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How Does The Debate About Switching To Renewable Energy Address The Economic, Technological, Political, Social, And Environmental Challenges Of Tackling Climate Change?

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Abstract

The international transition to renewable energy is a critical response to soften the blow of climate change. As countries around the world commit to a net-zero emission, challenges emerge in the domains of economics, technology, politics and social life. This research paper explores international perspectives on energy transitions, its causes/consequences and various possible course actions.

Introduction

The pressing need to address climate change has catalyzed intense international discussions on energy. The 2015 Paris agreement underlines the crucial transition to renewable energy sources to mitigate greenhouse gas emissions[1]. This transition entrails numerous challenges particularly in the 4 main domains; Economical, technological, Political and social.

Countries worldwide collaborate to achieve the international climate change objective, for instance, Germany has implemented a national carbon pricing system where non-renewable energy activities such as fueling is taxed to discourage the use of non renewable based energy sources, they have also subsidized electric vehicles[2]. Another great example is India; India has put in intense efforts in the Green India project which aims to cover India with green forest[3], the list goes on. Switzerland implemented various programs such as the Green Cross as well as making efforts to electrify public transport. It is evident that the transition to renewable energy is the next step forward, or is it? Countries globally are highly dependent on fossil fuel sources such as coal, oil and natural gas which is around 80% of the global energy production[4], the dependency has resulted in significant emissions contributing to a 1.1°C rise in global temperature since the pre-industrial era[5].

Scientists warn that if warming surpasses 1.5°C the world could face severe climate consequences[6]. As a result, countries worldwide have committed to reducing their emissions, with many setting targets to reach net-zero emissions by 2050[7].

Causes and consequences

The industrial revolution marked the onset of increasing carbon dioxide levels with the combustion of fossil fuels being the primary driver of climate change[8]. Rapid urbanization, deforestation and the expansion of the transportation networks around the world has further increased these emissions, these activities trap more heat in the earth's atmosphere further strengthening the greenhouse effect[9]

Few of the main and widespread consequences are spread into 3 main effects:

- **Environmental impact:** Where the rising global temperature has led to melting ice caps, ocean acidification, disruption of ecosystems and many more. Coral reefs which support marine biodiversity are now at risks of extension due to the warming of waters[10].
- **Social impact:** Vulnerable groups in low-income countries suffer the most from climate change. Coastal areas are experiencing displacement due to increasing sea levels, as droughts and floods endanger food security[11].
- **Economic impact:** The financial toll of climate change is immense as national disasters linked to climate change such as hurricanes and wildfires cause billions of dollars in damages annually[12].

Global perspective

Communities around the world have recognized the struggles and benefits of renewable energy sources such as wind, solar and hydropower. According to the United Nations, achieving a net zero emission is essential to limiting global warming[13]. In the 2021 UN climate change Conference many new commitments from major economies to transition away from coal and invest more in renewable energy was made[14].

Developed countries are generally more capable to make this transition as they have the resources and infrastructure to invest in large scaled projects such as solar farms and wind farms, In recent years the European Union has allocated billions of euros to support renewable energy initiatives as a part of its Green Deal which is aiming to become the first continent to reach climate neutrality by 2050[15].

Perspective 1: United Nations

The United Nations has recognized the shift to renewable energy as crucial for reaching net-zero emissions and keeping global warming to 1.5°C[16]. During the 2021 UN Climate Change Conference, key economies committed to eliminating coal and increasing investments in renewable energy[17]. The UN also emphasized the gap in resources between developed and developing nations and is urging richer countries to provide greater financial assistance to facilitate fair energy transitions[18].

Perspective 2: European Union1

European Commission President Ursula von der Leyen highlighted that the Green Deal serves as “A blueprint for establishing a sustainable economy in the EU,” with renewable energy as a key component[20]. Nonetheless, the substantial expenses associated with renewable energy initiatives have sparked worries regarding financial fairness, especially for smaller member states that are finding it difficult to achieve these lofty targets[21]. Even though the average cost of renewable energy infrastructure is gradually decreasing, the large amount of infrastructure needed is not financially stable nor providing enough power to power certain nations [51A]

Perspective 3: China

Being one of the biggest global polluters (Responsible for 13.9% Cumulative Co2 Emissions), China has committed to reaching net zero emissions by 2060 [22]. The nation is a leading investor in renewable technologies, but its dependence on coal to satisfy increasing energy demands continues to be a considerable problem[23]. President Xi Jinping stated that China's slow transition strikes a balance between immediate energy requirements and long-term sustainability, emphasizing, "We must maintain the stability of our energy system while advancing our climate obligations."[24]

Perspective 4: Developing Countries

Developing countries face significant difficulties in adopting renewable energy[25], many still depend on fossil fuels for economic development and growth. The capital intensive nature of renewable energy products makes the transition to renewable energy economically challenging[26], Low income nations (which are least responsible for global emissions) are often unable to shift to renewable sources without international aid[27].

Cumulative Carbon dioxide emissions 1750-2020 [52]

The rule of emerging economies is also a major point of demat, countries such as China and India are almost the largest global emitters but argue that developing nations should bear a greater share of the responsibility due to their history of emissions[28]. China has pledged to react to a net-zero by 2060 (China has rapidly expanded renewables and met its 2030 solar & wind target six years early, growing clean tech exports, and starting to cut CO_2, but still relies heavily on coal.) while India has committed a target date of 2070[29]. However, both countries continue to explain their use of coal in the short term to meet the growing energy demands[30].

National perspectives

The renewable energy debate also deeply affects national interests and priorities economically. For instance the United States has made substantial investment in renewable energy and with recent policies is promoting clean energy and technology supporting green jobs[31].

Perspective 1: Indian Government's stand

Prime Minister Narenda Modi made an announcement at COP26 regarding India's "Panchamrit" strategy, committing to the net zero emissions by 2070 and increasing non-fossil energy capacity to 500GW (gigawatts) by 2030[32]. Prime minister Modi also emphasized on the importance of balancing development and sustainability[33].

Perspective 2: Fossil Fuel Dependence

Aside from India, many countries around the world continue to depend heavily on coal to meet their energy needs. In India's case, coal contributes to approximately 70% of the total electricity generation[34]. This reliance is due to factors such as abundance of the domestic coal reserves, the lower cost of coal based power compared to some renewable options, the existing infrastructure built around coal power plants and many more[35]. Countries like China, South Africa and Indonesia similarly have this issue, coal remains a dominant source of electricity due to similar economic and logistic conditions[36], however, this heavy dependence poses a significant environmental challenge as coal is one of the most carbon intensive fossil fuel there is and majorly contributes to the greenhouse gas emissions like air pollution[37].

Perspective 3: Policy Advocacy and Ground-Level Implementation Challenges

Policy advocacy and grassroot challenges institutions such as the NITI Aayog and The energy and resource institute (TERI) are essential in promoting and integrating renewable energy strategies through policy advocacy, strategic planning and alignment with national and international sustainability goals[38]. These efforts aim to accelerate the transition to clean energy by influencing governmental priorities and investment, however, significant challenges continue to persist at the grassroots level where implementation often encounters infrastructural limitations, inadequate grid connectivity and limited technical capacity[39]. Additionally, community resistance and low awareness hinder widespread adoption[40], hence bridging the gap between high-level policy and ground realities requires constant context-sensitive approaches that prioritise local engagement and understanding[41]

Course of action

This problem continuous to be one of the most brain itching issue and has no straightforward course of action, several courses of actions have been proposed to support the transition to renewable energy without majorly affecting economies and social effects such as:

- Implementing international cooperation where wealthier countries should support developing nations with financial aid and technological assistance[42] as by number[52] (in most scenarios) most damage is caused by wealthier nations[43].
- Establishing a multilateral organization/organizations that act like the a World Bank and provide an investment fund to nations that require it (bank is funded by monthly required contributions by all countries)[44]
- Investing more in private sectors as companies such as Google and Microsoft aim to become carbon neutral hence a public-private partnership could accelerate the transition[45]

Conclusion

The transition to renewable energy is very complex and there stands a defining challenge and opportunities to everyone, while the causes and consequence of fossil fuel dependence is well proven and well documented[46], the global and nation responses vary based on economical, social and political stands as well as the showcase of the extreme downside to certain job industries[47]. Countries like Germany and China have made substantial progress while others face steep hurdles due to limited funding or political division[48]. International cooperation, financial aid and much more have emerged as key enablers of change but there is still a long way to go[49]. Despite the diverse challenges the need for a coordinated and equitable shift away from fossil fuels is universally recognized and absolutely essential[50], and achieving this will not just mitigate climate change but it also ensures long term global sustainability, energy security and economic resilience[51].

Sources:

1. United Nations, 2015, *Paris Agreement*, https://unfccc.int/sites/default/files/english_paris_agreement.pdf

2. Federal Ministry for Economic Affairs and Climate Action (Germany), 2023, *National Carbon Pricing System Overview*, https://www.bmwk.de/EN/Topics/climate-action/national-carbon-pricing.html

3. Ministry of Environment, Forest and Climate Change (India), 2022, *Green India Mission*, https://moef.gov.in/en/green-india-mission

4. International Energy Agency, 2023, *World Energy Outlook 2023*, https://www.iea.org/reports/world-energy-outlook-2023

5. Intergovernmental Panel on Climate Change, 2023, *Climate Change 2023: Synthesis Report*, https://www.ipcc.ch/report/sixth-assessment-report-cycle/

6. Intergovernmental Panel on Climate Change, 2018, *Special Report: Global Warming of 1.5°C*, https://www.ipcc.ch/sr15/

7. United Nations Framework Convention on Climate Change, 2022, *Net-Zero Targets by 2050*, https://unfccc.int/climate-action/net-zero-coalition

8. Smil, Vaclav, 2017, *Energy and Civilization: A History*, Cambridge: MIT Press.

9. National Aeronautics and Space Administration (NASA), 2023, *The Greenhouse Effect*, https://climate.nasa.gov/faq/19/

10. National Oceanic and Atmospheric Administration (NOAA), 2022, *Coral Reefs and Climate Change*, https://oceanservice.noaa.gov/education/tutorial_corals/coral08_reefs_climate.html

11. World Bank, 2022, *Climate Change and Poverty*, https://www.worldbank.org/en/topic/climatechange/overview

12. Munich Re, 2024, *Natural Catastrophe Review 2023*,

https://www.munichre.com/en/company/media-relations/media-information-and-corporat e-news/media-information/2024/natcat-2023.html

13. United Nations, 2022, *Net Zero by 2050 Is Possible*, https://www.un.org/en/climatechange/net-zero-coalition

14. United Nations Framework Convention on Climate Change, 2021, *COP26 Key Outcomes*, https://unfccc.int/process-and-meetings/conferences/glasgow-climate-change-conference october-november-2021/cop-26/cop-26-outcomes

15. European Commission, 2019, *The European Green Deal*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-d eal_en

16. United Nations, 2022, *Net Zero by 2050 Is Possible*, https://www.un.org/en/climatechange/net-zero-coalition

17. United Nations Framework Convention on Climate Change, 2021, *COP26 Key Outcomes*, https://unfccc.int/process-and-meetings/conferences/glasgow-climate-change-conference october-november-2021/cop-26/cop-26-outcomes

18. United Nations Development Programme, 2023, *The Just Energy Transition*, https://www.undp.org/publications/just-energy-transition

19. Guterres, António, 2023, *Speech at the UN Climate Ambition Summit*, September 20, https://www.un.org/sg/en/content/sg/speeches/2023-09-20/remarks-climate-ambition-sum mit

20. European Commission, 2019, *The European Green Deal*, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-d eal_en

21. Bruegel, 2021, *Financing the EU's Green Transition*, https://www.bruegel.org/policy-brief/financing-eus-green-transition

22. Government of China, 2021, *Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality*, http://english.www.gov.cn/policies/latestreleases/20211024/3bfc1b3d2cbb4d2f9dfb7ecf4 0d4e7a5.html

23. International Energy Agency, 2023, *China Energy Outlook 2023*, https://www.iea.org/reports/china-energy-outlook-2023

24. Xi, Jinping, 2020, *Speech at the UN General Assembly*, September 22, http://www.xinhuanet.com/english/2020-09/22/c_139388686.htm

25. World Resources Institute, 2023, *Challenges of Renewable Energy in Developing Countries*, https://www.wri.org/insights/challenges-renewable-energy-developing-countries

26. International Renewable Energy Agency, 2023, *Renewable Energy Finance: Status and Trends*, https://www.irena.org/publications/2023/Jun/Renewable-Energy-Finance-Status-and-Tren ds-2023

27. United Nations Development Programme, 2023, *The Just Energy Transition*, https://www.undp.org/publications/just-energy-transition

28. Climate Equity Reference Project, 2022, *Equity and the Global Carbon Budget*, https://climateequityreference.org/report/equity-and-the-global-carbon-budget-2022/

29. Government of India, 2022, *India's Long-Term Low Emission Development Strategy*, https://unfccc.int/sites/default/files/resource/India_LT-LEDS.pdf

30. International Energy Agency, 2023, *Coal 2023 Report*, https://www.iea.org/reports/coal-2023

31. United States Department of Energy, 2023, *Clean Energy Investments in America*, https://www.energy.gov/articles/clean-energy-investments-america

32. Government of India, 2021, *Panchamrit Commitments at COP26*, https://pib.gov.in/PressReleasePage.aspx?PRID=1768712

33. Modi, Narendra, 2021, *COP26 Address*, November 1, https://www.narendramodi.in/text-of-prime-minister-narendra-modi-s-national-statement at-cop26-summit-in-glasgow-558774

34. Ministry of Power (India), 2023, *Electricity Generation Statistics 2023*, https://powermin.gov.in/en/content/power-sector-glance-all-india

35. The Energy and Resources Institute (TERI), 2022, *The Role of Coal in India's Energy Future*, https://www.teriin.org/article/role-coal-indias-energy-future

36. International Energy Agency, 2023, *Coal 2023 Report*, https://www.iea.org/reports/coal-2023

37. World Health Organization, 2022, *Air Pollution and Health*, https://www.who.int/news-room/fact-sheets/detail/air-pollution

38. NITI Aayog, 2023, *National Energy Policy*, https://www.niti.gov.in/national-energy-policy

39. The Energy and Resources Institute (TERI), 2023, *Challenges in Renewable Energy Implementation*, https://www.teriin.org/article/challenges-renewable-energy-implementation

40. The Energy and Resources Institute (TERI), 2023, *Challenges in Renewable Energy Implementation*, https://www.teriin.org/article/challenges-renewable-energy-implementation

41. United Nations Development Programme, 2023, *The Just Energy Transition*, https://www.undp.org/publications/just-energy-transition

42. United Nations Framework Convention on Climate Change, 2023, *Climate Finance for Developing Countries*, https://unfccc.int/topics/climate-finance

43. Climate Equity Reference Project, 2022, *Equity and the Global Carbon Budget*,

https://climateequityreference.org/report/equity-and-the-global-carbon-budget-2022/

44. World Bank, 2023, *Global Climate Finance Architecture*, https://www.worldbank.org/en/topic/climatechange/brief/climate-finance

45. Google Sustainability, 2023, *Carbon Neutral Commitment*, https://sustainability.google/progress/operational-emissions/

46. Intergovernmental Panel on Climate Change, 2023, *Climate Change 2023: Synthesis Report*, https://www.ipcc.ch/report/sixth-assessment-report-cycle/

47. International Labour Organization, 2022, *Employment Impacts of the Energy Transition*, https://www.ilo.org/global/publications/books/WCMS_834840/lang–en/index.htm

48. International Energy Agency, 2023, *World Energy Outlook 2023*, https://www.iea.org/reports/world-energy-outlook-2023

49. United Nations Development Programme, 2023, *The Just Energy Transition*, https://www.undp.org/publications/just-energy-transition

50. United Nations, 2022, *Net Zero by 2050 Is Possible*, https://www.un.org/en/climatechange/net-zero-coalition

51.International Energy Agency, 2023, *World Energy Outlook 2023*, https://www.iea.org/reports/world-energy-outlook-2023

51A. *Open Electricity Economics 6 Cost of Renewable Electricity*

http://www.open-electricity-economics.org/book/text/06.html

Images/Tables

52. Major contributors to climate change-, https://phys.org/news/2022-11-responsible-climate-world-poorest-countries.html 53. Ener8

statics, https://www.ener8.com/energy-transition-infographic-2023/