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CARTHASIS

A research project on the sociopolitical aspects of the renewable energy transition

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ABSTRACT

Catharsis, a term rooted in ancient Greek, embodies the concept of 'purification.' In the context of this work, it signifies the essential endeavour of cleansing the energy sector from carbon emissions, thereby paving the way for more sustainable developmental trajectories. Within this framework of 'sustainability,' three fundamental pillars intersect: society, environment, and economy. The overarching ambition of Catharsis as a project is to establish an encompassing and interdisciplinary platform dedicated to energy system modelling and optimization across varying spatial scales and levels of intricacy. This platform aspires to harmoniously incorporate all facets pertinent to forging a prospective and sustainable energy landscape. It aims to discern optimal strategies for decarbonizing the energy sector while quantifying the attendant societal, economic, and environmental impacts.

The pursuit of this noble objective entails the subdivision of Catharsis' efforts into distinct groups, each engaging with different pivotal facets. This report delves into the socio-political dimensions intertwined with the renewable energy transition (RET). This encompasses ethical considerations, the societal repercussions of the energy shift, and the issue of energy poverty. The focal point is addressing intricate queries, such as: How can we delineate a sustainable energy consumption pattern, factoring in a growing global population and the prevailing imbalances between developed, developing, and underdeveloped nations? How can we effectively combat energy poverty and rectify disparities in accessing natural resources? Additionally, how can we curtail global energy consumption and encourage alternative, sustainable consumption patterns in alignment with society's primary objectives?

Dealing with the juxtaposition of socio-political issues within the renewable energy transition is not only a necessity but a responsibility that we must embrace in the face of growing environmental challenges and the pursuit of a better quality of life for all. This report seeks to present, as a preliminary work, some of the most important socio-political issues surrounding the RET and climate change. It underscores the critical importance of aligning our ambitious goals to transition to cleaner energy sources with the broader goals of society, encompassing environmental stewardship, economic prosperity, and social equity. Through a comprehensive exploration of the key elements in this alignment process, we have highlighted the significance of the current social political landscape, energy poverty and inequality, ethical dilemmas, repercussions of the energy shift, policy frameworks, behavioural change, and public awareness campaigns. These facets, when integrated effectively, can pave the way for a more sustainable and equitable energy future.

INTRODUCTION

What is the socio-political context?

The adoption of renewable energy takes place in a broader socio-political framework that is a complex and dynamic interaction of different elements that affect the transition from traditional fossil fuels to sustainable and cleaner energy sources. Several social, economic, and political aspects influence how renewable energy is adopted locally and globally. Fundamentally, the move towards renewable energy is propelled by a rising consciousness of the environmental threats posed by climate change and the negative effects of conventional fossil fuels on ecosystems and public health. Because of this understanding, there is now a greater public demand for cleaner substitutes, which has forced governments and industries to rethink their energy policies.

Policy makers frequently use laws and regulatory frameworks to influence how renewable energy sources are adopted. Governments are crucial in determining the energy landscape because they provide incentives like tax breaks, grants, and subsidies to promote the growth and application of renewable technology. On the other hand, policy obstacles or a lack of political-will may obstruct the transition, as is the case when the interests of the fossil fuel sector conflict with those of sustainability.

Additionally important in this setting are economic concerns. Over time, the price of renewable energy technologies has been steadily falling, making them more affordable than conventional fossil fuels. To achieve widespread adoption, infrastructure must be first invested in, and a supporting market environment must be created. Economic considerations also extend to job creation, as the renewable energy sector has the potential to both generate new employment opportunities and stimulate local economies.

Furthermore, social dynamics are crucial. Political choices and industry practises can be influenced by societal acceptance for renewable energy sources. Energy policies and investment decisions are influenced by grassroots movements, public pressure, and environmental awareness campaigns. Local communities that host renewable energy projects could also have both positive and negative effects, from boosted economic activity to worries about aesthetics and land use.

The use of renewable energy on a worldwide scale is linked to geopolitics and international relations. Countries with an abundance of renewable resources may start exporting energy, changing conventional energy trading patterns and lowering reliance on those that export fossil fuels. The relevance of adopting renewable energy as a common global objective is further underscored by collaborative agreements and attempts to combat climate change, such as the Paris Agreement. The broader socio-political environment surrounding the adoption of renewable energy involves a complex interplay between environmental awareness, political choices, economic factors, and social dynamics. A comprehensive strategy that balances the interests of various stakeholders while working towards a more sustainable energy future is necessary to successfully navigate this situation.

Who are the key stakeholders?

Every person who lives on the planet might be considered a stakeholder because of the global character of the effects of climate change and the shift to renewable energy as a mitigation method. In this study, "stakeholders" are referred to as the individuals, organisations, and institutions that either directly or indirectly influence or are affected by a decision on the transition to renewable energy sources as defined by USAID's 2016 report on Stakeholder Engagement for Biodiversity Conservation Goals [1]. Some of the key parties involved in the shift to renewable energy are listed below.

- Government and Regulatory Bodies
- Energy Companies and Utilities
- Renewable Energy Developers

- Investors and Financial Institutions
- Research and Academic Institutions
- Environmental and Climate Advocates
- Consumers and Communities
- Manufacturers and Suppliers
- Electric Grid Operators
- International Organizations
- Local Governments and Authorities
- Workforce and Labor Organizations
- Traditional Energy Industry

Stakeholders can directly affect the success of RET-related projects. They offer expertise, suggestions, concerns and priceless feedback that should be taken into account. A just transition will be ensured by addressing any stakeholder issues early in the process. This can help to avoid barriers, save resources hence increasing the likelihood of success and promoting a sense of ownership and legitimacy of the decisions made. It is crucial to effectively involve a diverse range of stakeholders in the decision-making and implementation processes since this ensures the greatest possible result. Planning choices in the energy sector are complicated and cannot be handled by one organisation. A project will undoubtedly fail if all affected stakeholders, especially the consumers and communities themselves, are not included in the planning stages. Any renewable energy project will gain from improved communication, collaboration, and information exchange as well as prevent hurting the people it is designed to serve by involving a variety of stakeholders [1].

What are the socio-political and economic motivations?

Socio-politically, the need to tackle climate change is a crucial driver, pressuring countries to use cleaner energy sources to fulfil obligations made at the international level, such as those made in the Paris Agreement. As governments work to lessen their vulnerability to supply disruptions and price volatility, energy security and the diversification of energy sources are crucial motivators for the RET. Political action is further encouraged by public sentiment and pressure, which enables the public's need for sustainable solutions to be met. Projects using renewable energy can result in employment in production, installation, maintenance, and research. Renewable energy may be promoted by policymakers as a means of promoting economic growth and job creation, particularly in areas with significant unemployment [2]. The desire of nations to assume leadership roles in the global transition to sustainable energy is noteworthy. Developing and implementing renewable energy technology proactively can help countries improve their international reputation and influence.

Renewable energy sources, especially solar and wind, are now viable and economical replacements for fossil fuels on the economic front. Additionally, due to low or non-existent fuel costs, renewable energy sources offer long-term pricing stability, minimising susceptibility to market volatility. Increased economic resilience and price control are two benefits of achieving energy independence by reducing reliance on imported fossil fuels. Additionally, the transition encourages innovation and technical development, opening doors for economic expansion and enhancing global competitiveness. Projects involving renewable energy frequently draw finance and private investment from financial institutions eager to promote sustainable efforts. This money influx can promote infrastructure growth and economic activity. Furthermore, they have lower external costs than fossil fuel-based energy sources do, which include air pollution, health effects, and environmental harm. Transitioning to renewables can reduce these external costs and their associated economic burdens [2].

CHAPTER I: GLOBAL ENERGY OUTLOOK, POVERTY AND INEQUALITY

Abstract

To provide a foundational perspective on the current state of affairs and gain insights into the origins of some of the socio-political challenges that the RET faces, this chapter provides an in-depth exploration of energy poverty, population growth and a discussion of the inequalities in energy access between different regions and communities. Reports from the International Energy Agency, Our World in Data, The World Bank, and the United Nations Development Programme are some of the major sources that the chapter draws on.

Energy access and human development

Reliable and affordable energy access is intricately linked with human development, exerting a profound influence on various facets of well-being and progress. Insufficient access to modern and reliable energy sources hampers the overall quality of life, particularly in developing regions [3]. With approximately 940 million people lacking access to electricity globally (13% percent of the global population) predominantly in sub-Saharan Africa and South Asia, addressing this disparity becomes crucial for holistic development.

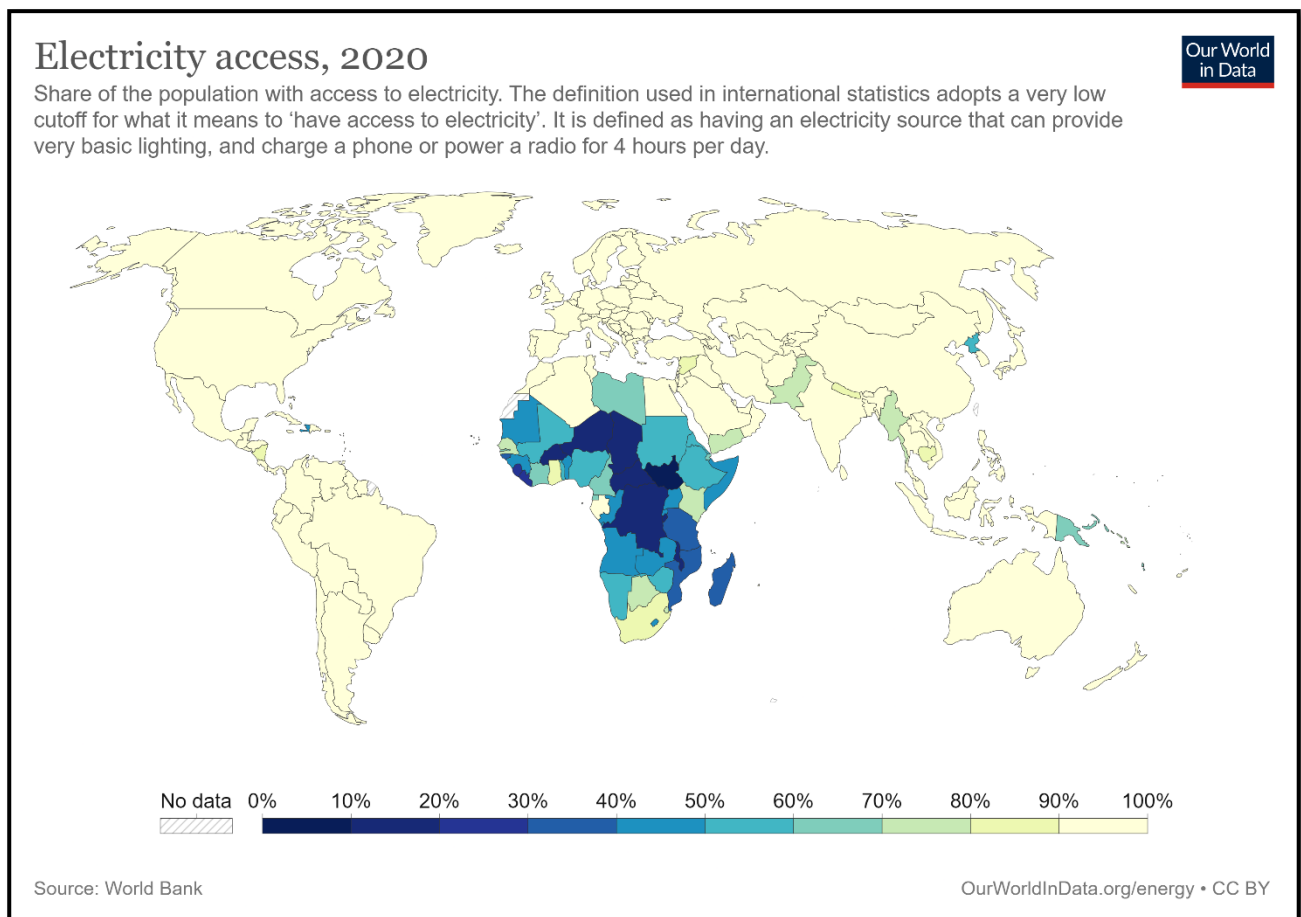


Figure 1: Electricity access 2020, Our World in Data

Healthcare services, heavily reliant on electricity for medical equipment, lighting, and vaccine preservation, are severely compromised without energy access. The World Health Organization emphasizes that energy availability is essential for effective healthcare delivery, particularly in underserved areas [4]. Similarly, education suffers as schools require energy for lighting, heating, and digital learning tools. Moreover, energy access affects environmental sustainability and health. Traditional biomass cooking methods contribute to indoor air pollution, impacting public health. Transitioning to electrical cookers for cooking, as highlighted by the International Energy Agency, can mitigate these health risks [6]. Economic growth is also closely intertwined with energy access, as industries, businesses, and agriculture rely on energy sources for

productivity and income generation. The World Bank underscores the role of energy access in fostering economic advancement and reducing poverty [5].

The energy sector shoulders a substantial portion of the global burden of greenhouse gas emissions, constituting a significant factor in humanity's role in driving climate change. As an illustrative example, consider the year 2016, where the energy sector singularly contributed to a staggering 73.2% of the total 49.4 billion tons of carbon dioxide equivalent greenhouse gas emissions. This trend is poised to intensify given the escalating global population and the corresponding surge in economic activities. Projections indicate an estimated 50% rise in energy consumption between 2018 and 2050 [7]. This impending scenario presents an acute challenge, a challenge that hinges on the intricate relationship between concerted climate action and the imperative to enhance the quality of life for populations entrenched in severe energy poverty. The former requires a reduction in energy consumption or transition to renewable energy technologies while the later requires the establishment of accessible, dependable, and economically viable energy access systems whether renewable or not.

Inequality in distribution of energy access

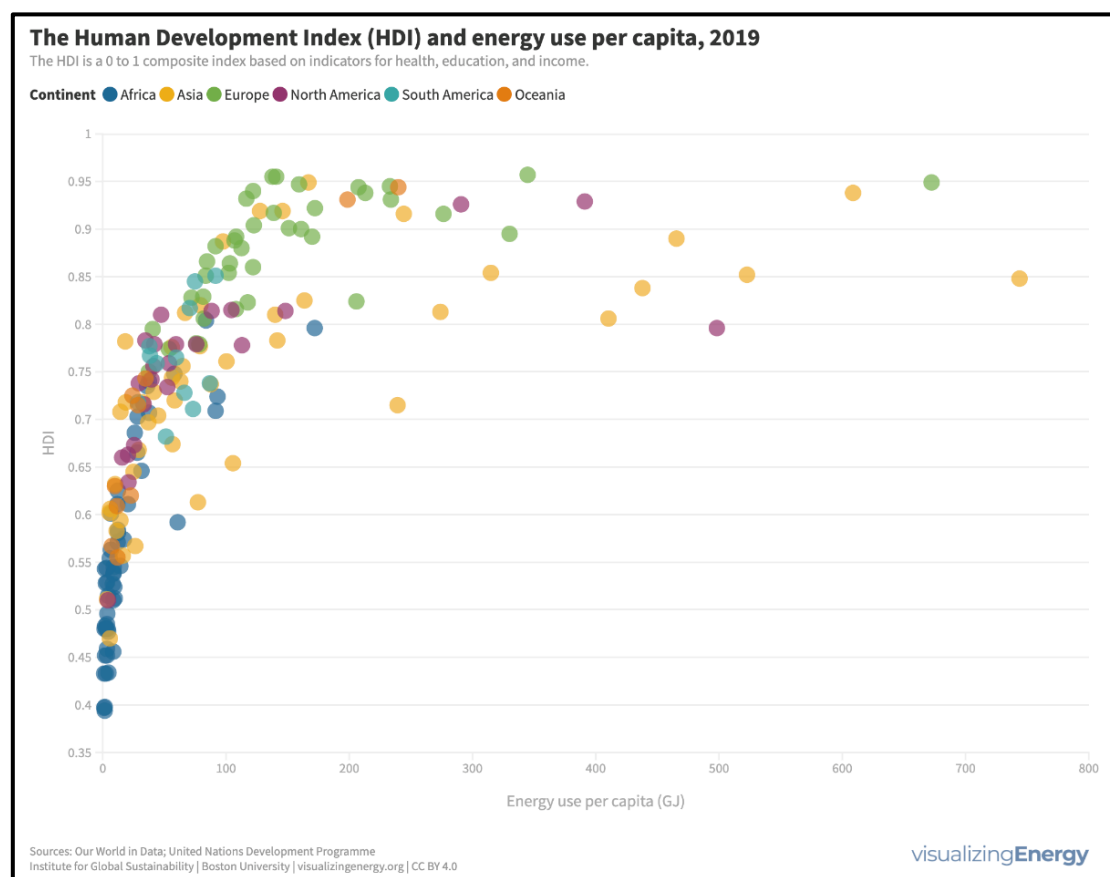


Figure 2: The Human Development Index and energy use per capita 2019, Our World in Data & UNDP

The interplay between human development and energy accessibility becomes strikingly evident upon scrutinizing the correlation between the human development index and energy consumption per capita. Notably, a discernible pattern emerges; most African nations exhibit minimal energy accessibility, consequently reflecting a considerably low HDI. In contrast, regions such as Europe and North America showcase significantly elevated HDI scores and energy access. This disparity carries with it an intrinsic element

of inequality and injustice concerning energy access, greenhouse gas emissions and climate action responsibility. To better comprehend the magnitude of this divergence, consider the ensuing examples:

- On average it takes 12 days for a British person to generate the amount of carbon emissions it will take a person in Burkina Faso a year to produce [8].
- The average carbon footprint of someone in the richest 1% could be 175 times that of someone in the poorest 10% [9].
- An average Swiss individual consumes approximately half the energy per capita compared to their American counterpart. This disparity, however, doesn't necessarily imply that the standard of living for a typical American is double that of a typical Swiss. Interestingly, certain metrics suggest that Switzerland may boast higher standards of living than the United States. Hence, aside from the evident unequal distribution, there's also a noticeable trend of inefficient and wasteful energy utilization amongst developed nations [10].

Mahatma Gandhi eloquently encapsulates this inequitable state of affairs. When questioned about his aspirations for India to achieve a living standard akin to that of Britain's, Gandhi's response was both insightful and pointed. He astutely noted that Britain had attained its elevated living standard by exploiting the resources of nearly half the world, referring to its colonial dominion. In light of this, he posed a thought-provoking query, asking, "How many worlds do you think India would require to reach a comparable living standard?" [10]. In essence, energy access stands as a linchpin for human development, influencing healthcare, education, economic prosperity, and environmental well-being. Addressing energy disparities requires concerted efforts by governments, international organizations, and the private sector to ensure equitable access to energy and uplift societies globally.

CHAPTER II: ETHICAL CONSIDERATIONS OF AN ENERGY TRANSITION

Abstract

The ethical issues of energy transitions in general are examined in this chapter. It includes an exposition of important problems and moral dilemmas in the RET. To promote a fair and ethical transition, it also makes some ethical practice recommendations that can be implemented to renewable energy projects (REPs). This section mostly draws inspiration from Clark Miller's "The Ethics of Energy Transitions" study and the Nuffield Council on Bioethics' "Biofuels: Ethical Issues" report.

Ethics and socio-energy system design

The study of what is right and wrong is referred to as ethics, sometimes known as moral philosophy. Concerns regarding ethics and justice come up frequently when discussing energy transitions, especially in the current global context where we anticipate significant changes to energy systems. These changes include the development of smart grids, the growth of electric and hybrid-electric vehicles, and the shift to more environmentally friendly energy sources. Along with affecting energy generation and distribution, these changes have the potential to influence the social, economic, and political structure of the energy industry. The consideration of social and ethical issues throughout the design and implementation of energy transitions is crucial, as is the incorporation of diverse traditions of ethical analysis. Micro-ethics is the study of ethics at the level of the individual while macro-ethics, studies ethics at the level of institutions, professions, and societies. At the largest macro-scale, humanity must respond to a variety of challenging issues, such as:

- Given the expected effects on future generations, how much longer can the continued release of carbon into the atmosphere be justified?
- Who bears responsibility for reducing carbon emissions?
- Who will cover the financial burden?
- What other sacrifices are acceptable or necessary in light of the imminent effects of climate change?

Transitions in the energy sector involve more than just alterations in the fuel utilised or the equipment that supports energy generation and use. Instead, these technical developments coincide with shifts in institutions, practises, choices, and beliefs. Because they alter not only the way energy is produced and consumed but also the distribution of power, money, risk, vulnerability, and resilience. Past transitions have shown that the accompanying social, economic, and political reorganisation is frequently one of the most important aspects of large energy transitions. The decision to construct a coal-fired power plant or a nuclear plant, for instance, may not mean much for the number of kilo-watts delivered to the grid or the price paid for them, but both will produce very different distributions of benefits, costs, and risks among their respective fuel cycles, supply chains. Therefore, the option is not between ethical and unethical energy sources; rather, it is between various system designs that influence ethical and unethical outcomes. Therefore, it's critical to promote the explicit integration of ethics into technical design decisions [11].

Commendable ethical practice in an energy transition

1. Develop ethics criteria for transition outcomes

In its systematic report to tackle energy ethics head-on, the Nuffield Council on Bioethics—one of the most significant bioethics bodies in the UK—highlighted the ethical conundrums connected with large-scale biofuel development and developed a set of substantive ethical criteria for future investments [12]. To guarantee a just transition, the practical ethical principles below can be extended to all REPs.

- REPs development should not be at the expense of people's essential rights – this includes access to sufficient food and water, health rights, work rights and land entitlements

- REPs should be environmentally sustainable.
- REPs should contribute to a net reduction of total greenhouse gas emissions and not exacerbate global climate change.
- REPs should develop in accordance with trade principles that are fair and recognise the rights of people to just reward (including labour rights and intellectual property rights).
- Costs and benefits of REPs should be distributed in an equitable way.
- If the first five principles are respected and if REPs can play a crucial role in mitigating dangerous climate change then, depending on certain key considerations, there is a duty to develop such biofuels.

It is important to note that energy policy is typically influenced by three factors: energy pricing, reliability of the energy supply and the consequent carbon emissions. The planning for the energy transition, however, rarely accounts for considerations of equity and access, the just distribution of revenues, benefits, costs, and risks, the social value or social destructiveness created, unless these factors result in social and political unrest and violence. It can be argued that it would be unfair and unethical to ignore this crucial factor.

2. Confront the socio- in socio-energy systems design early and often

Integrating ethical considerations into engineering design may be quite difficult for engineers. A workable strategy considers the human and social components of energy consistently and thoroughly throughout the whole design process. People play a variety of responsibilities in the energy industry, including those of designers, operators, engineers, managers, labourers, users, consumers, buyers, and locals who live close to the location of the energy systems. The design process ought to be fundamentally shaped by this human input at every level. Consultations can take place before the design phase begins, while first concepts are developed, as designs are nearing completion, and even as the project goes into construction and operation. Opening up the design process to direct, detailed, and extensive interaction with various stakeholder groups becomes crucial, especially in the context of energy transitions, in order to get a deep grasp of the social dynamics that will shape future energy systems. Including humanists and social scientists who can examine the social phenomena around energy projects in the planning phase is another option to consider.

3. Expand lifecycle assessments to include social outcomes and outcome distributions

Lifecycle analysis has become a common practice in assessing the sustainability of engineering projects. It goes beyond evaluating the environmental impacts of a single facility and considers its entire lifecycle, including supply chains, waste management, and eventual decommissioning. However, when it comes to using lifecycle analysis as a tool for ethical decision-making, it has three significant shortcomings:

- **Limited Socio-Economic Focus:** Typically, lifecycle analysis primarily focuses on environmental aspects and often neglects socio-economic considerations. While some projects include separate social impact assessments, these are not typically integrated into the comprehensive lifecycle approach. A more effective approach would involve merging social outcome and risk assessments with lifecycle analysis to provide a more holistic understanding of how new energy projects affect society from cradle to grave.
- **Aggregated Analysis:** Traditional lifecycle analysis tends to consolidate the impacts and risks of projects into an overall summation. While this is useful for cost-benefit calculations, it falls short in ethical analyses. Ethical assessments require an understanding of how these impacts are distributed across different communities, which can vary significantly in terms of geography, demographics, or time. For example, even if the overall risks of a proposed power plant are relatively low, if they

disproportionately affect a specific group without corresponding benefits, it raises substantial justice concerns. To address this, lifecycle analysis should account for the spatial and temporal distribution of social and environmental risks and outcomes associated with energy projects.

- **Lack of System-Wide Perspective:** Lifecycle analysis typically zooms in on individual facilities or products and overlooks the broader implications of energy system transitions. The upcoming shift towards new energy systems is likely to bring about comprehensive changes that can either amplify or offset the impacts of individual projects or technologies. To address this, we should adopt a more holistic perspective that considers the systemic transformations that may result from the transition to new energy systems.

CHAPTER III: SOCIETAL REPERCUSSIONS OF THE ENERGY SHIFT

Abstract

In this chapter, we delve into the negative consequences brought about by the RET. Our primary focus lies in scrutinizing the dynamics within low-income economies which include most regions in the global south such as some parts sub-Saharan Africa and south asia. This is of interest because these regions typically have a unique challenge of trying to mitigate climate change through the RET while also combating energy poverty. Additionally, we conduct an analysis of the repercussions on local communities and indigenous populations, drawing insights from a case study involving REPs developed within Kenya's indigenous communities. The main reference material for this section is a report from the International Work Group for Indigenous Affairs and various news articles.

Socio-economic repercussions on low-income economies

The global shift towards renewable energy sources is lauded for its potential to mitigate climate change and promote sustainable development. However, it is essential to recognize that this transition can have adverse impacts on the low-income economies. The pursuit of renewable energy projects like hydropower dams, wind farms, and solar installations may inadvertently result in the displacement of indigenous groups from their ancestral lands, disrupting their cultural heritage and traditional ways of life. These communities may face marginalization and struggle to secure their land rights amidst the development of such projects [13].

Moreover, transitioning to renewable energy technologies often requires substantial initial investments and technological expertise due to the need to mitigate their intermittency through battery storage systems as compared to convention fossil fuel systems. This poses challenges for poorer economies. While renewable energy can offer long-term benefits, the immediate financial burden can widen the technological and economic gap between developed and developing nations [3]. In some cases, the transition might lead to higher energy costs, disproportionately affecting vulnerable households that are already struggling to make ends meet. Additionally, economic dependency on wealthier countries for technology transfer and financial support can undermine the autonomy and decision-making capacity of developing economies giving rise to what some have termed a new form of neo-colonialism called 'Green colonialism'. Green Colonialism, also known as Eco-colonialism, Environmental Colonialism or Climate Colonialism is the practice of one country making or taking decisions and actions in another, under the pretext of benefit to the environment and by using influence to make policies and developmental strategies or technology that benefits one country or group of people by unfairly exploiting the resources of another [14].

In the process of transitioning, it is crucial to address these negative effects and prioritize equitable outcomes. Ensuring the meaningful participation of indigenous communities in decision-making, securing their land rights, and providing them with a share of the benefits from renewable energy projects are essential steps. A just transition strategy that encompasses these considerations is imperative to ensure that the move towards renewable energy does not exacerbate existing inequalities but instead fosters sustainable development for all.

Case study on the Indigenous communities in Kenya

A pertinent illustration of this dynamic emerges through the case of Kenya's ambitious endeavour to shift towards renewable energy sources. While commendable in its intention, this initiative has not been devoid of criticism, particularly with regard to its apparent disregard for the rights and wellbeing of Indigenous Peoples dwelling upon the lands earmarked for expansive wind and geothermal projects.



Figure 3: The Maasai are an Indigenous pastoralist community in Kenya

The recent report from the International Work Group for Indigenous Affairs (IWGIA) casts light on the intricacies. It highlights how the transition has inadvertently led to the displacement of Indigenous Peoples from territories they hold as sacred. Among these Indigenous communities, one finds diverse groups encompassing both hunter-gatherers such as the Ogiek, Sengwer, Yaaku Waata, and Sanya, as well as pastoralists like the Endorois, Turkana, Maasai, Samburu, and others.

The scrutiny primarily revolves around two flagship projects, the Lake Turkana Wind Power initiative and the Olkaria Geothermal Power plants. Both projects have triggered the need for community relocation. In the case of the wind project, the Indigenous Peoples were relocated to pave the way for road construction leading to the project site. Subsequently, attempts were made to rebuild the village with certain improvements. However, unforeseen consequences, such as an influx of job seeking individuals that significantly expanded the village, led to a host of challenges.



Figure 4: The Lake Turkana Wind Power initiative

Meanwhile, the geothermal endeavour implemented a relocation plan for four Maasai villages that inadequately accounted for crucial cultural considerations. Beyond the realm of human displacement, issues have arisen from the geothermal project's extraction processes, including the emission of toxic gases. This has resulted in documented health and environmental concerns. Affected communities in the vicinity have reported a surge in skin ailments, stillbirths among cattle, and premature deliveries [13].



Figure 5: The Olkaria Geothermal Power plants

This case exemplifies the complex web of interactions between renewable energy initiatives, indigenous rights, and the broader socio-environmental fabric. It emphasises the need for conscientious planning, thoughtful engagement, and holistic considerations when charting the path towards sustainable energy transitions.

Is it fair to impose green energy on low-income economies?

The trajectory of progress, from the industrial revolution to the present, has been significantly shaped by the evolution, dissemination, and enhancement of machinery fuelled by fossil resources. This progression has ushered the Western world into a realm of remarkable growth, development, and elevated living standards. In stark contrast, the global south stands as a stark example, harbouring a substantial populace still bereft of access to energy.

The repercussions of unreliable electric power reverberate across essential facets of life. Essential appliances remain dormant, taps run dry, and even hospitals shutter their services. This cascade of issues persists because the absence of dependable electricity impedes not only immediate solutions but also stifles broader economic advancement. Industries falter without the capability to utilize power tools or operate factories, subsequently deterring potential investors. This critical lack of investment obstructs the financial underpinning required to establish power-generating facilities capable of enticing industrial activity. Thus, a detrimental cycle perpetuates, encapsulating the global South in its current state. In February 2016, Piyush Goyal, India's Minister of Coal, astutely pointed out, the intermittent and unreliable nature of renewable energy sources when he said "All renewables are intermittent. Renewables have not provided baseload power for anyone in the world. After all, solar works when the sun is shining, wind works when the wind is blowing, hydro works when there is water in the rivers. You must have coal.... I do wish people would reflect on the justice of the situation."

Geopolitical ramifications of the Renewable Energy Transition

The surge of Western climate centered policy has proven to have a significant geopolitical effect. The decision by Western institutions to restrict some avenues for economic progress in favour climate protection through green financing has not led low-income economies to abandon their developmental aspirations; rather, it compelled them to seek alternative avenues of financial backing. This shift, in turn, created an opportune space for rising global players in the East, notably Russia and China, to extend their influence, particularly in Africa [14]. These nations have seized the moment by funding extensive power grid projects, which, intriguingly, encompass coal-powered facilities as well.

This geopolitical recalibration is especially visible in West-African regions like Niger, where the realignment of allegiances and support has been observed. Notably, there's been a discernible shift towards Russia from the once-dominant influence of France. This transformation is attributed, in part, to the Nigerien population's discontent regarding the exploitation of their uranium reserves, a pivotal resource for nuclear power generation. This sentiment resonates with the argument that France leveraged this resource to its advantage without adequately benefitting the Nigerien people, while Russia's overtures are perceived as potentially more equitable [15]. In essence, the unfolding narrative show the ripple effects of climate-focused policy decisions, which have inadvertently altered the geopolitical landscape. The vacuum created by the West's regulatory stance has prompted unexpected players to emerge as new power brokers on the global stage, reshaping dynamics and forging new allegiances in pursuit of their own interests.

CHAPTER IV: LIFESTYLE AND ENERGY CONSUMPTION

Abstract

This chapter explores the critical intersection between energy consumption patterns and societal objectives. It delves into the influence of lifestyle on shaping consumption behaviour. It presents compelling studies that illustrate successful efforts to align consumption patterns with societal values, providing valuable insights for sustainable energy transitions and draws mainly on insights from Fereidoon P. Sioshansi's "Energy, Sustainability and the Environment" chapter on Equity, Economic Growth and Lifestyle.

How does lifestyle influence energy consumption?

The way people or households choose to live their lives has a direct connection to how much energy they use and the emissions they produce. In the past, it was mainly the advanced nations that had the highest energy consumption rates. But now, due to an increasing population and more people living in cities, the amount of emissions per person from the wealthier households in certain developing countries such as India is slowly approaching the levels seen in developed nations. The following are some keyways in which lifestyle choices affect energy consumption:

- **Transportation:** The mode of transportation people use, whether it's driving a gas-guzzling SUV, carpooling, biking, or using public transport, can greatly impact energy consumption. A person who commutes long distances in a fuel-inefficient vehicle will consume more energy than someone who uses a more efficient mode of transport or lives closer to work.
- **Housing:** The type of housing people choose and how they heat, cool, and maintain their homes can significantly affect energy use. Larger homes, poor insulation, and energy-inefficient appliances can result in higher energy consumption.
- **Diet:** The production, transportation, and preparation of food require energy. Diets that rely heavily on processed or energy-intensive foods, such as meat, can contribute to higher energy consumption compared to plant-based diets that require fewer resources.
- **Consumer Choices:** The purchase of consumer goods, such as electronics, appliances, and clothing, can have indirect energy consumption effects. Energy is used in the manufacturing, transportation, and disposal of these products. Buying energy-efficient appliances and electronics, as well as choosing products with a longer lifespan, can reduce energy consumption.
- **Travel and Tourism:** Choices related to travel and tourism, such as taking long-haul flights or staying in energy-intensive accommodations, can contribute to increased energy consumption.
- **Conservation Habits:** Personal habits related to energy conservation, such as turning off lights when not in use, using programmable thermostats, and being mindful of water and electricity usage, can directly impact energy consumption at the household level.
- **Urban Planning:** The way cities are planned and designed can influence lifestyle choices related to transportation. Cities with efficient public transportation systems and pedestrian-friendly infrastructure can encourage people to use energy-efficient modes of transport.
- **Work and Leisure Activities:** The nature of work and leisure activities can also affect energy consumption. Telecommuting, for example, can reduce the need for commuting and office energy use, while energy-intensive leisure activities like running powerboats can increase energy consumption.
- **Cultural Norms:** Cultural norms and societal attitudes toward energy conservation can influence lifestyle choices. In some cultures, there may be a greater emphasis on environmental sustainability and energy efficiency, leading to more conscious energy consumption patterns.

Our individual energy habits and lifestyles usually exhibit consumer inertia, which is the tendency of some customers to buy or continue buying a product, even when superior options exist. When such tendencies persist across large populations and households, they become a primary driver of our excessive collective energy consumption. This phenomenon is a fundamental contributor to the challenges posed by climate change. A recent study, as an illustration, suggests that about 40% of greenhouse gas emissions in OECD countries can be directly attributed to the choices individuals make regarding services like transportation, heating, and personal consumption [16]. Even minor adjustments in lifestyle choices and consumption patterns when applied to large populations, offering a path toward a more sustainable energy consumption. It is important to note that:

- People can enjoy different levels of high-standard lifestyle with different levels of energy use and environmental impacts.
- A high standard of living does not necessarily translate into a high level of happiness or wellbeing.
- There is considerable scope for changing personal habits in rich countries to substantially reduce energy consumption with only modest changes in lifestyle and welfare levels.

Typically, in wealthier countries, there is more room for changes in lifestyle because people often consume things that aren't necessary for their basic needs, and instead, they focus on things that show their social status.

Transportation lifestyle – comparison of developed cities

A clear illustration of how personal choices can translate into a big difference in energy consumption and the environment is the personal car. A study shows differences in the transportation choices of people in developed cities [17].

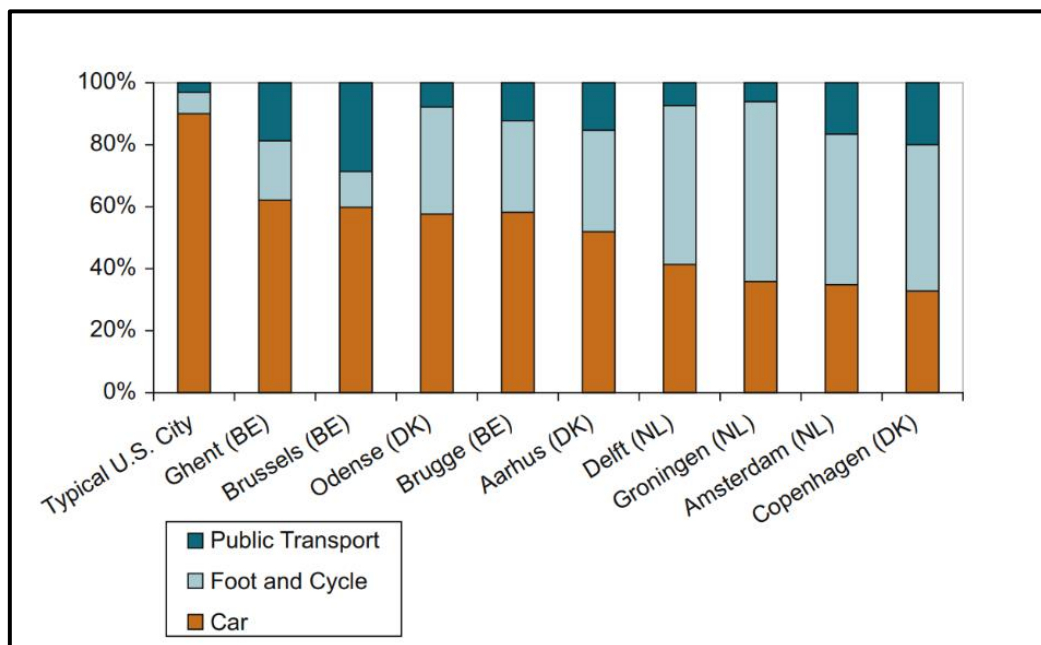


Figure 4 Transport mode preferences in selected developed cities

Apart from the challenges posed by limited public transportation options or dedicated bicycle lanes, many societies tend to link affluence and social standing with owning private cars. This strong association often leads to a preference for driving rather than considering alternatives like cycling, walking, or using public transit, particularly in countries like the United States. However, in cities renowned for their bicycle-friendly infrastructure such as Amsterdam and Copenhagen, where reliable and extensive public transportation

systems exist and where societal values prioritize public transport over private car ownership, residents can maintain high levels of mobility and quality of life while causing minimal harm to the environment. This example of transportation modes highlights how personal habits and lifestyles can evolve over time to favor more efficient and environmentally friendly choices. Public education campaigns, similar to those successfully discouraging smoking, have the potential to be effective in reshaping behaviours and promoting sustainable practices.

CHAPTER V: CLIMATE CHANGE MITIGATION POLICIES

Abstract

Numerous policies and strategies are being implemented, and more are being proposed to address climate change, with a particular focus on energy production and consumption. These policies can be broadly categorized into two approaches: those involving strict regulations like binding standards, carbon quotas, taxes, and subsidies, and those utilizing softer methods such as information campaigns designed to influence behaviour and lifestyle choices. In the context of energy, the societal objective is to promote energy conservation and advocate for low-carbon alternatives to traditional fossil fuels, such as renewable energy sources (RES), along with the exploration of innovative technologies like Carbon Capture and Storage (CCS). This chapter briefly explores some of the strengths and weaknesses associated with various categories of policies as outlined by Fereidoon P. Sioshansi's "Energy, Sustainability and the Environment" chapter on Equity, Economic Growth and Lifestyle, emphasizing their effectiveness in relation to influencing changes in lifestyle.

Population policy

Description

- Current global population trends project around 9 billion people by 2050.
- Small changes in the number of births per woman can have significant long-term effects on population growth.
- Sustainability and climate change mitigation are easier to achieve with a lower global population.
- Encouraging lower birth rates can be achieved through policies that avoid economic and social incentives to increase birth rates.

Strengths

- Promoting birth rates below 2.0 can benefit human welfare and the environment.
- Encouraging lower birth rates can be achieved through policies that avoid economic and social incentives to increase birth rates.
- Soft strategies like birth control information campaigns have been successful in some regions.
- Reducing birth rates can lead to a better material standard of living.

Weaknesses

- Population control policies can be sensitive and may conflict with principles of personal freedom.
- They can also clash with cultural traditions and religious beliefs.
- Economic incentives may be needed in some cases, which can be costly.
- Achieving international consensus on population policies can be challenging.

Conclusion

Population policies, including encouraging birth rates below 2.0, should be part of climate change mitigation strategies, considering both the environmental and human welfare aspects.

Equity Policies

Policy Description

- The pursuit of greater equity is a crucial aspect of sustainable development.
- Promoting economic satiation in affluent societies is a key goal.

- Emphasizes the need for equal access to limited natural resources, making it morally and politically justified.

Strengths

- Equity policies can address economic disparities and promote fairness.
- They recognize the challenges posed by limited natural resources.
- Highlight the need for equal rights to resource use, reinforcing moral and political legitimacy.
- Can help counterbalance energy and CO₂-intensive lifestyles associated with affluence.

Weaknesses

- Powerful decision-makers, often from the upper echelons of society, may resist changes to less energy-intensive lifestyles.
- The influence of the affluent can create political barriers to broader environmental and energy policy changes.
- Mainstream economic principles may lead to slow lifestyle changes in the context of climate change mitigation.

Conclusion

Equity policies are vital for addressing economic disparities and ensuring fairness in resource allocation. However, they may face challenges from affluent groups and could require adjustments to mainstream economic principles for faster lifestyle changes in the context of climate change mitigation.

Carbon Taxes

Policy Description

- Carbon taxes imposed on fossil fuels aim to boost the competitiveness of renewable energy sources (RES), nuclear energy, and low-carbon alternatives.
- Aligns with the polluter pays principle, where those responsible for pollution bear the costs.
- Increasing the price of carbon-heavy fuels encourages changes in consumer behaviour, promotes energy conservation, and incentivizes the transition to energy-efficient appliances and processes.

Strengths

- Promotes the adoption of cleaner energy sources and reduced carbon emissions.
- Encourages energy-efficient practices and appliance choices.
- Consistent with the polluter pays principle, holding those responsible for pollution accountable.
- Can generate revenue for environmental initiatives.

Weaknesses

- Faces social barriers as higher energy prices can disproportionately burden low-income households.
- Political challenges include the need for relatively high carbon tax rates to achieve substantial emission reductions.
- Resistance from energy-intensive production sectors may arise if taxes aren't universally applied across regions or countries.
- Implementing a global carbon tax, especially at the production source, requires international cooperation and enforcement, which can be complex and contentious.
- Past experiences suggest challenges in achieving global agreements on such taxes, as they may interfere with national policies.

Conclusion

Carbon taxes offer a promising means to encourage the adoption of cleaner energy sources and reduce carbon emissions. However, they face hurdles related to social equity, political opposition, and the complexity of global implementation, which may require innovative approaches to address these challenges effectively.

Subsidies for Energy Supply and Conservation

Policy Description

- Historically, government subsidies in industrial countries have primarily favoured fossil fuels and nuclear power.
- Support for renewable energy sources (RES) and energy conservation is a relatively recent development.
- Some examples of early subsidy programs include Danish investment subsidies for wind turbines introduced in 1979.

Strengths

- Subsidies can encourage the adoption of renewable energy sources and energy-efficient practices.
- They can help level the playing field by promoting cleaner and more sustainable energy options.
- Reducing fossil fuel subsidies can positively impact government budgets and decrease greenhouse gas (GHG) emissions.
- Subsidies can incentivize the construction of energy-efficient buildings like Passive Houses, which have a minimal heating consumption.

Weaknesses

- Accurate estimation of global subsidies is challenging due to data inconsistencies and a lack of international monitoring.
- The transition to low-energy buildings can be slow due to the long lifespan of existing structures, necessitating government subsidies for complete renovations.
- The feasibility of some proposals, such as subsidizing building owners who replace old structures with low-energy houses, may vary.

Conclusion

Government subsidies for energy supply and conservation play a pivotal role in promoting cleaner and more sustainable energy practices. However, historical biases towards fossil fuels need to be addressed, and careful monitoring of subsidy programs is crucial for their effectiveness.

CONCLUSION

Summary of key concepts

Aligning sustainable energy consumption with societal objectives is a dynamic and ongoing process that requires the collective efforts of governments, communities, businesses, and individuals. This report has identified some steps and practical solutions that could be beneficial in fostering a culture of sustainability summarised in the following table.

Step	Description
Define Clear Societal Objectives	Begin by identifying and defining specific societal objectives related to energy consumption. These could include reducing greenhouse gas emissions, enhancing energy access, promoting energy equity, or supporting local economies.
Engage Stakeholders	Involve all relevant stakeholders, including government agencies, community organizations, businesses, and the public, in the decision-making process. Ensure that diverse perspectives are considered. The inclusion of youth voices in the climate change discourse and policy making is a vital step too and can be seen for instance in the European Youth Energy Forums “the role of youth in the Future of the European Energy transition” position paper [18] which makes 12 proposals to increase youth participation.
Develop Comprehensive Policies	Create and implement policies and regulations that incentivize sustainable energy consumption. This may involve setting targets for renewable energy adoption, implementing energy efficiency standards, and providing financial incentives for sustainable practices.
Promote Education and Awareness	Launch educational campaigns to raise awareness about the importance of sustainable energy consumption. These campaigns should target both individuals and businesses and provide information on energy-saving practices.
Encourage Behavioural Change	Implement behavioural change programs that encourage individuals and organizations to adopt sustainable energy practices. This can include offering energy-saving tips, conducting energy audits, and providing feedback on consumption patterns.
Invest in Renewable Energy Sources	Increase the deployment of renewable energy sources such as solar, wind, and hydroelectric power. Incentivize the development of renewable energy projects through subsidies, tax incentives, and regulatory support.
Measure and Report Progress	Continuously monitor and assess the progress towards aligning energy consumption with societal objectives. Publish regular reports to track achievements, identify areas for improvement, and maintain transparency.
Collaborate Globally	Engage in international collaborations and agreements to address global energy challenges, such as climate change. Cooperate with other nations to share best practices and collectively work towards sustainable energy consumption.

Further avenues for research

The report has highlighted several pragmatic solutions that merit deeper investigation. These solutions encompass the need to establish an ethical framework for assessing transition outcomes, akin to the criteria set forth by the Nuffield Council on Bioethics [12], to address the ethical quandaries posed by Renewable Energy Projects (REPs). Additionally, there is a pressing call to expand the conventional lifecycle assessment methodology to encompass social impacts and equitable outcome distribution, thereby rectifying the deficiencies in conventional assessment tools [11]. Another compelling avenue for exploration lies in the formulation of quantifiable models that delineate diverse segments of society's lifestyles. These models possess the potential to be instrumental in crafting tailored and efficient energy systems to suit varying contextual needs. Building upon the groundwork already initiated by the UK Energy Research Centre in modelling lifestyle behaviours and energy consumption, this effort can be further extended and refined [19].

Furthermore, it is imperative to concentrate on crafting meticulous policy reforms at the local, national, and international levels. These reforms should be designed to mitigate the consequences of climate change in an equitable and just manner, ensuring that no segment of society bears a disproportionate burden. These policy initiatives hold the promise of fostering a more sustainable and equitable future in the face of climate challenges.

Final word

It is evident that a successful transition to sustainable energy consumption is not a one-size-fits-all solution but rather a multifaceted endeavour that requires collaboration across sectors, stakeholders, and nations. As our world becomes increasingly interconnected and our energy demands continue to rise, it is paramount that we prioritize the development and implementation of strategies that not only reduce our carbon footprint but also improve the well-being of communities worldwide. In essence, the journey towards aligning sustainable energy consumption with societal objectives is a shared endeavour that will shape our planet's future. It necessitates dedication, innovation, and collaboration at all levels of society, from individuals making conscious choices in their daily lives to governments and industries crafting forward-thinking policies and technologies. As we move forward, let us remain steadfast in our commitment to creating a world where energy is harnessed responsibly, equitably, and in harmony with the diverse needs and aspirations of our global community. By doing so, we can not only mitigate the challenges posed by climate change but also foster a more prosperous and just society for generations to come.

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