

PROJECT RESULT 2:

E-learning toolkit for green and social entrepreneurship

Module 4

Module title:

Entrepreneurship and Climate Change

Developed by

Partner 5, South-West University "Neofit Rilski"



Co-funded by the
Erasmus+ Programme
of the European Union

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

PROJECT NUMBER – 2021-1-EL02-KA220-YOU-000029015

Module 4: Entrepreneurship and climate change	
Aim of the module:	This module aims to provide learners with a multidisciplinary study on topics related to Climate change, with a focus on the paradoxical role of business and climate change, providing a comprehensive understanding of the relationship between business and climate change, discussing their negative impact and their potential contribution to reducing the emissions of greenhouse gases. Students will gain literacy in climate change political context that can shape business as well as issues relevant to business managers, policy makers, NGO activists and citizen-consumers. They will acquire a full understanding and knowledge how green enterprises work, how they are structured and which are the added values that such enterprises can bring to the global climate change system.
Learning objectives:	<p>The learning objectives of this module are:</p> <ul style="list-style-type: none"> ● To understand the Climate System and the global warming; ● To acquire full understanding and awareness on the Climate Change Convention, Kyoto protocol and the Paris Agreement; ● To transfer knowledge, tools and approaches to foster responsible entrepreneurial behaviours to deliver sustainable performance in complex environments; ● To improve knowledge and understanding on how green entrepreneurs work and their added value for the management of the climate change; ● To transfer the knowledge and tools how to critically assess the opportunities in the development of a sustainability purpose for a business.
Learning outcomes:	<p>By the end of this module, the learner should be able to:</p> <p>Apply analysis to policy options for addressing climate change;</p> <p>Compare and evaluate different policies and determine their effects on the behavior and performance of firms;</p> <p>Learn how to analyse cases of green entrepreneurship, in their social, cultural, economic and political contexts;</p> <p>Draw on diverse knowledge and inclusive ideas to develop their own account of green entrepreneurship;</p> <p>Explain the strategic options for businesses;</p> <p>Discuss the behavioral issues associated with carbon reduction;</p> <p>Discuss the ethical dimensions of climate change and the extent to which ethical values can be effectively, adopted by consumers and companies, and incorporated into government policies;</p> <p>Explain the political economy associated with climate change.</p> <p>More particularly the present module will contribute for building up of the following key competences identified in the PR1, Analysis Report on Innovative Digital learning Methods on Innovative Digital Learning Methods for Green and Social Entrepreneurship:</p> <p>C3: To choose and to apply in practice the concept of sustainability and sustainable development in the everyday operational activities of the social enterprises, especially in regards to mitigating and reducing and overcoming the negative effects of Climate change ;</p> <p>C4: To have the capacity to mobilize one’s knowledge on the current and most topical innovations in green economy and to apply them the miscellaneous types of business processes in regards to the challenges arising challenges of climate change and the need to overcome it;</p> <p>C5: To have the capacity to plan, develop, organise and manage partnership and networking activities for sustaining the business development of their social enterprises.</p>
Content:	<p>Introduction</p> <hr/> <p>TOPIC 1: INTRODUCTION IN ENTREPRENEURSHIP</p> <p>1.1 Essence of Entrepreneurship</p> <p>1.2 Entrepreneur’s Skills & Competences</p> <p>1.3 Entrepreneurship Strategies</p> <p>Food for thought questions (3 questions):</p> <p><i>What is the meaning of entrepreneurship?</i></p> <p><i>What do the entrepreneurs do?</i></p> <p><i>What makes entrepreneurs successful?</i></p>

	<p>TOPIC 2: CLIMATE CHANGES: ORIGINS AND IMPACTS 2.1 Human Activities and Origins of Climate Change 2.2 Impact of Climate Changes on Economy and Society; 2.3 Policies and Responses to the Negative Impacts of Climate Change; Food for thought questions (3 questions): <i>What / who causes the climate changes?</i> <i>How do climate changes affect business activities?</i> <i>Can negative impacts of climate change be avoided, prevent or reduced?</i></p>
	<p>TOPIC 3: ENTREPRENEURSHIP AS A TOOL FOR MANAGING CLIMATE CHANGES 3.1 Entrepreneurship and Green Innovations; 3.2 Business Activities, Operations and Sustainability; 3.3 Best Practices and Possible Solutions Food for thought questions (3 questions) What is a green innovation? What makes a business sustainable? How to turn a climate change problem into a solution? Case studies (2)</p>
	Activities (3 activities)
	Further reading (list of additional material)
	Quiz (10 questions)
	References:
Allocated time:	30 (thirty) hours
Hashtag of the Module	# entrepreneurship # climatechange

Introduction

As pointed above, this module aims to provide learners with a multidisciplinary study on topics related to Climate change, with a focus on the paradoxical role of business and climate change, providing a comprehensive understanding of the relationship between business and climate change, discussing their negative impact and their potential contribution to reducing the emissions of greenhouse gases. Students will gain literacy in climate change political context that can shape business as well as issues relevant to business managers, policy makers, NGO activists and citizen-consumers. They will acquire a full understanding and knowledge how green enterprises work, how they are structured and which are the added values that such enterprises can bring to the global climate change system.

The present Module has been structured in three main and separate topics, namely: **Topic 1: Introduction in Entrepreneurship**; **Topic 2: Climate Change: origins and impacts**, and **Topic 3: Entrepreneurship as a Tool for Managing Climate Changes**. The first two topics aim to provide some basic understanding on what are Entrepreneurship and Climate Change, while the third topic tries to address the concept the practical applicability of the concept sustainable development through limiting, mitigating the risks form the climate changes and even reversing the process of human business activities which do cause the climate change.

TOPIC 1. INTRODUCTION IN ENTREPRENEURSHIP

Entrepreneurship has a key role in business life. It is beneficial for any business organization to understand its essence, sources, principles, features and role. It is important every entrepreneur to possess a set of specific knowledge, skills and competences. The entrepreneurial strategy is a practical and systematic approach for how to

undertake the process of exploring and evaluating the core choices that entrepreneurs need to make as they translate their ideas into a reality.

1.1 Essence of Entrepreneurship

Definition of Entrepreneurship

As a fundamentally important part of our social-economic life, entrepreneurship has a key role for creation and successful development of business. The entrepreneurship involves a transformative process of social and market change creating value for individuals and society. Different authors suggest a variety of definitions of the entrepreneurship's essence:

- Competitive behaviours that drive the market process (Kirzner, 1973, pp. 19-20);
- Process by which individuals pursue opportunities without regard to the resources they currently control (Stevenson & Jarillo, 1990, p. 23);
- Way of thinking, reasoning and acting that is opportunity-based, holistic in approach and leadership balanced. Entrepreneurship results in the creation, enhancement, realization and renewal of value for the owners, all participants and stakeholders (Timmons & Spinelli, 2004, p. 47);
- A key to successful practice begins with action and creation of new organization (Barot, 2015, p. 163);
- Entrepreneurial ability bringing innovation to the market through entrepreneurship process and learning (Hessels & Naudé, 2019, pp. 389-403);
- A natural phenomenon in business generating jobs opportunities and lead to economic development (Diandra & Azmy, 2020, p. 236).

The origin and sources of Entrepreneurship

The ground on which entrepreneurship steps and originates from are provided in Table 1.1 alongside with the authors who have provide the respective concepts.

Table 1.1 Sources and concepts of Entrepreneurship

Source of Entrepreneurship	Authors
Opportunity-based entrepreneurship	(Jinjiang, Nazari, Yingqian, & Ning, 2020)
Market-driven entrepreneurship	(Ali & Levie, 2019)
Entrepreneurial skills	(Bonney, Davis-Sramek, & Cadotte, 2016)
Entrepreneurship and innovation are creation of value	(Maritz & Donovan, 2015)
Entrepreneurship is shaped by digital technology, and at the end provides entrepreneurial opportunities	(Nambisan, 2016)
Entrepreneurship education used to transform society	(Ratten & Usmanij, 2020)

Principles of entrepreneurship

Process of the effective entrepreneurial decision-making is related to knowing the basic principles of the

entrepreneurship:

- freedom in the choice of activity;
- right to carry out activities by individuals and legal entities;
- freedom in choosing business partners;
- autonomy in the formation of prices in accordance with the laws of the market economy;
- freedom in decision-making about business development, etc.;
- attracting the assets and funds of legal entities and citizens for the entrepreneurial activity;
 - independent formation of an activity program, selection of suppliers, users of the released production, establishment of prices in accordance with the production costs in compliance with the current legislation;
 - free hiring of workers;
 - attraction and use of material, financial, labor, natural and other resources which use is not prohibited or not limited by legislation;
 - free distribution of the profit remaining after payments, etc.

Features of Entrepreneurship

The main features and specifics of the entrepreneurship include:

- initiative;
- creativity;
- object oriented;
- risk taking;
- innovations;
- economic activity;
- economic and social responsibility;
- managerial and leadership functions independence;
- scale of thinking;
- business likeness.

Role of Entrepreneurship

Entrepreneurship is a driver of economic processes and one of the main reasons for the economy growth in the conditions of ever-increasing competition.

Entrepreneurship depends on individual motivations and experiences, socio-cultural factors and traditions, educational opportunities, availability of relevant skills and attitudes, supporting financial institutions and access to credit, existence of commercial trading centers, supporting infrastructure including trade routes with efficient transport and communication facilities, macroeconomic environment and overall political stability (Kalyan, 2018, p. 3756).

The role of the entrepreneurship can be summarized in the following main directions:

- economic growth;
- dispersal of economic power;
- increases national income;
- promotes capital formation;

- reduces concentration of economic power;
- promotes country's export trade;
- wealth creation and distribution;
- creates large scale employment opportunities;
- increase companies' performance;
- improvement in the standard of living;
- promotes balanced regional development.

1.2 Entrepreneur's Skills and Competences

Key importance for the success of any entrepreneur is the possession of the necessary skills and competences. They are the basis for the realization of the entrepreneurial functions and the achievement of results in the economic activities.

The skills (cognitive and practical) according to the European Qualification Frame are the ability to apply knowledge and use know-how in solving tasks and problems. It is worth mentioning that the abilities for using knowledge and skills should be interpreted from the point of taking responsibilities and being independent.

From historical point of view, the issue of the knowledge and skills of entrepreneurs in combination with their personal attitudes and behaviour for achieving results in their economic activities has its roots in the writings of the classicists of the theory of entrepreneurship. In the theoretical publications of entrepreneurship is established the view that entrepreneurs should possess particular knowledge, skills and behaviour in order to manage successfully their own business.

Being a successful entrepreneur is not just about having a good business idea. It takes a special type of person to be successful in business. Research has shown that successful entrepreneurs have common characteristics and are destined for entrepreneurship. Below are ten key characteristics of highly successful entrepreneurs:

Creative - Entrepreneurs are always thinking of new ideas and better ways of doing things. They think outside the box and look for opportunities to come up with new solutions.

Passionate - Entrepreneurs love what they do and are extremely dedicated to the businesses they create.

Motivated - Because of their passion for their ideas, entrepreneurs are willing to put in the long hours and hard work required to launch and run a successful new business.

Optimistic - Entrepreneurs always look on the bright side and are constant dreamers. They never dwell on the past or the negative. Instead, they focus on moving forward and moving up.

Future-oriented - Because entrepreneurs are focused on moving forward. They are goal oriented and know what they want. They set their goals and everything they do is aimed at achieving those goals.

Persuasive - entrepreneurs need to gain buy-in from those around them on their big idea. They use their persuasiveness to sell themselves and their ideas.

Flexible - Entrepreneurs know how to adapt to unfamiliar situations. They always approach things with an open mind and are willing to change course if they need to.

Resourceful - Entrepreneurs do not shy away from challenges or conflicts, instead they face them head on and come up with a solution. They know how to solve problems effectively. Entrepreneurs also know how to make the most of what they have. Time, money and effort are never used haphazardly.

Adventurous - Entrepreneurs know that to be successful, they must be willing to take risks but they don't

take risks lightly. They know how to plan for the unknown and make a calculated decision that is best for them and their business.

Decisive - There is no room for procrastination in business. Entrepreneurs know what needs to be done and don't hesitate to make the decisions that will lead them to success. They don't let opportunities pass them by; instead, they seize the day and get the job done.

All successful entrepreneurs demonstrate a sound understanding of general basic business skills. These business skills include:

Finance - budgeting, costing, setting prices, sourcing finance, cash flow forecasting and management, bookkeeping, basic accounting, tax

Marketing - selling techniques, promotional methods, branding, social media, customer care

Market research - researching customers, competitors and the marketplace

Legislation - health and safety, employee rights, insurance, premises, equipment, data protection, GDPR

Human resources - contracts of employment, recruitment and selection, setting targets, motivation, training

(NI-CO)

Regarding the literature review the entrepreneurship skill-sets include four main categories:

Technical skills – skills necessary to produce the business's product or service:

- operations specific to industry;
- communications;
- design;
- research and development;
- environmental observation.

Managerial skills – essential to the day-to-day management and administration of the company:

- planning;
- decision-making;
- motivating;
- marketing;
- finance;
- selling.

Entrepreneurial skills - involve recognizing economic opportunities and acting effectively on them:

- inner discipline;
- ability to take risk;
- innovative;
- change-orientated;
- persistence.

Personal maturity skills - include self-awareness, accountability, emotional and creative skills (Cooney, 2012).

In the scientific publications, competencies are defined as constant particular personal traits and characteristics which affect realization (Zwell, 2000). The competency approach is applied in the EU in connection with the formation of personalities, possessing key professional, civil and social competencies necessary for effective realization and adaptation to the constant changes in the socio-economic life.

The European Qualification Framework (EQF) for Lifelong Learning defines competence as "proved ability to

use knowledge, skills and personal, social and methodology constructs in work and education situations as well in professional and personal development” (European Commission, 2009).

The entrepreneurial competencies are defined as the individual characteristics and that it requires certain strategic skills for profitable functioning. H. Kaur and A. Bains define the nature and importance of entrepreneurship competencies such as (H. Kaur, 2013):

- strategy competency;
- commitment competency;
- conceptual competency;
- opportunity competency;
- relationship competency;
- organizing competency;
- learning competency;
- personal competency;
- technical competency;
- social responsibility competency;
- familism competency;
- ethical competency.

1.3 Entrepreneurship Strategies

In the book “The Essential Drucker” Peter Drucker presents four different entrepreneurial strategies. The entrepreneurial strategies are as important for any business as entrepreneurial management is. Despite this fact, there is almost no discussion about entrepreneurial strategies, despite their distinctive influence to the success of any business. Drucker distinguishes between entrepreneurial management, that is, practices and policies within the enterprise, and entrepreneurial strategies, that is, practices and policies outside. “Outside the enterprise” is understood as the marketplace the firm operates in. The author proposes four specific entrepreneurial strategies:

- “Being Fastest with the Mostest”;
- “Hitting them where they ain’t”;
- Finding and occupying a specialized “ecological niche”;
- Changing the economic characteristics of a product, a market or an industry.

The way Drucker calls these four strategies is evidently very metaphorical, almost a bit poetical, and it already gives an implicit, summed up explanation what these strategies are about. The author then goes into details and special characteristics of each of these strategies, with special focus on risks and opportunities. He supports his conclusions with a lot of examples from economic life, namely the success stories or failures of often well-known enterprises. One might easily find that the way corporations behave in the marketplace can be compared to the way animals behave in “wild” nature, as expressions like “finding an ecological niche” may suggest. Indeed, this interpretation is endorsed by the way Drucker describes the features of these strategies, sometimes, he even explicitly draws that comparison to biology.

“Being Fastest with the Mostest”

As the naming suggests, this strategy is mainly defined by trying to become the unchallenged leader in an economic field. Drucker observes that this is sometimes seen as the only entrepreneurial strategy, and he states that this view is false. Indeed, he sees it not even as the dominant entrepreneurial strategy. He considers this strategy to carry the biggest risks and demanding massive resources, even though it is highly rewarding when successful.

Drucker points out that "Being Fastest with the Mostest" must aim at creating something truly new, something truly different. But if one has established such a new product in the market, the strategy is far from being over. Drucker explains that the real effort behind this idea is just starting to begin. The entrepreneur now has to make sure he stays the unchallenged leader in this economic field. This requires that he has to make his product or his process obsolete before a competitor can do it. Work on the successor of the successful product has to start immediately, which means that the research budget must be higher after the original innovation has been established than before. Furthermore, the entrepreneur who has attained leadership has to be the one who systematically cuts the price of his own product or process. Otherwise, he may provide the possibility for competitors to follow up with imitated products, who could benefit from high prices. Drucker ends by concluding that "Being Fastest with the Mostest" is much too risky and much too difficult to be used for anything than major innovations, even though it is highly rewarding when successful.

Creative Imitation / "Hit them where they ain't"

This strategy is somehow a consequence of the risks the "Being Fastest with the Mostest" strategy we've just considered carries. In essential, it means that one does not innovate a new product from scratch, but instead trying to exploit the potential opportunities of an innovation someone else has made, but was not able to profit from it so far. Being successful in "Creative Imitation" means that one understands better what the innovation represents than the people who actually made it. This strategy aims at market leadership, too, but it is much less risky than the first strategy. If the new product is already known, it is much easier to find out what customers buy and how to fit their specific needs. The main risk with this strategy - besides misreading the trend in the market - is to offer too many products for too specific needs, resulting in a hard to manage, segmented market. This strategy requires that the true, origin innovator of a new product fails at placing his product successfully at the market, tailored to customers' specific needs. But economic practice shows that this is often the case, so the strategy of "Creative Imitation" is a promising one.

Entrepreneurial Judo

The basic, popular idea behind Judo is to try to use one's counteragent's power against himself. As Peter Drucker shows in his book, this principle might also be transferred to economic life. The concept is to try to prevail in a market others created or would be fit to supply much better, but simply don't care about it. Peter Drucker states that this opportunity arises mainly in two situations: with corporations who spurn innovations out of arrogance (they think the new product or service is not good enough for their enterprise), or with corporations who try to get just the high-profit part of a market. Entrepreneurial Judo aims at entering a market where the established leaders do not defend it or simply do not care about it. It also intends leadership in a market, but it does not challenge the leaders where they are aware of competition, but in areas where they do not care what's going on.

Finding and occupying a specialized "ecological niche"

In contrast to the strategies presented earlier, this one does not aim so much at leadership or dominance of a market, but rather at control. It tries to obtain a practical monopoly in a small area. Companies referring to this strategy will therefore remain relatively small and unknown to a broader public. The main idea behind this strategy is to offer a product that is essential, but nevertheless offers no incentive for others to compete. There are three possible ways of applying this strategy: The Toll-Gate Strategy: This means an entrepreneur tries to find a product that is essential to some bigger, complex process, but does not represent a big part of the whole thing. The market for this product must be so small that whoever enters it first preempts it. Such toll-gate positions are not easily to find. Furthermore, there is almost no chance for a company to grow or increase its business. The Specialty Skill

Strategy: Somehow similar to the first strategy, one would aim at occupying a certain field of the market, but not so much because it is too small for more than one enterprise, but because it requires very specialized, very unique knowledge no others are likely to have or to achieve. This means, a business occupying a specialty skills niche must constantly work on improving its own skill, making sure no runners-up will enter the stage. Another problem might result from the fact that the occupant of a specialty skills niche is dependent on somebody else bringing his product to the market, as this product is only a component of some bigger product. Another danger is that the specialty skill ceases being special and becoming universal knowledge. The Specialty Market Strategy: This strategy is very similar to the previous one. The difference is that it is not built around a product or service, but a specialized knowledge of a market. The entrepreneur thus tries to place a more or less common product on a very special market, meeting specific customers' needs that are not as common as the product itself might be in the overall market. This strategy has the same limitations as the specialty skills strategy. The greatest threat is its success, because when the market one occupies becomes a mass market, it is - however complex and difficult to understand it might be - not special any longer.

Changing the economic characteristics of a product

The former strategies always aimed in some way at introducing an innovation to the market. This last big strategy simply takes an old, well known product and tries to position it on the market as something different and new, when there is actually no physical change to the product. There are several ways of applying this strategy; each of them tries to create new customers for an existing product. By the way, creating customers is the core concern of any business. Creating Customer Utility: This strategy works by enabling customers to do what serves their purpose. The main element of this strategy is some additional service that is offered with the product that meets specific customers' needs. Pricing: This strategy tries to price different components of a product in a way that is accepted by customers. It is not so much about cutting the overall price of a product, but about thinking how the price should be divided among its components. Thus, the price of a component needn't always resemble the actual manufacturing or other costs associated with it, but the value it presents to the customer. The Customer's Reality: This strategy focuses on selling a product in a way it fits into the customer's world, and not in a way that resembles the manufacturer's point of view. This might concern pricing (as mentioned above), but sometimes it might just be enough to think of services or product packages appealing to potential customers. Delivering Value to the Customer: Similar to other strategies, one should focus on what delivers value to the customer rather than what is product to the manufacturer. Drucker describes it in simple words: "What the customer pays for each piece of the product has to work out as X dollars for us. But how the customer pays depends on what makes sense to him. It depends on what the product does for the customer. It depends on what fits his reality. It depends on what the customer sees as value" (Drucker P. F., 2001)

Food for thought

- *What is the meaning of entrepreneurship?*

Entrepreneurship is a key part of business life. It drives the market process and economic development. Its main characteristics are creativity and innovation; resource identification, acquisition and marshalling; economic organization; opportunity for gain (or increase) under risk and uncertainty.

- *What do the entrepreneurs do?*

Entrepreneurs develop, design, produce, market, and eventually sell businesses with the end goal of financial profit. There are entrepreneurs behind every business in the country, no matter what the size and scope. Being an

entrepreneur also means undertaking a lot of risk and initiative, and inevitably comes with a fair amount of stress and angst. Entrepreneurs are most likely to be the first ones at the office and the last to leave, and often put in extra hours in the evening along with forfeiting many of their weekends and holidays to make sure things are running as smoothly as possible.

- *What makes entrepreneurs successful?*

A successful entrepreneur has to possess a set of technical, managerial and personal skills. The most important are effective communication, ability to research and decision-making, motivating, innovative, creative, change-orientated and ability to take risk. The entrepreneur has a strong inner drive that helps to succeed. He always has a strong sense of self-confidence and a healthy opinion of his skills and abilities.

Topic 2: Climate Change: origins and impacts

2.1 Human activities and origins of climate change

Human activities contribute to climate change by causing changes in Earth's atmosphere in the amounts of greenhouse gases, aerosols (small particles), and cloudiness. The largest known contribution comes from the burning of fossil fuels, which releases carbon dioxide gas to the atmosphere. Greenhouse gases and aerosols affect climate by altering incoming solar radiation and outgoing infrared (thermal) radiation that are part of Earth's energy balance.

Since the start of the industrial era (about 1750), the overall effect of human activities on climate has been a warming influence. The human impact on climate during this era greatly exceeds that due to known changes in natural processes, such as solar changes and volcanic eruptions.

Global warming

The period of 2011-2020 is considered the warmest decade recorded, with global average temperature reaching 1.1°C above pre-industrial levels in 2019. Human-induced global warming is presently increasing at a rate of 0.2°C per decade. An increase of 2°C compared to the temperature in pre-industrial times is associated with serious negative impacts on to the natural environment and human health and wellbeing, including a much higher risk that dangerous and possibly catastrophic changes in the global environment will occur. For this reason, the international community has recognised the need to keep warming well below 2°C and pursue efforts to limit it to 1.5°C.

Greenhouse gases

Human activities result in emissions of four principal greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and the halocarbons (a group of gases containing fluorine, chlorine and bromine). These gases accumulate in the atmosphere, causing concentrations to increase with time.

Carbon dioxide has increased from fossil fuel use in transportation, building heating and cooling and the manufacture of cement and other goods. Deforestation releases CO₂ and reduces its uptake by plants. Carbon dioxide is also released in natural processes such as the decay of plant matter.

Methane has increased as a result of human activities related to agriculture, natural gas distribution and landfills. Methane is also released from natural processes that occur, for example, in wetlands. Methane concentrations are not currently increasing in the atmosphere because growth rates decreased over the last two decades.

Nitrous oxide is also emitted by human activities such as fertilizer use and fossil fuel burning. Natural processes in soils and the oceans also release N₂O.

Halocarbon gas concentrations have increased primarily due to human activities. Natural processes are also a small source. Principal halocarbons include the chlorofluorocarbons (e.g., CFC-11 and CFC-12), which were used

extensively as refrigeration agents and in other industrial processes before their presence in the atmosphere was found to cause stratospheric ozone depletion. The abundance of chlorofluorocarbon gases is decreasing as a result of international regulations designed to protect the ozone layer.

Ozone is a greenhouse gas that is continually produced and destroyed in the atmosphere by chemical reactions. In the troposphere, human activities have increased ozone through the release of gases such as carbon monoxide, hydrocarbons and nitrogen oxide, which chemically react to produce ozone. As mentioned above, halocarbons released by human activities destroy ozone in the stratosphere and have caused the ozone hole over Antarctica.

Water vapour is the most abundant and important greenhouse gas in the atmosphere. However, human activities have only a small direct influence on the amount of atmospheric water vapour. Indirectly, humans have the potential to affect water vapour substantially by changing climate. For example, a warmer atmosphere contains more water vapour. Human activities also influence water vapour through CH₄ emissions, because CH₄ undergoes chemical destruction in the stratosphere, producing a small amount of water vapour.

Aerosols are small particles present in the atmosphere with widely varying size, concentration and chemical composition. Some aerosols are emitted directly into the atmosphere while others are formed from emitted compounds. Aerosols contain both naturally occurring compounds and those emitted as a result of human activities. Fossil fuel and biomass burning have increased aerosols containing sulphur compounds, organic compounds and black carbon (soot). Human activities such as surface mining and industrial processes have increased dust in the atmosphere. Natural aerosols include mineral dust released from the surface, sea salt aerosols, biogenic emissions from the land and oceans and sulphate and dust aerosols produced by volcanic eruptions.

Causes for rising emissions:

- Burning coal, oil and gas produces carbon dioxide and nitrous oxide;
- Cutting down forests (deforestation). Trees help to regulate the climate by absorbing CO₂ from the atmosphere. When they are cut down, that beneficial effect is lost and the carbon stored in the trees is released into the atmosphere, adding to the greenhouse effect;
- Increasing livestock farming. Cows and sheep produce large amounts of methane when they digest their food;
- Fertilisers containing nitrogen produce nitrous oxide emissions;
- Fluorinated gases are emitted from equipment and products that use these gases. Such emissions have a very strong warming effect, up to 23 000 times greater than CO₂.

Increase in the solar radiation facilitating factors due to Human Activities

Aerosol particles influence radiative forcing directly through reflection and absorption of solar and infrared radiation in the atmosphere. Some aerosols cause a positive impact while others cause a negative on the quantity and the type solar radiation. The direct impact from the existence of the all aerosol types in the Earth's atmosphere is negative. Aerosols also cause a negative impact on the solar radiation absorbed and the heating of the plane indirectly through the changes they cause in cloud properties. Human activities since the industrial era have altered the nature of land cover over the globe, principally through changes in croplands, pastures and forests. They have also modified the reflective properties of ice and snow.

Overall, it is likely that more solar radiation is presently reflected from Earth's surface because of human activities and due to the increased amounts of cloud meteorological systems are causing a backward reflected radiation especially in the infrared spectrum. This leads to increasing greenhouse effect. This change results in a negative forcing. Aircraft produce persistent linear trails of condensation ('contrails') in regions that have suitably low

temperatures and high humidity. Contrails are a form of cirrus cloud that reflect solar radiation and absorb infrared radiation. Linear contrails from global aircraft operations have increased Earth's cloudiness and are estimated to cause a small positive radiative effects.

Increase in Solar Radiation due to Natural Changes

The natural increase in the amount of the solar radiation and thus the solar energy absorbed by the Earth's surface arise due to solar changes and explosive volcanic eruptions. The changes in the solar activity can add to the amount of the solar radiation received by the Earth's surface and the patterns of the atmospheric meteorological formations, the ocean flows and the formation of clouds. Solar output has increased gradually in the industrial era, causing a small positive radiative impact. This is in addition to the cyclic changes in solar radiation that follow an 11-year cycle. Solar energy directly heats the climate system and can also affect the presence in the atmosphere of some greenhouse gases, such as stratospheric ozone. Explosive volcanic eruptions can create a short-lived (2 to 3 years) negative impact through the temporary emissions of sulphate aerosol in the stratosphere. The differences in the solar radiation amounts received in the present day and the start of the industrial era due to the changes in the activity the Sun's Corona and the volcanic eruptions on the Earth are, however, small in scale in comparison to the negative impacts of human activities. As a result, in today's atmosphere, the energy from the solar radiation that remains non-reflected to the outer space is greater than in the past. Moreover, this is predominantly because of the human activities causing the greenhouse effect, which adds to the heating of the Earth's surface. The increased solar and volcanic activities due to the emission of carbonic dioxide do cause a similar effect but much lower in scale.

2.2 Impact of Climate Changes on Economy and Society

There are popular statements that the world would lose nearly 10 percent of total economic value by mid-century if the trajectory of climate change stays is kept unchanged and net-zero emissions target is not achieved. It is especially relevant for Southeast Asia emerging-market economies. Their economies are endangered around a quarter of the gross domestic product (GDP) by mid-century. What is more, some of them would face the necessity to move entire towns and even capital town (Malaysia) if climate changes not successfully fought.

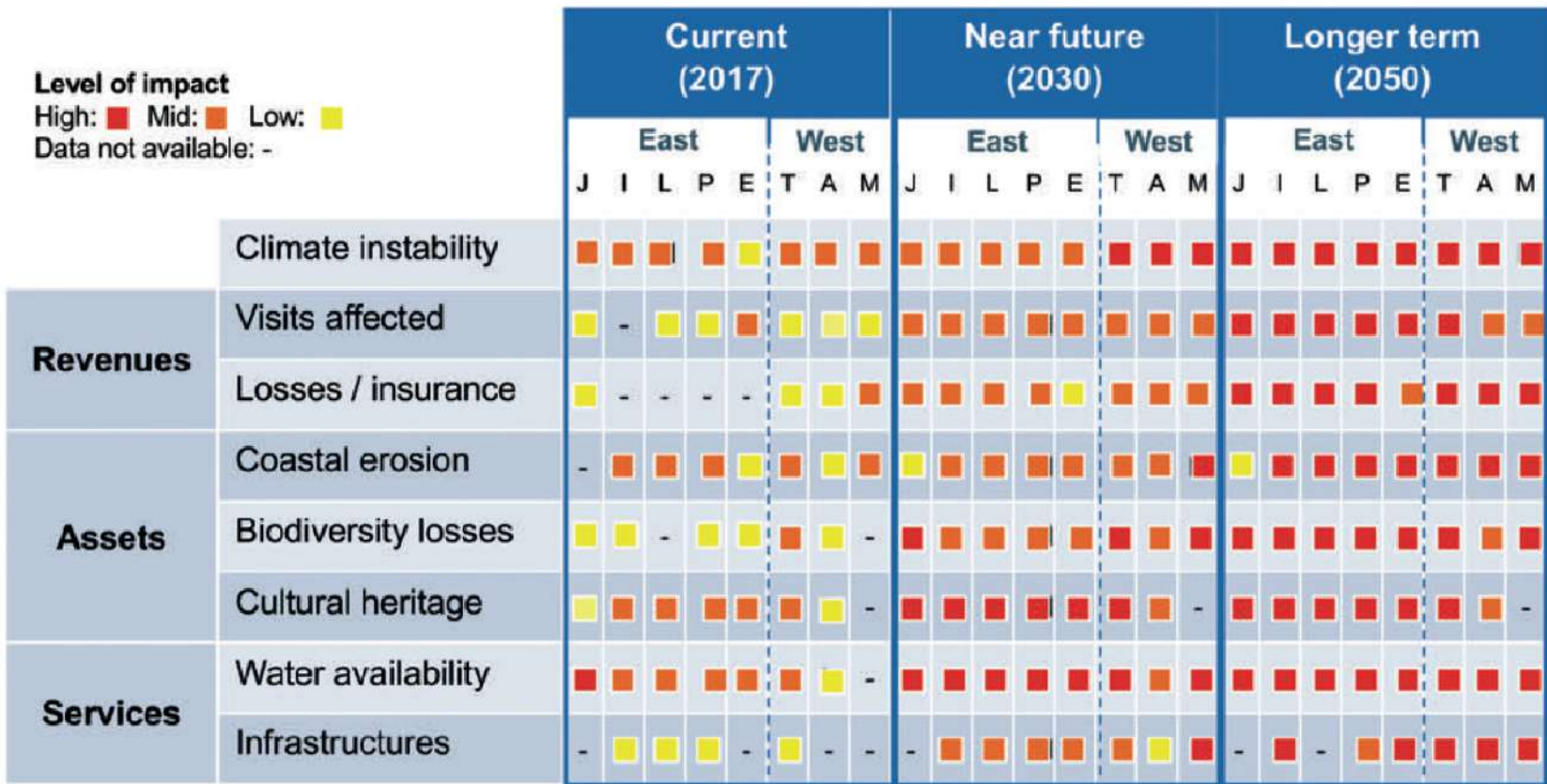


Chart 1.1 Overview of impact of climate change on the tourism sector through time

Source: Union for the Mediterranean (2017). Climate Change Impact on the Tourism Sector in the Southern Mediterranean – Foreseen development and policy measures (Bocci & Murciano, 2017)

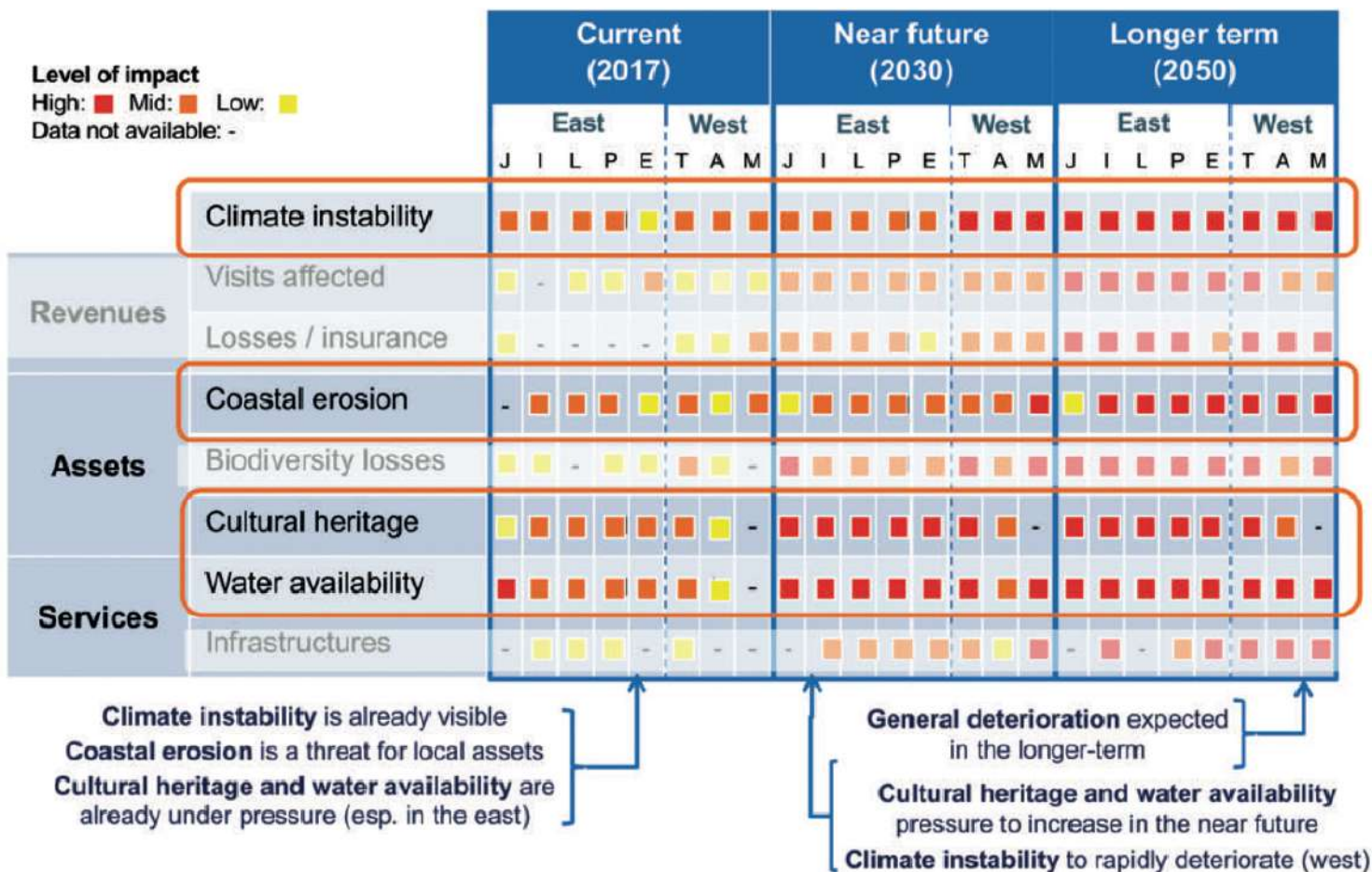


Chart 1.2 Areas of impacts of climate change not yet perceived at threats by the Tourism Sector but expected to grow rapidly

Source: Union for the Mediterranean (2017). Climate Change Impact on the Tourism Sector in the Southern Mediterranean – Foreseen development and policy measures (Bocci & Murciano, 2017)

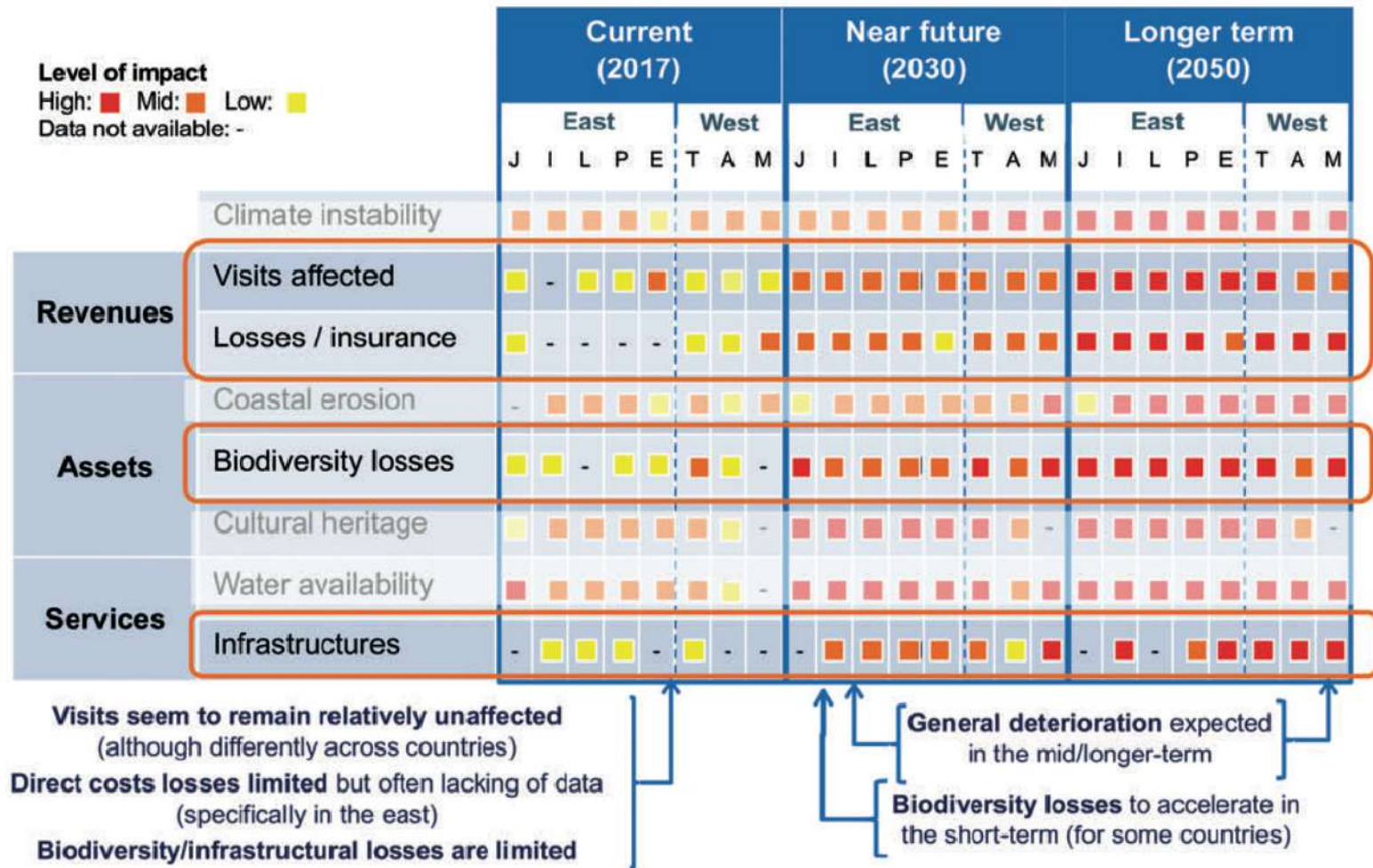


Chart 1.3 Areas of Impacts of Climate Change yet not perceived by the Tourism Sector but expected to grow rapidly (2017)

Source: Union for the Mediterranean (2017). *Climate Change Impact on the Tourism Sector in the Southern Mediterranean – Foreseen development and policy measures* (Bocci & Murciano, 2017)

The effects could be expected in two main directions: 1. Physical effects; and 2. Economic effects. Negative effects will also be related to Human settlements, industry, and infrastructure; as well as Human health, security, livelihoods, and poverty. Despite being considered as social problems; the last two groups of problems have economic projection and valuation as well.

The physical effects could contain negative effects related to: Major River runoff; Water supply; Phenology and growth rates; Distributions of species and biomes; Permafrost; Inland waters; Coral reefs; Other coastal ecosystems; Arctic coast erosion; Food production systems and food security. The food production and security related problems could be found in Rice yield; Wheat yield; Corn field; other crops (e.g., barley, potato, etc.); Vegetables and fruits; Livestock; Fisheries and aquaculture production; Farming area; Water demand for irrigation; as well as Pest and disease occurrence. Special problems would be related to Floodplains; Coastal areas; Population and assets; and Industry and infrastructure. Health related problems could be seen as Health effects of floods; Health effects of heat; Health effects of drought; Water-borne diseases; Vector-borne diseases; Livelihoods and poverty.

As implied, climate change will be likely to affect economy and society in both ways - directly and indirectly. The most affected businesses could be found in the following economic sectors:

Agriculture

The sector of agriculture and food production in particular, seems to be the most vulnerable to climate changes. For example, the agricultural and food sectors give nearly \$750 billion to the economy of the US. It is important to note, agriculture and fisheries are highly dependent on climate. Increases in temperature changes in the

frequency and severity of droughts and floods could create challenges for agricultural producers and endanger food safety. Warmer waters are likely to make the habitat ranges of many fish and shellfish species to shift, which could disrupt ecosystems and decrease hauls for the local fishers. Thus, climate changes could make it difficult for people to grow crops, raise animals, and catch fish in the same ways they know and practice in the past. However, the effects of climate change should also be considered together with the developments and changes in farming practices and technology.

Infrastructure

Floods put at risk significant part of the critical infrastructure of countries and societies. Moreover, floods put at risk whole towns and large metropolitan areas. Ocean and sea level have tendency to increase and thus endanger assets in trillions of dollars. This value is filled by the damage expected to housing, airports on the coasts, large ports, docks, the railway lines, oil platforms, gas pipe-lines, tourist facilities and assets, national defence and military bases and facilities, fibre optic cable as well as underwater data centres, winter sports facilities, etc. Raising the water level must be considered as a global risk. As implied, the endangered or damaged elements of the critical infrastructure must be repaired or replaced that would additionally bubble the costs for each society. Not only ocean and sea levels could be a potential danger. Inland infrastructural elements located near rivers are also vulnerable because the rivers can overflow with heavy precipitation that is expected to become more frequent as the atmosphere warms. Extreme weather entails more works and costs for maintenance and repair for runways and roads.

Tourism and sports

The countries with resources for winter recreation tourism could lose billions of dollars. The businesses could record losses due to less and less snow and ice. Winter resorts would become less attractive for tourists and thus the economies of the countries with such resorts built will be deprived of lots of revenues. For example, 'greening' of the Alps that even is visible from space would deprive myriads employees of their jobs as well as millions of tourists and sportsmen of their favourite winter destination. Nobody can do skiing on green grass.

Increased water temperatures could worsen the water quality around the world. Warmer water could provide a more favourable environment for more intense algae blooms that could be toxic, thus curtailing recreational and water sport activities as well as freshwater fishing. The worsening will be expected for both – sea's and river's waters. The rivers could be also endangered by droughts or lowering water levels. Recreation and sports could be less attractive near lakes, ponds and rivers.

More frequent and severe wildfires would worsen the air quality and discourage tourism. Sea level rise could submerge small islands and coastal areas, while deforestation and its destructive impacts on biodiversity could make some tourist resorts and whole destinations less and less attractive for tourists and sportsmen.

Businesses and financial markets

Some analysts see a possible link of the climate change with business and even financial markets. They point out that the frequency and intensity of extreme weather can damage factories, supply chains, and disrupt transport. Drought will make water scarcer and more expensive that could affect the cost of raw materials and production. Thus, climate volatility may force companies to deal with uncertainty in the price of resources for production, energy transport and insurance. More disasters would increase the costs of insurance companies which are significant players on the financial markets. Some products could become obsolete or lose their market, such as equipment related to coal mining or skiing in an area that no longer has snow.

Human health and productivity

If temperatures keep rising, the number of the cases of heat-related illnesses and health problems will also be

growing. Infections and contaminations will be more frequent as well. All these things will put the health-care systems in serious challenge. Pre-mature deaths of employees make businesses encounter additional losses. The annual losses for business and economy associated with extreme temperature-related deaths alone are projected for to achieve \$140 billion up to the end of the century in particular for the US.

The teaching material has been specified on the base of the sources referred (Marchant, 2021), (Wade, 2016), (Rebecca, Andrew, & Matthias, 2011), (USDA, 2022), (Crimmins, Ziska, & Garofalo, 2014), (EPA, 2022), (Keystone, 2022), (Guo, Kubli, & Saner, 2021), (Auffhammer, 2019).

2.3 Public policies and responses to negative impacts of climate change

After the relative stability over the past 10,000 years, today the global climate is changing (European Environment Agency, 2007). The security it gave to people during this period allowed the development of human civilization with all the specifics we know it. Climate change, however, has a wide range of impacts. Official reports indicate that the changes established in the last 4 decades, primarily related to the warming of the planet, have a visible impact on social and natural systems. Since 1970 the global average temperature has been rising at a rate of 1.7°C per century (Allen, et al.). As a result, precipitation amounts are changing, global mean sea level is rising (about 7–8 inches (or 16–21 cm) since 1900, with about 3 of those inches (about 7 cm) occurring since 1993), (Wuebbles, D.W. Fahey, Dokken, Stewar, & Maycoc, 2017) glaciers are retreating and the extent of Arctic ice cover is decreasing. As well as, the risk of extreme weather events, including heat/cold waves and flooding in urban areas and ecosystems, is increasing. And last but not least, as global temperatures increase, so does the risk of triggering large-scale, non-linear changes. The reason for them is the dependence of developed countries in Europe, America and Asia on energy sources (including fossil fuels, mining products, etc.), which contributes to aggravating the state of the environment. At the same time, changes in the global environment directly affect socio-economic relations in the countries all over the world, intensifying them.

An example of this can be the loss of biological diversity, which has a direct relationship with poverty, since it is most directly dependent on the functioning of ecosystem services (Allen, et al.). Biodiversity loss could be most easily illustrated by the reduction of genetic diversity in crops used in agriculture and farming, which implies losses of economic and social benefits, most notably food shortages. Thus, the growth of poverty leads to inequality, which together are likely to provoke conflict and create instability.

Another example can be given with the extraction of natural resources from ecosystems and mines, which is growing globally, regardless of its initial limitations. At the same time, it is unevenly distributed around the world: it is largest in Asia and smallest in Europe. Regardless of the circumstances, due to economic and political incentives, resource use and extraction continue to increase in absolute terms as a result of resource efficiency (Food and Agriculture Organization of the United Nations, 2009).

Climate change is a global issue and requires global action. Therefore, policies and programs are being developed to combat rising temperatures, greenhouse gases, food, water and energy issues.

The study of the legal framework on the aspects of climate change is tightly connected to the sustainable development philosophy. It outlines a set of events related to the policies and documents presupposing its limitation. Among them the following can be mentioned as more important:

- The World Commission on Environment and Development Report (Brundtland report) (1983 & 1987) (Development, 1987);
- First World Conference on the Environment in Stockholm - 1972;

- First World Conference of the United Nations on climate change and the sustainable development (Rio de Janeiro) - 1992;
- United Nations Framework Convention on Climate Change (UNFCCC) - 1990s (United Nations Framework Convention on Climate Change, 2018);
- Kyoto Protocol – 1997;
- Millennium Development Goals global anti-poverty movement – 2000; (United Nations, 2022)
- 2nd World Conference on Environment and Development (Johannesburg) – 2002;
- United Nations Conference on Sustainable Development (Rio + 20) (Rio de Janeiro) and the document "The future we want", upgrading the Millennium Development Goals with a set of sustainable development goals – 2012;
- Sustainable Development Goals, adopted by the UN General Assembly – 2015 (Figure 1).
- Paris Agreement on Climate Change – 2015;
- 15th Meeting of the Conference of the Parties (COP 15) and the 26th United Nations Conference on Climate Change (COP26) – 2021.

Figure 2.1: Sustainable development goals



Source: (United Nation, 2015, <https://sdgs.un.org/goals>)

Among the listed, three documents require special attention, namely the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement.

The UNFCCC was agreed to by virtually every nation on earth. Under this convention the whole world has agreed to stabilize greenhouse gas concentrations “at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system (IPCC).”

The Kyoto Protocol was adopted in 1997 in direct connection with the efforts of the government leaders to begin discussions to try and stem the outflow of greenhouse gas emissions to prevent the direst predicted outcomes. Kyoto Protocol is the first global agreement to reduce greenhouse gases. It called for reducing the emission of six

greenhouse gases in 41 countries plus the European Union to 5.2 percent below 1990 levels during the target period of 2008 to 2012 (History, 2008)¹.

In 2001, the Intergovernmental Panel on Climate Change (IPCC) as an intergovernmental body of the United Nations responsible for advancing knowledge on human-induced climate change issued its 3rd report on climate change, saying that global warming, unprecedented since the end of the last ice age, is “very likely,” with highly damaging future impacts.

Politicization over climate change, however, continued, with the signing of the Paris Agreement in 2015. In that agreement, 197 countries pledged to set targets for their own greenhouse gas cuts and to report their progress. The goal Paris Climate Agreement sets is to keep the world’s average temperature well below rising to 2°C (3.6 degrees F) above what it had been before the industrial revolution – and preferably to keep it below 1.5°C. This, according to international experts, is the red line that must be observed, keeping in mind that 2°C of warming could be a critical limit, which, if surpassed will lead to increasing risk of more deadly heat waves, droughts, storms and rising global sea levels.

Several countries around the world have also signed up to a national goal of netzero greenhouse gas emissions as part of their one contribution to this global effort. At the moment, every country in the world has signed the Paris Agreement. Including the USA, after January 2021 (ACCIONA, 2021).

Food for thought:

- **What/ who causes the climate change?**

Human activities contribute to climate change by causing changes in Earth’s atmosphere in the amounts of greenhouse gases, aerosols (small particles), and cloudiness. Climate change is predominantly caused by the burning of fossil fuels, which releases carbon dioxide gas to the atmosphere. Greenhouse gases and aerosols affect climate by altering incoming solar radiation and outgoing infrared (thermal) radiation that are part of Earth’s energy balance. Since the start of the industrial era (about 1750), the overall effect of human activities on climate has been a warming influence. The human impact on climate during this era greatly exceeds that due to known changes in **natural processes**, such as solar changes and volcanic eruptions.

- **How do climate changes affect business activities?**

As implied, the climate changes would affect business activities and daily life of all of us. They have potential to affect negatively the usual economic activity. The risks and damages on the main economic sectors such as agriculture and food production, tourism and sports, health care would burden societies with the huge costs and loses of money. The changes have potential to impact the businesses and financial markets (via insurance companies) and cause local or regional economic crises. Along with all those things, climate changes inevitably would impose a larger cost burden on the health care system and social security system in each country. Therefore, climate changes would prevent achieving the development goals of each contemporary society, if not fought successfully.

- **Can negative impacts of climate change to be prevented?**

Fortunately, there are always things that we can do to fight against climate change. In addition to international conventions and agreements, as well as the legislative practices at the national level, every single person can contribute to limiting climate change. Concrete steps in this direction can be the following:

1. Make Your Commute Green – use eco-friendly transportation
2. Be More Conservative with Energy Usage

¹ History.com Editors, Climate Change History, Last Updated August 8, 2022
<https://www.history.com/topics/natural-disasters-and-environment/history-of-climate-change>

3. Get Active and Vote
4. Recycle
5. Educate Yourself and Others
6. Encourage the use of renewable energies

TOPIC 3: ENTREPRENEURSHIP AS A TOOL FOR MANAGING CLIMATE CHANGES

3.1. Entrepreneurship and Green Innovations

The Concept of Innovation

The concept of “**innovation**” was introduced for the first time by the American economist of Austrian origin Joseph Schumpeter (Schumpeter, 1934) at the very beginning of the 20th century in connection with what he considered the "implementation of new combinations" in the economy

This concept is directly related to another concept - the concept of "invention" - understood as generalizing the concepts: "invention", "discovery", "new solution", "new idea".

Innovations, on the other hand, are the further development of inventions in their specific use in a given sector of the economy, including the institutionalization of relevant production methods or bringing certain new products to the market.

The success criterion is technical for the invention but commercial for the innovation.

The term "**innovation**" (Schumpeter, 1934) **refers to either the entire process of creating a new product, new technology, new organization, new market opportunities, etc., or the end result - the same new product, technology, organization, etc.**

According to Peter Drucker (Drucker P. , 2002) **Innovation** is the specific function of entrepreneurship, whether in an existing business, a public service institution, or a new venture started by a lone individual in the family kitchen. It is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating wealth.

Drucker (2002) also states that at present, “much confusion exists about the proper definition of entrepreneurship. Some observers use the term to refer to all small businesses; others, to all new businesses. In practice, however, a great many well-established businesses engage in highly successful entrepreneurship. The term, then, refers not to an enterprise’s size or age but to a certain kind of activity. At the heart of that activity is innovation: the effort to create purposeful, focused change in an enterprise’s economic or social potential.

Sources of Innovation

According to Peter Drucker identifies the sources, or moreover situations that provoke the appearance of innovations, namely: unexpected occurrences, incongruities, process needs, and industry and market changes. He points out also three additional sources of opportunity, which exist outside a company in its social and intellectual environment: demographic changes, changes in perception, and new knowledge.

The Innovation Strategies

The term "strategy" is of ancient Greek origin and is formed from the words "stratos" - army and "ago" - leader. In this sense, under "strategy" (in the managerial and business sense of this concept), it should be understood a combination of goals and basic company policies for reaching these goals, which is expressed in such a way that it allows to determine in what state or situation a given company (organization) is in or what kind of company (organization) it is and what kind it would like to be.

The innovation strategy, in turn, is one of the company's private strategies – it stems from and supports the company's general strategy.

The Paris Agreement and the 2030 Agenda for Sustainable Development set out a vision for a low-carbon, climate-resilient and sustainable future for all. Technological innovation is a key catalyst for efforts to implement national

climate action and realize the above vision. The 2030 Agenda for Sustainable Development refers to technological innovation in several of the Sustainable Development Goals, including Goal 7 (Affordable and Clean Energy), Goal 8 (Decent Work and Economic Growth), Goal 9 (Industry, innovation and infrastructure) and Goal 17 (Partnership for the Goals). The work of the Technology Executive Committee has resulted in a series of publications on topics such as strengthening national innovation systems and increasing funding for climate technology research, development and demonstration. Working with the Green Climate Fund and the Climate Technology Center and Network to improve understanding of the role that incubators and accelerators can play in supporting climate technology innovation entrepreneurs. This helped the Green Climate Fund explore opportunities to support such incubators and accelerators. The work done has also led to a publication by the three organizations entitled Catalytic Financing for Incubators and Accelerators. This TEC review complements this publication by highlighting policies and measures that can help entrepreneurs innovate in climate technology.

Climate entrepreneurs can drive climate solutions through innovation (the generation of new technologies, processes, or models to mitigate or adapt), or through facilitation (spreading existing adaptation and mitigation measures through business models that allow for local uptake of technology or practices). This is not always an ‘either/or’ for business models, as many entrepreneurs maybe both innovating and adapting some new technological element, while also facilitating local uptake. To address the gaps in financing and shortcomings of existing financial mechanisms, there is need for innovations in funding targeting climate entrepreneurs in developing economies, beyond the status quo reach of capital. New financial instruments can reduce risk by creating concessional or “blended public and private investment” and distributed risk.

Using new financial tools to shift how investors allocate risk and decrease opportunity cost can unlock private investment. Such tools are being developed and piloted by organizations like the Global Innovation Lab for Climate Finance (2020) and the World Bank Group in order to attract private finance to climate investment. The Lab for Climate Finance has projects such as peer-to-peer lending for renewable energy SMEs in India (Loans4SME) and a block chain crop insurance instrument in sub-Saharan Africa, among many other examples.

Finally, the need for tackling climate change has led many businesses to prefer technological innovations in order to reduce their environmental footprint as well as their operational costs. The integration of such technologies in their production process reduces the consumption of natural resources (primary and secondary raw materials, conventional fuels, electricity). Thus, the companies promoting low carbon innovative technologies will benefit from the need of other companies to become more environmentally friendly. For example, the telecommunications sector promotes applications on both mobile and non-mobile phones that allow for the reduction of transportation costs (e.g. working by distance).

3.2. Business Activities, Operations and Sustainability

The core meaning for the sustainability of business refers to the company's action toward reduction of the negative environmental impact on its operations. In that context, the influence of climate change is directly connected to the topic of sustainability of business operations and can have arguments linked to:

- **Employees** are increasingly looking for mission-driven, purpose-led employers who care about the planet when deciding where to work.
- **Consumers** are willing to pay a premium for goods from brands that are environmentally responsible.
- **Governments, investors, employees, and customers** are demanding new levels of enterprise accountability, including action to address climate change.
- Many of the world’s top economies have or are developing, corporate disclosure **requirements** around environmental impact, driving businesses to curb GHG emissions (EY, 2021).
- The rise of **environmental, social and governance (ESG) investment criteria and sustainable investing** means that a sustainable business is inherently more attractive to the rising numbers of responsible investors (Bloomberg Intelligence, 2021).

Analyzing the climate change challenge toward the established business model Deloitte (2020) focus on the six areas

which will be affected by climate change, but also can create opportunities and benefits for the company. The solution process to identify, address, and report on the impacts of climate change onto Regulatory compliance, Brand differentiation, Innovation and opportunity creation, Operational efficiency, Capital Access, Talent attraction, engagement and retention is organized into one solution framework - Deloitte Sustainability Risk Management Framework.

Addressing the need for a rethinking of the model of entrepreneur involvement Embry, Jones and York (2019) emphasize the importance of the inclusive entrepreneurship research to address the impacts of climate change. They have broken down climate change across categories of ecological, social, and health impacts. Each of these impacts they have examined for unique opportunities for entrepreneurial response to current challenges and mitigation of future problems. As these impacts do not happen in isolation, they presented an opportunity model for the field of entrepreneurship to study the implications of climate change through an inclusive and socially innovative aspect. The important part of their framework is the presence of the inclusive markets. This inclusivity is a necessary condition for the entrepreneurs ventures in their process of identifying socially innovative practices and products that appropriately address the ecological, social, or health impacts of climate change. The authors break down the entrepreneurial process into three levels of analysis – at the individual, organizational and institutional levels. Each of these levels of addressing and analysis is needed for achieving a better understanding of climate change mitigation efforts and opportunities.

The importance of achieving a state in which government, business and civil society collaboratively create an entrepreneur opportunities in the process of governance of climate change adaptation is presented by Debora de Block (2018), (De Block, Feindt, & van Slobbe, 2019) in the context of the term called ecosystem-based adaptation (EbA). The EbA, is generally used for measures where ecosystem services are used to support efforts to adapt to climate change. Based on the case study comparison of four ecosystem-based adaptation projects in the UK and the Netherlands, de Block argues that the opportunity creation is dynamic process. With individual and collective strategies used throughout the planning and implementation process and where strategies are both sequentially and simultaneously deployed.

The role of the environmental entrepreneur and their engagement towards achieving sustainable businesses is the focus of Thompson and Scott (2010). They present a conceptual model within the fields of entrepreneurship and sustainability and consider whether it needs organizations to be ‘on message’ for successful environmental outcomes to be achieved. The authors develop two new conceptual frameworks both featuring a Business/Environment Sustainability Index. One framework separates opportunity driven businesses from those constrained by regulation; and the second distinguishes economics as a predominant motive force from cause-driven behavior.

Getting a more practical approach toward dealing with the impact of climate change on business activities is creating a tool methodology that allows companies to screen climate risks and decide which adaptation options and strategies to pursue. The UKCIP’s Business Areas Climate Impacts Assessment Tool (BACLIAT vulnerability assessment), <https://www.ukcip.org.uk/wizard/future-climate-vulnerability/bacليات/> is a workshop aid for scoping the impacts of climate change on a business in the specific areas of market change, business logistics, business premises, employees and customers behavior, industrial processes, and corporate finance. The emphasis is put on Building adaptive capacity (BAC) and Delivering adaptation action (DAA). Adaptive capacity includes the knowledge, resources, support systems, and legislative frameworks that encourage, allow or require organizations to deliver adaptation actions. Delivering adaptation action involves putting in place the physical structures or managerial arrangements that respond to the opportunities or threats presented by the changing climate.

The GIZ Climate Expert tool targets SMEs (Resch & Gao, 2022) with the goal of developing complete adaptation strategies. This assessment tool allows SMEs to identify climate risks and opportunities for various business operations (infrastructure and operations, stakeholders, government and regulation, finance and market) using probability, magnitude and risk as assessment variables. One of the main features of the GIZ tool is that companies can specify the risks, costs and benefits of their operations, thereby quantifying the losses in different climate change scenarios and producing cost-benefit analyses

(CBA).

3.3. Best Practices and Possible Solutions

Entrepreneurial practices, which may contribute to solving the climate change problem, were analysed by Montiel & Ceranic (2015), De Block, (2018), Embry et al. (2019), Deloitte (2020), Oraftik, McGregor, Guttentag and Hume (2021), Resch and Gao (2022) and many others.

Using the classification of Zahra, Gedajlovic, Neubaum, and Shulman (2009) for social entrepreneurs, Montiel and Ceranic (2015) formulated the characteristics of sustainable entrepreneurial practices in bricolage, construction and engineering, which may mitigate climate change (see Table 3.1).

Table 3.1. Characteristics of sustainable entrepreneurial practices in bricolage, construction and engineering, which may mitigate climate change

Characteristics	Bricolage	Construction	Engineering
Theoretical inspiration	Hayek	Kirzner	Schumpeter
Scale	Small scale	Small to large scale	Large scale
Scope	Local	Local to national	National to international
Significance	They help maintain harmony in the face of sustainability problems.	They mend the sustainability fabric where it is torn, address acute sustainability needs within broader sustainability structures.	They seek to rip apart existing structures and replace them with new ones. They represent an important force for social change.
Source of discretion	Being on the spot with the skills to address local problems not on other 'radars'.	They address needs left unaddressed. They may be seen as a 'release valve' preventing negative publicity or sustainability problems that adversely affect existing business organizations.	Popular support to the extent that existing structures are incapable of addressing important sustainability needs.

Source: Montiel and Ceranic (2015)

According to De Block (2018), adaptation to climate change can be achieved by "soft" and "hard" practices. "Soft" measures usually concentrate on information, policy and institutions, while "hard" measures focus on physical and engineering solutions (Jones, Hole, & Zavaleta, 2012).

Ecosystem-based practices to climate change adaptation employ ecosystem services to facilitate adaptation to climate change. Ecosystem-based measures, especially if combined with engineering and technological solutions, may ensure the safety of populations and the ecosystems (Intergovernmental Panel on Climate Change, 2014).

Two approaches may be used to formulating proper responses to climate change - the top-down approach and the bottom-up approach. The top-down approach concentrates on governments and corporations, whereas the bottom-up approach centers on entrepreneurs (Embry, Jones, & York, 2019). It is advisable that the two approaches be jointly employed in order to maximize their advantages and minimize their disadvantages.

Based on the Deloitte Sustainability Risk Management Framework, Deloitte (2020) outlined four steps in the process of finding appropriate entrepreneurial solutions to the climate change problem - Strategy alignment, Identification and prioritization

of key climate-related risks and opportunities, Development of actions to mitigate risks and realize opportunities and Communication of climate-related risks and opportunities.

Two strategies may be employed to address the climate change challenge: first, mitigation of causes of climate change and second, adaptation to climate change effects (Oraftik et al., (2021). It is recommended that the two strategies be combined for achieving optimum results.

According to Resch and Gao (2022), entrepreneurial (business) response to climate change addresses two types of risks - physical risks and transition risk. These risks have sector-specific manifestation and require sector-specific measures.

Food for thought:

What is a green innovation?

What makes a business sustainable?

How to solve the climate change problem?

Case studies:

Case Study 1: Reactive measures – The Merchant’s Fish Bar

The Merchant’s Fish Bar in Bewdley is a well-established and successful SME. In November 2000, heavy rains resulted in the worst flooding for over 50 years along the River Severn and the town was severely affected. Merchant’s Fish Bar was flooded and the equipment in the chip shop damaged beyond repair. Unfortunately, their insurance policy excluded flood cover, and the business suffered a significant uninsured loss. As a reaction to this experience, the owner worked to adapt the shop during the refit, to take account of the flood risk. New fryers have been set on a hydraulic system, enabling them to be raised above flood level and the fridges are now all made from stainless steel, with the motors set at the top rather than the bottom. All equipment (except for the fryers) can now be removed before flooding occurs. In addition, the ducting for the ventilation system has also been sealed to prevent water finding its way in, which will have benefits even in the absence of a flood.

Source: Weathering the storm and saving money in a changing climate (2010). West Midlands Climate Change Adaptation Partnership.

Case Study 2: What functionality and instruments in addressing the climate impact on SMEs does The UKCIP’s Business Areas Climate Impacts Assessment Tool brings?

The BACLIAT is an online tool vulnerability assessment was originally developed with UK businesses by the UKCIP, formerly known as the UK Climate Impacts Programme, which was based on the Environmental Change Institute at the University of Oxford. It is a workshop-based process to help a certain person to quickly consider the potential impacts of future climate change on her/his organisation. It can be used as a standalone tool, or as a step in a risk-based framework such as the Adaptation Wizard of the BACLIAT tool.

By working with one’s colleagues – the people who know an organisation best – one can draw on a range of knowledge and experience, raise awareness and generate buy-in to the adaptation process. The workshop will lead the person using the BACLIAT tool and participating in the workshop to:

- increased awareness of the range of threats and opportunities that climate change could bring, many of which will not have been experienced before ; and of

- a good idea of how climate risks are spread across different business functions.

Suggested work groups:

- an individual company
- a sector group
- a group of business managers from across several organisations.

Although primarily designed as a resource for business, BACLIAT can be used by other organisations, such as local authorities, with some minor amendments to the business function headings.

Background:

Although the climate will continue to vary from year to year, climate projections for the UK suggest that the following changes can be expected:

- higher average temperatures, particularly in summer and winter
- changes in seasonal rainfall patterns
- rising sea levels
- more very hot days and heatwaves
- more intense downpours of rain
- higher intensity storms.

It is important to be clear on the difference between weather and climate:

Climate describes the average weather over an extended period (usually 30 years). For example, in the UK, spring temperatures are generally warmer now than in the 30-year period 1961 to 1990.

Weather describes what is happening at any point in time, including high temperatures, rain, snow, sleet and high winds.

In most cases, it has been extreme and unusual weather that has affected businesses rather than the changes in climate experienced so far. The future could continue to bring variable weather with occasional cold winters or wet summers, but human-induced climate change may mean changing frequency of certain weather events, and changes in climate that could cause problems for some businesses.

A set of six generic business functions have been designed to be applicable to any type of business or sector. Under each there will be several potential threats and benefits arising from climate change – the workshop will uncover impacts specific to your business.

The workshop itself (How it should be organized according to UKCIP):*Beforehand*

Check the broad business areas are appropriate for your organisation or sector – you may wish to amend these to match your organisational structure. This will help when assigning responsibility for implementing adaptation measures later in the process.

Who to invite

Invite participants who represent different business areas, functions, locations and responsibilities etc. – the wider the range, the richer the output.

Running the workshop:

- Give yourself about an hour – larger companies or those with a wide variety of locations or activities may need longer.
- Make sure the group has an understanding of climate change impacts and adaptation, including an overview of common impacts and any particular information relating to your sector. See the Introductory presentation (presentation file, 1.9 MB) and sector examples for agriculture, building design & construction, financial services and motor manufacturing.
- Explain the purpose of the workshop. If you are planning to use it as a starting point for a climate risk assessment, explain where it fits into the bigger picture. See Step 3 of the Wizard, Future climate vulnerability.
- Provide participants with the headline climate change messages – slide 14 from the BACLIAT presentation (2.1 MB, presentation file).
- If you have information on your vulnerability to the current climate, provide participants with a summary.
- Explain what you will be doing and make it clear that all suggestions will be recorded, regardless of whether or not they are sensible.

- Encourage participants to think of past events that could become more frequent with climate change, as well as more imaginative suggestions of impacts that have not yet happened.
- Brainstorm potential future threats and opportunities for each business area, amended to suit your structure. Don't worry about ideas being captured under the 'wrong' headings, or about duplication – they can be tidied up later.

Outcomes:

Before you use the information:

- Remove duplicates.
- Change the business areas headings to suit your organisation, if you have not already done so. This allows risks to be assigned to the appropriate staff who can then be involved in further discussions.
- Re-write each impact so that it is clear what the climate variable is, where the impact will be felt, and what the business consequences are.
- If you have already made an assessment of your vulnerability to the current climate, combine the risks you've identified with those from the BACLIAT workshop. The result will be a list of climate risks that include past events, events that will continue to happen as the climate changes, and potential impacts that have not yet been experienced.

You may decide to complete a risk assessment to identify your priority climate risks – see Step 3 of the Wizard, Future climate vulnerability and the Risk assessment spreadsheet (Table 3.4 available at <https://www.ukcip.org.uk/wizard/future-climate-vulnerability/>). Make sure you are able to estimate the likelihood of the impact and its consequences from your information.

Important online sources for use of the BACLIAT tool:

Resources: the BACLIAT presentation (2 MB, ppt file) and the Risk assessment template, Table 3.4 from step 3 of the Wizard, spreadsheet file (xls, 50 KB) are available at: <https://www.ukcip.org.uk/wizard/future-climate-vulnerability/>

If you do not have the time or resources to run a full workshop, the spreadsheet-based Speed BACLIAT will help you to do a quick, desk-based risk assessment. Based on Steps 2, 3 and 4 of the Wizard, it uses example impacts and a partly automated report to generate information that can identify adaptation actions. (xls, 650 KB)

Source: <https://www.ukcip.org.uk/wizard/future-climate-vulnerability/bacليات/>

Case Study 3: The Queen Elizabeth Olympic Park

What happens to old Olympic stadiums, venues and villages? Most are retired to the dustbin of history, becoming expensive museum pieces to the glory of past Olympic Games. What if we could transform those spaces and the public funds used for the Olympics to something more? What if we could use the world stage provided by the Olympics to show these facilities can be efficiently and cost-effectively transformed into a sustainable space that provides the best of green technology, honoring the history of the Olympics while bringing the world into a sustainable future?

Beginning in 2005, when London learned they would be hosting the 2012 Games, the Olympic Delivery Authority (ODA) undertook the Herculean effort of preparing this East London site for the 2012 Olympics. They promised the most sustainable Olympic Games in history, and used the power of the world stage to make a difference lasting far beyond the 2012 Games.

Preparing the site required the demolition of existing structures, soil decontamination, installation of new **infrastructure** (basic structures and facilities necessary for the operation of an enterprise), and moving all utility cables from overhead to underground. Industrial, contaminated land became a flourishing new urban park in one of Europe's largest regeneration projects. The Queen Elizabeth Olympic Park is now a renewable, vibrant and sustainable oasis.

The Queen Elizabeth Olympic Park consists of 580 acres situated on the site of the 2012 Summer Olympic and Paralympic Games in East London. The park is owned by the London Legacy Development Corporation (LLDC), and they are making excellent progress toward creating a new heart of East London. The LLDC took over management of the park in 2016

and endeavors to create a fully sustainable park by 2030.

The park currently boasts 6.5 km of waterways, 15 acres of conservation green space, and 4,300 new trees. It offers sustainable living, and also cultural and theme-park entertainment. The QEOP employed more than 5,000 people (30 percent local) for its transformation, and produced 60 apprentices. By 2025, it is expected more than 15,000 jobs will be created in the park.

The point of the QEOP is to provide a desirable, sustainable, healthy and safe place to live. It offers varied activities, community activities and a wide variety of living situations, cultural diversity, and a space that has something for everyone.

The 2012 Olympic Games in London were the costliest in history, at \$14.8 billion USD. By comparison, the 2016 Olympic Games in Rio were estimated to be \$6.2 billion. It cost an estimated £700 million GBP to construct the Olympic Stadium in London. There were arguments over how much public money was put into the Olympic Park. However, the fulfillment of almost a dozen years of planning that has revitalized an area once an industrial wasteland makes that public expenditure an investment.

The LLDC has set an exemplary example of how to use public funds in a way that allows for the construction of all accoutrements of the Olympic Games, then reapplying all of those materials, funds and structures. The Queen Elizabeth Olympic Park has places for everyone to live, work and play. It offers a vision of how areas could be constructed from games-time facilities into a permanent sustainable community.

The transformative nature of the design over a 25-year plan, beginning in 2005 and spanning to 2030, is awe-inspiring. Walkways and **green spaces** (areas of vegetation set apart for specific purposes in an urban environment) allowing for breakout sessions and public spaces during the games have been transformed into streets that provide the park with a high-quality network of paths that are safe, contemporary and sophisticated. People walk and cycle around the area, use public transportation to access work, home, and a multitude of community activities promoting culture, local businesses, **conservation** (preservation and restoration of the natural environment), green spaces, **biodiversity** (a large and varied supply of organisms in an ecosystem) and human diversity.

Source: <https://study.com/academy/lesson/queen-elizabeth-olympic-park-environmental-case-study.html>

Activities

Title of activity: Face-to-Face & Online lectures	
Format: (face to face, online, hybrid)	Hybrid
Learning objectives	The learning objectives of this activity are: <ul style="list-style-type: none"> To understand the Climate System and the global warming; To acquire full understanding and awareness on the Climate Change Convention, Kyoto protocol and the Paris Agreement; To improve knowledge and understanding on how green entrepreneurships work and their added value for the management of the climate change; To transfer the knowledge and tools how to critically assess the opportunities in the development of a sustainability purpose for a business.
Material/equipment needed	Laptop and Multimedia projector for the Lecturer/Techer; PCs or mobile devices (smart phones / tablets) for the persons engaged in the training
Description of the activity	On place and online lectures of 30 hours (1 training hour is equal to 45 minutes). Each topic is being presented in 10 consequent lectures recorded also as a video lesson. By a decision of the lecturer/lecturers, the students involved in the activity can be divided in several small groups. Each student group can be assigned with a specific theoretical topic taking into account of the students' preferences. In regards to the assigned topic the students are to be asked to prepare and make a joint presentation on the selected topic in live or in a pre-recorded manner.
Debriefing questions	10 (See the list after Topic 3)

Allocated time	30 hours
How can this activity be adapted in a different format?	The recorded video lessons can be provided also in a text file as a collection of lecture notes.
Notes for the trainer/facilitator	The number of lecturing hours can be squeezed and reduced to 15 depending on the initial level of the persons engaged in the training

Title of activity: Personal assignment	
Format: (face to face, online, hybrid)	Online
Learning objectives	The learning objectives of this activity are: <ul style="list-style-type: none"> • To understand to connection between the concept of Sustainable development, the negative impacts of Climate change and the need for adequate response form the Business world in the face of the entrepreneurs; • To identify the negative impacts from a Climate Change to a particular business; • To provide a set of possible solutions for mitigating the negative impact of Climate change from an entrepreneur’s perspective
Material/equipment needed	E-mail mailing list; automated single educational and training platform working from a server; PCs or mobile devices (smart phones / tablets) for the persons engaged in the training
Description of the activity	Each of the person involved in the training is to be provided with an assignment that she/he is the owner / manager of a SME in the tourism/transport/entertainment sector in a town that has currently being hit and damage by severe storms / floods / costal waves. The student is asked to provide a concept of 500 words with a t least 3 (maximum 5 suggestions) how her/his business should react /should get prepared for suture menace of the similar kind? Does she/he think of suggesting a kind of a green innovation?
Debriefing questions	What is a green innovation? What makes a business sustainable? How to solve the climate change problem?
Allocated time	6 hours
How can this activity be adapted in a different format?	If applicable
Notes for the trainer/facilitator	

Title of activity: Role Game	
Format: (face to face, online, hybrid)	Hybrid (Online & Face-to-Face)
Learning objectives	The learning objectives of this activity are: <ul style="list-style-type: none"> • To learn how to be creative and generate new ideas for green innovations; • To learn how to use and apply some of the basic techniques for generating and assessing innovative ideas; • To provide a set of possible solutions for mitigating the negative impact of Climate change from an entrepreneur’s perspective
Material/equipment needed	E-mail mailing list; automated single educational and training platform working from a server; PCs or mobile devices (smart phones / tablets) for the persons engaged in the training
Description of the activity	A role game of 60 minutes, in which the persons involved in the training are being allocated to different groups of social actors: employees, employers (entrepreneurs), representatives of trade unions; representatives of local authorities, representatives of local communities, representatives of central authorities. The persons participating in the role game have to discuss the proposal for the building up of specific big infrastructure project (site): such as a highway, a dam, an airport, a trade centre with a parking area and etc. Each group of actors have to provide a number of pros and cons on the suggested infrastructural project. And each participant in a certain group has to provide one pro and

	one con on the project with a description of not more than 100 words for her/his arguments for or against the infrastructural project from the point of view of his membership in the particular group. The membership in a certain group is allocated by random choice of the educational platform.
Debriefing questions	What is a green innovation? What makes a business sustainable? How to solve the climate change problem?
Allocated time	2 hour (1 hour of group work) + 1 hour for presenting of the results for each group
How can this activity be adapted in a different format?	If applicable
Notes for the trainer/facilitator	

Further reading

Resource name	Type	Link
ACCIONA. (2021). 6 THINGS YOU CAN DO TO PREVENT CLIMATE CHANGE	Website	https://www.activesustainability.com/climate-change/6-things-you-can-do-to-prevent-climate-change/?_adin=02021864894
BACLIAT vulnerability assessment. (n.d.).	Online tool / Website/paper/book/video/e-course etc	https://www.ukcip.org.uk/wizard/future-climate-vulnerability/bacliat/
Thompson, J., & Scott, J. M. (2010). Environmental entrepreneurship: The sustainability challenge. Institute for Small Business and Entrepreneurship.	Book	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjelKpoLD6AhXOSvEDHeYfB6AQFnoECAsQAQ&url=https%3A%2F%2Fcore.ac.uk%2Fdownload%2Fpdf%2F322333054.pdf&usg=AOvVaw0eiUubMFbyxyKRNMPAlcO2
United Nations Framework Convention on Climate Change (2018). Energize entrepreneurs to tackle climate change. Addressing climate change through innovation.	Information material from a web site	http://www.unfccc.int/ttclear/tec/brief12.html
Drucker, P. F. (2001). The Essential Drucker. Routledge. doi:10.4324/978008093932	Book	doi:10.4324/978008093932
Bocci, M. C., & Murciano, C. (2017). Climate Change Impact on the Tourism Sector in the Southern Mediterranean - Foreseen development and policy measures, Final Report	Report	https://ufmsecretariat.org
Schumpeter, J. (1934). The Theory of Economic Development. Cambridge, Massachusetts: Harvard University Press	Book	https://www.hup.harvard.edu/catalog.php?isbn=9780674879904&content=toc
Drucker, P. (2002) The Discipline of Innovation	Information material from a web site	https://hbr.org/2002/08/the-discipline-of-innovation

Quiz

The correct answers are highlighted in bold:

Q1. Which of the following is **not** a feature of the entrepreneurship?

- a) risk taking b) creativity **c) financial oriented** d) innovations

Q2. The definition "It tries to obtain a practical monopoly in a small area." refers to the following entrepreneurship strategy:



- a) "Hitting them where they ain't"
- b) Changing the economic characteristics of a product, a market or an industry
- c) **Finding and occupying a specialized "ecological niche"**
- d) "Being Fastest with the Mostest"

Q3. Sustainable entrepreneurial practices in engineering are theoretically inspired by:

- b) Hayek
- b) Kirzner
- c) Schumpeter**

Q4. Sustainable entrepreneurial practices in construction are theoretically inspired by:

- a) Hayek
- b) Kirzner**
- c) Schumpeter

Q5. Sustainable entrepreneurial practices in bricolage are theoretically inspired by:

- a) **Hayek**
- b) Kirzner
- c) Schumpeter

Q6. The scale of sustainable entrepreneurial practices in engineering is:

- a) Large**
- b) Small
- c) Medium

Q7. To be considered an eco-friendly technology, the technology must use a sustainable source of energy and what?

- a) Get at least half of its energy from renewable sources
- b) Have an efficiency of 100%
- c) Must produce no net adverse effects on the environment**
- d) Last for at least 20 years

Q8. Which is NOT a characteristic of eco-friendly technology?

- a) Recycled or reused materials
- b) Reduction of greenhouse gas emissions and pollutants
- c) Low consumption and low-impact
- d) Only 70% of its energy is derived from fossil fuel sources**

Q9: The term "innovation" (Schumpeter, 1934) refers to either the entire process of creating a new product, new technology, new organization, new market opportunities, etc., or the end result - the same new product, technology, organization, etc. This is true or false?

- a) True;**
- b) False;

Q10. Which areas suffer from the negative impacts of Climate Changes on Economy and Society?

- a) Human settlements, industry, and infrastructure; as well as Human health, security, livelihoods, and poverty;**
- b) Financial markets and stock exchanges;
- c) Maritime trade;
- d) Scientific explorations;
- e) Entertainment and sports events.

References

- ACCIONA. (2021). 6 THINGS YOU CAN DO TO PREVENT CLIMATE CHANGE. Retrieved from ACCIONA:
https://www.activesustainability.com/climate-change/6-things-you-can-do-to-prevent-climate-change/?_adin=02021864894
- Ali, A., & Levie, D. J. (2019). Market-Driven Entrepreneurship and Institutions. *Journal of Business Research*.
 doi:10.1016/j.jbusres.2019.03.010
- Allen, M. R., Dube, O., Soleck, W., Aragón-Durand, F., Cramer, W., Humphreys, S., . . . Mahowald, N. (n.d.). *2018: Framing and Context. In: Global Warming of 1.5°C*. NY, USA: Cambridge University Press, Cambridge, UK.
 doi:https://doi.org/10.1017/9781009157940.003
- Auffhammer, M. (2019). The (Economic) Impacts of Climate Change: Some Implications for Asian Economies. *ADB's working papers*. Retrieved from
<https://www.adb.org/publications/economic-impacts-climate-change-implications-asian-economies>
- BACLIAT *vulnerability assessment*. (n.d.). Retrieved from UKCIP.org.uk:
<https://www.ukcip.org.uk/wizard/future-climate-vulnerability/bacليات/>
- Barot, H. (2015). Entrepreneurship - A Key to Success. *The International Journal of Business and Management*, 3(1), 163.

- Bloomberg Intelligence. (2021, 2 23). Retrieved from bloomberg.com:
<https://www.bloomberg.com/professional/blog/esg-assets-may-hit-53-trillion-by-2025-a-third-of-global-aum/>
- Bocci, M. C., & Murciano, C. (2017). *Climate Change Impact on the Tourism Sector in the Southern Mediterranean - Foreseen development and policy measures, Final Report*. The UfM Secretariat, Union for the Mediterranean with the support of the European Union.
- Bonney, L., Davis-Sramek, B., & Cadotte, E. R. (2016). "Thinking" about business markets: A cognitive assessment of market awareness. *Journal of Business Research*, 69(8), 2641-2648.
- Cooney, T. M. (2012). *Entrepreneurship Skills for Growth-Orientated Businesses*. Copenhagen: Workshop on "Skills Development for SMEs and Entrepreneurship".
- Crimmins, A., Ziska, L., & Garofalo, J. (2014). Food Safety, Nutrition, and Distribution. In USGCRP, *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (pp. 189–216). Washington, DC: U.S. Global Change Research Program.
- De Block, D. (2018). *Entrepreneurship in Ecosystem-Based Adaptation to Climate Change*. Berlin. Retrieved from
<https://www.proquest.com/openview/26f1a6c3efc6f816d4d99166009e2296/1?pq-origsite=gscholar&cbl=2026366&diss=y>
- De Block, D., Feindt, P. H., & van Slobbe, E. (2019). Shaping conditions for entrepreneurship in climate change adaptation: a case study of an emerging governance arrangement in the Netherlands. *Ecology & Society*.
 doi:<https://doi.org/10.5751/ES-10310-240119>
- Deloitte. (2020). *Climate Change and Business. Responding to the pressing crisis*. Retrieved from deloitte.com:
<https://www2.deloitte.com/content/dam/Deloitte/my/Documents/risk/my-risk-sustainability-risk-climate-change-business.pdf>
- Development, T. W. (1987). *The World Commission on Environment and Development Report*. New York: United Nations.
- Diandra, D., & Azmy, A. (2020). Understanding Definition of Entrepreneurship. *Journal of Management Accounting and Economics*, 7(5), 236.
- Drucker, P. (2002, November 19). *The Discipline of Innovation*. Retrieved from Harvard Business Review:
<https://hbr.org/2002/08/the-discipline-of-innovation>
- Drucker, P. F. (2001). *The Essential Drucker*. Routledge. doi:10.4324/9780080939322
- Embry, E., Jones, J., & York, J. (2019). Climate change and entrepreneurship. In *Handbook of Inclusive Innovation* (pp. 377-393). Edward Elgar Publishing.
- EPA. (2022). *Climate Impacts on Agriculture and Food Supply*. Retrieved from Climate Change:
<https://climatechange.chicago.gov/climate-impacts/climate-impacts-agriculture-and-food-supply>
- European Commission. (2009). *European Qualification Framework for Life-long Learning*. European Commission, Education and Culture. Luxemburg: Department of official publications of the European Union. Retrieved from
https://ec.europa.eu/ploteus/sites/eac-efq/files/broch_bg.pdf
- European Environment Agency. (2007). *The pan-European environment: glimpses into an uncertain future. EEA Report No 4/2007*. Copenhagen: European Environment Agency.
- EY. (2021). *The future of sustainability reporting standards*. Retrieved from
https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/sustainability/ey-the-future-of-sustainability-reporting-standards-june-2021.pdf
- Food and Agriculture Organization of the United Nations. (2009). *The State of Food Insecurity in the World. Economic Crises & Impacts and Lessons Learnt*. Rome: FAO .
- Guo, J., Kubli, D., & Saner, P. (2021). *The economics of climate change: no action not an option*. Zurich: Swiss Re Management Ltd.
- H. Kaur, A. B. (2013). Understanding the Concept of Entrepreneur Competency. *Journal of Business Management & Social Sciences Research*, 2, 31-33.
- Hessels, J., & Naudé, W. (2019). The Intersection of the Fields of Entrepreneurship and Development Economics: A Review towards a New View. *Journal of Economic Surveys*, 33(2), 389-403.
- History. (2008). Climate Change History. Retrieved from
<https://www.history.com/topics/natural-disasters-and-environment/history-of-climate-change>
- Intergovernmental Panel on Climate Change. (2014). *Adaptation Needs and Options. In Climate Change 2014 – Impacts, Adaptation and Vulnerability*. Cambridge University Press. doi:10.1017/CBO9781107415379.019
- IPCC, B. (n.d.). What is the Paris Agreement and What's the Science Behind it? Retrieved from
https://becauseipcc.thesuccession.ca/what-is-the-paris-agreement-and-whats-the-science-behind-it/?gclid=CjwKCAjw11CZBhAzEiwAFvFhAjuVwYvfpZzRp0LyDdtXfsulZnhSArx7FcPGXyam8GpwelrXJGZRBocJL8QAvD_BwE
- Jinjiang, H., Nazari, M., Yingqian, Z., & Ning, C. (2020). Opportunity-Based Entrepreneurship and Environmental Quality of Sustainable Development: a Resource and Institutional Perspective. *Journal of Cleaner Production*.
 doi:10.1016/j.jclepro.2020.120390
- Jones, H. P., Hole, D. G., & Zavaleta, E. (2012). Harnessing nature to help people adapt to climate change. *Nature Climate Change*, 504-509.
- Kalyan, N. B. (2018). Features of Entrepreneurship in India. *International Journal of Research*, 5(1), 3756.
- Keystone, L. G. (2022, June 3). 'Greening' of the Alps is visible from space. Retrieved from SWI swissinfo.ch:
<https://www.swissinfo.ch/eng/-greening-of-the-alps-is-visible-from-space/47645516>
- Kirzner, I. M. (1973). *Competition and Entrepreneurship*. Chicago: University of Chicago Press.
- Marchant, N. (2021, June 28). *This is how climate change could impact the global economy*. Retrieved from World Economic Forum: <https://www.weforum.org/agenda/2021/06/impact-climate-change-global-gdp/>
- Maritz, A., & Donovan, J. (2015). Entrepreneurship and Innovation. *Education + Training*, 57(1), 74-87.
- Montiel, I., & Ceranic, T. (2015). Chapter 8: *Cooking up solutions for climate change: the role of sustainable entrepreneurs*. *Handbook of Entrepreneurship and Sustainable Development Research*. Cheltenham. Edward Elgar Publishing.
- Nambisan, S. (2016). Digital Entrepreneurship: Toward a Digital Technology Perspective of Entrepreneurship. *Entrepreneurship*



- Theory and Practice*, 41(6), 1029–1055.
- NI-CO. (n.d.). <https://www.inovatif.eu/wp-content/uploads/2020/04/Entrepreneurial-Skills.pdf>. Retrieved from <https://nico.org.uk/>.
- Oraftik, C., McGregor, C., Guttentag, M., & Hume, V. (2021). *Climate Entrepreneurship in Developing Economies: Supporting Entrepreneurs Tackling Climate Change*. Retrieved from <https://www.andeglobal.org/wp-content/uploads/2021/03/Climate-Entrepreneurship-in-Developing-Economies.pdf>
- Projects Archive. (2020). *Global Innovation Lab for Climate Finance*. Retrieved from <https://www.climatefinancelab.org/project/>
- Ratten, V., & Usmanij, P. (2020). Entrepreneurship education: Time for a change in research direction?. *The International Journal of Management Education*. doi:10.1016/j.ijme.2020.100367
- Rebecca, G., Andrew, B., & Matthias, R. (2011). Social and economic impacts of climate change on the urban environment. *Current Opinion in Environmental Sustainability*, 3(3), 150-157. doi:<https://doi.org/10.1016/j.cosust.2010.12.009>
- Resch, E., & Gao, J. (2022). *Climate Change: Business Risks and Opportunities - The Role of Private Sector Adaptation*. Retrieved from unepccc.org: <https://unepccc.org/wp-content/uploads/2022/04/climate-change-business-risks-and-opportunities-the-role-of-private-sector-adaption-web.pdf>
- Schumpeter, J. (1934). *The Theory of Economic Development*. Cambridge, Massachusetts: Harvard University Press.
- Stevenson, H. H., & Jarillo, J. C. (1990). A Paradigm of Entrepreneurship: Entrepreneurial Management. *Strategic Management Journal*, 11, 23.
- Thompson, J., & Scott, J. M. (2010). Environmental entrepreneurship: The sustainability challenge. *Institute for Small Business and Entrepreneurship*.
- Timmons, J. A., & Spinelli, S. (2004). *New Venture Creation Entrepreneurship for the 21st Century* (6th ed.). McGraw-Hill.
- United Nations. (2022, September 22). *Millenium Development Goals and Beyon 2015*. Retrieved from United Nations: <https://www.un.org/millenniumgoals/poverty.shtml>
- United Nations Framework Convention on Climate Change, T. E. (2018). *Energizing entrepreneurs to tackle climate change Addressing climate change through innovation*.
- USDA. (2022, February 24). *What is agriculture's share of the overall U.S. economy?* Retrieved from Economic Research Service: <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=58270>
- Wade, K. (2016). *The impact of climate change on the global economy*. Retrieved from Schrodgers: <https://prod.schrodgers.com/de/SysGlobalAssets/digital/us/pdfs/the-impact-of-climate-change.pdf>
- Wuebbles, D., D.W. Fahey, K. H., Dokken, D., Stewar, B., & Maycoc, T. (2017). *Climate Science Special Report: Fourth National Climate Assessment. Global Change Research Program*. Washington, DC, USA: USGCRP.
- Zahra, S. A., Gedajlovic, E., Neubaum, D. O., & Shulman, J. M. (2009). A typology of social entrepreneurs: Motives, search processes and ethical challenges. *Journal of Business Venturing*, 519-532.
- Zwell, M. (2000). *Creating a Competency*. New York.

