Tackling Climate Risks: Current Strategies for Monitoring and Preventing Climate Hazards

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ABSTRACT
The Paris Agreement's signatories submitted in 2021 their updated climate action targets and commitments, known as Nationally Determined Contributions (NDCs). These goals encompass the efforts that countries will make in the next few years to reduce emissions and improve resilience. Meteorological and climatic products are a significant tool in climate risk management and adaptation to climate variability. In order to build resilience for sustainable development, both climate change and extreme weather occurrences must be incorporated into risk assessments. The goal of this research is to highlight the key approaches used by the world's major countries for monitoring and preventing climate hazards. Furthermore, the main actions implemented by Romania are taken into account. We will also explore a potential link between climate risks in the context of online commerce and the redefinition of global business models.

KEYWORDS: *Climate Change, Climate Risks, Sustainable Development, Sustainable ecommerce*

JEL CLASSIFICATION: *L81, Q01, Q54, Q56*

1. INTRODUCTION

The frequency and intensity of extreme weather events and natural catastrophes are increasing globally as a result of climate change. This has a detrimental effect on the socioeconomic status of emerging nations, including challenges to current infrastructure and economic production. Examples include decreased agricultural productivity, increased incidence of diseases, and threats to water and food security.

The security of people, economic progress, and the environment are all significantly threatened by climate change. With increasingly frequent and severe extreme weather events, there is an increase in the dangers associated with climate change. The transition to a climate-neutral economy has long ceased to be a desideratum of environmentalists, becoming, in the current context, a mandatory step to limit the effects of global warming (Fritsche et al., 2021). All countries have begun to develop a number of efforts to prevent these catastrophes in light of these facts. To reduce these issues, governments have begun reconsidering their energy strategy and regulations. Different strategies have been put out to either completely or

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partially eliminate greenhouse gases and the consequences they cause. Different recommended approaches include enhancing the effectiveness of existing technologies, creating new gadgets that are effective and have less of an impact on the environment, and/or making a partial or complete switch to renewable energy sources.

Countries must be able to comprehend, control, and prepare for these climate threats in light of the uncertain future. Many nations have already begun to take action by creating national policies and action plans to reduce the risks associated with climate change and to adapt to it. The states of the European Union were among the first to understand the gravity of the moment and campaigned intensely for the conclusion of the Paris Agreement on climate change and its impact not only on the health and food system but also on ecosystems and biodiversity (Dimitrov, 2016; Klein et al., 2017; Ourbak & Magnan, 2018). However, there are still a lot of obstacles to overcome when it comes to creating, organising, and implementing these strategies and plans.

At the same time, one of the main pillars of today's economy is online commerce, which must keep pace with these legislative changes. As the impact of climate change becomes increasingly apparent, businesses operating online must be aware of and respond to climate-related risks. For example, businesses involved in international e-commerce may need to consider the vulnerability of their supply chains to climate risks. Extreme weather events such as hurricanes or floods can disrupt transport routes, delay deliveries, and damage infrastructure. Companies may need to develop strategies to monitor and mitigate these risks, such as diversifying suppliers, assessing the climate resilience of transport systems, or implementing contingency plans (Engel et. al., 2015).

In addition, redefining the international business model can also contribute to addressing climate risks. As companies shift to more sustainable practices, they can take advantage of the online trading platform to promote and sell green products and services. This shift can incentivise consumers to make sustainable choices, reduce their carbon footprint, and mitigate long-term climate risks.

Using a variety of approaches, a sizable number of studies have tried to quantify the effects of climate change in particular regions. An "economic" model that accounts for market effects or another sort of model that takes into account non-market effects is typically combined with a climate model that predicts climate change for a specific amount of CO_2 concentration (usually, a doubling from pre-industrial level).
This study intends to illustrate the advantages of incorporating meteorological data into climate risk management and the primary strategies employed by China, India, the United States, the European Union and Romania to reduce the consequences of climate changes.

2. HISTORICAL CONTEXT

To build the framework for climate services, a number of important projects and activities have been implemented. The World Climate Program, the World Climate Research Program (WCRP), the Intergovernmental Panel on Climate Change (IPCC), and other organisations were founded as a result of the 1979 First World Climate Conference (WCC-1), which was sponsored by the World Meteorological Organization (WMO). Although the IPCC's main goals are to provide scientific information to all levels of government so they can use it to develop mitigation and adaptation policies as well as for international climate change

negotiations, the WCRP's main goals have been to determine the predictability of the climate and the effect of human activities on the climate.

The United Nations Framework Convention on Climate Change (UNFCCC) and the Global Climate Observing System (GCOS) were both established at the Second World Climate Conference (WCC-2). Intergovernmental climate change discussions are facilitated by the UNFCCC, and the GCOS routinely evaluates the state of global climate observations over the atmosphere, land, and ocean and develops recommendations for their improvement. Definitions of key climate variables are updated by GCOS expert groups, which is required for the methodical observation of the Earth's climatic change.

The Third World Climate Conference (WCC-3) in 2009 laid the groundwork for the Global Framework for Climate Services (MMSC) to enable better management of the risks associated with climate variability and change, as well as adaptation to climate change through the development and incorporation of information and science-based climate predictions into planning, policy, and practice at global, regional, and national scales.

Before the industrial revolution, the distinct sources of greenhouse gases (GHGs) such as CO_2, CH_4, N_2O, and H_2O into the atmosphere were thought to be volcanoes, forest fires, and seismic activity (Murshed et al. 2020; Usman and Balsalobre-Lorente 2022). At the Conference of the Parties (COP-21) in Paris on December 12, 2015, the United Nations Framework Convention on Climate Change (UNFCCC) reached a significant agreement to combat climate change and intensify, accelerate, and increase the actions and investments necessary for a sustainable low-carbon future. To accomplish these ambitious goals, sufficient financial resources must be raised and made available, along with new technological frameworks, expanded capacity building, and the freedom for developing countries and the most vulnerable nations to act in accordance with their own national objectives.

3. INCORPORATING CLIMATE AND METEOROLOGICAL DATA INTO CLIMATE RISK ASSESSMENT

Since it may be helpful information for making decisions concerning climate variability, integrating climate and meteorological information into risk planning and management is crucial. There is evidence in the literature that local communities can benefit from weather predictions by creating economic possibilities, improving personal safety, fostering national security and safeguarding the environment.

Confidence in climate risk modeling is now increasing, particularly in locations and geographies that previously lacked significant data due to evolving climate research and new generations of climate models. Businesses may identify and quantify climate risk and use that data to guide their decision-making process thanks to a variety of advanced analytics and modeling tools.

The advantages of hydrometeorological forecasts have been demonstrated in several countries throughout the world (such as Kiribati, Ghana, and the Philippines), and are now the subject of study (Wetterhall et al., 2018; Fakhruddin et al., 2021). Agroeconomic models are frequently used in valuations of weather and climate services to simulate prospective benefits (Barrett et al., 2021). The agricultural and humanitarian industries have effectively used medium- and long-range weather predictions that incorporate climate and weather information (e.g., in Bangladesh, Indonesia, USA, EU).

By creating and incorporating climate forecasts and data that are supported by scientific evidence into the planning, policy, and implementation processes, the Global Framework for Climate Services (GFCS) vision calls for better risk management of risks from climate variability, as well as adaptation to climate change, regional, national, and international customs.

By better comprehending historical and present climatic conditions in nations using high-resolution, quality-controlled climate data, the ENACTS (Enhancing National Climate Services) effort puts climate-related threats into context (Dinku et al., 2017). With the help of tools like IRI's Climate Prediction Tool, a new generation of climate predictions (NextGen) can be made for a variety of variables of interest, including precipitation, temperature, crop yields, vegetation health indices, acute malnutrition, and others. These predictions can be objective and customised and can be made on multiple time scales, including sub-seasonal and seasonal ones (Munoz et al. 2019, 2020).

The importance of these initiatives in decision-making is shown in a series of regional and international initiatives on weather and climate services presented by Fakhruddin and Sillmann (2021). Zilberman examines key characteristics and the nature of innovation necessary for the advancement of climate smart agriculture (CSA) in developed and developing nations in his article, "Innovation in Response to Climate Change" (Weitzman & Martin, 2009). Over time, there have been several theoretical debates on the advantages of using a time-based index as opposed to conventional insurance. Following the release of a 2005 publication by The World Bank titled "Managing Agricultural Production Risk," which highlights the potential benefits of insurance on an indemnity basis, many studies have been initiated to develop a product of this nature.

4. THE INTERNATIONAL LANDSCAPE

Weather and climate services have been cited by more than 40 developing nations as essential components of their development planning and the foundation for their ability to meet the Paris Agreement's requirements through their nationally determined contributions (NDC), both for adaptation and mitigation. This is represented globally in portfolios for climate resilience and catastrophe risk reduction as well as low-carbon growth planning and global climate adaptation. At the same time, there are an increasing number of participants in the debate about sustainable development. In order to avoid fragmented implementation, this rise necessitates both a concurrent increase in user-focused and sector-specific climate services, as well as coordination.

4.1 The challenges of the 21st century

Governments around the world now consider global warming to be a top priority, especially in the last several decades. Since 1990, there has been an increase in political understanding of the need to take actions that lessen human activity's influence on the nation and the world, which contributes to the accelerated rise in global warming.

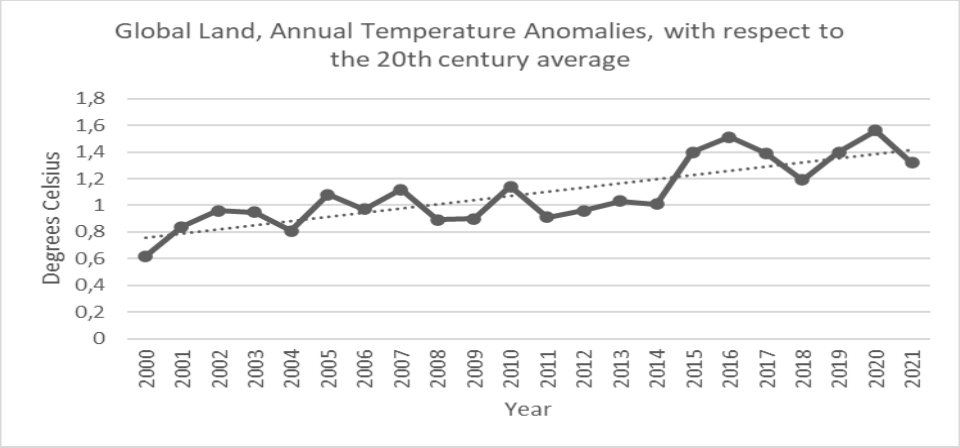

Figure 1. Global Land, Annual Temperature Anomalies, with respect to the 20th century average

Source: NOAA National Centers for Environmental information

The graph above displays the annual temperature variations in relation to the average during the 20th century (in degrees Celsius). The average worldwide temperature has risen by 0.82 degrees Celsius over the 20th century, according to statistics gathered by the NOAA. However, since 1981, the pace of increase has accelerated to around 0.18 degrees Celsius per decade, indicating a global acceleration in the warming of both surface and ocean temperatures.

According to the Copernicus service that monitors climate change, 2021 was the sixth hottest year on record because of the brief cooling influence of the La Nina event that took place earlier in the year. La Niña has a temporary cooling effect on the global average temperature and affects regional weather and climate conditions. In 2021, the stamp of La Niña was clearly observed in the tropical Pacific. The last major La Niña event was in 2011. The European Environment Agency (EEA) defines natural disasters as "violent, abrupt, and devastating changes in the environment whose origin is not human action, but rather natural events." Although earthquakes have always been a part of the Earth's evolutionary processes, the 21st century has seen a rise in their frequency and severity.

Table 1. Number of reported natural disasters from 2000 to 2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
All natural disasters	411	376	421	360	350	432	401	414	352	344	393
Drought	27	22	25	14	11	20	9	11	16	18	17
Earthquake	30	25	37	40	42	25	24	21	23	22	24
Extreme temperature	31	23	15	25	16	30	24	25	10	25	29
Extreme weather	102	105	122	86	124	130	76	105	111	87	94
Flood	157	157	172	158	128	193	226	218	165	151	184
Wildfire	30	14	22	14	8	13	9	18	5	9	7

Source: EMDAT (2020): OFDA/CRED International Disaster Database, Université catholique de Louvain – Brussels – Belgium

Table 2. Number of reported natural disasters from 2011 to 2019

	2011	2012	2013	2014	2015	2016	2017	2018	2019
All natural disasters	334	346	332	320	380	325	276	282	361
Drought	17	21	9	18	28	15	7	13	15
Earthquake	30	27	29	26	23	30	19	20	32
Extreme temperature	16	51	14	17	12	12	11	25	20
Extreme weather	84	90	105	99	118	84	85	84	85
Flood	156	136	149	135	160	161	114	109	170
Wildfire	8	6	10	4	12	10	13	10	13

Source: EMDAT (2020): OFDA/CRED International Disaster Database, Université catholique de Louvain – Brussels – Belgium

Between 2000 and 2019, there were 7,348 big catastrophes that claimed the lives of 1,23 million people, according to a study released by the United Nations (UN) in honor of the International Day for Disaster Risk Reduction. The paper states that extreme weather conditions and natural catastrophes have harmed 4.2 billion people, killed 1.23 million people, and cost the global economy $ 3 trillion. The Indian Ocean tsunami of 2004 claimed the lives of 226,400 people, but the 2010 Haitian earthquake of magnitude 7 claimed the lives of 222,000 people.

4.2 China

China committed to being carbon neutral by 2060 and achieving a minimal peak in CO2 emissions by 2030, while current studies indicate it may be able to do so much sooner (Wang et al., 2019; Gallagher et al., 2019). Since 2016, the nation's coal mining capacity has decreased by 400 million tons, with a further reduction targeted by 2030 (Reuters, 2017). China's coal consumption and related emissions appear to be constant as a result of this decrease, significant gains in the generation of renewable energy, actions to boost energy efficiency, and other factors. China is a global leader in the development and marketing of electric cars (EVs), and its automotive industry benefits other industries by fostering innovation and bringing down the price of EVs globally (Thornton, 2019).

Although these measures have slowed China's emissions growth, the country's real emissions are still increasing as a result of investments in new coal-fired power plants and the usage of fossil fuels in industrial sectors such as steel and cement (Myllyvirta, 2019).

In addition, in recent years, cross-border e-commerce in China has grown at an annual rate of around 20%, with the country becoming a world leader in ecommerce, thanks to the development of many specific platforms, but creating a growing mountain of waste and fueling global carbon emissions. However, climate risks can have a major impact on supply chains, but there are solutions already adopted by Chinese companies, such as creating a supply chain whose response to climate risk ensures not only business continuity but also a distinct competitive advantage.

4.3 India

India had planned to construct 175 gigawatts of renewable energy sources by 2022, but is now expected to increase this goal to 480 gigawatts (Lakshman, 2019). Rapidly declining prices

and robust government support for renewable energy are the reasons for this achievement. However, because regional government systems vary and many areas are significantly dependent on the income of the coal market, it remains difficult to implement renewable energy policies (Ramesh, 2018).

The most recent stimulus plan for India (2021) is more environmentally friendly, with two-thirds of the funds going toward green recovery, including $3 billion for solar PV and battery research. A green resurgence is undermined by India's continued backing of coal with new loans for a number of thermal power projects, despite the fact that the additional stimulus is a welcome move.

4.4 The United States

Although energy-related carbon dioxide emissions increased between 2017 and 2018, the United States, another major emitter, has seen a decline in emissions since 2005. In November 2020, President Donald Trump's decision to leave the Paris Agreement became effective, which was a setback for US climate policy. However, the US rejoined the Paris Agreement in 2021 during the Biden administration.

Numerous states, corporations, and localities continue to take this problem seriously in the United States despite national climate action. For instance, the "We Are Still In" alliance unites more than 3,500 corporate executives, governors, mayors, and important institutional officials who support the Paris Agreement. With the steady growth of online retail sales, sustainability in the e-commerce industry is becoming increasingly important. The apparent simplicity of the product delivery has an environmental impact.

Carbon emissions from e-commerce logistics in the world's largest urban areas are estimated to reach around 25 million tonnes of CO_2 by 2030. At the same time, retailers in this industry will ensure a greener supply chain and satisfy increasingly demanding consumers looking for fast and cheap products by favouring shipping.

4.5 The European Union

The EU is committed to halting climate change and is taking the lead globally in this effort. With its involvement in the global efforts of the 1990s (Rio Summit, Kyoto Protocol), this commitment started decades ago and strengthened in the first decade of this century with the release of a first package of energy and weather-related measures. That package, which was enacted in 2007, included GHG emission reduction objectives for the EU and called for the transformation of the energy industry by 2020. It also introduced a number of instruments and rules that are still the cornerstone of Union climate and energy policy today. With the addition of objectives for 2030, the degree of ambition of the emission reduction targets was raised in 2014. With the help of these regulations, GHG emissions in the EU have been significantly reduced (between 1990 and 2018, emissions decreased by 23% while GDP increased by 61%), essentially decoupling economic development from higher emissions levels.

A shift in the EU's climate strategy and an acceleration of the original plans for changing the energy model may result from Russia's recent invasion of Ukraine (in February 2022). Given that Russia plays a significant role in supplying the EU with oil and, more importantly, gas (the EU imports 90% of the gas it uses, and more than 40% of that gas comes from Russia). The Member States have reached a political agreement to accelerate policies aimed at decarbonising energy, reducing dependence on gas and its influence in setting energy prices in the EU, and achieving a model based on the PVE's objectives. Furthermore, 27% of oil

imports and 46% of coal imports also originate in Russia; these percentages vary widely between the different EU countries.

For the public sector, the EU's major budgetary tools, the multiannual financial framework (MFF 2021-2027) and the recovery fund, have set forth explicit goals for percentages of spending devoted to climate action. Additionally, a framework for state aid has been devised, ensuring that the Member States have the backing they need to offer the necessary financial assistance. In order to attract investment and a sustainable financing strategy, a number of programs have been established in the area of private capital.

4.6 Romania

According to a poll by the European Investment Bank, 84% of respondents from Romania believe that climate threats and their effects are the biggest threat to mankind in the 21st century. Through the Integrated National Plan in the Field of Energy and Climate Change 2021–2030, Romania has promised to cut its ETS emissions by 43.9% by 2030 compared to 2005 levels and to increase the worldwide percentage of renewable energy in the final gross energy consumption by 30.7%. These pledges represent the country's effort to help the European Union achieve its climate goals by 2030, including cutting greenhouse gas emissions by at least 55% and increasing the proportion of renewable energy in gross final energy consumption by 32%.

The report "Education on Climate Change and the Environment in Sustainable Schools" was released in 2022. It is the law that establishes the framework for an environmental education strategy and promotes the development of environmental skills among students by incorporating them into the national curriculum for primary and secondary education. Romania was ranked 30th in the Climate Performance Index (CCPI) report for 2021, down 6 points from the year before, despite efforts to decrease climate risks. Romania is ranked 17th internationally in terms of greenhouse gas emissions and energy efficiency according to the study, which uses 4 primary indicators. Instead, Romania receives poor marks (35 and 48, respectively) for its initiatives on climate change and renewable energy.

5. CONCLUSIONS

The results collected to date, presented at COP-26 (Glasgow, 2021), demonstrate that the pledges are insufficient to guarantee that the rise in the planet's average temperature does not surpass 2oC in this century, despite the significant agreements made at COP-25 (Paris, 2015) to stop climate change.

The international community is dedicated to advancing efforts in this direction, realising that, over the long run, the consequences of inaction on climate change will be substantially greater than those of the shift to a sustainable economy, even if those costs will be felt more quickly.

Climate services may provide a strong collection of data, tools, and integrated solutions to provide decision-makers with the knowledge they need. Opportunities are lost, the service may not be sustainable, and it may clash with other concurrent operations if they are conducted separately or for a single purpose. Although some redundancy is advantageous, coordination of efforts is required to avoid fruitless repetition. The integration and sharing of climate services that are important and beneficial to many industries could result from a good overlap of activities. But the lack of climate data, unreliable information and the lack of

digitisation of many records make it difficult to create climate models and scenario projections. And, consequently, making decisions about what to do in the areas that, from a point of view of probabilities, present a greater risk of suffering heat waves, floods, droughts, etc. The link between tackling climate risks and redefining the business model in international online commerce lies in the need to address and mitigate climate hazards within the context of global trade. Businesses operating in the online realm must consider the impacts of climate change on their operations, supply chains, and customer behavior, and adapt their strategies accordingly to contribute to climate resilience and sustainability.

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