



RESEARCH PAPER

Peace in Perspective: A Visual Data Analysis of the Global Peace Index 2023

¹Hani Nasar and ²Itrat Batool Naqvi*

1. Student, School of Life Sciences, Forman Christian College (A Chartered University) Lahore, Punjab, Pakistan

1. Associate Professor Department of Statistics, Forman Christian College (A Chartered University) Lahore, Punjab, Pakistan

***Corresponding Author:** itratnaqvi@fccollege.edu.pk

ABSTRACT

This paper delves into the Global Peace Index (GPI), a comprehensive metric evaluating global peace through factors like safety, security, ongoing conflict, and militarization. The objective is to dissect the GPI's assessment of global peace, identifying key factors that influence a nation's peace status. Employing statistical analysis alongside data visualization techniques, the study methodically examines the GPI's multifaceted criteria. The findings underscore the critical role of safety and security, alongside the impact of ongoing conflicts, in determining a nation's peace status. Notably, the analysis reveals pronounced regional disparities in peace, illustrating the intricate challenges of bolstering global peace. The paper concludes by proposing targeted peace-building initiatives, advocating for a holistic strategy to foster safer, more secure societies globally. It is recommended to address the underlying issues identified, marking a significant step towards realizing the aspirations of the GPI for enhanced global peace.

KEYWORDS Data Visualization of GPI 2023, Global Peace Index 2023, Justice, Peace, Secondary Data Analysis

Introduction

Research on peace has evolved, initially focusing on reducing wars and conflicts, known as 'negative peace.' Over time, the field also included 'positive peace,' which looks at cooperation and integration in society. Historically, the emphasis has often shifted from conflicts between countries to civil and internal conflicts, reflecting the complexity of achieving peace (Gleditsch et al., 2014). This background is useful when looking at tools like the Global Peace Index, which measures peace across different countries using a variety of indicators.

The Global Peace Index (GPI) report shows how peaceful countries and regions are. It is produced by the Institute for Economics & Peace and shared through Vision of Humanity. It looks at factors like safety, conflicts, and how much countries use their military to figure out how peaceful a place is. Since it started in 2007, the GPI has been updated every year to help us see how peace changes over time and what we can do to make the world more peaceful (Nair, 2016). It uses a lot of different information to rank countries on peace, and this helps governments, researchers, and people like us understand where peace is strong and where it needs help. The idea is to show that peace is good for everyone's well-being and to encourage ways to build a more peaceful world.

The GPI's comprehensive approach also highlights the multifaceted nature of peace. It integrates economic, social, and political dimensions, acknowledging that true peace extends beyond the mere absence of war. For instance, factors such as political instability, relationships with neighboring countries, and social injustice are considered, which aligns with the broader definition of positive peace. This multidimensional perspective is crucial because it provides a holistic understanding of peace, allowing for more targeted and

effective peacebuilding efforts. Additionally, the GPI's annual updates and extensive data collection offer valuable trends and patterns, enabling policymakers and researchers to track progress and identify emerging threats to global peace. By offering a detailed and dynamic picture of peace, the GPI serves as a critical tool in the global effort to promote stability and harmony.

Literature Review

Peace research has evolved significantly over the decades, encompassing a wide array of approaches and methodologies to understand the multifaceted nature of peace and conflict. Johan Galtung's seminal work in the late 1960s introduced the concepts of negative peace, defined as the absence of violence or war, and positive peace, which includes the presence of social justice, equality, and harmony (Olivius & Åkebo, 2021). This bifurcation has influenced subsequent research, influencing scholars to investigate the underlying conditions that sustain peaceful societies. Recent studies emphasize the importance of social cohesion and economic development in fostering durable peace. For instance, some argue that economic stability and equitable resource distribution are critical in preventing the onset of civil wars (Murshed & Tajoddin, 2009). Additionally, the role of governance and political institutions has been highlighted, with research suggesting that transparent and inclusive governance structures are vital in mitigating conflict and promoting peace (Annahar et al., 2023). The intersectionality of peace studies with other disciplines, such as economics, psychology, sociology, and political science, has enriched the field, allowing for more comprehensive analyses of peacebuilding processes (Ghaderia, 2011). This interdisciplinary approach underscores the complexity of achieving sustainable peace and the need for holistic strategies that address multiple dimensions of human security.

The Global Peace Index (GPI), developed by the Institute for Economics & Peace (IEP), emerges as a pioneering tool designed to measure the relative peace of nations and regions across the globe. Since its inception in 2007, the GPI has annually provided valuable insights, guiding policymakers, researchers, and the public in understanding the dynamics of global peace. The GPI was conceived with the goal of quantifying the concept of peace using a comprehensive array of indicators. It categorizes these indicators into three main domains: societal safety and security, ongoing domestic and international conflict, and militarization. This methodology allows the GPI to provide a nuanced analysis of peace, encompassing a wide spectrum of factors from homicide rates to military expenditure.

The GPI has significantly contributed to tracking changes in global peace over time, identifying regions of peace and conflict, and informing policy and international development strategies. Its data and findings have been extensively utilized in academic research, contributing to a deeper understanding of the economics of peace and the factors that promote or hinder peaceful societies. The GPI's role extends beyond academia, influencing policy discussions and offering a benchmark for the effectiveness of peacebuilding initiatives. However, despite its wide application and influence, the GPI faces criticism and challenges related to the complexity of measuring peace, potential biases in indicator selection, and data interpretation. Critics argue that the GPI's methodology may oversimplify the multifaceted nature of peace and conflict, raising questions about the accuracy and reliability of its rankings. These debates highlight the importance of continuous methodological refinement and the need for a critical approach to interpreting GPI data (Nair, 2016).

Measuring peace is challenging because it's complex and ever-changing, as highlighted by Söderström and Olivius (2022). Peace involves many voices and perspectives, making it hard to capture fully with a single method. It's also a dynamic process, not a fixed state, influenced by past and future events. Additionally, peace is felt differently by individuals, adding an emotional layer that needs careful consideration. The Global Peace Index (GPI) often falls short because it primarily measures peace through the absence of conflict and

uses broad, state-level data. This approach misses the diverse experiences and emotional aspects of peace, and it doesn't account for the evolving nature of peace over time. Therefore, while the GPI provides useful data, it doesn't capture the full, nuanced picture of what peace truly means to different people and communities.

Material and Methods

The data for the analysis on “Global Peace” is taken from Vision of Humanity. The Global Peace Index (GPI) is a composite index developed by the Institute for Economics & Peace (IEP) that measures the peacefulness of countries. The GPI is composed of 23 qualitative and quantitative indicators, each weighted on a scale of 1-5. The lower the score, the more peaceful the country is considered.

In a world where conflict and militarization can significantly impede peacefulness, it is important to analyze and understand the interrelations of these factors. Utilizing data analysis in R, this study aims to dissect the various aspects of peace, assessing their current state, progress, and challenges across different regions and countries. The choice of R as a tool for this analysis is predicated on its robust statistical and graphical capabilities, making it ideal for handling large data sets and complex analyses. Additionally, R's extensive libraries and packages facilitate sophisticated visualizations and modeling techniques, enabling a deeper exploration of the intricate relationships between the GPI indicators. This comprehensive analysis will contribute valuable insights into the dynamics of global peace, aiding policymakers, and researchers in their efforts to promote stability and harmony worldwide.

Results and Discussion

Table 1
Five most and least peaceful countries of the year 2023

Country	Overall Scores	Type
Iceland	1.124	Most Peaceful
Denmark	1.310	Most Peaceful
Ireland	1.312	Most Peaceful
New Zealand	1.313	Most Peaceful
Austria	1.316	Most Peaceful
Afghanistan	3.448	Least Peaceful
Yemen	3.350	Least Peaceful
Syria	3.294	Least Peaceful
South Sudan	3.221	Least Peaceful
Democratic Republic of the Congo	3.214	Least Peaceful

Global Peace Index 2023: Overall Scores

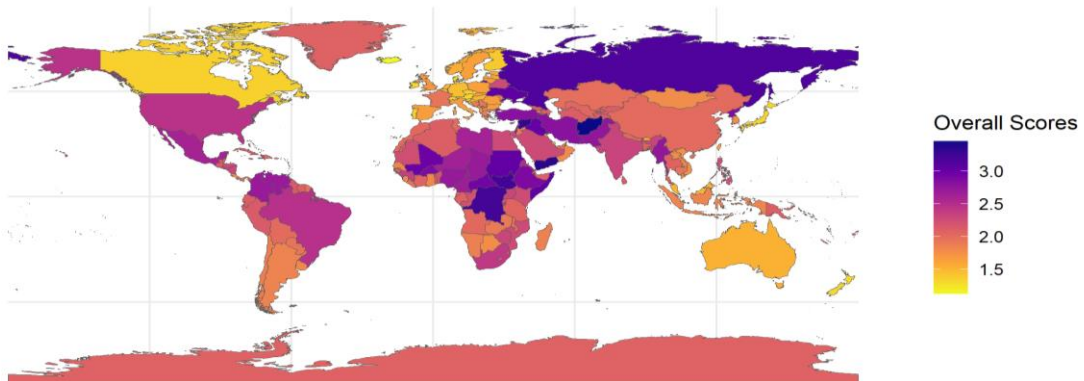


Figure 1. Choropleth map visualizing the overall peace scores by country

Using the Global Peace Index dataset for 2023, the table shows the top 5 most peaceful countries and the top 5 least peaceful countries based on their overall peace scores. The table effectively compares the two groups, allowing for a clear and concise comparison. The most peaceful countries are those with the lowest scores, reflecting their higher state of peace, while the least peaceful countries, with the highest scores, are those facing more significant challenges related to safety, security, and ongoing conflict.

Similarly, the map displayed is a choropleth map from the Global Peace Index 2023, showing the overall peace scores by country. In this map, countries are colored based on their peace scores, with darker shades of purple indicating less peace and lighter shades of yellow representing more peaceful nations. This visual representation helps to quickly identify which countries are the most and least peaceful. Such a map is useful for understanding global peace patterns at a glance.



Figure 2. Heatmap of GPI 2023 scores across four peace-related variables by country

The heatmap provides an at-a-glance comparison of peace index scores across a selection of countries, using a composite of indicators related to safety and security, ongoing conflict, and militarization, on a scale where lower scores indicate greater peacefulness. Countries like Switzerland, Iceland, and Singapore rank as some of the most peaceful, with low scores across all indicators, particularly in ongoing conflict and militarization. In contrast, nations such as Iraq and South Sudan exhibit high scores, highlighting significant challenges in all the measured variables, especially in ongoing conflict, which contribute to their lower standings regarding peacefulness.

This visualization serves as a powerful tool for quickly identifying the relative peace or conflict within these countries, with the dendrogram on the right suggesting clusters of countries with similar profiles. The differences in scores between the top and bottom countries highlight the diverse global landscapes of peace and underscore the ongoing need for targeted policy interventions in those regions struggling with conflict and insecurity.

Moreover, the heatmap and dendrogram highlight the elaborate interplay between the measured variables. Countries with high levels of safety and security generally show lower levels of militarization and ongoing conflict. This correlation is evident in nations like Iceland and New Zealand, which are not only among the safest but also exhibit minimal

militarization. On the other hand, countries like Iraq and Afghanistan, plagued by high conflict levels, also display significant militarization, underscoring the cyclical nature of conflict and militarization. Such insights align with the findings of Aziz and Asadullah (2017), who emphasize that prolonged conflicts often lead to increased military expenditure, which in turn, fuels further conflict. Additionally, the relationship between peace and economic stability can be inferred from the economic profiles of the peaceful nations in the heatmap. For instance, Switzerland and Singapore, known for their robust economies, also rank high on peace indicators, suggesting that economic prosperity may contribute to or be a result of a peaceful environment. This notion is further supported by the research of Collier and Hoeffler (2004), who argue that economic incentives can be powerful tools in peacebuilding efforts. These studies collectively highlight the multifaceted nature of peace, influenced by security, economic stability, and militarization.



Figure 3. Scatter plot matrix showing correlations between the three peace-related variables

The scatter plot matrix provides a multifaceted view of how the various indicators of the Global Peace Index (GPI) correlate with one another across all the countries. The matrix compares Overall Scores with specific factors: Safety and Security, Ongoing Conflict, and Militarization, with each point representing a country’s score in these categories.

The density plots along the diagonal show the distribution of scores for each indicator. The strong positive correlation between Overall Scores and Safety and Security (correlation coefficient of 0.921) and Ongoing Conflict (0.924) is evident, indicating that as scores for Safety and Security and Ongoing Conflict increase (representing worsening conditions), the Overall GPI Score also increases, signifying less peace. The correlation between Overall Scores and Militarization is positive but moderate (0.562), suggesting that

while Militarization is an important factor, its impact on the overall peace score is less direct or possibly mediated by other factors.

The scatter plot matrix also reveals intriguing patterns when considering the correlations between specific indicators. For instance, the correlation between Safety and Security and Ongoing Conflict is notably high (0.749), suggesting that regions experiencing high levels of conflict often suffer from diminished safety and security. This relationship aligns with findings that the presence of conflict directly undermines public safety and infrastructure (Le et al., 2022). Interestingly, the correlation between Safety and Security and Militarization is relatively low (0.314), indicating that high militarization does not necessarily equate to higher safety and security. This insight supports the work of Mummolo (2018), who contends that excessive militarization can sometimes exacerbate tensions rather than mitigate them.

The scatter plot illustrating the relationship between Ongoing Conflict and Militarization (correlation coefficient of 0.473) shows a moderate positive trend, reflecting that conflict-ridden countries often have higher military expenditures. However, the variability in this relationship suggests that other factors, such as international aid and political stability, might also play significant roles, as discussed by Steinwand (2015). Furthermore, the density plots provide a clear visual representation of the score distributions, offering insights into the skewness of each indicator's data. For example, the Militarization plot reveals a right-skewed distribution, indicating that while most countries have moderate militarization levels, a few have exceptionally high scores.

Overall, these visualizations and correlations underscore the complexity of achieving peace, highlighting that reducing conflict and enhancing security are crucial, yet challenging, objectives for many nations. The nuanced relationships between these indicators emphasize the need for comprehensive, multi-dimensional strategies in peacebuilding efforts.

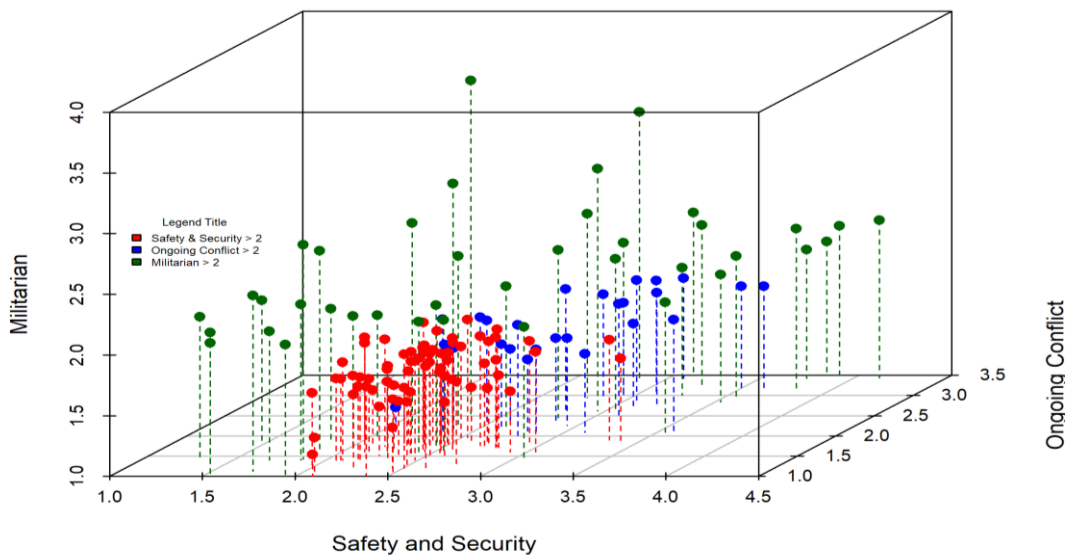


Figure 4. 3D scatter plot illustrating the relationship between Safety and Security, Ongoing Conflict, and Militarization in various countries

This 3-D scatterplot is a valuable tool for visualizing the complex interplay between safety, conflict, and militarization in various countries. The clustering of red, blue, and green dots highlights the overlap of these issues, suggesting that countries with high military engagement often also experience significant safety and security concerns as well as

ongoing conflicts. This observation aligns with studies by Collier and Hoeffler (2004) as well as other studies which suggest that high military presence can be both a response to and a cause of ongoing conflict (Oliveira, 2016).

Furthermore, the vertical lines connecting each dot to the base plane offer a clear perspective on how each country scores on individual factors. For instance, a green dot situated high on the Militarism axis but low on the Safety and Security axis indicates a country with high military engagement but relatively better safety conditions. Conversely, countries with dots scattered at higher values on all three axes indicate severe issues across all metrics, reflecting a deeply entrenched cycle of violence and insecurity (Żakowska, 2020).

The spatial distribution of the dots also reveals that countries rarely excel in one area without facing challenges in another. For example, countries with high safety scores often exhibit lower militarization and conflict levels. This pattern supports the findings of various studies that argue that peaceful conditions are typically maintained through balanced governance and minimal military intervention.

Overall, this 3-D scatterplot not only highlights the intricate relationships between key peace and conflict indicators but also underscores the importance of addressing multiple dimensions simultaneously to foster a peaceful and secure environment.

Taking the above results and visualizations into account, the analysis of the Global Peace Index (GPI) 2023 reveals nuanced insights into the dynamics of global peacefulness and emphasizes the critical roles of safety and security, ongoing conflict, and militarization. The sharp contrasts between the most and least peaceful countries underscore the complex landscape of global peace and the multifaceted challenges that nations face. The correlation analysis, particularly the strong associations between overall peace scores and indicators like safety and security, as well as ongoing conflict, highlights the paramount importance of these factors in influencing a nation's peace status.

The visualizations, including choropleth maps, heatmaps, and scatter plot matrices, provide compelling evidence of the disparities in peacefulness across regions, showcasing how some countries have managed to cultivate environments of tranquility despite global challenges. The findings from this paper underscore the urgency of targeted peacebuilding initiatives that address the root causes of conflict and militarization.

It is evident that enhancing safety and security, reducing conflict, and addressing militarization are pivotal to improving global peace. The paper's analysis also points towards the need for a comprehensive and deep understanding of peace that considers the relationship of various factors contributing to or detracting from peaceful societies. The GPI's comprehensive approach to measuring peace provides valuable insights into the factors that enhance or hinder peace. The findings from this paper should serve as a catalyst for further research and action, guiding efforts to build more peaceful and secure societies worldwide.

The analysis of the 3-D scatterplot reveals additional insights in understanding global peace. The visualization explores an interesting pattern that countries with higher safety and security often experience lower levels of militarization and ongoing conflict. This suggests that improving safety and security can be a critical step towards reducing conflict and the need for heavy militarization. Studies support this idea, arguing that stable and secure environments are less likely to escalate into conflict.

Moreover, the data points clustered at higher levels of all three indicators—safety and security, ongoing conflict, and militarization—highlight the vicious cycle of violence that some countries are trapped in. These nations require comprehensive peacebuilding

strategies that simultaneously address multiple angles of insecurity. Studies emphasize the importance of integrating political, economic, and social reforms in post-conflict recovery to prevent the resurgence of violence.

The GPI's findings also point to the significance of international cooperation in fostering global peace. Countries that have achieved high peace scores often participate in international peacekeeping missions and conflict resolution efforts. This international dimension of peace underscores the interconnectedness of global security and the need for collaborative efforts to address common threats.

Lastly, the insights from the GPI should inform policymakers about the critical areas requiring intervention. For example, investing in education and healthcare can indirectly contribute to peace by promoting social stability and reducing grievances that often lead to conflict. These investments can build resilient societies capable of withstanding and recovering from conflicts.

In conclusion, the Global Peace Index offers a valuable framework for understanding the multifaceted nature of peace and conflict. The correlations between safety and security, ongoing conflict, and militarization, as illustrated through various visualizations, highlight the need for comprehensive and integrated approaches to peacebuilding. The GPI's insights should serve as a guide for policymakers and researchers, emphasizing the importance of addressing multiple dimensions of peace to create more resilient and peaceful societies.

Conclusion

The empirical insights gained from the GPI underscore the complexity of achieving global peace. The comprehensive nature of the GPI, accounting for various qualitative and quantitative measures, allows for an in-depth understanding of the factors that cultivate a peaceful society. It is evident that no single factor can independently determine a country's peace status; instead, it is the intricate interplay of security, conflict, and military policies that shapes the peacefulness of nations. The data-driven approach to understanding peace highlights the need for nuanced and multifaceted strategies in peacebuilding efforts.

Recommendations

In light of these findings, it is recommended that policymakers and international bodies prioritize the enhancement of safety and security and the reduction of conflict as key strategies for peacebuilding. Efforts should be made to address the root causes of conflict, invest in early warning systems, and promote dialogue and reconciliation. Moreover, demilitarization initiatives could be beneficial in regions where the military's role is disproportionately affecting peace. It is also crucial for interventions to be tailored to the specific needs and contexts of individual countries, as the drivers of peace and conflict are unique to each nation.

In today's perspective, peace is seen as more than just the absence of war. It includes two main aspects: 'negative peace,' which means no direct violence or conflict, and 'positive peace,' which involves creating a fair and inclusive society. Positive peace focuses on building a society where there is justice, equal rights, and opportunities for everyone, and where sustainable development is promoted. To achieve real peace, we need to do more than just stop fights; we need to actively work on solving underlying issues through dialogue, education, and making changes in our systems and policies. This way, peace becomes a lasting part of society, benefiting everyone (Mustafa et al., 2023).

References

- Annahar, N., Widaningsih, I., Paskarina, C., & Muhtar, E. A. (2023). A bibliometric review of inclusive governance concept. *Cogent Social Sciences*, 9(1), Article 2168839. <https://doi.org/10.1080/23311886.2023.2168839>
- Aziz, N., & Asadullah, M. N. (2017). Military spending, armed conflict and economic growth in developing countries in the post-Cold War era. *Journal of Economic Studies*, 44(1), 47-68. <https://doi.org/10.1108/JES-01-2015-0021>
- Collier, P., & Hoeffler, A. (2004). Greed and grievance in civil war. *Oxford Economic Papers*, 56(4), 563-595. <https://doi.org/10.1093/oep/gpf064>
- Ghaderia, M. (2011). Peace-based curriculum based on the theories of "difference" and "similarity." *Procedia - Social and Behavioral Sciences*, 15(1), 3430-3440. <https://doi.org/10.1016/j.sbspro.2011.04.314>
- Gleditsch, N. P., Nordkvelle, J., & Strand, H. (2014). Peace research – Just the study of war? *Journal of Peace Research*, 51(2), 145-158. <https://doi.org/10.1177/0022343313514074>
- Le, T.-H., Bui, M.-T., & Uddin, G. S. (2022). Economic and social impacts of conflict: A cross-country analysis. *Economic Modelling*, 115, 105980. <https://doi.org/10.1016/j.econmod.2022.105980>
- Mummolo, J. (2018). Militarization fails to enhance police safety or reduce crime but may harm police reputation. *Proceedings of the National Academy of Sciences of the United States of America*, 15(37), 9181-9186. <https://doi.org/10.1073/pnas.1805161115>
- Murshed, S. M., & Tajoddin, M. Z. (2009). Revisiting the greed and grievance explanations for violent internal conflict. *Journal of International Development*, 21(1), 87-111. <https://doi.org/10.1002/jid.1478>
- Mustafa, G., Jamshed, U., Nawaz, S., Arslan, M., & Ahmad, T. (2023). Peace: A conceptual understanding. *Journal of Positive School Psychology*, 7(4), 853-863.
- Nair, N. V. (2016). Constructing indices of peace: A critical reappraisal with particular reference to Global Peace Index. *Gandhi Marg Quarterly*, 38(1), 71-100.
- Oliveira, A. (2016). The use of military force in the management and resolution of conflicts. *JANUS.NET e-journal of International Relations*, 7(1), 33-54.
- Olivius, E., & Åkebo, M. (2021). Exploring varieties of peace: Advancing the agenda. *Journof Peacebuilding & Development*, 16(1), 3-8. <https://doi.org/10.1177/1542316621995641>
- Söderström, J., & Olivius, E. (2022). Pluralism, temporality and affect – methodological challenges of making peace researchable. *Conflict, Security & Development*, 22(5), 411-433. <https://doi.org/10.1080/14678802.2022.2123218>
- Steinwand, M. C. (2015). Foreign aid and political stability. *Conflict Management and Peace Science*, 32(4), 395-424. <http://dx.doi.org/10.1177/0738894214541227>
- Żakowska, M. (2020). The roots of armed conflicts: Multilevel security perspective. *Security and Defence Quarterly*, 30(3), 49-64. <https://doi.org/10.35467/sdq/124962>