

The G20 Contribution to Strengthening International Cooperation for Sustainable Food and Energy Systems

Herclara Ayu Noveantika¹, and Ali Muhammad^{1*}

¹Department of International Relations, Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract. The G20 occupies a central position in addressing the pressing challenges of global food and energy systems. Rising temperatures, supply chain disruptions, and geopolitical conflicts have intensified these crises, disproportionately affected low-income populations and developed countries. This study investigates the G20's role in advancing sustainable and resilient systems, with a focus on climate-resilient agriculture, energy diversification, and the reduction of fossil fuel dependence. Employing policy discourse analysis of G20 communiqués, working group reports, and related international frameworks, the research identifies both achievements and persistent shortcomings. The findings indicate that, while the G20 has improved policy coordination and fostered multilateral initiatives, implementation remains uneven and access to resources is unequal. The study argues that stronger accountability mechanisms, enhanced technology transfer, and broader engagement with non-G20 actors are essential to improving the forum's effectiveness. The policy implications underscore the need for the G20 to move beyond declarative commitments toward inclusive and action-oriented measures that can reinforce global food and energy security while supporting sustainable development and climate resilience.

Keywords: Agriculture, Climate resilience, Climate-resilient, G20, Global Energy Security, Global Food Security, Sustainable Development

1 Introduction

The global food and energy systems are under increasing strain. Rising global temperatures, supply chain disruptions, and geopolitical conflicts such as the Russia-Ukraine war have exposed the fragility of these systems, particularly in developing and low-income countries. For instance, the International Energy Agency (IEA) reported that energy markets began tightening in 2021, and the global energy crisis peaked following Russia's invasion of Ukraine, with natural gas, electricity, and oil prices reaching record highs [1]. At the same time, climate change and biodiversity loss are exacerbating the vulnerability of agricultural productivity and the dependence on fossil fuels.

The impacts of these crises are most severe for low-income groups and developing countries. Extreme weather events reduce agricultural productivity in tropical regions and

* Corresponding author: alimuhammad@umy.ac.id

worsen food supply, while surging food and energy prices disproportionately strain household budgets [2]. The IMF notes that climate risks heighten economic inequality: the poorest populations are more vulnerable to natural disasters and climate change, while structural inequalities hinder access to clean energy technologies and nutritious food [2].

Within this context, the G20 has emerged as a pivotal actor in coordinating responses to food security, energy transition, and climate change. Established in 1999 in the aftermath of the Asian and Russian financial crises [3], the G20 has evolved into a central platform for global economic governance. Comprising the world's largest economies, the G20 accounts for over 80% of global GDP, approximately 75% of international trade, and around 60% of the global population. While its original mandate focused on financial stability, the G20 has progressively broadened its scope to encompass issues of sustainable development, food systems resilience, and clean energy transitions. The G20's overarching objective—to promote strong, sustainable, balanced, and inclusive economic growth—is closely aligned with the 2030 Agenda and the Sustainable Development Goals (SDGs) [4]. Indonesia's Presidency in 2022 and India's Presidency in 2023 placed special emphasis on “Recover Together, Recover Stronger” and “One Earth, One Family, One Future,” respectively, integrating sustainability into G20 priorities. At the 2022 Bali Summit under Indonesia's Presidency, G20 leaders reaffirmed their commitment to limiting global warming to 1.5°C and agreed to take collective action to address the ongoing food and energy crises. Indonesia also launched a new partnership, the US\$20 billion Joint Energy Transition Partnership (JETP), with partner countries to support clean energy transition efforts and accelerate the achievement of national emissions peak targets.

The G20's role as a multilateral platform is highly significant in advancing the achievement of the Sustainable Development Goals (SDGs). With its membership comprising the world's 20 largest economies, the G20 possesses the strategic capacity to harmonize cross-sectoral policies in support of simultaneous progress toward SDG 2 (Zero Hunger), SDG 7 (Affordable and Clean Energy), and SDG 13 (Climate Action) [5]. The forum serves as a platform for member states to coordinate interlinked policies on food, energy, and climate, including through joint commitments to scale up renewable energy development, provide emergency food assistance, or implement fossil fuel subsidy reforms. The G20's collective commitment to inclusive growth and green transition is widely regarded as essential for narrowing global inequalities and accelerating the realization of sustainable development objectives.

This paper addresses the question: How can the G20 foster effective international cooperation toward sustainable food and energy systems? By examining the mechanisms and initiatives within the G20 framework, the study evaluates both the potential and limitations of the G20 in advancing global sustainability objectives aligned with the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 7 (Affordable and Clean Energy), and SDG 13 (Climate Action).

2 Research method

This study employs a qualitative policy discourse analysis to examine how the G20 addresses the interlinked challenges of food security, energy transition, and international cooperation. Policy discourse analysis is chosen because it captures both the substantive content of policy commitments and the underlying narratives that shape collective action in global governance.

The primary sources consist of official G20 documents published between 2015 and 2024, including Leaders' Declarations, Ministerial Statements, and Working Group Reports. These were selected based on three inclusion criteria: (1) direct relevance to food systems, energy governance, or sustainability; (2) official recognition within the G20 framework; and (3) availability in public archives. Documents that are purely financial or unrelated to

sustainability issues were excluded. To provide contextual depth, reports from international organizations such as the FAO, IEA, IPCC, and the World Bank were also examined. In addition, peer-reviewed scholarly articles on food–energy–climate linkages and global governance informed the theoretical framing.

The analysis was organized thematically into three operational categories. First, food security, which captures G20 commitments to climate-resilient agriculture, emergency food assistance, and efforts to reduce global hunger. Second, energy transition, which encompasses policy measures on renewable energy expansion, fossil fuel subsidy reforms, and clean technology partnerships. Third, international cooperation, which focuses on cross-cutting mechanisms such as technology transfer, financing initiatives, and engagement with non-G20 stakeholders. These categories allow for a structured assessment of both achievements and limitations in the G20’s sustainability governance.

3 Results and Discussions

Given the complexity of today’s global challenges, including rising food insecurity, energy crises, and escalating climate risks this discussion is structured around three key dimensions that reflect the strategic intervention domains of the G20. First, in the area of global food security, the analysis explores how G20 policies and initiatives contribute to supply stability, accessibility, and the transformation of food systems that are both adaptive and inclusive. Second, in the energy sector, the study examines the extent to which the G20 promotes the transition to clean energy through policy instruments, financing mechanisms, and cross-border technological cooperation. Third, it assesses institutional synergies and policy coherence across the food, energy, and climate sectors as facilitated by the G20’s coordination mechanisms.

This approach aims to critically evaluate the effectiveness of the G20 in supporting the achievement of Sustainable Development Goals (SDGs) 2, 7, and 13, while also identifying institutional opportunities and limitations in their implementation.

3.1 G20 and Global Food Security Governance

The G20 has increasingly recognized food security as a global public good. The 2011 G20 Action Plan on Food Price Volatility and Agriculture established the Agricultural Market Information System (AMIS) to enhance transparency in global markets. The G20 has also supported the strengthening of food systems through various partnerships, such as the Global Alliance Against Hunger and Poverty launched under Brazil’s Presidency, and joint research initiatives focused on climate-resilient crop varieties [6]. Recent data from the Food and Agriculture Organization (FAO) indicates a troubling upward trend in chronic hunger over the past decade. In 2023, the global Prevalence of Undernourishment was reported at 9.1%, up from 7.5% in 2019. This corresponds to approximately 733 million people facing food insecurity in 2023—an increase of about 152 million individuals compared to 2019 [4].

More recently, G20 Agriculture Ministers have emphasized the importance of resilient food supply chains, inclusive rural development, and climate-resilient agriculture. Under India’s Presidency in 2023, the G20 launched the Global Biofortification Network and endorsed agroecological approaches to enhance both nutrition and agricultural productivity. However, criticism persists regarding the G20’s predominant focus on food production over equitable distribution, as well as the insufficient integration of smallholder farmers and Indigenous communities into global food security solutions.

The G20’s achievements include strengthening resilience through enhanced market information and coordinated policy efforts. The Agricultural Market Information System (AMIS), hosted by the FAO since 2011, serves as a key example of effective data

coordination to improve market transparency [6]. The Global Alliance complements G20 initiatives by addressing food inequality through coordinated technical assistance. The G20 has also reached consensus on principles that link increased agricultural productivity with climate resilience and improved nutrition, such as reducing post-harvest losses and enhancing storage infrastructure [7]. Support for local fertilizer supply chains and nutrition-focused research has also played a significant role in these efforts. However, substantial challenges remain. Geopolitical conflicts and extreme weather events continue to disrupt food production. The FAO has noted that such climatic extremes have impaired crop yields and heightened the risk of global food insecurity. Similarly, the IPCC has affirmed that climate change is already diminishing agricultural output in tropical and vulnerable regions, intensifying food price pressures and increasing hunger risks, particularly among low-income communities [8].

A key criticism centers on the inequitable access within global food systems: while the G20 has largely focused on increasing aggregate food production, the direct involvement of smallholder farmers and Indigenous communities remains limited. As highlighted by the FAO, weaknesses in global food systems often stem from unequal access to innovation, technology, and natural resources. In this context, CGIAR researchers have proposed that the substantial global agricultural subsidies—amounting to hundreds of billions of dollars—should be reallocated toward funding agricultural research and development (R&D) and smallholder-focused programs, as current subsidies have shown limited effectiveness in improving overall food availability [9]. Furthermore, recent academic literature has emphasized the critical importance of implementing multi-level governance and strengthening global institutional frameworks to ensure the long-term sustainability of food systems across national borders [10].

The potential for transformative policy lies in the integration of holistic approaches, such as redirecting subsidies to promote environmentally friendly farming practices, implementing food security guarantees for vulnerable groups, and investing in distribution and storage infrastructure (including cold chains and local markets). The G20 is well-positioned to accelerate initiatives such as biofortification and the development of food systems that prioritize healthy diets, while also strengthening global research and development in key staples like maize and rice. Furthermore, adaptive policy measures—such as crop diversification with drought-tolerant varieties and soil conservation strategies, as recommended by the IPCC—should be embedded within a shared policy framework to enhance the resilience and sustainability of food systems at the global level. [8]. Policy synergies between food, climate, and energy—such as bioenergy initiatives that support smallholder farmers—are also essential. Overall, the G20 has advanced global awareness and introduced several structural initiatives in support of SDG 2, including the Agricultural Market Information System (AMIS), the Global Alliance Against Hunger and Poverty, and commitments to open trade. However, the implementation of these efforts must be complemented by inclusive strategies that effectively reach and empower the most vulnerable populations.

3.2 Energy Transition under G20 Frameworks

The G20 has positioned the clean energy transition as a central priority in advancing both SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). The 2023 New Delhi Declaration reaffirmed the commitment to accelerating a "clean, sustainable, just, affordable, and inclusive energy transition" as a cornerstone for inclusive growth and climate goal attainment. Key elements include a strong emphasis on providing low-cost financing for developing countries and ensuring a diverse energy supply to enhance energy security. The G20 supports a range of forums and alliances to drive this agenda forward, such as the Clean

Energy Ministerial (CEM), the Global Bioenergy Partnership, the Green Hydrogen Alliance, and the Just Energy Transition Partnership (JETP), involving countries like Indonesia, South Africa, and Vietnam. For instance, in 2022, Indonesia launched a US\$20 billion JETP package aimed at accelerating its transition from coal-based energy to renewables [11]. This represents the largest public-private financial support package for a clean energy transition to date. The G20 has also backed energy efficiency initiatives such as the Voluntary Action Plan on Doubling the Rate of Energy Efficiency Improvement by 2030 and promoted the use of sustainable biofuels and the integration of cross-border electricity grids. Furthermore, the G20 has agreed to accelerate the development of green hydrogen and environmentally friendly nuclear technologies, such as Small Modular Reactors (SMRs), within a framework of international collaboration.

Global investment in clean energy has surged over the past decade. According to the International Energy Agency (IEA), total global energy investment is projected to exceed US\$3 trillion in 2024—the highest level on record. Of this amount, approximately US\$2 trillion is allocated to clean technologies, including renewables, electric vehicles, energy efficiency, smart grids, and green hydrogen, while the remaining US\$1 trillion is invested in fossil energy. As such, approximately two-thirds of all investments in the energy sector are currently focused on clean energy, which is strong evidence of the increasing flow of capital towards sustainable energy solutions.

The G20's achievements include the establishment of energy transition principles that recognize the central role of renewable energy and efficiency, as well as the large-scale mobilization of investments in clean energy technologies. Under the G20 framework, Indonesia and its international partners jointly mobilized financing for the Just Energy Transition Partnership (JETP) through multilateral institutions. The G20 New Delhi analysis report highlights the urgent need for an estimated US\$4 trillion in annual global investment for clean energy, underscoring the importance of scaling up green finance. G20 actions have also driven increases in renewable capacity: the New Delhi Declaration affirmed the commitment to tripling global renewable energy capacity by 2030. This target is aligned with the objectives of the Paris Agreement on achieving net-zero emissions, demonstrating that the G20's energy transition agenda makes a direct contribution to the realization of both SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

Despite repeated commitments to phase out fossil fuel subsidies since 2009, significant challenges continue to hinder their implementation. According to the International Monetary Fund (IMF), eliminating these subsidies could reduce global CO₂ emissions by up to 43% by 2030. In several developed and developing countries, the energy crises triggered by the COVID-19 pandemic and the war in Ukraine have led to a resurgence of fossil fuel subsidies as governments sought to stabilize prices. These subsidies have reached hundreds of billions of dollars annually, reflecting a policy reversal that prioritizes short-term affordability over long-term sustainability [12]. Another major challenge lies in the disparity of capacities: developing countries require access to low-cost financing and intensive technology transfer to bridge the transition gap. These needs can only be met through robust global partnerships. On the technological front, some governments remain heavily reliant on coal or oil, which slows the adoption of emerging innovations such as green hydrogen. For instance, although the G20 supports the development of carbon-free hydrogen, the establishment of global certification schemes and critical mineral supply chains remains a work in progress, requiring time and coordinated international efforts to fully materialize.

The transformative policy potential of the G20 framework is substantial, provided it is implemented consistently. Reforming fossil fuel subsidies by shifting toward carbon pricing or targeted support for vulnerable groups could unlock trillions of dollars for productive investment in clean energy. Such measures would not only enhance climate resilience but also promote equity and long-term economic sustainability across member and partner

countries [13]. The G20's support for innovations, such as the Global Biofuel Alliance and the promotion of cross-border energy grid transactions, paves the way for emerging solutions. Commitments to renewable energy, efficiency improvements, and smart grid infrastructure are critical steps toward achieving universal access to clean energy. If the G20 can further strengthen multilateral coordination and ensure a just transition for workers and low-income communities, its role in advancing SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action) will become even more significant.

3.3 Institutional Synergies and Policy Coherence

As a multilateral economic forum, the G20 serves as a critical bridge among global institutions to align policies across the food, energy, and climate sectors. In the area of food security, for example, G20-FAO cooperation, through initiatives such as the Agricultural Market Information System (AMIS) and the Global Alliance Against Hunger and Poverty, has strengthened international policy coordination and response mechanisms [6]. G20 summits frequently engage international financial institutions. At the 2025 Johannesburg Summit, the FAO Director commended South Africa's G20 Presidency for prioritizing food security as a cornerstone for achieving SDG 2. In the energy and climate domains, the G20 collaborates with institutions such as the IMF, World Bank, Financial Stability Board (FSB), and standard-setting bodies like the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC). The G20 New Delhi Declaration notably adopted recommendations from the dedicated G20 report on the macroeconomic risks of climate change, signaling a deeper integration of economic and environmental perspectives into global policy discourse [7]. This illustrates institutional synergy: climate risk analyses conducted by the IMF and G20 are being utilized to formulate a financial framework.

The G20 also promotes policy coherence through the establishment of global principles. For example, G20 leaders have agreed to refrain from imposing food export bans in order to prevent distortions in global markets. In the financial sector, the G20 Sustainable Finance Working Group (SFWG) and the G20 Sustainable Finance Roadmap have recommended transparency mechanisms and incentive structures to ensure that capital flows are aligned with the goals of the Paris Agreement [7]. The G20 facilitates various technical forums, such as the Technical Assistance Action Plan for climate data, to address challenges related to data gaps and the standardization of sustainability reporting. At the G20 meeting in São Paulo (February 2024), the World Bank and the Government of Brazil established a strategic partnership for climate investment under the G20 framework, including a US\$1 billion loan to support Brazil's Climate Fund [14]. This illustrates how the G20 and international financial institutions, such as the World Bank, Inter-American Development Bank (IDB), and central banks, are synergizing to support national green programs. Through coordinated investment frameworks, technical assistance, and climate-aligned lending, these collaborations enhance the capacity of developing countries to implement low-carbon development strategies and climate resilience measures in line with global sustainability goals.

However, global policy coherence continues to face significant implementation gaps. While the G20 frequently produces sophisticated policy documents, the translation into concrete action is often hindered by divergent national interests. For instance, despite longstanding G20 commitments to phase out fossil fuel subsidies, progress remains uneven and slow. Additionally, policy orientations within the G20 may at times be contradictory—for example, one member state may promote import restrictions to protect domestic farmers, while another advocates for free markets, resulting in policy misalignment. Coherence between energy transition goals and food security is also not yet fully integrated; the expansion of biofuel production, for example, must be carefully managed to avoid

exacerbating pressure on arable land. The G20 plays a critical mediating role in navigating these differences through dialogue platforms such as ministerial meetings and engagement groups (e.g., C20, T20, L20).

The potential for transformation through this institutional synergy is substantial. As a supporter of SDGs 2, 7, and 13, the G20 can catalyze transformative policy by harmonizing global regulatory frameworks. For instance, the G20's Technical Assistance Action Plan (TAAP) for climate finance aims to address data-related barriers, thereby enabling multilateral financial institutions to more effectively support sustainable investment. The G20's acknowledgment of the scale of financial needs, such as the estimated US\$ 5.8–5.9 trillion required for developing countries' Nationally Determined Contributions (NDCs) and US\$ 4 trillion annually for clean energy, demonstrates its efforts to integrate the SDG and Paris Agreement targets into the global finance architecture. Institutional synergy is expected to facilitate the realization of these goals: the World Bank, IMF, and G20 have jointly advanced climate-related banking targets, while cross-sectoral collaborations (e.g., digital technologies for agriculture and energy) are promoted through engagement groups like T20 and B20. If the G20 framework can align sectoral policies and effectively implement technical recommendations in a coordinated manner, it could yield a unified global policy framework that transformatively advances food security, clean energy, and climate resilience in tandem [15].

4 Conclusion

The G20 plays a pivotal role in shaping international cooperation for sustainable food and energy systems, particularly in the face of escalating global challenges such as climate change, geopolitical instability, and rising inequality. Through its broad and cross-sectoral mandate, the G20 has mobilized important initiatives, ranging from the Agricultural Market Information System (AMIS) and the Global Alliance Against Hunger and Poverty to the Just Energy Transition Partnerships (JETP) and the promotion of clean technologies. These efforts demonstrate the forum's growing commitment to achieving Sustainable Development Goals (SDGs) 2, 7, and 13.

At Nonetheless, critical implementation gaps remain. Despite repeated policy declarations, issues such as fossil fuel subsidy reform, equitable access to innovation, and coherence between food, energy, and climate policies continue to pose significant challenges. Varying national interests and capacities often hinder the translation of global commitments into actionable results, particularly in developing countries that face systemic financial and technological barriers.

To harness its full transformative potential, the G20 must reinforce institutional synergy, align sectoral policy frameworks, and scale up support for inclusive and resilient systems. Coordinated action across member states and collaboration with international financial institutions will be essential in bridging investment gaps, accelerating low-carbon transitions, and ensuring that no population is left behind. If the G20 can maintain momentum and enhance the coherence and inclusivity of its policy mechanisms, it can serve as a powerful catalyst for a more just, sustainable, and climate-resilient global future.

References

1. Iea, "Global Energy Crisis," [iea.org](https://www.iea.org/topics/global-energy-crisis). [Online]. Available: <https://www.iea.org/topics/global-energy-crisis>
2. A. M. Celine Guivarch, Nicolas Taconet, "Linking Climate and Inequality," International Monetary Fund. [Online]. Available:

- <https://www.imf.org/en/Publications/fandd/issues/2021/09/climate-change-and-inequality-guivarch-mejean-taconet#:~:text=While the effects of climate,more vulnerable to their impacts>
3. P. Martin, “G20 Finance Ministers and Central Bank Governors Meeting,” pp. 1–8, 2022.
 4. FAO, “Indicator 2.1.1 - Prevalence of undernourishment,” Food and Agriculture Organization of the United Nations. [Online]. Available: <https://www.fao.org/sustainable-development-goals-data-portal/data/indicators/2.1.1-prevalence-of-undernourishment/en#:~:text=After rising sharply from 2019,5 percent in 2019>
 5. G20 Development Working Group, “2023 G20 New Delhi Update,” pp. 1–92, 2023, [Online]. Available: https://www.g20.in/content/dam/gtwenty/gtwenty_new/document/G20-2023-New-Delhi-Update.pdf
 6. FAO, “G20: Food security is vital for peace, stability and human dignity, FAO says,” Food and Agriculture Organization of the United Nations. [Online]. Available: <https://www.fao.org/newsroom/detail/g20--food-security-is-vital-for-peace--stability-and-human-dignity--fao-says/en#:~:text=The Director,all the technical assistance needed>
 7. El Editor, “G20 New Delhi Leaders’ Declaration,” Rev. Política y Estrateg., no. 142, pp. 181–205, 2024, <https://doi.org/10.26797/rpye.vi142.1066>.
 8. C. Mbow et al., Food security. 2022. <https://doi.org/10.1017/9781009157988.007>.
 9. R. V. Swati Malhotra, “G20 Agriculture Ministers underscore importance of food system sustainability, open and fair trade, and digital innovations as long-term food crisis responses,” IFPRI. [Online]. Available: <https://www.ifpri.org/blog/g20-agriculture-ministers-underscore-importance-food-system-sustainability-open-and-fair-trade/#:~:text=investment in R%26D and under,necessary investments in food systems>
 10. A. S. Ali Maksum, Sitti Zarina Alimuddin, “Navigating Global Challenges and National Interest: The Discourse of Indonesian President Joko Widodo at the 2022 G20 Summit,” Scopus, 2024, [Online]. Available: <https://www.scopus.com/pages/publications/85212084463>
 11. JETP, “JETP Comprehensive Investment and Policy Plan (CIPP),” JETP Indonesia. [Online]. Available: <https://jetp-id.org/#:~:text=At an initial commitment of,market developments and policy priorities>
 12. Iea, “The financial choices shaping our energy futures investment,” IEA.org. [Online]. Available: <https://www.iea.org/topics/investment>
 13. A. Niranjana, “G20 poured more than \$1tn into fossil fuel subsidies despite Cop26 pledges – report,” The Guardian. [Online]. Available: <https://www.theguardian.com/environment/2023/aug/23/g20-poured-more-than-1tn-on-fossil-fuel-subsidies-despite-cop26-pledges-report#:~:text=quarters go to fossil fuels>
 14. W. Group, “World Bank Group and Brazil’s Finance and Environment ministries join forces to boost climate investments,” 2024. [Online]. Available: <https://www.worldbank.org/en/news/press-release/2024/02/26/world-bank-group-and-brazil-s-finance-and-environment-ministries-join-forces-to-boost-climate-investments#:~:text=To this end%2C the three, cities%2C and solid waste management>
 15. F. Al-Fadhat, “Indonesia’s G20 presidency: neoliberal policy and authoritarian tendencies,” Aust. J. Int. Aff., vol. 76, 2022, [Online]. <https://doi.org/10.1080/10357718.2022.2070598>