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Macro-relevant Environment and Climate Change

1. Introduction to Macro-environmental Factors

The terms environment and climate change are often used interchangeably in academic circles to assess the territorial areas of different geotectonic units. However, from a commercial point of view, these terms have different meanings. In the commercial world, understanding the macro environment, which encompasses the political, economic, social, and technological factors prevailing in the country, is crucial for informed decision-making and strategic planning.

The macro-environment generally comprises forces that can influence an organisation, with elements such as social, cultural, economic, and legal factors and events. Different organisations will tend to focus excessively on distinct forces in the macro-environment. It's important to note that macro-environmental factors can significantly influence the overall performance of projects, both negatively and positively. Understanding and adapting to these factors can help in mitigating risks and capitalizing on opportunities. Climate change, generally, is a dynamic phenomenon leading to alterations in specific climate variables over time or space, such as atmospheric or surface temperature, solar radiation, cloudiness, atmospheric composition, rainfall, humidity, etc. Many natural processes produce periods of high and low climatic variability, characterised by violent swings in temperature or extremes in cold and heat, drought and rainfall, wind, etc. In later years, international experiences with such degradation forced scientists to realise that soil erosion, improper land use, and deforestation were intensified in many parts of the world.

1.1. Definition and Scope

The term 'macro-environment' is generally used to refer to a 'wider environment' that might affect an organisation and its industry and, in turn, be affected by long-term strategic and public policy outcomes. Different scholars have kindred ideas about what constitutes the macro-environment. In addition to the classic PEST

framework (i.e., Political, Economic, Social, and Technological factors), scholars have added several other dimensions to this 'wider' conceptualisation of the business environment. For instance, Moran and Ghoshal define the macro-environment as a complex system of general social, economic and legal conditions that enable businesses to operate, yet over which they have little control; Reger couches the term more directly as "external trends and developments which impact on strategy": accidental, necessary, and desired (the 'glass half full or empty' approach); and Mintzberg suggests a far broader definition, encompassing individuals in the organisation, interpersonal relations, the organisation and its informal networks, and the organization-environment interface.

All in all, there are several variants of the macro-environmental concept, each involving at differing extents agents in (i) ideas about its static and dynamic display, (ii) its parts, or (iii) its spatial scope. Also, micro-environmental and macro-environmental elements are interrelated. For instance, industry policies can affect the macro-economic elements of a region. In more generic terms, macro-environmental elements are broader issues, whilst micro-environmental elements are close to the firm - but macro-environmental elements can still have micro-economic impacts. This way, for instance, businesses have a direct interest in the ability of a region to attract workers from other communities, and many organisations will include this as a macro-environmental risk in their advertising strategies.

2. Climate Change: Causes and Impacts

Climate change, a substantial change in long-term weather patterns, results from internal or external forcing and plays a significant role in climate variability. While global warming, caused by increased greenhouse gas emissions, might be the first factor to come to mind, it is only one of many drivers contributing to climate change. Several human activities at local, regional, and global scales influence climate and climate change. In addition to air, water, and ground pollution, as well as the loss of biodiversity, these human activities lead to flooding, landslides, and erosion, which affect ecosystems or cause sea level changes, storms, hurricanes, droughts, and changes in the quality of life for residents.

One of the significant impacts of climate change is the increase in extreme climate and weather events. These changes result in human and economic losses as well. Changes in seasons, temperature rises, increased or decreased precipitation, and frequency and intensity of suddenly occurring extreme events are some climate change impacts. Moreover, weather disasters caused by hydrological and

meteorological changes are a conspicuous form of climate change, melting of snow and ice, and extreme weather such as heavy rainfall or rapid land evaporation, bringing widespread loss and destruction. The consequences of climate change are global in scope and go well beyond the environment. Climate change also impacts the economy, human health, living conditions, infrastructure, and ecosystem.

2.1. Greenhouse Gas Emissions

The globe is getting warmer, and it is mainly our doing. Climate change is a projected increase in the Earth's atmosphere and oceans' average temperature. Greenhouse gas (GHG) emissions stemming from human activities work to trap heat in the atmosphere in a very similar way to what a greenhouse does. These gases can remain in the atmosphere for centuries to thousands of years, resulting in long-lasting planetary changes. The primary sources of GHG emissions include energy supply, transportation, and land use, especially agriculture, waste generation, fugitive emissions, and industrial processes.

The leading long-lived greenhouse gases wrongfully enriched due to human activities are CO2, CH4, N2O, HFCs, PFCs, SF6, and NF3. Once these GHGs are emitted into the atmosphere, not only do they cause global warming (planetary heating), but their concentrations also result in lower pH levels (more acidic) in oceans and cause noticeable climate changes. Climate changes are transpiring in both land and marine environments and exacerbate various environmental challenges. Extreme weather and climate events, including floods and droughts, alter agricultural production while rising sea levels slowly erode our small island states. There are projected changes in precipitation regimes, extreme weather events such as floods and cyclones, changes in their frequency, intensity, and areas impacted, changes in air temperature and ocean temperature, and more severe and more prolonged heat waves. Together, these trends are generating numerous and far-reaching socio-economic repercussions. Ipitude et al. (2018) estimate that climate change-induced reductions in barley and maise yields are expected to result in an average price increase of at least 16% for beer in 20 countries.

3. International Agreements and Treaties

International agreements and associated regulations, protocols, and procedures, as well as unilateral and multilateral treaties, have been developed to encourage cooperative approaches by countries to address climate change and its consequences on a global level. The Protocol to the 1992 United Nations Framework Convention on Climate Change (the Kyoto Protocol) entered force in 2005. The Protocol committed 37 industrialised countries and the European Union

(EU) members of the Convention when it was adopted to reduce or limit their greenhouse gas emissions over the five years from 2008-2012. In 1997, nations joined an international treaty, the Kyoto Protocol, which sets internationally binding emission reduction targets. Currently, 192 countries and the European Union have ratified the Kyoto Protocol. Most of the world's nations have signed and ratified the UN Climate Convention, a treaty that limits the amount of greenhouse gases that nations emit into the atmosphere. Yet voluntary targets set by the nations have not reached necessary benchmarks for preventing significant disasters from occurring in the environment.

In 2015, the UK became the first country in the world to introduce legally binding carbon reduction targets and independent monitoring and advice to slow environmental degradation from climate change. The Climate Change Act requires the UK to reduce greenhouse gas emissions by at least 80% from 1990 levels. The UK signed the Kyoto Protocol in 2002 and became a party to the agreement in 2009. Both of these agreements were drafted to relieve global warming. Starting from the Copenhagen Accord, greenhouse gas emission reduction, climate change adaptation, and mitigation have been made legally binding in some countries. Because different national priorities are viewed as offsetting the policy of co-benefits and climate change, they can be seen as a major international challenge. The primary root is the ongoing conflicts between most countries arising from the distribution of costs and benefits on the issue of shared but differentiated responsibility in the United Nations Framework Convention on Climate Change (UNFCCC) negotiations.

3.1. Paris Agreement

The Paris Agreement builds on the United Nations Framework Convention on Climate Change (UNFCCC) and, for the first time, brings all nations into a common cause to undertake efforts to combat climate change and to adapt to its impacts. The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Recognising that the global environmental and climate system represents the quintessential common concern of humankind and stressing the urgent need to conserve and protect it, and also to cooperate in setting down the content of this joint official statement for governments and other actors, is a shared vision expressed in the preamble of the Paris Agreement.

The Paris Agreement outlines the need for countries to place greater ambition in their climate change responses. Recognising the progressive voluntary actions taken by countries as the world's political and economic landscapes evolve, the agreement contains dynamic mechanisms for stakeholders to increase collective action over time. To support this, applied practice and the available data suggest that if all countries delivered their updated 2030 climate goals from the current 1.5 degrees Celsius pledge cycle, global carbon dioxide (CO2) emissions would still escalate towards the end of this 2020s decade. These current policies could drive CO2 emissions to a level that would still be 16 per cent higher in 2030 than at the current time. In addition, given the time scales associated with economic markets, the transformations will have unforeseen impacts if the necessary measures are not taken to achieve them. Therefore, the objective is to address the inefficiency of economics and the lack of support from the energy market should the appropriate measures not be taken today.

4. Economic Implications of Climate Change

Climate change will have vast economic implications, including significant social costs. Slow progress or reversals of the observed trends of regional and global-scale warming, ice sheet wastage, increased water vapour, and several other climate variables may affect the socioeconomic impacts and the overall results from economic models based on climate scenarios. There is a possibility for fast adjustments in several sectors, although such a situation has been encountered for a few climate components. Insurers and other investors have started to decarbonise their asset portfolios, although to a limited extent. If not, the entire history of mitigation models has been invalidated in practice; increasing decarbonisation of assets could translate into higher SGG investments, changing the share of significant investors, companies, and countries shortly, further lowering the free-rider issue.

Banks have been moving to integrate physical climate risk into their risk profile, a recent process. The European Central Bank has developed a comprehensive framework to assess physical and in-kind risks for monetary policy and financial system transmission channels. A benchmark model is under development to determine the channels between a representative risk measure, the discount rate of physical risks, and other relevant risks. Last but not least, several opportunities have emerged from the substantial costs and risks of environmental degradation. Natural resource scarcity and climate change may be good news regarding growth for several industries and fields of activity. Market opportunities have sprung up

for environmental technologies and the circular economy sector. Albeit slower spreads worldwide, the development of SGG-aligned market finance, carbon trading, and SGG indices are potentially game-changers in global finance. Whether future climate action is voluntary, independent of national actions or international cooperation will result in segmented losses and gains across countries and within regions. Global action will reduce GHGs significantly and generate a significant climate action interest across national boundaries. The remaining narratives might all consider that the technology of carbon extraction by the ocean and the carbon uptake included in consumer products (cement, electricity, and steel) will be artificially developed up to a point in the future. The interest in the technology and the company holding it may depend on climate policy alone, regardless of the NBvals.

4.1. Investment and Finance

Economic Implications Investment and Finance

An examination of voluntary private sector initiatives and publicly led actions to advance the design of international policy space to achieve the 1.5C goal of the Paris Agreement. This includes developing models to enable equitable burden-sharing and design, policy implementation to support action on climate across multiple scales, allocation of resources in national planning and decision-making processes, and considering the need to reduce inequalities and alleviate development deficits as much as possible. Structural change will be driven less by the definition of long-term aggregate emissions goals and instead through supportive investment-led strategies. Investment in climate-resilient development is often equivalent to increasing the overall level of investment in the economy in pursuit of genuinely sustainable development.

Investment financing strategies (IFS) will involve the design of four sets of investment partnerships: an investment policy and regulatory partnership set, a financial and private sector instrument partnership set, an international climate policy partnership set, and an overarching, cross-cutting financing strategy partnership set. Role of investments: Investment rule outside the 1.5C goal: The strategy requires a range of policy priorities beyond investment policy, including risk-oriented asset allocation decisions rather than 'pure' income-oriented. Thus, an investment-led strategy would both focus on the use of commercial finance to support low-carbon growth yet also seek to direct finance for climate action to sovereign wealth funds, pensions, and institutional investors that can afford lower

rates of returns in the pursuit of building a revenue stream from the process of planet-saving.

5. Policy Responses and Regulations

Policy responses regarding the provision of information on climate change and impacts: This section identifies the various organisations and reports covering the topic of the macro-relevant environment and climate change, including reference to the latest scientific evidence. It also provides information regarding the initiatives in place that measure, monitor, and incorporate these environmental considerations into the core of their activities. This sub-section has become much more lengthy due to the widening pool of entities publicly disclosing information on their rational approach to measuring, managing, and reducing the environmental economic risks and opportunities at stake.

Policy responses concerning international policy coordination and evolution: This section outlines the range of international agreements and cooperation efforts that now exist and addresses climate change issues. This begins by focusing on the United Nations Framework Convention on Climate Change and its Kyoto Protocol. It then discusses the developing emissions markets and trading agreements that link countries and regions to reduce emissions at the lowest possible marginal cost. In 2007, the OECD and the IEA announced a plan to implement President Bush's vision. In the Helsinki Statement on Climate Change and Competitiveness, six OECD Ministers called for "developing a common set of environmental standards and trade rules" for the WTO to negotiate. In November 2007, the European Commission proposed to unilaterally sanction imports from countries that fail to adopt binding international climate change targets.

5.1. Carbon Pricing Mechanisms

A central policy response to climate change is the implementation of carbon pricing mechanisms designed to reduce the emissions of greenhouse gases. There are two main carbon pricing mechanisms: a carbon tax, where emitters are charged a specific price per unit of their emissions, and a cap and trade system, also known as an Emissions Trading System (ETS), where a quantity of emissions is determined, and permits for emitting that quantity are auctioned or given to emitters, who are allowed to trade them. An issuing authority can use a carbon pricing mechanism as a standalone policy or as one element of a broader climate policy package that includes support mechanisms for boosting low-carbon technologies and innovation, environmental performance standards and regulations, and messaging about the urgency of climate action. The broader

policy package also includes capacity-building activities, such as technology research, development, demonstration, and policy alignment between national and subnational government levels.

The effectiveness of carbon pricing mechanisms can be evaluated using the same criteria as any other policy intervention if they lead to the desired emission reductions. Carbon pricing mechanisms can be linked across borders if the jurisdictions involved have compatible environmental accounting frameworks or if their frameworks can be adjusted or harmonised. While most emissions trading systems are connected in stage 1, some developing and globalising systems, such as the Chinese and the European Union emissions trading systems, are also designed to accommodate linking with more gradually formulating stage 2 ETSs. There are currently no linked carbon pricing mechanisms or regulations at the international level.

6. Technological Innovations and Solutions

Rapid technological innovations are transforming the world, making it feasible to transition to a future where global warming is curtailed within the decades immediately ahead. This innovation is helping to reduce the cost of renewable energy, increase energy efficiency, shift towards more environmentally friendly dietary choices, and promote growth in knowledge-based activities and products, such as environmental and conservation tourism. New renewable energy installations worldwide now surpass the combined net addition of coal, natural gas, and nuclear power.

Considerable progress has been made in developing green technologies, such as next-generation biofuels reforming the process of cement making, big data leading to significant efficiencies in transport and manufacturing, and the surge in the development of electric vehicles and battery technology. Numerous developing countries are leapfrogging developed countries towards more sustainable technologies, including renewable energy, farm practices, and other techniques for attaining an environmentally sustainable relationship between people and other living things. Innovations in sustainable technologies contribute to the significant effort to overcome climate change but are part of a more comprehensive collection of solutions. A growing range of economic and financial opportunities can foster a transition to global environmental sustainability. Growing numbers of tech investors are focused on funding companies that address these increasingly urgent global problems and the entrepreneurs starting those companies. Climate-related revenues continue to grow for many tech companies, and new forms or

organisations steadfastly concerned with environmental sustainability, such as B-Lab, have emerged to screen and certify new biological and humane companies regarding their environmental and conservation bona fides.

6.1. Renewable Energy Technologies

The adoption of renewable energy technologies is an example of various technological innovations that have the potential to significantly mitigate the impacts of or provide adaptation to anthropogenic climate change. Renewable energy - wind, solar, hydro, geothermal, ocean energy, bioenergy and renewable energy derived from waste - can displace or reduce the consumption of non-renewable, carbon-emitting energy from fossil fuels and nuclear reactors. The negative environmental and social externality implications caused by fossil fuel and nuclear power generation can be reduced by stimulating the use of renewable energy options with their host of ecological benefits. However, it should be noted that the construction and maintenance of renewable energy technologies pose environmental and social risks, including economic losses, mainly in the case of geothermal and ocean energy systems, which seek to harness the earth's and oceans' inherent internal forces.

A range of studies project a world powered almost exclusively by renewable energy by 2050. Various advanced renewable energy technologies already exist or are in development. They can be subdivided by their energy source, the technology used, the generation and storage type and scale, the location in which they are employed, the rate of technological maturity, societal acceptance, and regulatory frictions. Following is a brief description of different renewable energy technologies, their benefits, limitations, and deployment barriers, and a list of countries facing these barriers to date. However, it should be noted that these lists of barriers are non-exhaustive and may shift over time.

7. Corporate Social Responsibility and Sustainability

This section delves into corporate social responsibility (CSR) and its nexus with sustainability, particularly in climate change. It elucidates the role of businesses in contributing to environmental sustainability and societal well-being. However, it is hard to operationalise environmental practices without social inclusiveness, good governance, and the overall well-being embedded in the sustainability concepts. The CSR concept goes beyond philanthropy in a narrower sense. It refers to protecting and promoting the interests of all stakeholders (e.g. customers, employees, suppliers, shareholders, the State, etc.). The global acceptance of CSR stems from globalisation and MNCs. Still, it has become controversial and even a

matter of political concern in the age of climate change. The so-called Corporate Sovereignty theories show how MNCs try to neutralise governments, avoid regulation, or actively shape the global policy environment self-interestedly. Criticisms follow regarding the absence of public voice in a lot of CSR initiatives, the dominance of nature discourses supporting hegemonic logics, the lack of democracy, the redefinition of the social layer as both a threat to governance and an interest to manage (through the policed corporatism approaches of governments), etc., but CSR is still often the only game in town against social and environmental abuse that MNCs abhor.

Firms can decide to go beyond mere philanthropy or CSR and behave socially and environmentally responsibly. This is often called corporate sustainability. It implies that companies integrate societal and environmental concerns into their business operations. In the US, corporate sustainability is often believed to be "a compromise on the absolute sovereignty demands of stockholders." While this is primarily a finance-oriented interpretation of the objectives, corporate sustainability goes beyond putting a "price for everything" and "everything for a price." However, the environment "has no price" (as stated by Basil of Caesarea). Econometricians such as Graham and Tupy find that 80% of the variation in corporate responsibility is explained by three variables: the ability of firms to externalise costs in general and shift them mainly to customers and society, the complex web of the subsidy state, and cronyism. Corrigan calls for raising the financial risk to shareholders and insurers that stems from "environmental externalities created by major developers." Aras and Crowther argue that such responsibility "may bring some benefits in the form of positive publicity, greater goodwill, enhanced corporate image, licensed operations, leading to the securing and maintaining of the 'license to operate' and a hostile demonstration, and so on."

7.1. Environmental Reporting

This section focuses on corporate social responsibility, the social pillar of sustainability, which is becoming increasingly important as an additional criterion for investors' investment decisions. Not so much companies' environmental performance but investors' perception, including so-called Environmental Social Governance (ESG) criteria, increasingly depend on ecological and exploitation news. However, more scientifically stringent studies are still scarce. Environmental performance, such as how much (air) pollution a firm emits, is complex for outside observers to verify. However, What is observable is the lack

of transparency and a transparent interface so that assurance can be gained about such relevant risk factors.

Environmental reporting is the public release of information about the interaction between organisations and the natural environment that a company provides its stakeholders. According to Grey, Owen and Maunders, valuable insights into environmental reporting have been weakened due to the ambiguous nature of the construct and the difficulty inherent in separating parts of the construct, the sub-themes. These academics also believe that individuals do not engage in one type of environmental reporting but rather pursue several organisational 'reporting strategies' encompassing the environment. For their part, they focus on the presence of environmental information in various annual report sections, accordingly proposing the terms 'non-site-specific environmental reporting', where environmental information is located outside of the environmental section, and 'site-specific environmental reporting', where the information is located within the environmental section.

8. Case Studies and Best Practices

A range of case studies demonstrate effective climate change mitigation and adaptation strategies. Kenya applies climate and environmental considerations when making FDI decisions. The Corridor project in Western Sweden engages the private sector and builds new infrastructure to attract investment. Landlords in WaterAid's Water and Sanitation for the Urban Poor (WSUP) programme are encouraged to invest in affordable, pro-poor water and sanitation services. Affordable multi-hazard insurance (insurance against several hazards) strategies in developing countries combine insurance with proactive risk reduction efforts. In Asia, insurance against so-called tropical cyclone risk, again combined with protective measures, is being introduced. Developing a world "business and trees" programme helps localised action.

Local service delivery in fragile, post-conflict and decentralised local government contexts. Some local governments cannot increase revenues, and a reduction in external finance and aid further limits possibilities for expansion of services. In these cases, the focus may be to help companies use local alliances and networks to adapt to these complex environments. In one country in Sub-Saharan Africa, for example, local manufacturers lack ready access to finance, given the higher capital costs and risk premiums charged in the market. Given cost-mounting inputs, commodities, and unpredictable droughts, the Kenya Investment Agency (KenInvest) and relevant Ministries consider climate and environmental

considerations before offering investment promotion services to potential clients. The agency provides guidelines and minimum environmental thresholds for potential investment projects. Also, it plays an advisory role in the affairs of other relevant bodies, such as the National Environment Management Authority (NEMA) and local authorities.

8.1. Successful Climate Change Mitigation Strategies

12. Compilation of macro-relevant environment and climate change case studies

8.1. Successful climate change mitigation strategies 8.1.1. Reducing residential energy demand in Australia

In this case study, consumers' motivations and attitudes were evaluated before, during, and after their participation in the Victoria SmartLighting trial, a campaign promoting the adoption of energy-efficient lighting technology for residential use. This research discovered a preference among consumers for a value-based approach that acknowledges the nature of their rights and responsibilities in the environmental implications of their energy consumption.

In response to the finding that light energy demand represents a choice about how to live, the Victorian Government launched the 6-star energy rating system for landscapes on June 1. This percentage is expected to increase further since the Band is a significant investment requiring both resources and support. The Victorian Government is assisting.

A sample of customers (adults per licensed ge. mar population according to the Australian Bureau of Statistics) in one postcode in each participating utility was invited to participate, with 100% of those accepting the electricity-only retailers and 210% of whom received the combined regulator retailers.

9. Conclusion and Future Perspectives

9.1. Conclusions Due to the rapidly increasing accumulation of peer-reviewed research results in both environmental economics and macroeconomics of climate adaptation and mitigation, we provide an up-to-date, diverse, dynamic, and comprehensive review of the pertinent literature. Focusing on the environment and human-made climate change is unavoidable in a time of enormous biodiversity and social losses. Our article focuses on ecological, social, and environmental losses and gains associated with climate change and its adaptation and mitigation. However, few studies on environmental and human capital losses and gains caused by food and energy production are available in the scientific

literature. Relevant literature dealing with the topic in connection to society is almost missing.

9.2. Future Perspectives In terms of future perspective, further understanding of the environmental impact of households is of utmost importance. Although the environment (degradation) is becoming a significant determinant of individual health and labour effort, only a few authors covered this topic in their research. Relevant research could examine the environmental intersubjectivity of households. Additionally, ecological grief and anxiety experienced in the uncertain time of climate threats and deteriorating environmental quality may be the subject of further research. Independent of the development of the COVID-19 pandemic, an ongoing challenge will be to enforce emission reductions and adapt food and energy production to changing climatic conditions. Finally, socio-economic scenarios describe different plausible futures with emissions and socio-economic development. To downscale the results of climate models to continental and subcontinental levels, socioeconomic scenarios are combined with projections of population and gross domestic product (GDP).

9.1. Emerging Trends in Climate Change Adaptation

9.1. Emerging Trends

So far, the volume has provided a retrospective view of what has emerged over two decades of primarily poverty-focused investment on the adaptation agenda. This final section now shifts the focus to review emerging trends in climate change adaptation. Four dominant themes have been identified as the emergent new shifts are in approach and not focus. Focusing on medium to more extended time frames, this is a deliberately speculative chapter, drawing mainly from journalistic, practitioner-focused and grey sources on trends in development, adaptation, and humanitarian contexts.

In the coming section, emerging knowledge, policy, and funding trends will be reviewed. 'Knowledge and Standards' explores the emergence of new approaches in crop improvement, including gene editing and gene drives for altering entire populations of plants, animals, and vectors. 'Adaptation Strategies' reviews high-level international moves signifying acceptance of M&E at the UNFCCC level, with particular attention to near-term infamous policy debates on Common Time Frames. 'Governance Approaches' highlights the momentum environmental, social, and other safeguarding moves have embedded around the globe and draws significant shifts towards examining the parity of treatment of these global and

national screens. The increased focus on the Global Commission implies a growing trend for the linkage of 'external' reviews with multilateral commitments. The chapter questions what these 'emerging trends' of adaptation might mean for the future, mainly focusing on control, consent, and responsibility issues.