



A Transdisciplinary Perspective about Climate Change: A Case of Portugal

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Short Letter

The theme of climate change can be studied in several areas of knowledge, namely psychology, science and technology, economy and politics [1], [2], [3], [4]. We will discuss this topic as it relates to all countries of the world [5] using Portugal as a case study. We shall highlight the interconnection between biological systems [6] as it affects the sustainability of the planet Earth [7].

In psychology [8], climate change is perceived as an “existential threat” [9] due to its strong impacts on societies in general, and thus needs to be analyzed through different perspectives [10]. Doherty e Clayton [11] identified three classes of psychological impacts of climate change: direct impacts like environmental catastrophe; indirect impacts like future risks; and psychosocial impacts like migration, post-disaster adjustment or political conflicts.

Regarding the first class of psychological impacts [12], Carl Jung’s considers that the human psyche functions in the same way as natural systems. He stated that the environmental crisis (climate change) reflects the state of the human psyche, and thus is part of nature [13]. Through his theory of archetypes, he states that man is connected to nature and the manipulation of natural environments, by the western society, is parallel to the repressive attitude of the conscious ego to the unconscious, non-rational and intuitive parts of the psyche itself [14]. When we try to manipulate the external environment without respecting it, it will respond with a negative climate change. If we ignore or manipulate instinctive psychological functions, they return in the form of neurotic systems. With the principle that what is wrong in the world is also in human beings, the author emphasizes that in order to try to solve everyday problems, human beings have to be aware of their “shadow”, which involves recognizing the darker aspects of our personalities. By denying its existence, it will have consequences not only on some individuals but also the entire world.

Regarding the second class of psychological impact, the American Psychological Association, APA [15], through its most recent report about the impacts of the environmental crisis on the mental health of people, identified that the psychological effects of this crisis can include trauma, post-traumatic stress, feelings of anxiety and can lead to behavioural risks associated with suicide. These changes can also generate disorientation, low performance at work, in addition to harming the self-esteem and interpersonal relationships of people. The most serious thing is these changes can lead to loss of personal identity [16].

The third class of psychological impact includes migrations caused by these changes which can generate conflicts between groups, political conflicts or even terrorism [17]. To battle climate changes, resilience is suggested as the most important solution in this report. Human beings must develop this ability to overcome their problem. People should be encouraged to be optimistic, to build up their social relationships and strengthen their mental health. From a community perspective, it is suggested that there is need for the reinforcement of mental health professionals in institutions, development of social programs to support the community, as well as publishing of policies to help mitigate these climate changes.

In Portugal, the community of psychologists is aware of this issue and has been creating guidelines and strategies to promote greater awareness of climate change effects, which are in line with what the American Psychological Association introduced. In 2019, the Ordem dos Psicólogos Portugueses, OPP (Portuguese Psychological Association) organized the “The International Summit on Psychology and Global Health: A Leader in Climate Action” [18], in partnership with APA. The role of psychology and psychologists in the face of a climate crisis was discussed in this event, as well strategies for changing the society’s behaviour to minimize existing climate change [19].

In the area of science and technology [20], the manufacturing of oil, steel, cement and plastic materials followed by electricity, agricultural production and transport has contributed greatly to the global climate change. Bill Gates [21] calls “Green Premiums” the costs necessary to change the energetic economy based on “dirty” technologies that emit large amount of carbon dioxide in relation to other energetic resources where the energy comes from zero-carbon sources, such as wind turbines and solar panels.

Furthermore, the science divulgator David Attenborough [22] adds that since the 1950s, the human species has entered the so-called “Great Acceleration”, a result of Anthropocene [23]. Thus, the finite natural resources that we have available in nature need to be used equitably by human beings, according to the 17 Sustainable Development Goals (SDG) of the United Nations, namely goal 6 (“Clean Water and Sanitation”), goal 7 (“Affordable and Clean Energy”), goal 11 (“Sustainable Cities And Communities”) and goal 13 (“Climate Action”) [24].

In this regard, the report of the Intergovernmental Panel on Climate Change (IPCC) [25], [26] provides the potential future risks due to global warming caused by the process of deforestation in the Amazon Basin, the excessive use of plastic residues, pollutants linked to oil that contribute to the emission of carbon dioxide, nitrous oxide from burning coal. Peter Wadhams [27] defend that these situations could trigger a series of feedbacks, such as changes in the Jet Stream, warmer rivers, forest fires, loss of the Buffer Effect, loss of Albedo, methane in Marine Milk, among others [28]. These topics were part of the Climate Summit Agenda, COP-26, that took place in Glasgow, in November 2021.

Talking about climate change in Portugal, there is a progressive extinction of jobs linked to fossil fuels, such as the Galp refinery, in Matosinhos, which closed in 2021. In fact, EDP, Galp, Martifer and Vestas [29] are creating a “green hydrogen” industrial cluster in Sines – H2Sines – through a 10 MW pilot project. They aim in the future to reach 1.5 GW of renewable electricity generation capacity to supply electrolyzers. This group consisting of several companies is applying for the Projecto de Importância para o Interesse Comum Europeu (Project of Importance for the Common European Interest) (IPCEI). Portugal already closed the Sines coal plant in 2021, and the Pego plant has just closed too. Pedro Amaral Jorge [30], president of the Portuguese Association of Renewable Energies (APREN), justifies the replacement of coal by clean technologies because the emission of a ton of CO₂ generates a cost of about 40 Euros, while the current price of renewable electricity (wind and photovoltaic) is less than 30 Euros per MW/h. Furthermore, since 2005, the European Trade in Emission Licenses (CELE) created an allocation of licenses based on the most efficient facilities, which is already having a positive impact on the Portuguese industries [31].

Thus, Carlos Abreu [32], manager of the Portuguese cement company called Secil is also implementing a project called “Clean Cement Line” which aims to reduce CO₂ emissions by 20%. From 2031 onwards, the cement sector will have to pay a fee for each kilo of CO₂ emitted. So, currently cement companies are decarbonizing in order to have in the future lower costs in purchasing Emission Licensing, and therefore lower production costs.

Most positively, the Iberian Peninsula, of which Portugal is one part, is the region in Europe with the

greatest renewable potential at wind and solar level [33]. For example, for several years, Portugal has used wind energy, both on onshore (on land) with the Lamego, Marão, Serras de Alvéolos and Larouco, Fonte dos Mosteiros projects, as well as, offshore (on sea) with the Windfloat Atlantic project at Viana do Castelo, in accordance with the National Energy and Climate Plan (NECP). Since 2020, the Levelized Cost of Electricity (LCOE) of the photovoltaic has also become a complementary energy source to wind power, as its energy efficiency has increased and photovoltaic equipment has become increasingly cheaper. In Portugal, currently 60% of electricity consumption comes from renewable sources, with the goal of reaching 80%, in 2030.

However, the Roadmap for Carbon Neutrality (RNC2050) [34] suggests that the advanced technologies in carbon capture and logistic distribution need a better management of natural resources in order to be implemented on a large scale throughout the Portuguese territory. For example, there is need for the Portuguese Government to make a better use of forests (one of the main elements of CO₂ storage) and agriculture waste (soil fertilizer) through the financial resources available and it should be under the supervision of scientific experts.

In this regard, the researcher Pedro Matos Soares [35], from the Faculdade de Ciências, University of Lisbon, has been involved in projects on the effects of global warming in Portugal - the SIAM I and II Reports, in 1999 and 2006, respectively. Currently, through financing by the European Economic Area Financial Mechanism (designated by EEA Grants), he leads a new investigation that studies the main climatic impact in Portugal, namely coastal areas, water resources and the agroforestry sector, with the participation of Banco de Portugal (Bank of Portugal) in order to study the impacts of climate change on the Portuguese macro economy.

So, the demand for new “green jobs” in the field of Renewable Energies is expected to increase in the future in order to achieve carbon neutrality in 2050 [36]. Currently, the largest engineering schools in Portugal are already teaching courses in this area of expertise as a response to the great demand of these specialists. In fact, Portugal is already exporting know-how on “green electricity” to Northern Europe and in the last 5 years has grown 40% in national market, with a strong potential for future growth.

Furthermore, the Portuguese Government has defined 2040, as the target year in which Portuguese people will leave vehicles on combustion engines and electric together with biodiesel vehicles will be used preferably through a new urban policy [37]. There are some research studies that show that air pollutions coming from fuel combustion, industrial processes and climate change are closely linked, as defended by Francisco Ferreira, the president of Zero - Associação Sistema Terrestre Sustentável (Sustainable Terrestrial System Association) [38]. This perspective is supported by the Pacto de Autarcas para o Clima e Energia (Covenant of Mayors for Climate and Energy) [39] that aims to reduce 40% of greenhouse gases (GEE) until 2030, having had the adhesion of several Portuguese municipalities. Also some investigations carried out by Sofia Vaz [40] show that between 2002 and 2016, it tripled the percentage of the Portuguese population that used Wastewater Treatment Plants for the treatment of domestic waste in Portugal. Nevertheless, currently Portugal only recycles 57% of solid waste (packaging, plastic bags, and so on) while the European average is around 70%.

The economist Sofia Santos [41], a specialist in green and climate finance, defends the introduction of the ethical agent into the economic model, so as to incorporate the happiness of others into our own well-being. So, nationally and worldwide, these are some challenges to be faced in order to implement the objectives of the Paris Agreement and the Action Plan of the European Commission for sustainable growth.

In synthesis, a balance between people’s well-being and the development of economy with environmental concerns should be encouraged, so that the effects of climate change [42] might not be an irreversible problem for future generations [43], [44], in terms of their psychological, social and physical well-being, as defended by several environmental activists, such as, Greta Thunberg.

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