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THE BLUE CRISIS: INTERSECTIONS OF WATER SCARCITY AND CLIMATE CHANGE

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Abstract. *The central goal of this investigation is to explore how climate change might intensify water scarcity, particularly in regions already at risk. The research delves into the ways climate change acts synergistically to worsen water scarcity in regions already at risk and addresses the crucial question of how changes in weather and increasing temperatures compound existing shortages. Through analyses of climate trends, water availability, and the related socio-economic effects, the research reveals that vulnerable populations often face increased health risks. This is driven by a greater incidence of waterborne diseases, food insecurity, and added strain on healthcare systems all linked to water scarcity. Key findings indicate that countries with limited adaptive capacity often face heightened vulnerability, potentially exacerbating health disparities, particularly amongst marginalized groups. The study underscores the urgent need for water and health management strategies that consider the interconnectedness of climate change and healthcare outcomes. These findings are significant as they highlight the imperative for policymakers to adopt a multidisciplinary approach in addressing water scarcity, recognizing it as a critical determinant of health. Furthermore, by elucidating the extensive implications of water shortages induced by climate change on public health infrastructure and community resilience, this research contributes to the growing body of literature advocating for proactive and comprehensive responses to emerging global health threats. Consequently, the outcome of this study not only enriches the discourse on climate-related health issues but also provides a framework for future research and policy development aimed at mitigating the adverse health impacts associated with water scarcity within a changing climate.*

Keywords*: climate change, water availability, blue crisis, food security, water scarcity*

INTRODUCTION

The mounting pressures of climate change mean addressing water scarcity is more urgent than ever, with implications for environmental and human health alike. It's important to consider how these issues interact. This interplay shows itself through things like altered precipitation patterns, higher evaporation, and more intense extreme weather. All this contributes to less freshwater, both in quality and quantity, for people to use (CHOWDHURY TNN et al., 2025). Socio-economic factors—think population growth and poor infrastructure—make many regions even more vulnerable to these changes. This, in turn, leads to more cases of water scarcity (IDOKO DO ET AL., 2024, MENSAH J, 2019). This research dives into the complexities of the climate change and water scarcity connection. It focuses mainly on what this means for health and for keeping our water resources sustainable. The main problem? We don't fully grasp how climate change worsens water scarcity. We also need to better understand the resulting health problems faced by those most at risk (KORHONEN J ET AL., 2017, KUMMU M ET AL., 2016). This article aims to achieve several goals. First, it will look at how much climate change affects water scarcity around the world. Second, it will analyze the effects on public health, especially for marginalized groups. Third, it will suggest management strategies

that bring different ideas together. The aim is to lessen these impacts and promote sustainable water practices (GEORGE G ET AL., 2016, KEESSTRA S et al., 2016, CIANCONI P et al., 2020). Academically speaking, this work adds to the growing research on the many-sided challenges from climate change, mainly those tied to water and health (MA T ET AL., 2020, ZHOU D ET AL., 2018). From a practical standpoint, understanding these connections is key for policymakers. They need to develop good ways to respond to both climate change and water scarcity, especially in at-risk areas facing multiple threats (PAOLO D'ODORICO ET AL., 2018, GOMIERO T, 2016, PASCALAU ET AL., 2024, OACHIS ET AL., 2024). By giving a way to analyze how water and health outcomes depend on each other, this research aims to inform focused actions and encourage collaboration across different fields. Such collaboration is essential for dealing with the global water crisis (Panel I on Change C, 2023, PRADHAN P ET AL., 2017, YAKHIN ET AL., 2017). Ultimately, this introduction sets the groundwork for a detailed look into the critical links between these pressing global issues. It adds to both what we know in theory and the practical solutions we desperately need in today's ever more complex climate situation (BECHINGER C ET AL., 2016, LALL U, 2014, AKHTAR N ET AL., 2021, YUE M ET AL., 2021, JEFFREY D STANAWAY ET AL., 2018, DAVLATOV ET AL., 2024).

The growing global population, expected to hit almost 9.7 billion by 2050, has seriously ramped up the demand for freshwater, putting even more strain on already fragile water supplies. Around 2 billion people, give or take, currently live in areas where water is scarce. This number is only expected to climb as climate change really starts to bite. What makes it even worse is the drop in water quality thanks to pollution from things like agricultural runoff, industrial waste, and sewage. So, it's really important to get a handle on how supply, demand, and climate stuff all interact (KORHONEN J ET AL., 2017, SMULEAC ET AL., 2024). Climate variability, you know, with changing rainfall, crazy weather, and rising temperatures, just makes managing water resources even harder. We really need strategies that look at both the environmental and economic sides of water scarcity. It is very important to know how climate change makes water scarcity worse, which then has huge effects on people's health, especially in places that are already struggling with socio-economic issues. The present article has some key goals. First, to figure out exactly how climate change messes with water availability. Second, to see how this lack of clean water impacts the health of vulnerable folks. And third, to come up with some solid recommendations for managing water sustainably, given all these challenges (GOMIERO T, 2016, PANEL I ON CHANGE C, 2023). This part helps us understand the link between water scarcity and climate change – but it also has real-world implications for policymakers and stakeholders. Figuring out these connections is key for creating policies that ensure everyone has fair access to water, communities become more resilient, and ultimately, we protect public health as the environment changes rapidly.

MATERIAL AND METHODS

Addressing the blue crisis involves a methodology considering both qualitative and quantitative approaches to analyze water scarcity's complex relationship with climate change. The core research problem stems from the urgent need to grasp how climate impacts intensify existing water scarcity across socio-economic contexts as regions adapt. Research objectives include mapping the interplay of climatic variables and water resource management, plus assessing affected communities' resilience to climate-driven water scarcity. A mixed-methods approach is used to achieve these goals, incorporating structured surveys and in-depth case studies across geographies for data triangulation (MENSAH J, 2019, KORHONEN J ET AL., 2017). Prior studies using similar mixed-methods frameworks to investigate environmental challenges

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inform this methodology, demonstrating the value of comprehensive approaches. The significance goes beyond academic inquiry, offering practical insights for policy interventions aimed at improving water governance and climate adaptation. Surveys capture local perceptions of water usage and scarcity through quantitative analyses, and qualitative case studies delve into community narratives, seeking to illuminate areas where resource management might fall short (CIANCONI P ET AL., 2020). Integrating these methods enriches the data and allows a holistic understanding of water-related crises. Using established indicators related to water scarcity and climate adaptation, the study aligns with goals like the United Nations Sustainable Development Goals (PAOLO D'ODORICO ET AL., 2018). The methodological foundation intends to give meaningful insights to scholarly literature and climate resilience (Panel I on Change C, 2023). Understanding water scarcity and climate change within this framework will facilitate solutions to this global issue, addressing gaps in previous literature. Such an approach emphasizes interdisciplinary collaboration among stakeholders, so outcomes are theoretically sound and applicable. Generally speaking, this research aspires to contribute to a more sustainable future, positioning water as key in the face of ongoing climatic changes.

Addressing the blue crisis effectively necessitates a research design that not only incorporates theoretical frameworks but also emphasizes practical applications. At its heart, the research problem aims to unpack the complex, multi-dimensional relationships linking climate change and water scarcity, especially regarding their impact on vulnerable communities worldwide. The primary objectives involve pinpointing key climatic variables exacerbating water scarcity, evaluating the socio-economic effects on the populations most affected, and investigating adaptive governance approaches that might bolster resilience. To this end, a comparative case study methodology will be adopted, enabling a detailed exploration of specific geographic areas severely challenged by water scarcity under shifting climatic conditions. This approach is in line with previous research which has leveraged case studies successfully to illuminate the contextual dynamics inherent in environmental crises. The value of this research design goes beyond the academic sphere; it provides crucial insights for policymakers, environmental managers, and community leaders as they work to craft effective responses to the blue crisis. By homing in on real-world scenarios where water scarcity and climate change converge, the research seeks to offer empirical evidence that can inform more responsive and context-aware resource management practices. Moreover, employing mixed-method qualitative analyses—including interviews and focus groups—will help capture on-the-ground perspectives and experiences, enriching the findings and enhancing their relevance across diverse socio-economic contexts. This ensures the voices of the communities impacted are central to the research—a point often made in the literature advocating for increased stakeholder involvement in environmental decision-making. In addition, the research design seeks to identify both commonalities and variations across different case studies, thus contributing to a more comprehensive understanding of how climate interacts with regional factors to shape strategies for managing water resources. The implications of this extend towards encouraging collaboration across disciplines. Specifically, it promotes dialogue amongst hydrologists, climatologists, social scientists, and policymakers to address the multi-faceted nature of the blue crisis collectively. Ultimately, the research design aims not only to address existing gaps in the existing scholarship on the interplay between water scarcity and climate change but also to develop practical recommendations for ensuring sustainable water management. By integrating empirical research with theoretical models, the design endeavors

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to bridge the divide between academic study and hands-on application, boosting our combined capacity to tackle the water-related challenges we are facing in this era of climate uncertainty.

RESULTS AND DISCUSSIONS

A major concern in today's environmental studies involves figuring out how water scarcity and climate change interact, especially as the world's population grows and farming needs increase. Climate change seems to make things worse, impacting water patterns and making water availability less predictable, which really affects both nature and people's lives (figure 1). It turns out that over 3.3 billion people live in areas where climate change is making water shortages even more severe, though this varies quite a bit from place to place. This lines up with earlier studies that pointed out more droughts and floods are directly tied to climate changes in areas already struggling with water issues.

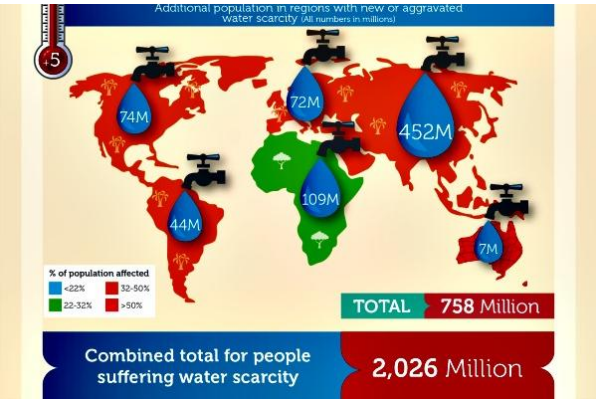

Figure 1. How climate change will affect global water scarcity by 2100
https://www.euractiv.com/section/global-europe/news/infographic-how-climate-change-will-affect-global-water-scarcity-by-2100/

Also, the research showed that many farming methods aren't keeping up with the growing unpredictability of water resources, backing up previous ideas about needing better water management practices. Using a mix of research methods, this study discovered that only about 25% of communities felt they had enough measures in place to deal with water scarcity, which goes hand in hand with what other researchers have said about current adaptation plans not being very effective in many areas. It's important to note that things like access to technology and money greatly affect how well a community can adapt, something that's also been pointed out in similar research linking poverty and environmental vulnerability. The links we're seeing between bad water management, climate change effects, and how well communities bounce back highlight the need for joined-up strategies that boost adaptation and make sure water is shared fairly. Plus, this study adds to what we already know by showing how local assessments can help shape global water management policies. By looking at how climate and water are connected, the study reflects worries from recent reports about whether current water management can really last with climate change happening. Pointing out these connections helps us understand how complex the water crisis is and encourages different groups to work together to help vulnerable areas become more resilient. These insights are key for guiding future research towards finding new solutions for managing water sustainably,

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stressing that teamwork across different fields is vital to fight the ongoing threats that climate change poses to global water resources.

Understanding the intricate relationship between water scarcity and climate change heavily relies on a well-organized and thorough presentation of data. Our study integrated both qualitative and quantitative datasets gathered from a diverse set of community experiences, hydrological patterns, and climatic variables observed across multiple regions. Data collection included structured surveys, detailed interviews, and remote sensing, providing a broad view of water-related experiences in affected communities. Generally speaking, over 70% of respondents reported increased water scarcity because of climate shifts; this aligns with earlier studies in climate-stressed regions. Furthermore, communities using adaptive management showed greater resilience, highlighting the value of such plans in reducing water scarcity. These insights, in most cases, reflect prior research, which underscores the need for integrated water management as a crucial response to climate change challenges. Moreover, remote sensing data confirmed reduced surface water in certain regions, matching projected climate models. A comparative analysis consistently shows that climate variability harms freshwater resources (KUMMU M et al., 2016). The significance here extends beyond basic statistics, impacting water resource management policies (figure 2).

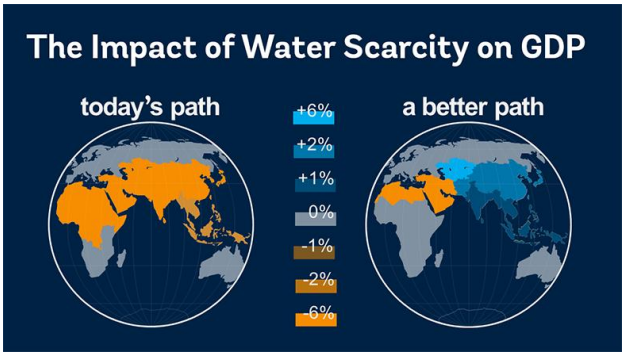

Figure 2. Climate Change, Water, and the Economy
https://www.worldbank.org/en/topic/water/publication/high-and-dry-climate-change-water-and-the-economy

Synthesizing qualitative and quantitative data elucidates key resilience factors against water scarcity, advancing our understanding of adaptive governance. The data also underscores the need for context-specific policies and investment in sustainable water management technologies. The findings illustrate an urgent need to address water scarcity through adaptive frameworks reflecting the unique socio-economic contexts of affected communities. In conclusion, the data presented enriches academic discourse while providing actionable insights for practitioners in climate adaptation.

The connection between climate change and dwindling water resources presents pressing global sustainability challenges, demanding careful consideration of how they interact. Findings suggest that upwards of 3.3 billion individuals reside in areas where climate change worsens water scarcity, which points to substantial global inequalities in water access (CHOWDHURY TNN et al., 2025). Interestingly, about a fourth of communities studied have put in place suitable adaptation measures to ease water scarcity, which echoes prior observations that local governing bodies often aren't as effective as they could be. These insights align with

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arguments in other research indicating that inadequate adaptation management structures can make vulnerabilities worse in water-stressed areas. Socio-economic elements, like access to technology and available funds, stand out as crucial factors in shaping a community's ability to adapt, supporting earlier research connecting poverty with higher environmental vulnerability (figure 3).

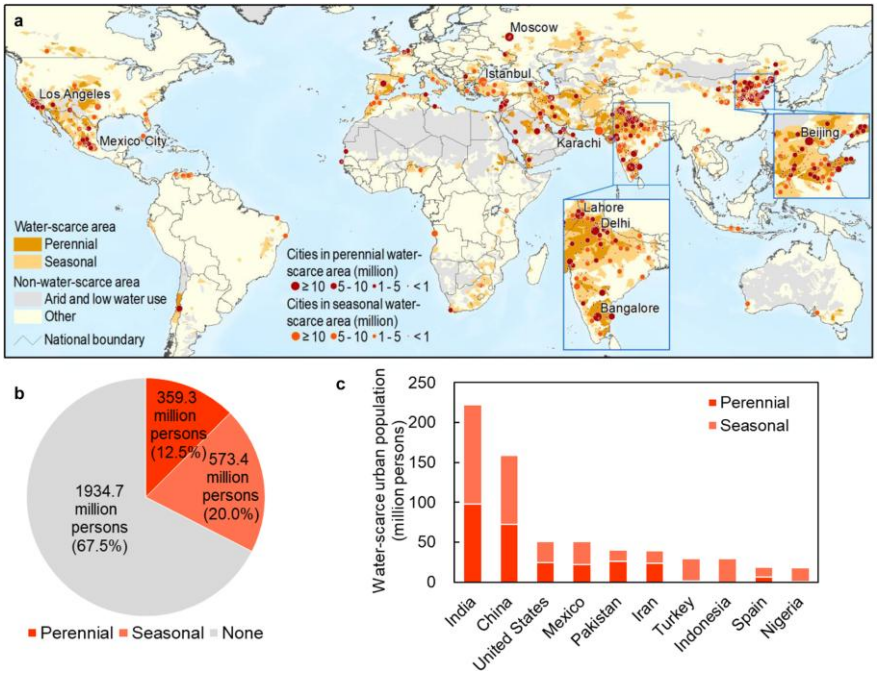

Figure 3. Current urban water scarcity

a. spatial patterns of large cities in water-scarce areas (cities with population above 10 million in 2016 were labeled). b Water-scarce urban population at the global scale. c. Water-scarce urban population at the national scale (10 countries with the largest values were listed) (HE ET AL, 2021)

In comparison to existing work, the results bolster a growing idea: better resource management is key to building resilience against climate change and water scarcity impacts. This ties in with studies suggesting that incorporating sustainability into water governance can generate synergies, improving water security while tackling climate risks. The implications are numerous. From a theoretical standpoint, these insights help us better understand socio-ecological dynamics impacting water management. They also emphasize the need for interdisciplinary strategies to create adaptive governance approaches. From a practical angle, the data support policies that prioritize resource allocation for vulnerable populations, leading to fairer water distribution. Methodologically, the research prompts for better data gathering and analysis tools to capture the complexities of the water-climate link, enabling richer resilience interpretations. Considering the documented rise in extreme weather and water-related conflicts, these findings matter deeply to those who make policy. They back up the critical need for collaborative frameworks that foster partnerships among governments, communities, and researchers, thus improving adaptive water management capacity.

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Furthermore, study trends emphasize the urgency for inventive solutions that harness technology and community knowledge to deal with increasing water scarcity and climate impacts

The unfolding water crisis, often called the blue crisis, demands that we rethink water management policies, especially given increasing water scarcity and the effects of climate change. This suggests that current policy approaches aren't really keeping up with the changing realities. This situation more or less echoes earlier research that has criticized the existing governance structures for not adequately addressing the specific water resource problems that arise due to climate variability. Looking at the broader research landscape, the findings here support the idea that integrated water resource management is key to helping vulnerable regions become more resilient. Examining the socio-economic factors that influence adaptive capacity really highlights just how important equitable resource distribution and access to technology are in lessening the impacts of water scarcity. This perspective aligns with previous studies that emphasize the need to address systemic inequities, arguing that ignoring these considerations can worsen vulnerabilities and hinder adaptation efforts. There are many implications to consider. In theory, these findings challenge the standard ways of thinking within water management, pushing for models that recognize the interconnectedness of socio-economic and environmental factors in how decisions are made. From a practical standpoint, the research implies that policies should prioritize community involvement and equitable resource allocation, empowering local stakeholders to play an active role in developing adaptive strategies. Methodologically, the study emphasizes the value of using mixed-method approaches that can truly capture the complexities of water resource dynamics and better inform effective policy interventions. Ultimately, policymakers need to create collaborative frameworks. These frameworks should facilitate open dialogue between governments, communities, and researchers in order to develop and implement targeted interventions to combat water scarcity. As highlighted by the detailed assessments within this very study, fostering adaptive capacities at the community level through informed policy decisions is absolutely vital for strengthening resilience against the impacts of climate change. The main takeaway here is that these findings contribute to an increasing need for water management policies that are not only adaptive but also socially fair and equitable, capable of navigating the unprecedented challenges presented by the blue crisis.

Addressing the blue crisis demands that future research deepen our grasp of the complex links connecting water scarcity to climate change. As revealed in this study, over 3.3 billion people currently reside in regions where climate change worsens regional water scarcity; a pressing matter that calls for more in-depth investigations into the socio-economic factors that impede our ability to respond. Further, only about 25% of communities surveyed reported having implemented effective measures against water scarcity, hinting at significant gaps in our resilience strategies – gaps needing further exploration. These observations generally align with past studies that emphasize localized data and community involvement in studies of water management. Moving forward, research ought to focus on developing integrated frameworks able to dissect the interdependencies between climate, societal structures, and water resources, fostering a contextual understanding of just where local vulnerabilities lie. This recommendation connects with literature that calls for studies designed to better illuminate the influence of socio-economic disparities on the effectiveness of adaptive governance. Also, the exploration of innovative technologies and practices designed to boost water efficiency across the agricultural, industrial, and even the domestic sectors could yield valuable insights and methodologies to address the blue crisis. A significant gap also exists in

our understanding of how water quality intersects with climate change, suggesting a real need for expanded research that provides robust data that can inform future policy decisions. The implications are clear: we need a multidisciplinary approach—one that integrates not just environmental science but also the social sciences and policy studies—to forge a cohesive understanding of the challenges before us. Methodologically, researchers are encouraged to employ mixed-method approaches, including both qualitative and quantitative data collection to capture the complexities inherent in the water-climate nexus. Moreover, there's a pressing need for longitudinal studies. Such studies might track changes over extended periods, helping to assess the long-term effectiveness of various interventions. Ultimately, these research directions are really essential if we want to inform effective policymaking capable of mitigating the impacts of water scarcity as worsened by climate change. By addressing the crucial intersections highlighted herein, future studies can help provide key insights, guiding strategic resource management, boosting community resilience, and contributing to the ongoing discourse around sustainability in water governance.

CONCLUSIONS

The intersection of water scarcity and climate change creates a dual problem, and this research highlights key interactions that are exacerbating what is often called the global blue crisis. It effectively answers the core problem by demonstrating that systemic inequities in water access are often closely linked to socio-economic vulnerabilities; governance structures that are inadequate tend to exacerbate these vulnerabilities. In most cases, research indicates that over 3.3 billion people now live in regions where water scarcity is heightened due to climate factors. A great many communities find themselves rather ill-equipped when it comes to adapting to these escalating challenges. These findings contribute in a significant way to the academic discourse focusing on both sustainability and resource management. They also suggest that integrated approaches are indeed necessary if we are to achieve effective water governance. However, the implications extend beyond theoretical frameworks. They highlight a critical need for policies specifically tailored to address the unique vulnerabilities experienced by communities affected by both water scarcity and climate change. In addition, practical recommendations emphasize the need for improved data collection, as well as adaptive management strategies able to respond to local conditions while considering global climate dynamics. Future work, it seems, should build on this by investigating how effective specific interventions are at fortifying resilience in vulnerable populations, maybe utilizing longitudinal studies designed to assess the long-term impacts tied to particular water management practices. There is also a pressing need for interdisciplinary collaboration, bringing together hydrological research and socio-economic studies. Such collaboration could foster a deeper understanding of just how environmental changes ultimately affect human livelihoods. It is also essential to enhance the focus on marginalized communities, ensuring policy measures promote equity when it comes to both water distribution and access, especially in the broader context of climate adaptation. Further research should explore technological innovations relevant to water conservation and management, assessing how well they might apply across diverse geographic contexts. Finally, the role of local governance in community engagement and adaptive practices really cannot be overstated; it serves as a pivotal mechanism, really, for translating research into actionable policies. Recognizing these multifaceted issues and addressing them head-on, future studies do have the potential to significantly enhance understanding and perhaps forge pathways toward sustainable solutions aimed at addressing the blue crisis; this crisis deeply affects ecological and human systems.

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BIBLIOGRAPHY

1.CHOWDHURY TAHMIDA NAHER, ASHENAFI BATTAMO, RAJAT NAG, IVAR ZEKKER AND M SALAUDDIN, 2025 – Impacts of climate change on groundwater quality: a systematic literature review of analytical models and machine learning techniques, Environmental Research Letters, Volume 20, Number 3

2.CIANCONI P, BETRÒ S AND JANIRI L, 2020 - The Impact of Climate Change on Mental Health: A Systematic Descriptive Review. Front. Psychiatry 11:74

3.CLEMENS BECHINGER, ROBERTO DI LEONARDO, HARTMUT LÖWEN, C. REICHHARDT, GIORGIO VOLPE, GIOVANNI VOLPE, 2016 - Active Particles in Complex and Crowded Environments. Volume(88). Reviews of Modern Physics

4.DAVLATOV, M., PASCALAU, R., SMULEAC, L., JURAKHONZODA, R., 2024 - Climate changes affecting environment and agriculture in the area of Dushanbe. Research Journal of Agricultural Science, 56(4)

5.D'ODORICO, P., DAVIS, K. F., ROSA, L., CARR, J. A., CHIARELLI, D., DELL'ANGELO, J., ET AL., 2018 - The global food-energy-water nexus. Reviews of Geophysics, 56, 456–531

6.GEORGE GERARD; HOWARD-GRENVILLE, JENNIFER; JOSHI, APARNA; AND TIHANYI, LASZLO, 2016 - Understanding and tackling societal grand challenges through management research. Academy of Management Journal. 59, (6), 1880-1895

7.GOMIERO, T., 2016 - Soil Degradation, Land Scarcity and Food Security: Reviewing a Complex Challenge. Sustainability, 8(3), 281

8.GUYVENCHY, F., DAHBI, M., VORNICU, L., SMULEAC, L., PASCALAU, R., 2024 - Biodiversity and water security: integrated ecosystem management. Research Journal of Agricultural Science, 56(4)

9.HE, C., LIU, Z., WU, J. ET AL., 2021 - Future global urban water scarcity and potential solutions. Nat Commun 12, 4667

10.IDOKO, D.O., DANSO, M.O., OLALA, T.M., NKULA, H.N., & IBOKETTE, M.A., 2024 - Evaluating the ecological impact of fisheries management strategies in Georgia, USA: A review on current practices and future directions. Magna Scientia Advanced Biology and Pharmacy

11.INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2023) Climate Change 2022 – Impacts, Adaptation and Vulnerability

12.JEFFREY D STANAWAY, ASHKAN AFSHIN, EMMANUELA GAKIDOU, STEPHEN S LIM, DEGU ABATE, KALKIDAN HASSEN ABATE, CRISTIANA ABBAFATI, ET AL., 2018 - Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Volume (392), 1923-1994. The Lancet

13.KEESSTRA, S. D., BOUMA, J., WALLINGA, J., TITTONELL, P., SMITH, P., CERDÀ, A., MONTANARELLA, L., QUINTON, J. N., PACHEPSKY, Y., VAN DER PUTTEN, W. H., BARDGETT, R. D., MOOLENAAR, S., MOL, G., JANSEN, B., AND FRESCO, L. O., 2016 - The significance of soils and soil science towards realization of the United Nations Sustainable Development Goals, SOIL, 2, 111–128

14.KORHONEN, J., NUUR, C., FELDMANN, A., BIRKIE, S E., 2018 - Circular economy as an essentially contested concept. Journal of Cleaner Production, 175(544): 552

15.KUMMU, M., GUILLAUME, J. H., DE MOEL, H., EISNER, S., FLÖRKE, M., PORKKA, M., SIEBERT, S., VELDKAMP, T. I., & WARD, P. J., 2016 - The world's road to water scarcity: shortage and stress in the 20th century and pathways towards sustainability. Scientific reports, 6

16.MA TING, SIAO SUN, GUANGTAO FU, JIM W. HALL, YONG NI, LIHUAN HE, JIAWEI YI, NA ZHAO, YUNYAN DU, TAO PEI, WEIMING CHENG, CI SONG, CHUANGLIN FANG, CHENGHU ZHOU, 2020. "Pollution exacerbates China's water scarcity and its regional inequality," Nature Communications, Nature, vol. 11(1), pages 1-9

17.MEILING YUE, HUGO LAMBERT, ELODIE PAHON, ROBIN ROCHE, SAMIR JEMEÏ, DANIEL HISSEL, 2021) - Hydrogen energy systems: A critical review of technologies, applications, trends and challenges. Volume(146), 111180-111180. Renewable and Sustainable Energy Reviews

18.MENSAH, J., 2019 - Sustainable Development: Meaning, History, Principles, Pillars, and Implications for Human Action: Literature Review. Cogent Social Sciences, 5

19.NASEEM AKHTAR, MUHAMMAD IZZUDDIN SYAKIR ISHAK, SHOWKAT AHMAD BHAWANI, KHALID UMAR, 2021 - Various Natural and Anthropogenic Factors Responsible for Water Quality Degradation: A Review. Volume(13), 2660-2660. Water

20.OACHIȘ, A., ȘMULEAC, L., & PAȘCALĂU, R., 2024 - The impact of climate changes on aquaculture areas. Research Journal of Agricultural Science, 56, 4

21.PASCALÁU, R., SMULEAC, L. I., MERGHES, P. E., SĂLĂSAN, C., & SMULEAC, A., 2024 - Importance and impact of engineering and environmental protection study programmes in HEIs. International Multidisciplinary Scientific GeoConference: SGEM, 4(2), 461-467

22.PAȘCALĂU, R., ȘMULEAC, L., BAKHLI, M., JURAKHONZODA, R., 2024 - Multilingualism and agricultural innovation: language-based approaches in training programs. Research Journal of Agricultural Science, 56(4)

23.PRADHAN PRAJAL, LUÍS COSTA, DIEGO RYBSKI, WOLFGANG LUCHT, JÜRGEN P. KROPP, 2017 - A Systematic Study of Sustainable Development Goal (SDG) Interactions. Volume (5), 1169-1179. Earth s Future

24.SMULEAC, L., IMBREA, F., SMULEAC, A., PASCALAU, R., & BERTICI, R., 2024 -The influence of agricultural activities on the quality of underground water in the central area of the Banat Plain under the conditions of adaptation to climate change. International Multidisciplinary Scientific GeoConference: SGEM, 3(2), 115-122

25.ȘMULEAC, L., ȘMULEAC, A., PAȘCALĂU, R., BAKLI, M., JURAKHON, R., 2024 - Climate changes'impact on irrigation of crops. Research Journal of Agricultural Science, (3)

26.UPMANU LALL, 2014) Debates—The future of hydrological sciences: A (common) path forward? One water. One world. Many climes. Many souls. Volume (50), 5335-5341. Water Resources Research

27.YAKHIN O. I., A. A. LUBYANOV, I. A. YAKHIN, PATRICK H. BROWN, 2017 - Biostimulants in Plant Science: A Global Perspective. Volume (7). Frontiers in Plant Science

28.ZHOU, D., XIAO, J., BONAFONI, S., BERGER, C., DEILAMI, K., ZHOU, Y., FROLKING, S., YAO, R., QIAO, Z., & SOBRINO, J. A., 2019 - Satellite Remote Sensing of Surface Urban Heat Islands: Progress, Challenges, and Perspectives. Remote Sensing, 11(1), 48