by promoting resilience and adaptability, particularly in waste management, renewable energy, and sustainable transportation [22]. Hasan & Du, highlight that green technological innovation attracts private investments, fostering economic growth through R&D initiatives and creating a cycle of innovation that aligns with economic and environmental goals [23]. The rapid progress in green technology necessitates a professional workforce proficient in areas such as data analytics, artificial intelligence, and sustainable engineering, creating opportunities for skill development [24].

Policy stability is crucial for effective climate change mitigation, as consistent and long-term frameworks are essential for implementing renewable energy projects and carbon reduction measures [22]. Governments prioritizing policy stability create an environment conducive to long-term investment in clean energy technology, expediting the shift to a low-carbon economy [25]. Additionally, Xu et al. emphasize that policy stability reduces uncertainty for enterprises and investors in the green technology sector, fostering private sector engagement, and leading to increased R&D, technical innovation, and the proliferation of climate-friendly practices [26]. Policy stability's impact extends beyond mitigation, significantly influencing the success of climate change adaptation efforts [27]. Skill development plays a multidimensional role in social mobility, serving as a pathway for individuals to ascend the socioeconomic ladder [1]. Education, as highlighted by Yang et al. is a crucial influencer of social mobility, providing individuals with specific skills and knowledge, particularly in higher education, opening avenues for upward mobility [28]. Occupational skills, directly impacting economic mobility, are instrumental in this process [29]. In the contemporary job market, technology skills have become pivotal for social mobility, contributing to the emergence of the digital divide [30]. Green infrastructure, encompassing ecological solutions and sustainable behaviors, has gained popularity as a method for mitigating climate change [25]. Policy stability's moderating role is crucial, as Korkut et al. assert that green infrastructure initiatives are most effective when supported by a robust legislative framework, ensuring long-term impact [31]. Aysan et al. highlight policy stability's significance in fostering a conducive environment for the execution and maintenance of green infrastructure projects, acting as a moderator that enhances the translation of policies into tangible environmental outcomes [32].

The relationship between green technological innovation and climate change mitigation is mediated by policy stability, according to Korkut et al. [31]. Governments incentivizing and investing in green technologies recognize the increasing importance of policy stability, as consistent and stable regulations, as emphasized by Zhou et al. [33], that attract private investments and align technological advances with climate change mitigation goals [33]. Amin et al. underscore the role of policy stability in fostering skill development in the renewable energy sector, as stable policies not only promote innovation but also establish the foundation for a competent workforce, facilitating the effective deployment of green technical solutions in the fight against climate change [22]. Green infrastructure, encompassing environmentally friendly behaviors and projects, holds the potential to impact social mobility by influencing government investments. According to Cherukunnath & Singh, skill development becomes pivotal for individuals to capitalize on the employment opportunities arising from green infrastructure initiatives, facilitating upward mobility [34]. This importance of education combined with skill development is echoed by Breinholt & Holm, highlighting how training programs can equip individuals to work in environmentally sustainable industries, acting as a gateway for social mobility [35]. Skill development also mediates the connection between green technology innovation and social mobility [16]. In the evolving landscape of green technology, continuous learning and adaptation are imperative for individuals to stay competitive in the labor market, contributing to personal development and social mobility [36]. The effective application of climate change mitigation and adaptation methods relies on policy stability, which serves as the foundation for long-term planning, investment, and regulatory frameworks [22]. However, environmental resistance, acting as a moderator, can influence the efficacy of stable policies [37]. Public opposition to environmentally sustainable policies, stemming from competing societal priorities, ignorance, or economic considerations, poses challenges to the smooth implementation of stable policies, hindering the achievement of climate-related goals [38]. Additionally, bureaucratic obstacles within governmental frameworks may impede the conversion of stable policies into feasible initiatives, limiting the impact of even the most stable climate policies due to convoluted administrative processes, competing interests, and inconsistent regulations [39].

Government investments in green infrastructure projects make skill development increasingly important in deciding how much access people have to possibilities for upward mobility. Skill development is essential for people to take advantage of the employment opportunities that green infrastructure initiatives generate [34]. Additionally, Breinholt & Holm highlights the importance of

education as a major factor in social mobility, particularly when it is combined with skill development [35]. Education and training programs can give people the skills they need to work in environmentally sustainable industries in the context of green infrastructure, opening doors for social mobility. Skill development also mediates the connection between green technological innovation and social mobility. Green sector technological improvements necessitate a workforce with particular capabilities [16]. People with entrepreneurial talents, which are frequently acquired in reaction to technology advancements, may experience upward mobility through wealth development and job creation [40]. Continuous learning and adaptation are required for individuals to remain competitive in the labor market in the context of green technology innovation [36]. This continuing skill development ensures that individuals are well-equipped to traverse the ever-changing world of green technology, thereby contributing to personal development and social mobility.

In order to solve environmental concerns, stable policies lay the groundwork for long-term planning, investment, and the creation of regulatory frameworks. However, a variety of environmental resistances can affect how effective stable programs are [37]. In the context of climate change, environmental resistance functions as a moderator, influencing the efficacy of policy stability. Public opposition to environmentally sustainable policies might obstruct the smooth implementation of stable policies, posing obstacles to the accomplishment of climate-related goals [38]. This resistance could be caused by competing societal priorities, ignorance, or economic considerations. Moreover, obstacles arising from bureaucratic processes in governmental frameworks may impede the conversion of stable policies into feasible initiatives [39]. Even the most stable climate policies may have limited effects due to convoluted administrative procedures, competing interests among governmental entities, and inconsistent regulations. Skill development is often seen as a social mobility catalyst, providing individuals with the competences required to access better employment prospects and contribute significantly to economic growth [41]. The literature supports a positive association between skill development and social mobility, with education and training programs identified as significant drivers of upward mobility [29]. However, environmental resistance appears as a moderating factor in the link between skill development and social mobility. C. Yang & Arhonditsis investigate how public perceptions toward ecologically sustainable practices may impact the demand for specific talents [42]. For example, if there is opposition to green technologies or sustainable practices, individuals developing talents in these areas may confront employment market obstacles, hurting their social mobility.

3. Development of hypothesis and framework

3.1. Resource-based view (RBV) theory

This study uses the Resource-Based View (RBV) theory to analyze complex dynamics connected to green infrastructure, green technological innovation, policy stability, skill development, and environmental resistance [43]. The RBV theory holds that enterprises and society can achieve long-term success and a competitive edge by using their resources and capabilities. Green infrastructure includes renewable energy installations and eco-friendly infrastructure [44]. These resources boost operational efficiency and attract investment, giving RBV a competitive edge. Green infrastructure helps develop sustainable regulatory frameworks, which stabilizes policy. These tools help organizations build environmental technology expertise [45]. In contrast, green technology innovation involves knowledge, patents, and creative methods. The RBV hypothesis states that intangible resources create an enduring competitive advantage by encouraging sustainable practices. Environmentally friendly innovation promotes sustainability-focused regulatory changes, which stabilizes policy. It also fosters competence by requiring eco-friendly technologies and methods [46]. RBV shows that

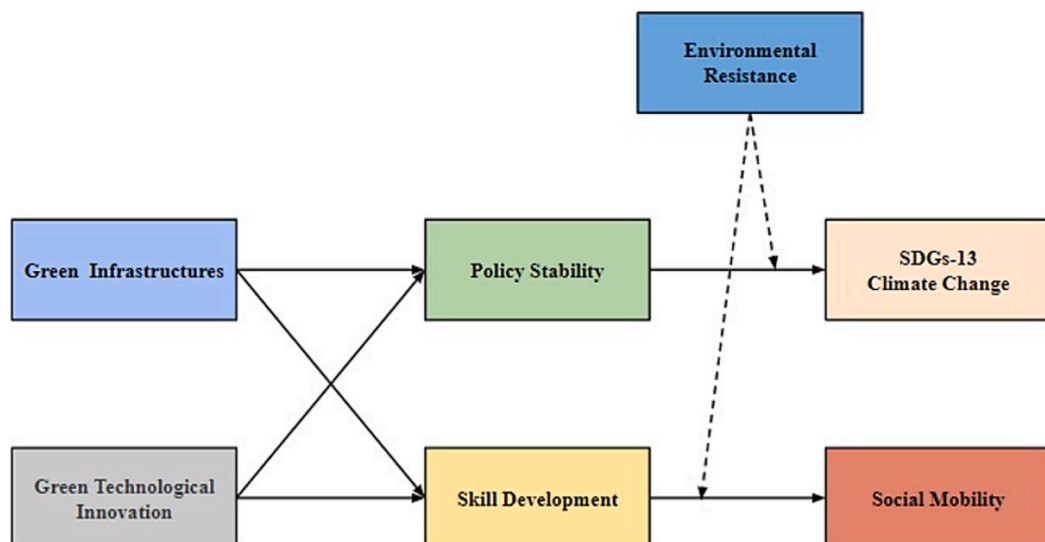


Fig. 1. Conceptual framework (CASE-1).

policy stability strongly affects resource utilization and strategic decision-making. Consistent policies foster long-term planning and resource allocation. Infrastructure and innovation thrive with strong policies [47]. This allows climate change mitigation and social mobility skill development. Skill development, a type of human capital, improves organizational and societal performance. RBV emphasizes skills and competencies as key resources for innovation and competitiveness. Green initiatives require environmental technological expertise [43]. These programs aim to boost labor productivity and social mobility by providing higher-value jobs. Environmental resistance in the RBV paradigm refers to external challenges for businesses. RBV recognizes the need for resilience and adaptability to face environmental challenges [46]. This study found that environmental resistance affects policy stability, skill development, climate change mitigation, and social mobility. This shows the importance of adaptive methods for sustainable development [46].

Based on the above discussion and literature review we developed the following hypothesis and conceptual framework as shown in Fig. 1.

- H1.** Green infrastructure has a significant impact on policy stability
- H2.** Green infrastructure has a significant impact on skill development
- H3.** Green technological innovation has a significant impact on policy stability
- H4.** Green technological innovation has a significant impact on skill development
- H5.** Policy stability has a significant impact on SDGs-13 climate change
- H6.** Skill development has a significant impact on social mobility
- H7a.** Policy stability mediates the relationship between green infrastructure and SDGs-13 climate change
- H7b.** Policy stability mediates the relationship between green technological innovation and SDGs-13 climate change
- H8a.** Skill development mediates the relationship between green infrastructure and social mobility
- H8b.** Skill development mediates the relationship between green technological innovation and social mobility
- H9a.** Environmental resistance moderates the relationship between policy stability and SDGs-13 climate change
- H9b.** Environmental resistance moderates the relationship between skill development and social mobility

4. Methodology

This study used a mixed-method approach, seamlessly blending quantitative and qualitative approaches to provide a thorough examination of the intricate dynamics in the domains of green initiatives, policy stability, skill development, environmental resistance, SDGs-13, and COP-27. In Case-1 and Case-2 prior consent had been taken from the potential participants for their availability and data contributions by contacting them. The studies involving human participants were reviewed and approved by Zhejiang University, China. The participants provided their written informed consent to participate in this study. The study was conducted by the Declaration of Helsinki.

4.1. Case-1

The study focuses on individuals living near the CPEC) a region where environmental policy and economic development are closely intertwined. A sample of 375 residents was selected using stratified random selection to ensure geographic representation. A questionnaire was created to gather diverse perspectives on environmental resistance, skill development, policy stability, and green initiatives (see Appendix A) supplementary materials. The questionnaire aimed to elicit quantitative data that could be analyzed statistically, focusing on the relationships between various parameters. The data was thoroughly analyzed using structural equation modeling (SEM) with Smart PLS 4.

4.2. Case-2

The study aimed to understand the impact of environmental policy and activities on COP-27 and G20 summits by engaging with key stakeholders. The qualitative component supported the quantitative dimension by examining policy formulation, lobbying campaigns, and community-level dynamics. In-depth semi-structured interviews were conducted to gather insights into their experiences, attitudes, and contributions to environmental projects (see Appendix-A) supplementary materials. A thematic analysis technique was used to analyze the qualitative data, allowing for a comprehensive interpretation of stakeholder narratives. This approach allowed for a deeper understanding of the complex aspects of environmental sustainability.

5. Results

5.1. Case 1 (quantitative findings)

The study validated the model by employing the partial least squares structural equation modeling (PLS-SEM) technique, which was executed using SmartPLS 4.0. The data was analyzed utilizing this methodology. PLS-SEM is considered more appropriate for exploratory investigations when compared to covariance-based structural equation modeling (CB-SEM) [48]. This factor played a significant role in the choice to utilize PLS-SEM instead of CB-SEM. It is worth considering that partial least squares structural equation modeling (PLS-SEM) is relatively more straightforward to interpret when compared to CB-SEM [49]. This study is characterized by an exploratory examination. Moreover, the Partial Least Squares (PLS) method is particularly suitable for assessing data collected from extremely limited sample sizes owing to its intrinsic adaptability [50].

5.1.1. Path analysis

This study employed a method called bootstrapping, which involved the collection of 5000 separate samplers to conduct statistical validation of the model hypotheses [51,52]. The t and p values were computed so that it could be decided whether or not the hypotheses should be accepted [53]. The positive coefficient of 0.332 indicates a positive relationship between these variables. The hypothesis is accepted because the low p-value of 0.000 suggests statistical significance. Hence H1 is accepted. The positive coefficient of 0.186 suggests a positive relationship, however, the p-value of 0.047 is less than the level of significance of 0.05. H2 is accepted. The statistical significance of the positive coefficient of 0.134 and the accompanying p-value of 0.031 support the acceptance of hypothesis H3. The positive coefficient of 0.239 and the low p-value of 0.004 suggest statistical significance, implying the acceptance of hypothesis H4. The low p-value of 0.002 and the positive coefficient of 0.275 indicate that the hypothesis is accepted. Hence H5 is accepted. The relationship between skill development and social mobility is the subject of the sixth hypothesis (H6). Even though the p-value is greater than 0.05, the positive coefficient of 0.133 shows a positive relationship. The additional hypotheses (H7a, H7b, H8a, and H8b) widen the analytical scope by investigating sequential interactions and including mediating factors. In the context of H7a, the positive coefficient of 0.091 suggests a positive indirect relationship between green infrastructure and climate change, mediated by political stability ($p = 0.009$). H7a is accepted. The hypotheses H7b, on the other hand, looks into the relationship between green technical innovation, policy stability, and climate change. The positive coefficient of 0.037 indicates a positive indirect correlation ($p = 0.019$), and H7b is accepted. The positive coefficient of 0.025, $p = 0.012$ indicates a positive indirect association, implying that improved green infrastructure is associated with increased skill development, which in turn contributes to increased social mobility. Hence H8a is accepted. A positive indirect association is indicated by the positive coefficient of 0.032. H8b is accepted with a p-value of 0.003, which is less than the significance limit. Two hypotheses (H9a and H9b) study the interacting effects of distinct factors in the context of moderation analysis. The positive coefficient of 0.342 indicates that there is a significant interaction effect. The hypothesis is accepted since the t-value of 5.868 and the p-value of 0.000 support the interaction effect's statistical significance. H9b, on the other hand, investigates the interaction effect of environmental resistance and skill development on social mobility. A non-significant coefficient of 0.003 and a comparatively high p-value of 0.477. The H9b has been rejected. Table 1 and Fig. 2 show the results of the moderation analysis.

5.2. CASE-2 (qualitative findings)

5.2.1. Perceptions and experiences with green initiatives

Participants in this study articulated a comprehensive perspective affected by global discourses, particularly events such as COP-27

Table 1
Path analysis.

| Hypotheses | Relationship | Beta (b) | SD | T value | P Values | Decision |
|----------------------------|-------------------|----------|-------|---------|----------|----------|
| Direct Relation | | | | | | |
| H1 | GI - > PS | 0.332 | 0.090 | 3.671 | 0.000 | Accepted |
| H2 | GI - > SD | 0.186 | 0.111 | 1.674 | 0.047 | Accepted |
| H3 | GTI - > PS | 0.134 | 0.071 | 1.870 | 0.031 | Accepted |
| H4 | GTI - > SD | 0.239 | 0.089 | 2.693 | 0.004 | Accepted |
| H5 | PS - > CC | 0.275 | 0.096 | 2.869 | 0.002 | Accepted |
| H6 | SD - > SM | 0.133 | 0.095 | 1.395 | 0.082 | Rejected |
| Mediation Analysis | | | | | | |
| H7a | GI - > PS - > CC | 0.091 | 0.038 | 2.371 | 0.009 | Accepted |
| H7b | GTI - > PS - > CC | 0.037 | 0.028 | 1.934 | 0.019 | Accepted |
| H8a | GI - > SD - > SM | 0.025 | 0.027 | 2.153 | 0.012 | Accepted |
| H8b | GTI - > SD - > SM | 0.032 | 0.028 | 2.843 | 0.003 | Accepted |
| Moderation Analysis | | | | | | |
| H9a | ER * PS - > CC | 0.342 | 0.058 | 5.868 | 0.000 | Accepted |
| H9b | ER * SD - > SM | 0.003 | 0.055 | 0.057 | 0.477 | Rejected |

Note: CC= Climate change, ER = Environmental resistance, GI = Green infrastructure, GTI = Green technological innovation, PS= Policy stability, SD= Skill development, SM= Social mobility.

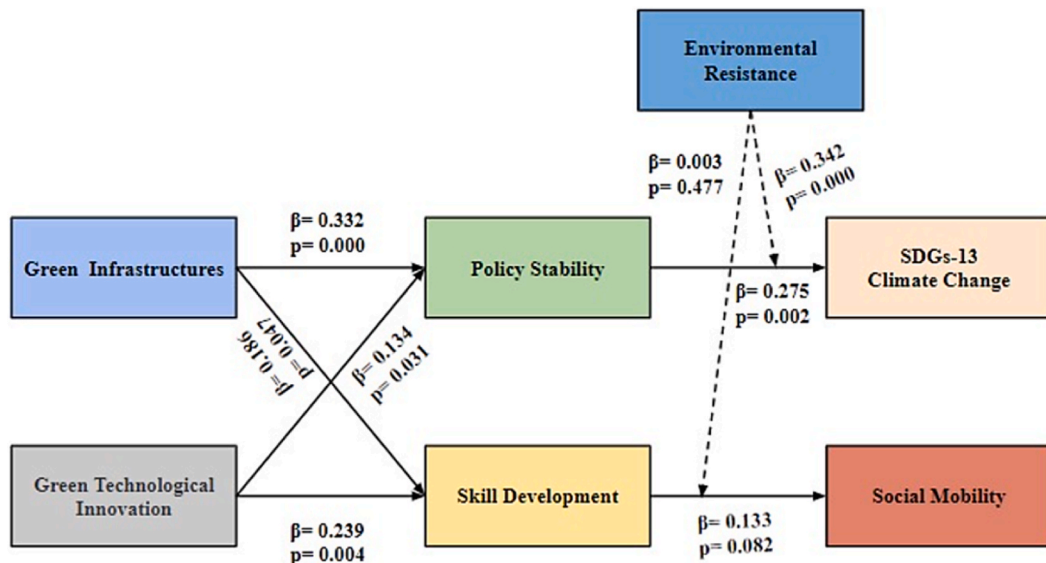


Fig. 2. Path model.

while investigating their perceptions and experiences with green initiatives.

Climate change and green initiatives extended beyond individual acts to include a collective, multinational endeavor to achieve environmental sustainability. "To me, green initiatives are not just about using clean, renewable energy sources locally," one participant said. It is also about synchronizing with global efforts about climate change, such as those discussed at conferences like COP-27, when leaders establish broader environmental sustainability policies." When participants thought about events like COP-27, the engagement with green efforts took on a more expansive perspective within the sub-theme of personal involvement and influence. One attendee said, "I have been involved in this local community garden project for years, but learning about the talks at COP-27 helps me consider how our regional initiatives relate to a bigger, worldwide movement. We feel like we are not doing this alone.

5.2.2. Policy stability in the context of green initiatives

The second theme focused on policy stability within the framework of green efforts, highlighting the global implications of policies deliberated at events like the G20 Summit. The significance of policies adopted at these summits in determining the trajectory of global green initiatives was acknowledged by the participants. "Having strong policies in place, both locally and internationally, as discussed in events like the G20 Summit, sets the tone," stated one participant. It is like a global pledge that spreads, inspiring both individuals and companies to adopt a greener lifestyle." Under the subtheme of experiences with policy stability, participants recognized the relationship between decisions made at international summits and local policies. "We had this fantastic local project to reduce plastic waste, but when the global policy landscape, as discussed in the G20 Summit, changed, funding was cut, and the project struggled to survive," one participant said. Global stability is important for our local activities." This interconnection highlights the importance of policy coherence and stability at both the global and local levels to properly support and sustain green projects.

5.2.3. Skill development and its connection to green initiatives

Participants in an exploration of the topic of skill development and its relationship to green efforts underlined the critical connection between learning new skills and being able to access employment possibilities in environmentally conscious industries. There was general agreement during the talks that international events, especially COP27, have a significant influence on the need for specialized knowledge in line with green objectives. "Attending workshops on sustainable practices has not only broadened my skill set but has also opened doors to job opportunities," said one participant, expressing this opinion. The skills that are stressed in these courses seem to align with the global discussions that occur at gatherings such as COP27." Participants acknowledged the existence of barriers to gaining skills for green jobs in the sub-theme addressing difficulties and possibilities for skill development. They did, however, appreciate the positive features of global initiatives, such as those highlighted at the G20 Summit, which recognized the need for uniform skill development programs. "There are challenges in developing skills for green jobs," one participant said, "but it is encouraging to see global initiatives, such as those discussed at the G20 Summit, recognizing the need for standardized skill development programs." It opens up doors for everyone."

5.2.4. Environmental resistance

As we moved on to the issue of environmental resistance, participants showed differing levels of comprehension and familiarity with this idea. The talks emphasized how important it is for international climate gatherings like COP27 to raise awareness of the complexity of environmental resistance. "I have heard the term 'environmental resistance' more during discussions around COP

conferences," one participant said. It is not only about individual acts; we can improve our strategy by being conscious of the greater power that is opposing change." Environmental opposition was also identified as a factor influencing policy implementation. Participants remarked that debates at meetings such as the G20 Summit emphasized how resistance, whether from the public or bureaucratic sources, may have a substantial impact on policy implementation. "Discussions at the G20 Summit make it clear that environmental resistance is a real hurdle," one participant noted. It is not only about developing policies; it is also about overcoming opposition to ensuring those policies are effectively executed."

5.2.5. Global climate discussions and events

Lastly, while examining international climate talks and events, participants voiced hope for the impact of these conversations, especially during COP27. They held that these conversations influence the global narrative, which in turn affects the views and behaviors of people. This sentiment was expressed by one participant, who said, "The global narrative on climate change is shaped by events like COP27. The idea that decisions made there affect not just legislation but also how people like me view and participate in green projects is encouraging." Furthermore, participants demonstrated various levels of understanding of global policies discussed at international venues such as the G20 Summit, indicating that such information influences their expectations for local policy consistency and support. "I try to stay informed about global policies, especially those discussed at the G20 Summit," one attendee said. It has an impact on my expectations for how local policies should connect with global initiatives toward sustainability." The graphical model can be seen in Fig. 3 based on the stakeholder perspective and SDGs-13.

6. Discussion

6.1. Quantitative

The need for environmentally sustainable practices and technologies to be integrated has grown as a result of the global imperative to address climate change. Green infrastructure has been a focal area for politicians looking to lessen the effects of climate change [54]. It includes a variety of sustainable solutions, such as renewable energy projects and urban planning initiatives [55]. According to Lorika et al., the deployment of green infrastructure projects is frequently followed by the development and improvement of environmental policies [56]. These rules, which are especially intended to encourage and regulate green activities, help to maintain a stable regulatory environment. A workforce trained in sustainable practices is essential for the implementation and upkeep of green infrastructure projects, according to research [57]. Therefore, to guarantee a workforce capable of efficiently contributing to and maintaining green initiatives, governments and companies investing in green infrastructure frequently give priority to skill

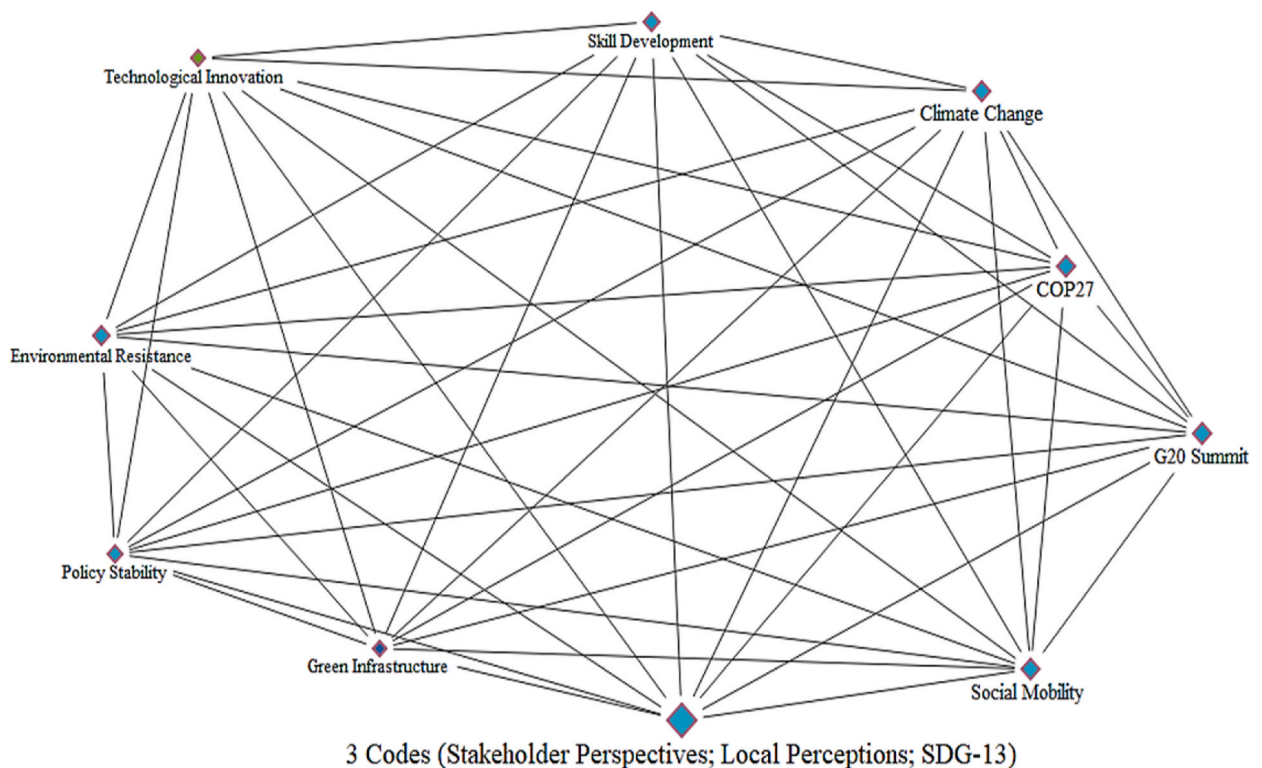


Fig. 3. Code relation model drive through analysis (Case-2).

does not moderate the association between skill development and social mobility. Economic conditions, job market dynamics, and societal views all have an impact on the impact of skill development on social mobility [63].

6.2. Qualitative

The examination of the interrelated dynamics of green initiatives, policy stability, skill development, and environmental resistance revealed participants increased global awareness. Individuals regarded their local efforts as essential to a larger global movement, influenced significantly by international events such as COP27. This is consistent with previous research emphasizing the function of global conferences in influencing public understanding and instilling a sense of shared responsibility for environmental sustainability [64]. Individuals displayed an understanding of the delicate interplay between global and local environmental policy by acknowledging the international significance of policies discussed at forums such as the G20 Summit in India. This is consistent with research that emphasizes the critical significance of global policy decisions in impacting national and local environmental policy landscapes [65]. The results underline the significance of global policy stability talks and the possible influence of worldwide policy changes on the accomplishment of regional green projects. Talks regarding skill development indicated the growing knowledge of how the labor market is changing due to conversations about environmental sustainability on a worldwide scale. People acknowledged the importance of events like COP27 in developing the skills required for sustainable practices, in line with the body of literature that already exists and emphasizes the significance of global events on the demand for certain skills in green sectors [66]. The study confirmed previous research on the complexity of public views and bureaucratic barriers in the context of environmental policy by demonstrating differing degrees of awareness and recognition of environmental resistance [67]. The link between environmental resistance and talks at global gatherings like COP27 and the G20 Summit in India emphasizes the importance of international forums in shedding light on the obstacles to effective policy implementation that resistance entails. Findings from global climate debates were consistent with the research, which emphasized the impact of worldwide events on individual attitudes and behaviors [68]. Individuals were aware of COP27 and the G20 Summit and saw them as crucial in influencing the global narrative on climate change. This is consistent with research demonstrating the importance of global narratives in changing individual attitudes and behaviors toward environmental sustainability [69]. The theme-based trends focused on knowledge areas of SDGs are depicted in Fig. 4.

7. Conclusion

The in-depth Case-1 analysis has intricately unraveled the relationship between green policies, skill development, policy stability, and environmental sustainability, greatly adding to the current body of knowledge. The empirical results clearly demonstrate the strong relationships that exist between green technological innovation, stable policy, and skill development, and they also reveal the critical role that these relationships play in shaping Sustainable Development Goal 13, which focuses on climate change. Notably, the research shows a strong link between policy stability and the introduction of breakthrough green technology. This correlation suggests that the foundational frameworks essential to environmental stability may be strengthened by advances in green technologies. Furthermore, the study emphasizes the critical relationship between policy stability and its important role in reducing climate change, underlining the critical need for stable policies in effectively addressing environmental problems. The quantitative research also emphasizes the important significance of skill development as a critical link between social mobility and environmental measures. This emphasizes how crucial it is to develop and acquire the kind of skills that lead to upward social mobility, especially in the ecologically sustainable sectors. However, while the data supports various hypotheses, it also suggests a nuanced viewpoint by implying that social mobility may not be directly driven by skill growth alone. This provides opportunities to investigate further to identify underlying processes or other elements that support social progress in the green sector. Simultaneously, the qualitative investigation revealed a variety of opinions and experiences regarding green efforts, policy stability, skill development, and environmental resilience.

Case 2 delved deeply into the intricate dynamics surrounding major international gatherings such as COP27 and the G20 Summit and their influence on public attitudes and behaviors regarding environmental sustainability. The study's focus on these global events sheds light on their role as catalysts for increasing public awareness of environmental barriers and challenges, thereby offering fresh perspectives on the complexities posed by environmental opposition. By examining how these events shape perceptions and behaviors related to environmental sustainability, the research provides valuable insights into the interconnectedness of global discourse and local actions. One key aspect explored in Case 2 is the impact of international events on policy stability. The study reveals that major gatherings like COP27 and the G20 Summit often lead to renewed commitments and agreements on environmental policies at the global level. These agreements, in turn, can influence national and regional policies, creating a ripple effect that impacts environmental sustainability efforts on a broader scale. Understanding how international events contribute to policy stability is essential for policymakers and stakeholders involved in shaping environmental agendas and implementing effective strategies. Additionally, Case 2 emphasizes the role of skill development in enhancing environmental sustainability outcomes. The study's findings suggest that international events serve as platforms for promoting knowledge exchange, capacity-building, and skill development initiatives related to green technologies and sustainable practices. This emphasis on skill development reflects a growing recognition of the importance of equipping individuals and organizations with the expertise needed to address environmental challenges effectively. By leveraging opportunities presented by global gatherings, stakeholders can foster innovation and drive positive change in environmental practices.

8. Study contribution

This study on CPEC makes a substantial contribution to the understanding of sustainable development and environmental

responsibility within rapidly developing economic corridors. By delving into the intricate dynamics of environmental opposition, policy stability, skill development, and green initiatives, the research offers valuable insights that resonate beyond the CPEC region. One of the key contributions lies in its nuanced exploration of how global concerns about climate change manifest at the regional level, as evidenced by COP27 and the G20 Summit. By positioning the CPEC as a microcosm, the study sheds light on the localized expressions of global discourse, providing a deeper understanding of how international agendas translate into regional policies and initiatives. The study's mixed-method research approach is another noteworthy contribution. By combining quantitative surveys with qualitative interviews of key stakeholders such as elected officials, environmental activists, and community leaders, the research captures a comprehensive range of perspectives and experiences related to green programs and environmental legislation within the CPEC. This approach enhances the study's credibility and robustness, offering a more nuanced understanding of the complex interactions between policy frameworks, technological innovations, skill development, and their collective impact on social mobility and climate change mitigation. Moreover, the identification of a critical research gap regarding the dynamics of economic development and environmental sustainability in rapidly growing economies adds significant value to the existing literature. The study's context-specific insights and practical implications for policymakers, environmental groups, and communities navigating the challenges of sustainable development within economic corridors underscore its relevance and potential impact in guiding future strategies and interventions.

9. Implications

9.1. Managerial implications

The study's emphasis on involving key stakeholders in policy formulation carries significant managerial implications. Managers overseeing projects within the CPEC corridor or similar contexts should prioritize inclusive decision-making processes that incorporate inputs from elected officials, environmental activists, and community leaders. This approach ensures that policies concerning environmental sustainability align with local needs, preferences, and concerns. Additionally, managers can facilitate dialogue and collaboration among diverse stakeholders to develop holistic strategies that balance economic growth with environmental responsibility. The study's findings highlight the importance of investing in skill development initiatives related to green technologies and sustainable practices. Managers can use this insight to design training programs aimed at equipping workforce members with the necessary knowledge and expertise to implement and maintain green infrastructure effectively. By fostering a skilled workforce, organizations operating within the CPEC corridor can drive innovation, reduce environmental impact, and enhance overall sustainability outcomes. Strategic partnerships play a crucial role in driving impactful environmental initiatives. Managers can leverage the study's insights to cultivate partnerships between government entities, environmental organizations, academia, and local communities. These partnerships can facilitate knowledge sharing, resource mobilization, and collaborative problem-solving, leading to more robust and sustainable outcomes. By forging strong alliances, managers can harness collective expertise and resources to address complex environmental challenges within the CPEC corridor and beyond.

9.2. Practical implications

The study underscores the importance of community engagement in driving successful environmental initiatives. Practically, managers can adopt community-centric approaches that prioritize local knowledge, participation, and empowerment. This may involve organizing community forums, conducting outreach campaigns, and involving residents in decision-making processes related to green infrastructure projects. By fostering a sense of ownership and responsibility among communities, managers can ensure the long-term sustainability and acceptance of environmental interventions. The interconnected nature of green infrastructure, technological innovation, and policy stability highlighted in the study informs practical resource allocation strategies. Managers can use data-driven insights to prioritize investments in areas that yield maximum environmental and social impact. This includes allocating resources for green technology research and development, infrastructure upgrades, policy implementation, and capacity-building initiatives. Strategic resource allocation ensures efficient use of resources and enhances the overall effectiveness of environmental sustainability efforts. The study's mixed-method research approach underscores the value of evidence-based decision-making. Managers can leverage quantitative data from surveys and qualitative insights from interviews to inform strategic decisions related to environmental policies, investments, and stakeholder engagement. Access to comprehensive data allows for a nuanced understanding of local dynamics, challenges, and opportunities, enabling managers to design targeted interventions that address specific environmental and social needs.

9.3. Theoretical implications

The study contributes to theoretical frameworks by highlighting the complexity of sustainable development in rapidly developing economies like the CPEC corridor. The interconnectedness of economic growth, environmental sustainability, and social mobility requires nuanced theoretical models that capture the dynamic interactions and trade-offs inherent in these contexts. Managers and researchers can build upon this understanding to develop more robust theoretical frameworks that guide sustainable development practices in similar settings. By analyzing the CPEC as a microcosm of global discourse on climate change and economic development, the study bridges theoretical concepts with on-the-ground realities. This bridge is essential for understanding how global initiatives and policies translate into actionable strategies at the regional and local levels. Theoretical frameworks that account for these

intersections can inform more effective strategies for addressing global challenges such as climate change within specific socio-economic contexts. The study's identification of a critical research gap underscores the ongoing need for theoretical advancements in sustainable development research. Future research directions may include exploring the implementation mechanisms of environmental policies, assessing community resilience to environmental changes, and investigating the role of international collaborations in driving sustainability outcomes. By addressing these gaps, researchers can contribute to a more comprehensive understanding of sustainable development processes and strategies.

9.4. Policy implications

The study's implications for various stakeholders are multifaceted and carry significant weight in shaping policies and actions related to environmental sustainability, economic development, and social well-being. Researchers, in particular, are encouraged to delve deeper into the intricate dynamics observed within rapidly growing economies. The study underscores the need for comprehensive research that not only explores the interplay between green infrastructure, technological innovation, policy stability, and skill development but also captures the diverse and nuanced perspectives of local communities living along the CPEC corridor. Employing mixed-method approaches, such as combining quantitative surveys with qualitative interviews of key stakeholders, is deemed essential to gaining a holistic understanding of these complex dynamics. Policymakers stand to benefit significantly from the study's findings. They are urged to prioritize the integration of green initiatives and sustainability measures into economic development strategies, recognizing that environmental considerations are integral to long-term economic success. By adopting evidence-based policy formulation processes informed by insights from stakeholders and research outcomes, policymakers can design and implement more effective and sustainable policies that strike a balance between economic growth and environmental responsibility.

Government organizations, including relevant ministries and agencies, play a crucial role in translating policy objectives into actionable initiatives on the ground. The study highlights the importance of incentivizing the development and deployment of green technologies and infrastructure within economic corridors like the CPEC. This may involve offering financial incentives, regulatory support, and fostering public-private partnerships to accelerate the adoption of sustainable practices. Collaboration with local communities, environmental groups, and elected representatives is also emphasized as a means to ensure that policies align with the needs and priorities of those directly impacted by development projects. At the societal level, the study underscores the necessity of raising awareness and fostering a culture of environmental stewardship and sustainable living. Citizens living in and around the CPEC corridor, as well as other similar regions experiencing rapid economic growth, need to be informed about the importance of green initiatives, environmental legislation, and sustainable practices. This includes promoting initiatives that enhance environmental literacy, encourage participation in conservation efforts, and provide training and skill development opportunities related to green technologies and sustainability practices.

10. Limitations and future direction

10.1. Limitations

There are a few limitations to this study that should be taken into account. First off, the specificity of the setting may limit the generalizability of the findings, which could restrict its relevance to other areas or groups. Furthermore, the overall robustness may be impacted by biases and inaccuracies brought about by the dependence on self-reported data. Another drawback of temporal factors is that, as the study only offers a snapshot and not a longitudinal perspective, it may miss long-term dynamics and changes over time. Although the study acknowledges the complexity of environmental resistance, it is possible that it does not adequately capture all of its complex psychological, cultural, and socioeconomic aspects.

10.2. Future direction

Future studies should incorporate longitudinal studies to investigate the sustainability and long-term effects of green efforts on social mobility and environmental resistance to solve these constraints and improve the field. Cross-cultural investigations could add to our understanding by looking into how cultural differences influence the identified links. In-depth research that focuses on the multidimensional character of environmental resistance is encouraged, as it will give insight into other elements that lead to resistance. Exploration of additional mediating variables other than skill development and policy stability may provide a more comprehensive understanding of the complicated processes involved. Furthermore, experimental designs evaluating specific policy interventions and the development of quantitatively driven policy recommendations can provide policymakers and practitioners with practical insights. By addressing these constraints and pursuing these future objectives, future research endeavors can expand on the foundation established by this study, resulting in a more thorough understanding of the linkages between green initiatives, social mobility, and environmental sustainability.

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Ethical approval consent

The studies involving human participants were reviewed and approved by Zhejiang University, China. The patients/participants provided their written informed consent to participate in this study. The study was conducted by the Declaration of Helsinki.

CRedit authorship contribution statement

Shumaila Arzo: Writing – original draft, Methodology, Data curation, Conceptualization. **Mi Hong:** Writing – review & editing, Supervision, Resources, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e33524>.

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