NOTTSMUN 2024

COP

STUDYGUIDE

Content

Introduction to the chairboard

President - Benny Nguyen

Hi! My name is Benny Nguyen, and I am an exchange student studying Politics & International Relations at the University of Nottingham. Coming from Vietnam, I have been engaging with the Vietnamese MUN community for 4 years now, and I am super excited to bring my knowledge and expertise about MUN from Vietnam to the UK, and see what the community here has to offer. As the president of COP, I am thrilled to bring you some of the topics that are very close to my passions - sustainability and climate change. I sincerely hope that you will have an amazing time learning and creating memories at Nottingham!

President - Louis Bolton

Hi my name is Louis. I'm a first year student at the University of Manchester, studying Mathematics with Finance. Although my degree doesn't show it, I have a keen interest in world affairs and started doing model UN in high school. Over the past four years I have had the pleasure of chairing at my school's conference and attending various others as a delegate. I believe that with the theme of building bridges and the given topics, the weekend will be filled with diverse and exciting debates. I can't wait to see you at NOTTSMUN 2024!

Introduction to the committee

The Conference of the Parties (COP), is the supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC). It is an annual gathering where representatives from member countries come together to negotiate and discuss global efforts to address climate change[1].

History

The UNFCCC was adopted in 1992 during the Earth Summit[2] in Rio de Janeiro, Brazil, and entered into force in 1994. The Conference of the Parties (COP) was established as the convention's governing body, with the first COP meeting held in Berlin, Germany, in 1995[3]. Since then, COP meetings have been held annually in different host countries around the world. Notable COP meetings include COP3 in Kyoto, Japan (1997)[4], where the Kyoto Protocol was adopted, establishing legally binding emission reduction targets for developed countries; COP15 in Copenhagen, Denmark (2009)[5], which aimed to negotiate a new global climate agreement but resulted in the Copenhagen Accord, a political agreement outlining mitigation pledges from major economies; and COP21 in Paris, France (2015)[6], where the Paris Agreement was adopted, setting the framework for global climate action post-2020.

Rules of Procedure

In COP NOTTSMUN 2024, we will be using the rules of procedure of NOTTSMUN[7], ensuring transparency, inclusivity, and fairness in the negotiation process and provide a framework for constructive dialogue and consensus-building among parties.

[1] *Conference of the Parties (COP) | UNFCCC*
[2] *United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3-14 June 1992 | United Nations*
[3] *Berlin Climate Change Conference - March 1995 | UNFCCC*
[4] *COP 3 | UNFCCC*
[5] *COP15 ends with landmark biodiversity agreement (unep.org)*
[6] *COP 21 | UNFCCC*
[7] *Rules of Procedure NottsMUN 2024 (1).pdf*

Strengthening disaster resilience for a changing climate

Background

According to the United Nations Office for Disaster Risk Reduction (UNDRR), disaster resilience means “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner.”[8] Humans have faced natural hazards from the beginning of time. With severe implications for human activities and lives, disasters play an essential role in forming our awareness of the dynamic surrounding environment. From the eruption of Mount Vesuvius in 79 AD[9] to the Great Lisbon earthquake of 1755[10], disasters shaped our understanding of risk and led to early disaster management practices.

One of the first records of disaster management policy was the Congressional Act of 1803 by the US Congress. It addresses the need for the government to provide assistance to a New Hampshire town after an extensive fire[11]. However, disaster resilience did not become an internationally recognised concept until the 20th century. Some of the remarkable disasters, such as the 1976 Tangshan Earthquake[12] or Hurricane Katrina in 2005[13], emphasized the need for the international community to take greater responsibility for addressing the situation. For example, Hurricane Katrina killed around 1,500 people and cost around $300 billion to the US economy[14]. Moreover, the number of climate disasters intensifies every year, creating more tension for worldwide populations to address these issues in the short and long run. According to the World Bank, the annual frequency of natural disasters increased by 250% between 1980 and 2012[15]. The impacts of disasters are severe on my facets, such as the population, the economy, and the environment in general. Climate change acts as a "threat multiplier," exacerbating existing vulnerabilities and creating new risks. Factors such as rising sea levels, extreme weather events, or changing precipitation patterns worsen the impacts of disasters, especially on vulnerable communities around the world.

[8] https://www.preventionweb.net/understanding-disaster-risk/key-concepts/resilience
[9] https://www.thecollector.com/famous-eruption-of-mount-vesuvius/
[10] https://hakaimagazine.com/features/the-earthquake-that-brought-enlightenment/
[11] https://www.waynegov.com/1113/History-of-Emergency-Management
[12] https://www.thoughtco.com/the-great-tangshan-earthquake-of-1976-195214
[13] https://www.weather.gov/mob/katrina
[14] https://www.metoffice.gov.uk/weather/learn-about/weather/case-studies/katrina
[15] https://blogs.worldbank.org/endpovertyinsouthasia/how-can-sri-lanka-better-protect-its-people-against-disasters

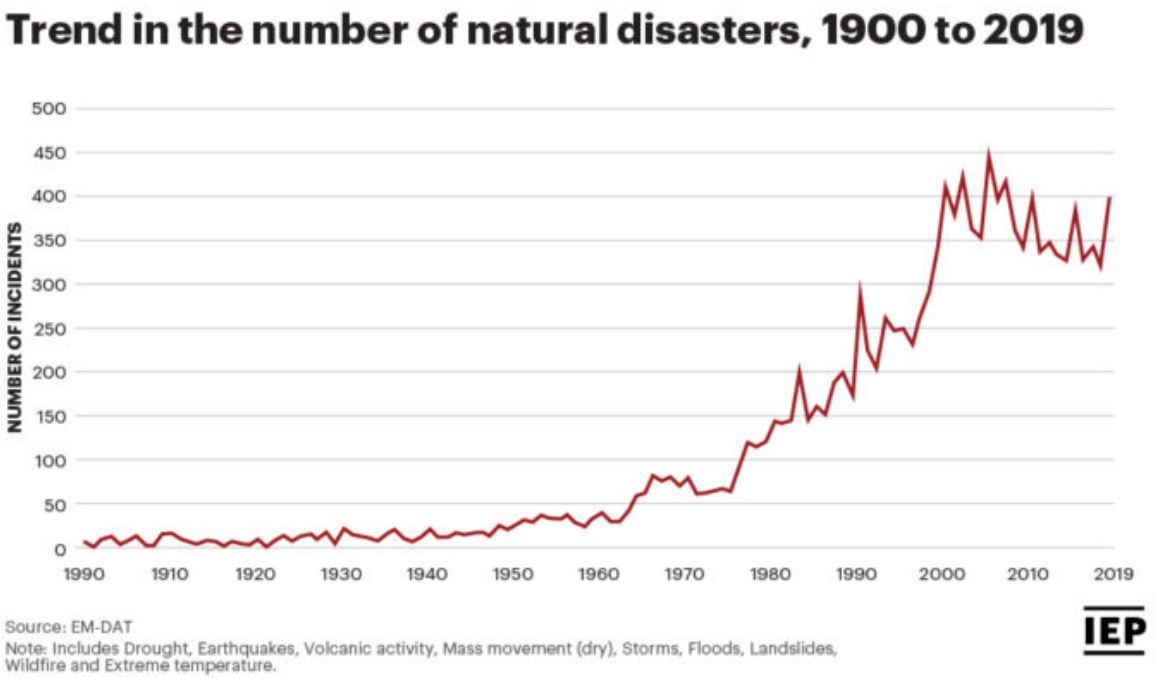


Figure 1: Trend in number of natural disasters, 1900 to 2019, by Institute for Economics and Peace.[16]

Acknowledging the negative consequences of natural disasters, the world has made multiple efforts to address the issue as a whole. Some of the first landmark agreements are the 1989 Yokohama Strategy[17] and the 2005 Hyogo Framework for Action[18], laying the

[16] https://www.visionofhumanity.org/global-number-of-natural-disasters-increases-ten-times/
[17] https://hdq.uswr.ac.ir/browse.php?a_id=321&sid=1&slc_lang=en&html=1
[18] https://climate-adapt.eea.europa.eu/en/metadata/publications/hyogo-framework-for-action-2005-2015-building-the-resilience-of-nations-and-communities-to-disasters

foundation for global disaster risk reduction efforts. At COP, climate change is discussed as a development issue, covering multiple sustainable development goals (SDGs): no poverty, no hunger, and good health and well-being[19]. Countries are coming together to help address the implications of climate change and build resilience for the most vulnerable countries to natural disasters. At NOTTSMUN, the delegates will have a chance to discuss how they can ensure that countries can stand firm to the severe impacts of climate change.

Discussion

Political

Not only is disaster resilience dependent on the environment, but it also relies deeply on politics. The ability to govern will either make or break a country's resilience towards climate change.

Within each nation, effective national governance is critical for implementing disaster preparedness plans, allocating resources efficiently, and enforcing regulations. Weak governance structures and a lack of political will can impede progress. Usually, these weak structures are driven by multiple factors, such as environmental degradation, increased poverty, poorly managed urban development, or hyperconnected financial systems. These factors will make a nation much more vulnerable to hazards, which could lead to devastating consequences. In these cases, it is crucial that each individual government reflects and reforms its structure in order to create a long-lasting impact[20].

The effectiveness of disaster resilience strategies hinges on international cooperation and shared responsibility. Multilateral agreements, resource sharing, and knowledge exchange are crucial. It has been known that disasters can foster international cooperation through acts of exchange, which can expand the quantity and the range of exports, and preferential trade agreements lead to enhanced resilience against exogenous shocks[21]. However, political tensions and competing priorities can hinder collaboration.

Economic

Natural disasters can bring devastating economic impacts. Developing countries are disproportionately impacted by disasters due to limited resources, weaker infrastructure, and dependence on vulnerable livelihoods like agriculture. This widens the economic gap between developed and developing nations. Furthermore, The economic costs of disasters are staggering, encompassing infrastructure repair, humanitarian aid, and lost productivity. This places a burden on national budgets and hinders long-term development.

Acknowledging these implications, the international community is coming together to help developing countries become more resilient. At COP27 Finance Day in 2022, UK Export Finance became the first export credit agency in the world to offer this in its direct lending to

[19] https://www.opml.co.uk/blog/cop-sdg-poverty-hunger-health
[20] https://www.preventionweb.net/understanding-disaster-risk/risk-drivers/weak-governance
[21] https://academic.oup.com/isq/article/65/3/606/6321887

low-income countries and small island developing states. The UK Government is committing to triple funding for climate adaptation as part of that budget, from £500 million in 2019 to £1.5 billion in 2025[22]. Besides, smaller countries are having their voices raised on the platform. Also at COP27, Barbadian Prime Minister Mia Mottley advocated for the Bridgetown Initiative, which is an international financial reform to help developing countries access funding more easily[23]. While most of the Member States reacted positively, the proposal also faced concerns about how the world can reform the existing financial system.

Social/Cultural

Natural disasters affect the world structurally. Women, children, the elderly, and people with disabilities are often disproportionately affected by disasters due to social and cultural factors like limited access to resources, information, and decision-making processes. On the other hand, multiple communities are also negatively affected by disasters, such as ethnic minorities or Indigenous People. Therefore, building community resilience through public education, awareness campaigns, and participatory planning is essential. It is important to include the most vulnerable actors in the system since they can acquire deep knowledge and participation for resilience in the long run. Indigenous Peoples own, occupy, or use a quarter of the world's surface area, they safeguard 80 percent of the world's remaining biodiversity - They hold vital ancestral knowledge and expertise on how to adapt, mitigate, and reduce climate and disaster risks[24].

Technological

Technological advancements are crucial in mitigating the impacts of natural disasters. One of the most notable technologies available is the early warning system. Advanced early warning systems using satellites, sensors, and communication technologies can save lives by enabling timely evacuation and preparedness measures. In Japan, the development of early warning systems was extremely enhanced after the 2011 earthquake, creating substantial development in technology and ensuring safety for the people[25]. However, not all countries can develop a sophisticated system like Japan. Access to and affordability of such technologies can be a challenge, particularly for developing countries. Therefore, this issue has been brought up to COP. In COP27, UN Secretary-General António Guterres announced a USD 3.1 billion plan to ensure everyone on the planet is protected by early warning systems within the next five years[26]. This will help incentivize further technological development in the places that need it the most. Also, information-sharing plays an important role in ensuring quick response to disasters. Sharing technological advancements in areas like early warning systems and data analysis with developing countries is crucial for building their disaster resilience capabilities. Initiatives such as European Disaster Risk Management[27] should be available to more countries around the world.

[22] https://www.gov.uk/government/news/cop27-finance-day-building-resilience-for-countries-hit-by-natural-disasters
[23] https://www.e3g.org/news/the-bridgetown-initiative-a-climate-and-development-plan-for-cop27/
[24] https://www.undrr.org/indigenous-peoples-and-disaster-risk-reduction-participation-all
[25] https://www.frontiersin.org/articles/10.3389/feart.2021.726045/full
[26] https://news.un.org/en/story/2022/11/1130277
[27] https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/european-disaster-risk-management_en

On the other hand, the construction of disaster-resilient infrastructure is also an essential part of success. Building infrastructure using disaster-resistant materials and techniques can minimize damage and accelerate recovery. However, this requires significant investment and technical expertise, which may not be readily available in all regions. Countries are also coming together to increase investment for better infrastructures in developing nations. In COP27, Denmark, Finland, Germany, Ireland, Slovenia, Sweden, Switzerland, and the Walloon Region of Belgium announced USD 105.6 million in funding towards the Global Environment Facility funds targeting the immediate climate adaptation needs of low-lying and low-income states[28].

Legal

International legal instruments like the Sendai Framework for Disaster Risk Reduction (SFDRR) provide a global framework for disaster risk reduction and response, outlining commitments and best practices for member states. The framework advocates for "the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."[29] Even though there is no official international law about natural disasters, frameworks help keep countries responsible for making sure that the process is equitable and serves the countries and communities that need it the most. Effective enforcement mechanisms are crucial for ensuring compliance with regulations and holding stakeholders accountable for implementing disaster risk reduction measures.

Furthermore, strong national policies and regulatory frameworks are needed to enforce building codes, promote land-use planning, and allocate resources for pre-disaster preparedness. Each country should adapt and apply international frameworks to its own government to ensure that the efforts are put into place.

Environmental

Climate change is a major driver of increased disaster risk by altering weather patterns, causing sea level rise, and accelerating environmental degradation. Addressing climate change is key to building long-term resilience. Key stakeholders at COP must work together to point out achievable and equitable solutions to address climate change and prevent further disasters.

Besides, loss of biodiversity can disrupt natural processes that mitigate the impacts of disasters like vegetation holding soil in place and slowing down floods. In COP27, the Forest and Climate Leaders' Partnership was launched to unite action by governments, businesses, and community leaders to halt forest loss and land degradation by 2030.

Blocks

[28] https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries
[29] https://www.undrr.org/implementing-sendai-framework/what-sendai-framework

Developed countries

These countries are the economic powerhouses around the world, such as the US, UK, China, France, etc. They are historically responsible for climate change through their economic activities, such as resource exploitation or industrialisation. Most of the impacts from these activities are passed down to developing countries, for instance, the relocation of waste and emissions. Therefore, they need to contribute positively to international efforts, like financial assistance and technology transfer. It is worth noting that they also hold different opinions about how they can invest in solving climate change. For example, the UK government is very involved in financial initiatives. They currently plan to spend about £1bn on humanitarian aid in 2024. The new "resilience and adaptation fund" will automatically take 15% of that money, which will be used to help countries prepare for future humanitarian and climate disasters[30]. On the other hand, China would be willing to support a mechanism for compensating poorer countries for losses and damage caused by climate change, but China later said that would not involve contributing cash[31].

Key Points:

- Advocate for ambitious global emissions reduction targets to address the root cause of the problem.
- Highlight existing financial commitments and technological advancements shared with developing countries.
- Push for increased transparency and accountability in utilizing allocated funds for disaster risk reduction projects.
- Support capacity-building initiatives in developing countries to enhance their preparedness and resilience.

Developing countries

These countries are the major middle-income countries around the world. Even though some of them have dynamic economic activities, they are still vulnerable to catastrophes like natural disasters. There are some specific vulnerable communities in these countries, and they need special attention and investment from developed nations. Most of these countries are located in Southeast Asia, Africa, the Caribbean, or Latin America. Some of these countries have recently been more active on the global stage in their disaster resilience efforts, such as Barbados with the Bridgetown Initiative[32]. They are hoping to direct the world's attention to special issues and hold developed nations accountable for their climate actions.

Key Points:

- Demand equitable access to climate financing for adaptation and mitigation efforts.

[30] https://www.bbc.co.uk/news/uk-67456174

[31] https://www.reuters.com/business/environment/china-willing-contribute-climate-compensation-mechanism-chinese-climate-envoy-2022-11-09/

[32] https://www.un.org/sustainabledevelopment/blog/2023/04/press-release-with-clock-ticking-for-the-sdgs-un-chief-and-barbados-prime-minister-call-for-urgent-action-to-transform-broken-global-financial-system/

- Advocate for technology transfer and capacity-building programs to enhance disaster preparedness and response capabilities.
- Call for addressing historical inequalities and the disproportionate burden of disaster risk borne by developing countries.
- Push for stronger legal frameworks and enforcement mechanisms to hold developed countries accountable for their emissions reduction commitments.

Least developed countries (LDCs)

These are mostly countries with low populations and are located in remote areas of the world, such as the Small Island Developing States (SIDS), which makes them even more vulnerable to climate impacts. They need the world to focus on their extreme vulnerability and the need for specific attention and support.

Key Points:

- Advocate for dedicated financial and technical assistance tailored to the unique needs of LDCs.
- Call for addressing underlying factors like poverty and food insecurity that exacerbate disaster risk.
- Push for inclusion in decision-making processes regarding climate change and disaster risk reduction strategies.
- Support initiatives for building local capacities and promoting community-based adaptation efforts.

Civil society and NGOs

These are the pressure groups that advocate for inclusive and holistic solutions that prioritize vulnerable communities and participatory approaches. They could come from many parts of the world, with different objectives tailored to specific groups/areas.

Key Points:

- Promote community-based disaster risk reduction strategies that consider local knowledge and needs.
- Advocate for integrating disaster risk reduction into development planning at all levels.
- Push for increased transparency and accountability in resource allocation and decision-making processes.
- Support initiatives that address the social and economic factors that exacerbate disaster risk and vulnerability.

Questions to consider

- How can international cooperation be enhanced to improve disaster preparedness and response?
- What financial mechanisms can support vulnerable countries in building resilience?
- How can technology be leveraged to address climate-related challenges?

- What effective mechanisms can be implemented to ensure equitable access to climate finance and technology transfer?
- How can we address the underlying social and economic factors that exacerbate disaster risk?
- What role can international cooperation play in promoting risk-informed development and resilient infrastructure?
- How can the international community collaborate on monitoring and evaluating the effectiveness of climate policies?
- How can economic incentives be aligned with sustainable and resilient practices?
- How can we hold countries accountable for their commitments to reducing emissions and building resilience?
- How can data sharing and transparency be improved to enhance global cooperation?

Further reading

https://www.youtube.com/watch?v=5J0egwAfO0w&ab_channel=UNClimateChange

https://www.gov.uk/government/news/cop27-finance-day-building-resilience-for-countries-hit-by-natural-disasters

https://www.reuters.com/business/finance/what-is-bridgetown-initiative-asking-paris-financial-summit-2023-06-20/

https://pmo.gov.bb/wp-content/uploads/2022/10/The-2022-Bridgetown-Initiative.pdf

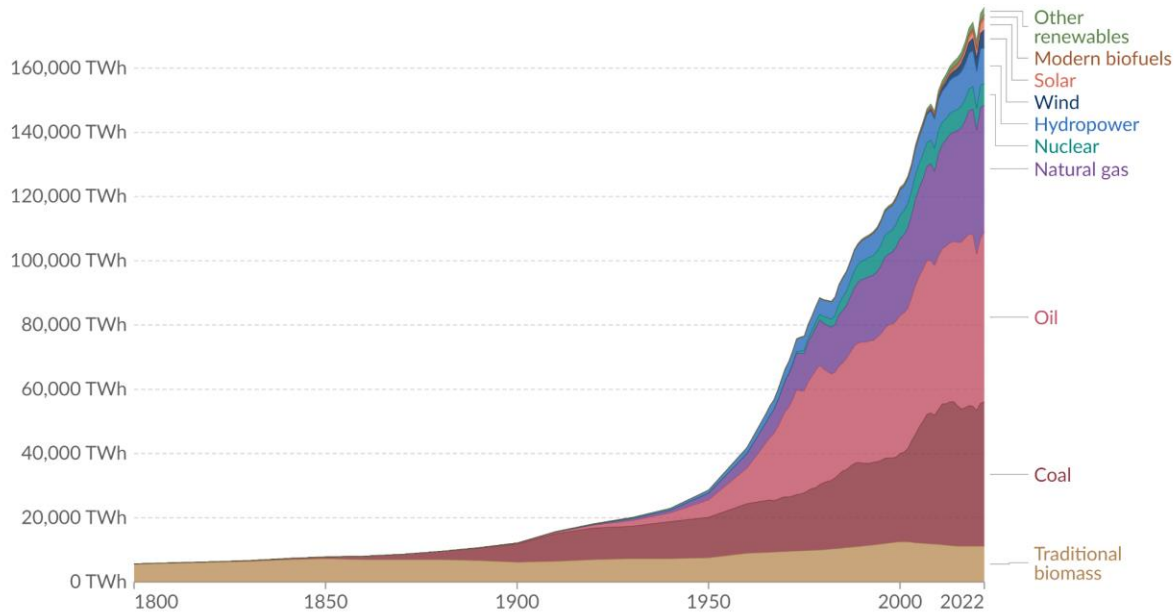
Mitigating energy waste whilst increasing green/sustainable energy production

Background

With the increase in climate change, it is more important now than ever before to limit, or stop if possible, energy waste. Since the Industrial Revolution the consumption of energy kept rising year upon year, with an exponential growth since the 1970s with an important increase in oil consumption as it took over from coal being the major source of energy.

Global primary energy consumption by source

Primary energy[1] is based on the substitution method[2] and measured in terawatt-hours[3].



Data source: Energy Institute - Statistical Review of World Energy (2023); Smil (2017)
Note: In the absence of more recent data, traditional biomass is assumed constant since 2015.
OurWorldInData.org/energy | CC BY

1. Primary energy: Primary energy is the energy available as resources – such as the fuels burnt in power plants – before it has been transformed. This relates to the coal before it has been burned, the uranium, or the barrels of oil. Primary energy includes energy that the end user needs, in the form of electricity, transport and heating, plus inefficiencies and energy that is lost when raw resources are transformed into a usable form. You can read more on the different ways of measuring energy in our article.

2. Substitution method: The 'substitution method' is used by researchers to correct primary energy consumption for efficiency losses experienced by fossil fuels. It tries to adjust non-fossil energy sources to the inputs that would be needed if it was generated from fossil fuels. It assumes that wind and solar electricity is as inefficient as coal or gas. To do this, energy generation from non-fossil sources are divided by a standard 'thermal efficiency factor' – typically around 0.4 Nuclear power is also adjusted despite it also experiencing thermal losses in a power plant. Since it's reported in terms of electricity output, we need to do this adjustment to calculate its equivalent input value. You can read more about this adjustment in our article.

3. Watt-hour: A watt-hour is the energy delivered by one watt of power for one hour. Since one watt is equivalent to one Joule per second, a watt-hour is equivalent to 3600 Joules of energy. Metric prefixes are used for multiples of the unit, usually: - kilowatt-hours (kWh), or a thousand watt-hours. - Megawatt-hours (MWh), or a million watt-hours. - Gigawatt-hours (GWh), or a billion watt-hours. - Terawatt-hours (TWh), or a trillion watt-hours.

Figure 2: Global primary energy consumption by source graph, extracted from Energy Production and Consumption (2024, revised) article, by Our World in Data[33].

Producing energy costs time, money and even energy, which means if it is not used or used inefficiently then the latter will have been wasted. Furthermore, wasted energy means that, if carbon was emitted in production, then it could have been prevented.
Consider the instance of hydroelectric energy production, the kinetic energy from the water current turns the blades of turbines which, in turn, drives a generator producing electricity. In this case there are many ways that energy waste can occur. The efficiency of turbines is a major factor, its design and the speed and volume of the water dictates how much energy will be produced. Furthermore, some facilities use a pumped storage system where energy is used to pump water back into the reservoir in order to be reused.

Additionally, we must also increase green/renewable energy supplies in order to be less dependent on other, more polluting, sources of energy.
On the face of it, it might seem counterintuitive to increase energy production whilst wanting to simultaneously decrease it, but the type of energy is pivotal in the discussion.

There is a common misconception that the terms renewable and green energy can be used interchangeably, but in truth they are not the same.
Renewable energy, as defined by the UN, is "energy derived from natural sources that are replenished at a higher rate than they are consumed"[34]*. It has the benefit of being inexhaustible as well as generally emitting far lower emissions than other sources, such as fossil fuels.*

Green energy, however, is a subset of renewable energy. It refers to the energy sources that have the least amount of environmental impact. They are effective in reducing the carbon footprint because they don't emit harmful carbon emissions. They have the benefit of being inexhaustible as well as emitting far lower emissions than fossil fuels.

Discussion

This goal is not easily achievable and there are many reasons why it still poses a grave problem even today.

Political

Countries are able to import energy from other states in order to fulfill their requirements. However, said imports may lead to geopolitical complications. For example, the security of a nation could be compromised if it relies too much on energy imports, especially if the country it does trade with is politically unstable.

[33] *Energy Production and Consumption - Our World in Data*
[34] *What is renewable energy? | United Nations*

Inversely, international conflicts may lead to energy issues. As we can see on the figure below, a quarter of the gross available energy that the European Union disposed of in 2020 came from Russia, most of which are natural gasses, oil and coal[35].

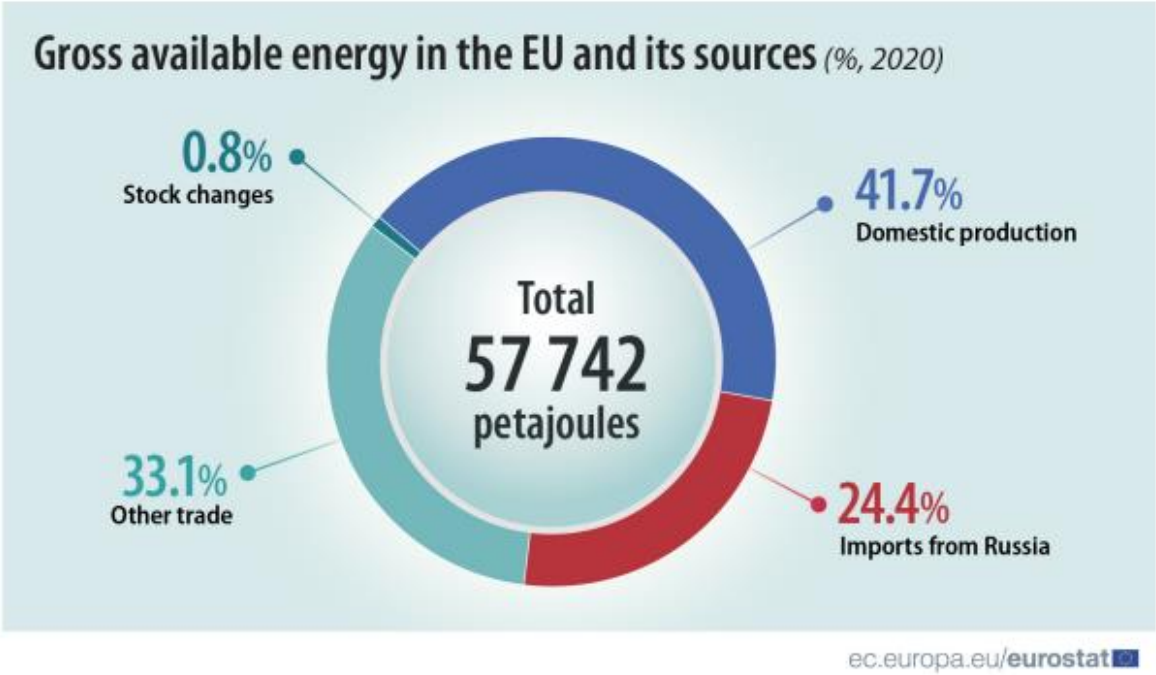


Figure 3: Gross available energy in the EU and its sources donut chart, extracted from EU energy mix and import dependency (2022), by Statistics Explained[36].

Since the invasion of Ukraine, Russia has reduced gas flows to the EU by around 80% between May and October 2022. This meant that affected countries had to create new energy policies that enabled the current energy demands to be met whilst trying to keep long-term energy security[37]. The European Commission came up with the REPowerEU[38] back in May 2022, it's a plan that aims to give the EU more independence on Russia's gas, oil and coal imports, as fast as possible, whilst helping the clean energy movement.

Economic

Since the pandemic, the world has seen a general rapid growth in the economy, and with it a growth in consumption. Mixed to ill-managed waste creates a rise in energy waste.

Renewable energies are not as reliable as other sources of energy, meaning that a country that has fully transitioned to green energy is much more prone to fluctuating energy prices

[35] *EU-Russia relations under strain: what are the causes? | Topics | European Parliament (europa.eu)*
[36] *104551.pdf (europa.eu)*
[37] *6 ways Ukraine war led energy crisis reshaped the world | World Economic Forum (weforum.org)*
[38] *REPowerEU: energy policy in EU countries' recovery and resilience plans - Consilium (europa.eu)*

than a country that still uses oil, natural gasses, coal, etc. which in turn will be to the detriment of its own economy.

However, a group of researchers at the University of Oxford believe that by transitioning to a carbon free energy system could save the world $12 trillion. Their study claims to prove that energy services could increase by 55% by increasing energies such as wind, solar and clean fuels like green hydrogen[39].

Social

Most ways that countries have tried to mitigate energy consumption and waste have led to the population enduring the consequences. For example, when governments put carbon taxes so that companies limit their CO_2 emissions, said companies end up raising their prices and the consumers (the population) are the ones that end up paying the price.

In developed countries, it isn't rare for energy waste to occur in families' homes, such as throwing away perfectly good food or using more electricity than needed. The accumulation of all these small wastes has a large impact on the total amount of energy consumed. Initiatives, such as the Green Deal[40] in the United Kingdom, have been tried but often fail due to poor implementation.

In 2008, British Columbia implemented a revenue-neutral carbon tax aimed at reducing greenhouse gas emissions and encouraging businesses and consumers to adopt cleaner energy sources. Initially set at $10 per tonne of carbon dioxide equivalent emissions, the tax increased gradually over the years. Critics argued that the carbon tax disproportionately affected low-income households, as they spent a higher percentage of their income on energy and consumer goods. Naturally, It wasn't well received by the public at first. However, surprisingly, polling data shows that the tax is now generally supported[41] [42].

Technological

In order to produce more energy you must consume more energy. Additionally, its transportation also consumes energy, so a better solution would be to have an energy source right where energy is needed, but that alone poses a number of new problems. The cost of production, the scale of the source,

Furthermore, in some instances, energy storage can be quite complicated. They have a finite lifespan, need technical expertise to install, operate and maintain, and are costly, dictating their scalability. However technological advancements are being made to help combat these issues.

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[39] *Decarbonising the energy system by 2050 could save trillions - Oxford study | University of Oxford*
[40] *Green Deal: energy saving for your home: Overview - GOV.UK (www.gov.uk)*
[41] *British Columbia's Revenue-Neutral Carbon Tax: A Review of the Latest "Grand Experiment" in Environmental Policy | The Nicholas Institute for Energy, Environment & Sustainability (duke.edu)*
[42] *British Columbia's revenue-neutral carbon tax: A review of the latest "grand experiment" in environmental policy - ScienceDirect*

Thermal energy storage (TES) is an increasing sector (see figure … below to see its practicality), according to the International Renewable Energy Agency (IREA) its global market has the potential to go from 234 GWh of installed capacity in 2019, all the way to 800 GWh in 2030, giving it an estimated future value of $7.7 billion. This is thanks to the fact that the world is moving to more green energies, and TES systems play a vital role in storing excess energy produced by renewable sources, such as solar and wind. But also on account of the growth in technologies, for instance, new designs of heat exchangers increase heat transfer efficiency, making it a more viable option.

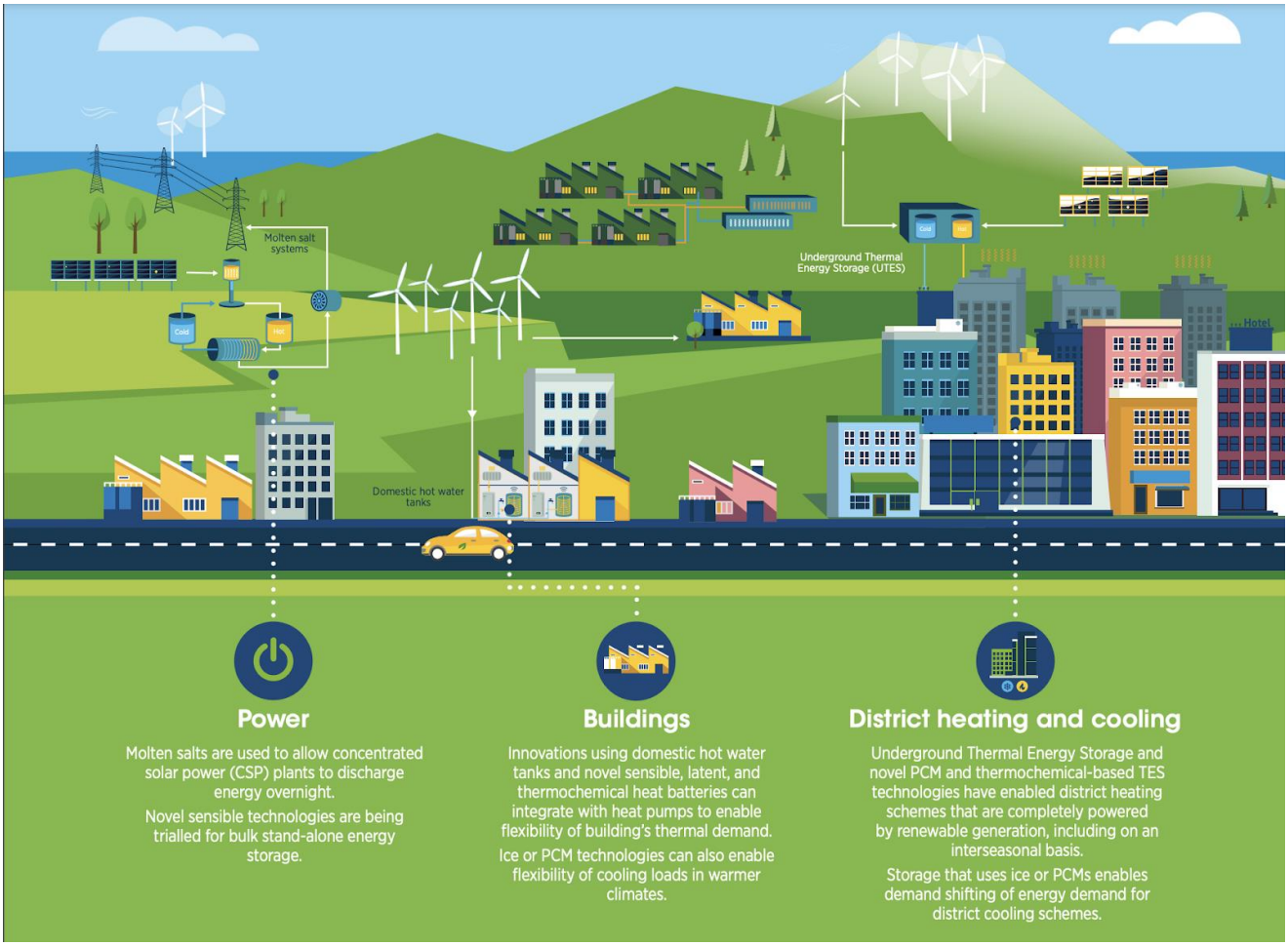

Figure 3: Thermal energy technologies allow renewable energy to be stored and used later for heating and cooling. Image: Innovation Outlook: Thermal Energy Storage, IRENA [43]

Legal

International treaties and agreements have been signed by many countries, such as the Paris Agreement[44] adopted in COP21 in 2015, where countries establish commitments for a greener future. Compliance with international agreements is monitored and evaluated through periodic reporting, peer review mechanisms, and multilateral negotiations aimed at strengthening collective action and accountability. However, this doesn't ultimately stop

[43] *These 4 energy storage technologies are key to climate efforts | World Economic Forum (weforum.org)*
[44] *The Paris Agreement | UNFCCC*

countries from not adhering to them or from ultimately withdrawing from agreements, namely the United States formally withdrawing from the Paris Agreement in 2020.

Regulatory agencies are vital when it comes to setting standards and regulations and overseeing the enforcement of energy efficiency practices. The agencies vary from region to region; there's the Environmental Protection Agency (EPA)[45] in the United States and the European Commission Directorate-General for Energy (DG ENER)[46]. Standards are based on technical assessments, market analyses, stakeholder consultations, and scientific research to ensure that they are effective, achievable, and economically feasible. Enforcement measures may include fines, penalties, product recalls, import bans, and legal proceedings against non-compliant entities found to be in violation of regulatory requirements. Overall, regulatory agencies play a critical role in advancing energy efficiency, promoting sustainable development, and addressing climate change by implementing and enforcing energy efficiency standards and regulations that drive innovation, investment, and behavior change across diverse sectors of the economy

Environmental

The environmental implications of energy waste are significant and contribute to various negative effects on ecosystems, biodiversity, and overall environmental sustainability. Inefficient energy use can result in incomplete combustion of fossil fuels, leading to the release of pollutants such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), particulate matter, and volatile organic compounds (VOCs), contributing to a decrease in air quality and respiratory and cardiovascular health complications[47].
Energy production, especially in power plants, often requires large amounts of water for cooling purposes. Inefficient energy systems may increase water scarcity issues. Additionally, runoff from energy production and consumption activities has the potential to contaminate water sources with pollutants, affecting aquatic ecosystems. The Navajo Generating Station (NGS) in Arizona, one of the largest coal-fired power plants in the western United States, used water from the nearby Lake Powell reservoir for its cooling operations, consuming millions of gallons of water daily, raising concerns about the depletion of water resources, particularly in the context of prolonged drought conditions and competing demands from agriculture, urban areas, and Native American communities[48].

The environmental characteristics of a country can significantly influence the complexity of transitioning to a greener energy grid. Countries with rugged terrain, limited land availability, or geographical constraints may face challenges in deploying renewable energy infrastructure, such as solar panels or wind turbines.
Climate variability, extreme weather events, and seasonal fluctuations in sunlight and wind can affect the reliability and predictability of renewable energy sources.
As discussed prior, water scarcity and competing demands for water resources can impact the deployment of renewable energy technologies, particularly those that rely on water-intensive cooling systems or hydroelectric power generation.

[45] *Our Mission and What We Do | About EPA | US EPA*
[46] *Energy - European Commission (europa.eu)*
[47] *Common Atmospheric Pollutants & Their Properties - Chemistry: AQA GCSE Higher (senecalearning.com)*
[48] *Navajo Generating Station (usbr.gov)*

Furthermore, access to critical minerals, rare earth elements, and raw materials for manufacturing renewable energy technologies, such as solar panels, batteries, and wind turbines, can pose supply chain risks and geopolitical challenges. Countries dependent on imported resources or subject to trade restrictions may face uncertainties in securing reliable and sustainable sources of renewable energy technology, affecting the pace and scale of the energy transition.
Germany has made significant investments in onshore wind energy as part of its renewable energy transition. However, the country faces challenges in siting new wind farms due to limited available land and concerns about landscape aesthetics, biodiversity impacts, and conflicts with other land uses such as agriculture and tourism. These constraints have led to debates over wind energy development and the need for innovative solutions to balance renewable energy goals with environmental considerations[49].

Blocks

It is important to note that these blocks are not aimed to divide countries but rather to show general rules that may separate them.

High-Income Countries (HICs)

HICs: Countries with a GNI per capita greater than US$ 13,205, as defined by the World Bank.

High-Income Countries typically have well-developed energy infrastructures and relatively high levels of energy consumption per capita. However, energy waste in HICs may also pose significant challenges.
Towards the end of the 20th century, many people in HICs moved away from city centers, leading to suburbanization. However, some cities are now experiencing re-urbanisation as people are drawn back to living in the city.
Traffic jams are often experienced due to the high number of cars on the road. In fact, cars stuck in traffic jams/red lights are said to pollute 40% more, relative to cars that are moving[50].
Some cities operate Energy Recovery Facilities (ERF) that incinerate waste to produce electricity. However, there are ongoing debates about the sustainability of energy recovery plants, their impact on recycling efforts, and greenhouse gas emissions and some communities prioritize recycling and landfill disposal over waste-to-energy due to economic and environmental concerns[51].
Energy waste exacerbates social disparities and energy poverty in HICs, disproportionately affecting vulnerable populations, such as low-income households, elderly individuals, and marginalized communities. High energy costs, inadequate housing conditions, and limited access to energy-efficient technologies can exacerbate energy insecurity and widen socioeconomic inequalities.

[49] *Germany's wind sector is growing — but not fast enough – DW – 07/19/2023*
[50] *How sitting in traffic jams can harm your health (medicalnewstoday.com)*
[51] *Does Burning Garbage to Produce Electricity Make Sense? | Scientific American*

HICs undertake various initiatives to address energy waste and promote energy efficiency. Investment in renewable energy sources such as solar, wind, hydroelectric, and geothermal power are important to HICs diversifying their energy portfolios and reducing reliance on fossil fuels. Through policies, subsidies, and research initiatives, HICs accelerate the deployment of renewable energy infrastructure and promote the transition to a low-carbon energy future.
They also tend to support research and development initiatives in energy efficiency, renewable energy technologies, and sustainable energy systems through public-private partnerships, academic collaborations, and government funding programs.

Middle-Income Countries (MICs)

MICs: Countries with a GNI per capita between US$ 13,205 and US$ 1,085, as defined by the World Bank.

MICs face unique challenges and opportunities regarding energy waste due to their diverse socio-economic conditions, industrialization levels, and energy infrastructure.
Inefficient energy use hampers economic competitiveness, undermines productivity, and limits opportunities for sustainable development, in turn making it harder for MICs to develop further.
These countries often experience energy supply shortages, infrastructure constraints, and reliability issues due to outdated energy systems and inadequate investment in grid infrastructure.
Some face resource constraints and competing demands for energy, water, and natural resources, exacerbating challenges in managing energy waste and promoting sustainable development. Limited access to affordable energy services, water scarcity, and environmental degradation strain natural ecosystems and hinder efforts to achieve energy access, food security, and poverty reduction goals.

However, while energy waste is predominantly viewed as a negative phenomenon due to its economic, environmental, and social implications, there are limited contexts where energy waste in MICs might present certain positive aspects or opportunities.
Addressing energy waste in MICs creates market opportunities for energy service providers, technology vendors, and clean energy entrepreneurs. Investing in energy efficiency solutions, renewable energy projects, and sustainable infrastructure stimulates economic growth, job creation, and private sector investment, contributing to poverty alleviation and inclusive development objectives.
It can also catalyze policy innovation, governance reform, and institutional strengthening to address systemic inefficiencies and promote sustainable energy transitions.
By leveraging opportunities for innovation, investment, and policy reform, MICs can accelerate the transition to cleaner, more efficient energy systems that benefit society, the economy, and the environment.

Low-Income Countries LICs

LICs: Countries with a GNI per capita inferior to US$ 1,085, as defined by the World Bank.

LICs face distinct challenges related to energy waste due to limited access to modern energy services, inadequate infrastructure, and socio-economic constraints.
Lack of access to reliable, affordable, and clean energy sources force communities to rely on inefficient and polluting energy sources such as traditional biomass, kerosene, and diesel for cooking, heating, and lighting. Energy waste exacerbates energy poverty and access constraints, perpetuating cycles of socio-economic inequality, health disparities, and environmental degradation.
Energy waste represents a significant economic burden for LICs, diverting scarce financial resources away from essential services such as healthcare, education, and infrastructure development. Inefficient energy systems drive up operating costs for businesses, undermine agricultural productivity, and limit opportunities for income generation and economic growth.
Furthermore, Energy waste in LICs contributes to indoor and outdoor air pollution, respiratory illnesses, and premature deaths, particularly among women and children who are disproportionately exposed to household air pollutants from cooking with solid fuels. This leads to a discrepancy in life expectancy among countries with a gap of 18.1 years forming between LICs (62 years) and HICs (80 years) as of 2019[52].
Additionally, LICs are disproportionately vulnerable to climate change impacts, including extreme weather events, sea-level rise, and agricultural disruptions.
Access to appropriate technologies, technical expertise, and institutional capacities is needed to address energy waste effectively. Building local capacity, fostering technology transfer, and promoting innovation are essential for empowering LICs to adopt sustainable energy solutions, improve energy efficiency, and enhance energy access for underserved populations.

[52] *Uneven access to health services drives life expectancy gaps: WHO*

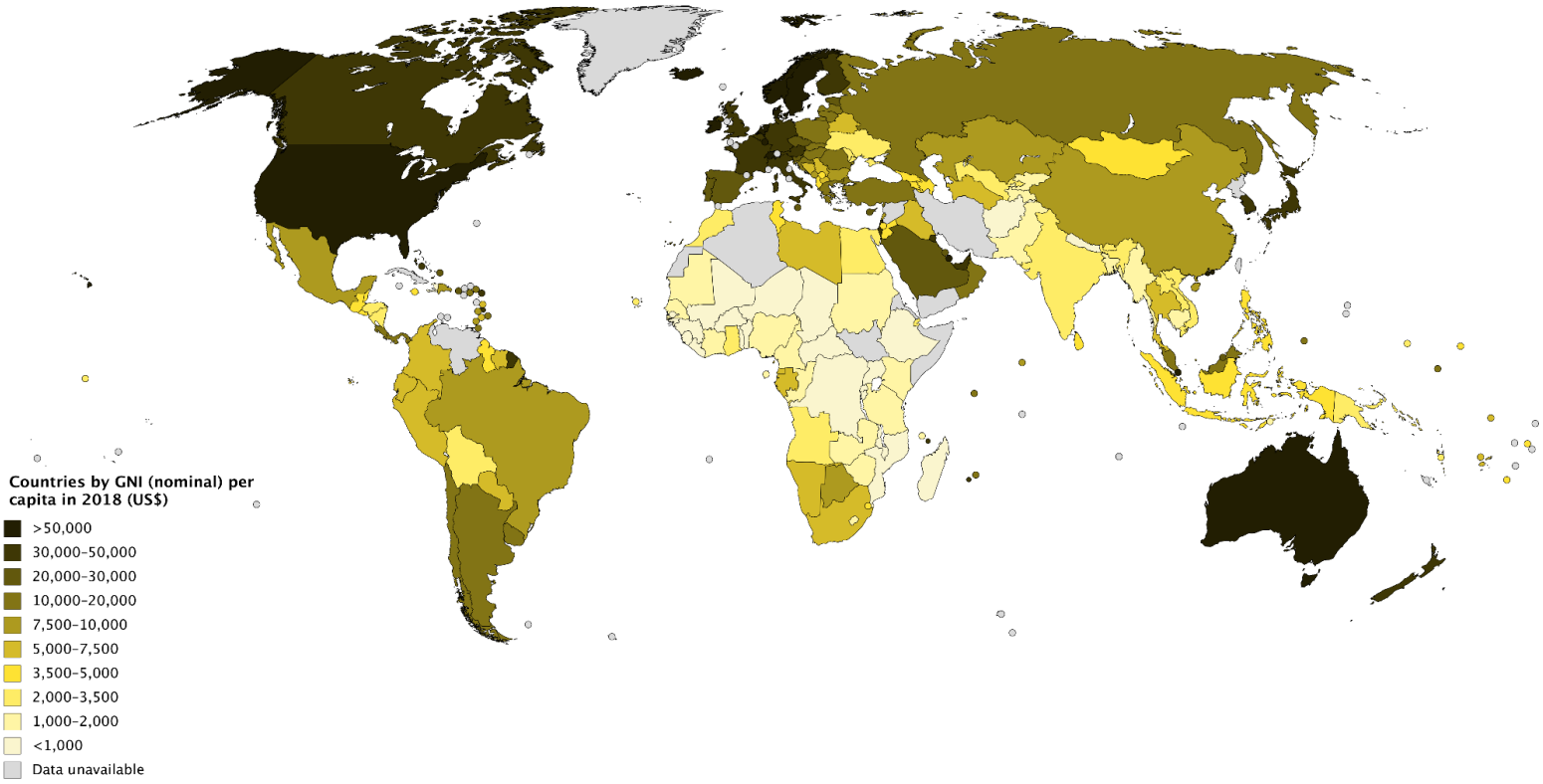

Figure 3: Countries by nominal GNI per capita according to the Atlas method (2018), source: wikipedia[53].

Questions to consider

- *How can countries come together, cooperate and reach an agreement in tackling energy waste and green/renewable energy implementation whilst ensuring that said agreement is properly adhered to ?*
- *What strategies will be the most impactful in reaching a more sustainable future, whilst minimizing any negatives drawbacks ?*
- *How do you create a specific plan with clear objectives whilst considering the various needs of each country ?*
- *Are any countries to blame for the current energy situation, and should there be consequences for past actions from nations ?*
- *Are there particular cases where countries are exempt from any regulations ?*

[53] *List of countries by GNI (nominal) per capita - Wikipedia*

- *Should differences be made between different types of wasted energy (eg. solar power and fossil fuels) ?*

Further reading

IRENA – International Renewable Energy Agency

UN-Energy | United Nations Development Programme (undp.org)

The world's energy problem - Our World in Data

Improving access to clean energy for underserved communities | Navigating Impact (thegiin.org)

Clarke and Dawe - The Energy Market Explained (youtube.com)

Useful and wasted energy in energy systems - Edukite Learning (youtube.com)

How green is the energy revolution really? (youtube.com)

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