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ACHIEVEMENT OF THE SUSTAINABLE DEVELOPMENT GOALS (SDG) IN PORTUGAL AND FORECAST OF KEY INDICATORS UNTIL 2030

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Abstract. In the current economic, social and political context, maintaining a stable trajectory of sustainable development, and thus achieving the UN Sustainable Development Goals, must be the central objective of every European country. The aim of this paper is to evaluate the level of achievement of the Sustainable Development Goals (SDGs) in Portugal, given that there were no similar published studies. The data used in the research was compiled from European Statistical Office – Eurostat, from 2007 until the most recent reports, and were processed and interpreted based on dynamic indices and time series forecasting (ARIMA model). Research results predict 57.50% achievement of the SDG targets, placing Portugal in the ranks of EU countries with high performance in terms of sustainable development and transition to a low-carbon economy.

Keywords: sustainable development goals (SDG), Portugal, sustainable development, SDG indicators, 2030 Agenda for Sustainable Development.

JEL Classification: Q01, Q56.

Introduction

The need to implement sustainable changes in human actions of all kinds is a pressing necessity in today's society. The identification of the dangers affecting human existence in the long term, those directly linked to climate warming, economic, social and environmental instability, as well as those generated by COVID-19 pandemic on a global scale, make the

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sustainable development goals of the UN's 2030 Agenda for sustainable development real global strategic priorities (United Nations, 2015).

To be or not to be in line with the global priorities set by the 2030 Agenda is no longer an option today. This is why the permanent identification of the current state of implementation of the Sustainable Development Goals (SDG) at the level of each country, as well as the risks that may affect the sustainable development of society and economy, be-come concerns, concrete actions that specialists and responsible bodies undertake.

In this respect, the current findings of regional and international political bodies are not encouraging, because after about a decade of action to implement the SDGs, humanity is in the midst of a crisis, which in many cases reduces decades of progress to zero. This is because, in some areas, the world is becoming poorer, inequalities are inevitable, especially for women and children, and the planet is clearly affected by the climate crisis but also by the current global pandemic situation.

To respond to these challenges, we are identifying common views of responsible decision-makers, who are increasingly promoting the idea of joint, innovative actions to implement the responsible strategies of the 2030 Agenda, as well as renewing the global commitment to the sustainability of the planet through solidarity and international cooperation involving all countries of the world (United Nations High Commissioner for Refugees, 2020).

In this context, like most countries in the world, Portugal is one of the European countries that have supported from the beginning the sustainability of domestic actions, implementing measures of the necessary measures to protect the environment and support the sustainable development (High-Level Political Forum… [HLPF], 2021).

In fact, Portugal, through the strategies implemented, is one of the countries that attaches particular importance to joint actions between governmental and public institutions, at local and national level, with the involvement of civil society in this process. Moreover, the importance of raising public awareness through the interventions of non-governmental organizations, academic circles and local authorities has led to full transparency of actions and measures to achieve the goals of the 2030 Agenda. Moreover, the pre-existing social and political structures for sustainable development and strong political support, combined with the active involvement of civil society, have enabled Portugal to achieve most of the SDG targets (European Environment Agency, 2021; Ministry of Foreign Affairs [MoFA], 2017).

Portugal has been and remains a vocal supporter of the implementation of the SDGs and is working hard to achieve the targets. Moreover, Portugal has defined its strategic objectives with regard to the SDGs, prioritizing SDGs 4, 5, 9, 10, 13 and 14 placing great importance on training, education and improving lifelong skills and competences. In this way, Portugal seeks to close existing gaps with the European average, with direct positive effects on people's well-being and the promotion of equality and social cohesion, as well as on increasing economic performance, reducing poverty and protecting the environment.

It is worth mentioning that on June 7 2019 the Portuguese Parliament declared cli-mate emergency, which opens new perspectives on the measures that could be adopted. During the rotating EU presidency from January-June 2021, Portugal's priorities were centered on the resilience, social, green, digital and global pillars, putting climate emergency at the top of the agenda.

We thus identify concrete measures that have supported the achievement of the SDGs, but also specific actions that have contributed to combating the serious effects of the COVID-19 pandemic on the economy, the environment and society, such as mainly: Application of temporary support measures for vulnerable persons and protection of the elderly and pensioners (SDG1); Adoption of measures to maintain jobs directly contributing to the elimination of hunger, establishment of the "Council for Food Security and Nutrition in Portugal" (CONSANP) and the definition of a national found and nutrition strategy to meet SDG2; extending access to health services nationwide to all citizens, regardless of their status, thereby contributing to achieving SDG 3 and SDG 10 targets; Supporting businesses, workers and families who have been affected by restrictions on economic activity (SDG 8); Increasing the efficiency of the justice system and ensuring access for all (SDG 16); Building a strong and coherent anti-corruption framework and promoting non-discrimination, anti-racism and anti-discrimination laws (2021–2025) (HLPF, 2021; MoFA, 2017; UN Women, 2021).

Portugal's actions towards the three strategic pillars of decarbonisation of the economy and society, wider implementation of circular economy principles and improved coastal zone management and protection (SDG 13), increasing the efficiency of production processes and leading to increased resource efficiency and cost reduction (SDG 12), should also not to be neglected. In Portugal, renewable energy currently covers around 60% of electricity generation, with 2021 being the end of coal-fired power plants (HLPF, 2021; MoFA, 2017).

We also highlight that the Portugal's new cooperation strategy for 2021–2023 has been designed and implemented in line with the 2030 Agenda for Sustainable Development, demonstrating openness to new partnerships and improving existing ones. Through this strategy, Portugal aims to make full use of all funding opportunities available at EU and international level, involving the private sector in this process (SDG17). Moreover, in 2020, Lisbon will host the second UN Ocean Conference, aiming to support the implementation of the SDG14, as well as finding the best solutions to the specific problems, which will certainly contribute to accelerate the process of achieving the specific targets (HLPF, 2021; Statistics Portugal, 2021).

Based on these findings, the present paper provides additional knowledge on the current state of implementation of the SDGs in Portugal, as well as the forecast of their evolution, being a relevant step in identifying the key points in achieving the 2030 Agenda targets, particularly the less positive ones and for which measures, actions for change and transformation of unfavorable elements into opportunities for sustainable development of the economy, society and the environment can be identified.

1. The current state of achievement of the SDGs in Portugal

Portugal, like most countries in the world, has understood and acted to implement sustainable growth strategies, playing an active role within the European Union, in particular in giving greater attention to peace, security and good governance issues and supporting fragile states, promoting the conservation and sustainable use of the world's seas and oceans, and supporting all aspects of human rights, inequality reduction and gender issues (HLPF, 2021).

In fact, Portugal has supported and continues to support the scaling up of measures to implement the SDGs, promoting a clear division of responsibilities between the public sector

and private companies, as well as between developed and developing countries, by encouraging cooperation between different stakeholders at global, regional and national level.

Highlighting the role played by Portugal at European and global level in implementing the 2030 Agenda targets is supported by the results it has achieved over the last period of time, results highlighted through the global SDG indicators, which provide an overview of Portugal's progress towards the 2030 Agenda. The results capturing Portugal's achievements in reaching the 2030 Agenda targets are captured in the report "Agenda 2030 Indicators for Portugal 2010/2020" by the National Institute of Statistics Portugal, which was based on a number of 44 relevant indicators (MoFA, 2017).

Therefore, in order to respond to the purpose of our research, which is to identify the likelihood of achieving the specific targets of the 2030 Agenda, we will analyze below the status of Portugal's achievement of the 17 SDGs.

SDG1 – No Poverty. For Portugal, reducing poverty levels has been a priority because poverty has complex effects on society, from access to decent housing, education and quality health services, to access to decent work with effects on personal development.

Thus the risk of poverty in Portugal in 2019 included around 1.7 million people, even though a number of social protection measures have been implemented to reduce the risks arising for people of the 3rd age, those with disabilities, unemployed or in other unfavorable situations. Statistically, 16.23% of Portuguese residents were at risk of poverty in 2019, a decrease of 3.3 percentage points compared to 2014 (MoFA, 2017).

Worryingly, in Portugal, children were the group of population most at risk of poverty in 2019, when 19.11% of those population under 18 years old were at risk of poverty, compared to 14.92% of the labor force population, or 17.53% of those over retirement age. It is worth noting that Portugal has some-what reduced this at-risk-of-poverty threshold for children compared to 2012 and 2014, when it was 24.4% and 24.8% respectively (MoFA, 2017).

It is also worth noting that the risk of poverty affects the male and female populations in different ways, with 16.7% for women and 15.6% for men in 2019. It should also be noted that the risk of poverty also affects the employed population in Portugal (9.5% in 2019). In addition, in 2020, 35.7% of all unemployed jobseekers received unemployment benefits (30.6% in 2019), and among them, unemployed women (54%) prevailed over men (46%). Although public expenditure on health, education and social protection is considered particularly important in total government expenditure in Portugal, its relative share peaked in 2019 (65.5%), 1.1 pp more than in 2018. On the other hand, between 2010–2019, the figures for this indicator have always been consistently lower in Portugal compared to other EU Member States (MoFA, 2017).

There are also researchers who approach the issue of poverty from the perspective of access to fuel for heating/cooling homes, and this is one of the issues that countries like Portugal and especially those in southern Europe need to consider in the context of global warming and all the negative effects that the economies of these countries can face. In these countries, future climate change, in particular the intensification of heat waves, has a significant impact on people's health but also on the provision of fuel for cooling/heating homes, especially for the poor (Simoes et al., 2016; Pye et al., 2015).

According to Arnold and Farinha Rodrigues (2015), "Portugal has one of the most unequal distribution of income in Europe", while poverty levels for some categories are at high levels. Factors such as unemployment, the tax system, the progressive tax system, tax reforms, non-pension benefits, generate inequalities and affect poverty significantly.

Through the measures and adjustments implemented, Portugal can also significantly reduce its poverty rates by the 2030's. Through an education system that contributes to the reduction of school drop-out rates, offering more vocational training courses and improving adult education can increase the income-generating capacity of households and also encourage a more equitable distribution of income in Portuguese society (Rodrigues & Andrade, 2014; Alves, 2012).

SDG2 – Zero Hunger. From the perspective of this goal, we take into account that all countries of the world are aiming for the total elimination of hunger and malnutrition globally, which is reflected in a series of actions focused on nutrition, food security, agriculture and biodiversity. There are a number of linkages and interactions between these actions, which need to be addressed in a systemic way, thus meeting the sustainable requirements of food systems sustainability as also set out in the EU's "From farm to fork" strategy (Custodio Cerezales, 2020; Development Initiatives Poverty Research, 2020).

From the perspective of developed country economies, this indicator focuses on tar-gets for sustainable agricultural practices and improved living conditions in underdeveloped and emerging economies. Therefore, for developed countries, SDG 2 is mainly concerned with inadequate dietary intake of the population, which is increasingly sedentary, which is why we identify a growing proportion of people as overweight or obese.

This is worrying for Portugal, as in 2019, 53.6% of the total population above 18 years old were overweight or obese. Moreover, obesity adversely affects the lives of 1.5 million Portuguese over 18 years (representing 16.9% of total population), affecting a higher proportion of the female population than the male population. This is why Portugal's efforts must be directed towards organic and food production that combines best environmental practices with a high level of biodiversity, conservation of natural resources, high animal welfare standards and the supply of chemical-free or processed products. In 2019, Portugal had 5.32% organic production of the total agricultural production area (MoFA, 2017).

SDG3 – Health and well-being. Regardless of a society's level of development, health and well-being are central elements of any society, and ongoing action to prevent disease and promote health has a direct impact on well-being (Alves et al., 2020; Ionescu et al., 2020).

According to OECD data, Portugal ranks below the European average on a number of measures of well-being. These findings, which provide information on the health index of people, especially older people, can help Portugal in developing people-centered health systems where people's lives and well-being can be improved (OECD, 2020; Brandão et al., 2018).

In the same sense, Portugal, by creating the National Health System as early as 1979, has sought national coverage of the health system by implementing the measures recommended by the World Health Organization accompanied by examples of good practice in the field through the periodical preparation of national health plans.

However, in Portugal there are a number of issues that support a high mortality rate, such as in 2019, 288.5 people per 100,000 inhabitants aged between 30 and 70 years died due to cardiovascular diseases, cancer, or diabetes. The first two mortality groups accounted for more than half of all deaths in Portugal, and between 2010 and 2019 the mortality rate attributed to these diseases for the age range mentioned increased by 5.7%. In addition, in 2019, there were more than 55,000 doctors certified by the Portuguese Medical Association, representing an average of 5.4 doctors per 1,000 inhabitants, the highest value in the 2010–2019 period (MoFA, 2017).

SDG4 – Quality education. For Portugal, guaranteeing the right to quality education for all stages of schooling, including improving reading and mathematical skills, as well as the right to vocational training are essential elements of sustainable development.

From this point of view, Portugal has seen increases for each cycle of education, with completion rates in 2018/2019 of 97.9%, 96.2% and 94.2% respectively. In addition, the proportion of students who graduated was 86.9% in the 2018/19 school year, 6.2 pp. higher than in 2009/10. Moreover, in terms of ICT use in 2019, 52% of the population aged 16–74 proved to have digital skills at least at a basic level, 4 percentage points more than 5 years ago (48%).

However, digital skills diffusion in Portugal for 16–74 year olds in 2019 continued to be lower than the EU27 average (56%). On the other hand, for 16–24 year olds, a percentage of young Portuguese people with digital skills equal or better than basic level is identified with a positive difference of 10 percentage point in 2015 and a positive difference of 8 percentage points in 2019 compared to the EU average (MoFA, 2017).

Formal e-learning programs can also provide an effective alternative to face-to-face physical training, allowing young people and others to continue their studies in a flexible and interactive manner, while employed full time. In this sense, educational models through e-learning tools and methods can contribute and play a major role in the transition towards sustainable societal models, with great relevance to lifelong learning (Azeiteiro et al., 2015; Farinha et al., 2018).

Equally important for Portugal is the issue of the main benefits of innovation development process and knowledge management. It is important to adopt measures to ease and encourage the patent registration process and also to take advantage of the results of investments already made in research and development to increase the efficiency of production processes and reduce related costs. Therefore, Portuguese engineering should focus more on product design than managing production processes, thus meeting the 2030 Agenda targets in an easier and faster way (Santos et al., 2019; Włodarczyk et al., 2018).

SDG5 – Gender equality. As we now see in Portugal an improvement in labor market dynamics, rising employment and a reduction in income distribution inequalities, we also see a reduction in the gender gap in employment and precarious work is also reducing. however, this current trend cannot be interpreted as progress in terms of improving gender equality, as this development is accompanied by an increasingly vulnerable position of the male population, due to the deterioration of the general conditions on the labor market, the increase in the number of low-paid jobs, but also the rise in unemployment and poverty levels (Ribeiro et al., 2015; Pouliakas & Theodossiou, 2010).

In recent decades, the fight for gender equality has been associated with women's fight for access to quality education, financial independence, equal pay and equal responsibilities, as well as the combat against domestic violence and sexual harassment. As a result, public policies in Portugal have focused mainly on increasing and improving the role of women in society. However, gender equality applies to both men and women, and negative aspects of men's position in society are now evident: men spend less time with their children, men have a lower life expectancy, are potentially at higher risk of injury, have a much higher share of crime statistics, represent a significant lower percentage of representation in professions traditionally assigned to women, like social services, nursing, etc. Still, men hold most of the leading positions, and they earn more than women do. Statistics also show that men are the main authors of acts of violence in public and private spheres (Wall et al., 2017).

For Portugal, as for many other countries in the world, a number of national plans have been drawn up and implemented with a view to encouraging gender equality and extending non-discrimination measures, in accordance with international engagements. In terms of the results of these initiatives, we identify that in Portugal the percentage of women in management positions declined modestly in 2020 compared to previous year (2.6% versus 2.7%), but the percentage of female managers has for the first time exceeded half of the seats filled in public administration, accounting for 54.2% in 2020.

In addition, in 2019, 41% of the population (28% men and 13% women) in the agricultural area owned farms, while three years before this proportion was approximately 39% (27% men and 12% women) (Eurostat, 2021a).

SDG6 – Clean water and sanitation. Portugal does not have an explicit Human Right to Water and Sanitation (HRtWS) issue from a legal point of view, but has voted for it in the UN General Assembly and is also party to the "International Covenant on Economic, Social and Cultural Rights". Because in Portugal more than 96% of the population connected to drinking water services, HRtWS is considered a non-issue for this country. However, there have also been negative situations generated by inaccessibility to water and sanitation, especially after the economic crisis period (2010–2014), as the country faced a large number of households that have been deprived of access to water due to non-payment of water costs (Lopes, 2020).

Accordingly, Portugal's recent experience, taking into account global factors and challenges, demonstrates that the implementation of sound public policies for the water sector is a key success factor for the sustainability of water services (Alegre et al., 2020). In this context, Portugal has set itself the target of ensuring safe consumption and access to water, sanitation and hygiene by 2030 and encouraging sustainable consumption. As Portuguese Ministry of Environment, Spatial Planning and Energy (2015) mention, "the protection and recovery of ecosystems where water is a valuable resource, such as forests, mountains, wetlands and rivers, are becoming essential to alleviate water scarcity".

From this perspective, the assessment of the "safe water indicator" in Portugal, which takes into account the quality of water distributed through public drinking water systems, maintained its very high level of almost 99% in 2019. However, the indicator of water distributed per capita in some regions, such as Algarve (377.0 liters/inhabitant/day), attained higher levels of per capita consumption, mainly due to the high tourist pressure in these areas (MoFA, 2017).

SDG7 – Clean and affordable energy. It is well known that energy poverty profoundly affects living and health conditions in any country. With this in mind, we point out that the case of Portugal is different, because even though the climate is mild, in terms of SDG 7, this is one of the most vulnerable countries in the European Union. This is because, the extent, variability, societal vulnerability to fuel poverty is a characteristic of all regions in Portugal (Dobbins et al., 2019; Firoiu et al., 2021).

Horta et al. (2019) highlight that households consider normal and acceptable the situation in which they feel both cold and heat in their homes. This further affects the recognition of the problem of energy poverty and the need to prevent its detrimental implications on the well-being and health conditions of the Portuguese population.

On the other hand, given that Portugal has no natural resources of fossil origin, we identify considerable imports of primary energy resources for consumption, which is why in 2019, 74.2% of the energy consumed was imported. This is why, in Portugal, we identify a series of measures and policies that favor, on the one hand, an increase in renewable energy production and, on the other, an increase in energy efficiency by reducing energy consumption.

In this context, the use of renewable energy technologies is currently one of the national strategies that are in line with the promotion of a more sustainable economy and the prevention of climate change.

Thus, in 2016, the contribution of RES to gross final energy consumption was 30.9%, one of the highest values for this indicator during the last years. In 2019, the value of this indicator has grown again to 30.6%, which is why we highlight that Portugal through the National Energy and Climate Integration Plan for 2021–2030 is approaching the target set for 2020 of 31.0% and for 2030 at 47.0%. At the same time, the share of renewables in the total amount of electricity produced in Portugal has increased every year, reaching 53.8% in 2019 (MoFA, 2017).

Also from the transport sector perspective, the integration of renewable energy is being pursued by incorporating biofuel substitutes and other technologies. In 2019, the percentage of renewable energy consumption reached its peak value of 41.6%, following a decrease in 2017 (41.0%) and 2018 (40.9%) (MoFA, 2017).

SDG8 – Decent work and growth. Decent work and its correlation with economic growth is an important issue that needs to be analyzed from multiple points of view, as it directly influences the quality and sustainability of people's lives in general and the working population in particular.

According to research by Ferreira et al. (2019), the working population in Portugal has subjective dimensions in terms of decent work experiences, which is why identifying factors (especially negative ones) that influence decent work and consequently the sustainability of the economy is one of the priorities of public and private policy.

In the same vein, the report "Decent Work in Portugal 2008-18: From Crisis to Recovery" (International Labour Organization [ILO], 2018) identifies that Portugal has emerged from the crisis through the implementation of a series of economic and social policies that have contributed to a better business environment, improved efficiency of the public sector, while improving education and training. Therefore, the Portuguese experience was not based on labor cost reduction and labor market flexibility, which is why by the end of 2017, employment, reached the level before the 2008 economic and financial crisis (ILO, 2018).

Sustainable economic growth means creating the right conditions for people to benefit from the stability of decent jobs while protecting the environment. Creating decent and sustainable jobs is therefore a serious challenge for all economies, including Portugal.

GDP growth is one of the best-known strategies for measuring the performance of an economy and is commonly used in measuring a country's socio-economic development. For Portugal, in 2014–2019 interval, the real GDP per capita increased (2.5% in 2019), compared to a decrease of 7.8% in 2020, which is also a direct effect of the COVID-19 pandemic. In the same context of the COVID-19 pandemic, the EU27 real GDP per capita average recorded a decrease in 2020 (–6.3%), which is lower than in Portugal (MoFA, 2017).

In terms of unemployment, the rate increased progressively between 2011 and 2013, then declined continuously from that year until 2020, when an additional 0.3 percentage points was observed, explained by the negative effects of the pandemic. In 2020, the unemployment rate in Portugal was particularly high for women (7.12%) than for men (6.53%). On the other hand, at EU27 level, unemployment rates were systematically lower than those recorded in Portugal until 2018. In 2020, the gap between the Portuguese and the EU27 population aged between 15 and 74 years was only 0.2 percentage points (6.9% and 7.1% respectively). This indicator is the direct consequence of the influence of tourism sector in the Portuguese economy (MoFA, 2017).

In addition, in 2019, Tourism Direct Gross Value Added (TDGVA) in Portugal reached 8.4% of national economy, which is 0.4 percentage points more than the previous year. TDGVA generated by tourism in Portugal in 2019 (8.4%), compared to the EU-27 average in the same year, places Portugal in first position among European countries. In 2020, the share of TDGVA in total GVA fell from 8.4% to 4.6%, which is a highly significant decline and an unprecedented result for Portugal's tourism exports (MoFA, 2017).

SDG9 – "Industry, innovation and infrastructure". The process of innovation and innovation requires in a complex vision a collaborative policy of government, academia, industry and civil society. Therefore, both for Portugal and for all other countries, the innovation process must be geared towards generating creative solutions to current problems as well as future challenges. Greater collaboration between the public and private actors involved, as well as the consideration of civil society participation in the innovation process, are indispensable elements for the creation of an efficient and sustainable innovation ecosystem (Gibson & Naquin, 2011; Selada, 2017).

In the same sense, Ratinho and Henriques (2010) point out that technology transfer and the production of high-tech firms accommodated in industrial parks and business incubators directly influence economic growth as well as job creation, while decreasing national unemployment. On the other hand, the existence of innovation centers because of investment in in-novation also influences the development of human networks and their involvement in activities related to technology transfer and commercialization. Given the financial and economic problems of both Portugal and other regions in the EU area, investment in in-novation and the transfer of knowledge and know-how must be carefully analyzed and targeted at areas where the results can be directly quantified and materialized in sustain-able growth of the economy and society (Gibson & Naquin, 2011).

For Portugal, the investments in energy, transport infrastructure and ICT sector are essential to support sustainable development of the national economy. In this context, efforts

to develop and modernize local infrastructure, investments in renewable energy, communication technologies and access for all, including marginalized groups, are key elements for Portugal in the measures implemented to achieve the 2030 Agenda targets.

In this context, air passenger transport (passenger-kilometers) in 2019 grew by 10.7% compared to 2018 (+69.3% vs. 2010). Road transport also saw a slight increase in 2019 (+0.2% compared to 2018), and rail transport for passengers grew to little more than 5 billion passenger-kilometers, with an increase of 10.6% compared to 2018 and 20.7% compared to 2010. In addition, from the perspective of "Share of medium and high technology to industry value added in total value added" it represented 24.0% in 2019, an increment of 1.3 percentage points compared to 2018 (MoFA, 2017).

SDG10 – Reduced inequalities. It is universally recognized that market forces play a crucial role in the wage distribution process in any country, including Portugal. Therefore, the institutional framework at the level of each country can directly contribute to limiting the evolution of inequality, an issue frequently debated and analyzed at the level of countries, especially those that share a similar regulatory environment, as is the case of the EU. We also identify that the minimum wage may contain lower inequality, but also that measures leading to improved educational performance are a key factor in reducing pay inequality (Centeno & Novo, 2014).

Another relevant aspect contributing to the increase in inequality is that generated by migration flows in Europe. Migrant populations have different needs in terms of health care, language, traditions, etc., which is why the creation of inequalities could put health systems in particular at risk if they are not addressed in an integrated manner (Ledoux et al., 2018; Matlin et al., 2018).

Social inequalities in any economy are also generated by a number of other conditions, such as age, gender, social class, educational, political, territorial or religious inequalities. Therefore, for Portugal, reducing economic inequality by narrowing the gap between it and the richest countries has become a national priority.

According to European statistics for 2019, the national average net monetary income was 12,696 euro, which represents an increase of 7.7% compared to 2018 and over 40% compared to 2013. The bottom 40% of the population earned 6,678 euro, which equals an increment of 9.4% compared to 2018 and over 40% compared to 2013 (Eurostat, 2021).

In other words, Portugal recorded an average growth rate of average per capita income for all population of 3.1% between 2015 and 2019, lower than that average growth rate recorded between 2014 and 2018. In Portugal, in the period 2010–2020, the share of labor force in GDP declined until 2016, after which it has been on an upward trend until the present and an increase since then. In 2020 this ratio was 47.9%, 3.1 percentage points higher than in 2019, mainly due to the impact of the global pandemic. Over the same period, in the average value of the indicator for all EU countries was 49.0%, so Portugal has been consistently placed at a lower level of performance (MoFA, 2017).

SDG11 – Sustainable Cities and Communities. Because of the negative effects of climate change but also in view of the changes needed to achieve a sustainable growth rate, sustainable communities are now an increasingly common reality in European countries and beyond. On the other hand, no "green city" concept can be implemented in reality unless

green city residents are prepared to voluntarily and consistently respect certain restrictions on resource consumption (Premalatha et al., 2013).

In this new context, a new model of urban development based on smart cities is taking shape, thus maintaining the economic significance of cities, further supporting the urbanization process and providing a response to the current paradigm of developing a post-carbon urban model. On the other hand, smart cities are complex projects in which investments in human and social capital and ICT infrastructure boost economic development, while ensuring environmental protection and leading to an overall increase in the quality of life. In Portugal, the smart city concept is characterized by an "embryonic Triple-helix model of innovation", which is based on a close collaboration between smart cities actors and civil society, so that a dynamic and sustainable innovation ecosystem is developed through the consensus of all parties involved in the urban innovation process (Selada, 2017; Albino et al., 2015).

While we identify both regionally and globally unprecedented urban growth, followed by high rates of population growth, we cannot overlook the fact that this has generated enormous negative effects, through the growing number of slum dwellers, rising levels of air pollution, poor infrastructure for basic services, unplanned urban expansion, etc., making cities more vulnerable to disasters of all kinds (environmental, social, economic).

In this respect, we identify a number of priorities quantified by specific indicators that mainly reflect the evolution of two significant indicators ("Proportion of solid waste collected and managed in controlled facilities out of total municipal waste generated by cities" and "Urban waste collected"), for which there is a constant upward trend in Portugal.

Thus, in 2019, were collected around 5.3 million tonnes of municipal waste (equivalent of 514 kilograms per inhabitant), representing an increase of 1.3 percentage points from 2018 values. On the positive side, the ratio of municipal waste per GDP showed a slight decrease from 26.7 kg/ thousand-euro GDP in 2018 to 26.4 kg/ thousand-euro GDP in 2019, despite the increase in the volume of municipal waste collected (MoFA, 2017).

SDG12 – Responsible consumption and production. Responsible consumption and production policy is a key objective in increasing the sustainability of the economy. For EU Member States and implicitly also for Portugal, the research highlights that the current targets are mainly focused on production and less on consumption. The results also suggest that EU countries should focus more on the consumption side, on consumption policy in direct correlation with sustainable production. Sustainability should therefore also be seen as an effective way of mitigating environmental impacts from a consumption and lifestyle point of view (Liobikienė & Dagiliūtė, 2016).

With the 2030 target to ensure sustainable consumption and production patterns, Portugal is one of the countries that has implemented a series of measures to ensure that the principle of "doing more and better with less" is respected and promoted by all public and private economic agents. Managing resources efficiently and increasing investment in sustainable infrastructure, green and decent jobs and a better quality of life for all is a target for Portugal for 2030 (Loureiro et al., 2012).

The "Domestic Material Consumption" (DMC) indicator, that measures the total amount of materials used by the total economy directly, declined in the period 2010–2019 by 14.8% while GDP grown by 6.7%. This evolution suggests a positive situation of the Portuguese

economy, thus proving an increase in efficiency. However, for the year 2019, it recorded a somewhat lower growth (2.4%). In the same context of increasing efficiency, it is estimated that by 2025 municipal waste reuse and recycling programs in Portugal will increase to at least 55% by weight, and by 2030 to 60% and 65% by 2035 (MoFA, 2017).

SDG13 – Climate action. Portugal has adopted the Paris Agreement in 2015, which is a central pillar for achieving sustainable development goals. Portugal is also an active state in the implementation of the United Nations Framework Convention on Climate Change (UNFCCC) requirements for the elimination of greenhouse gases (GHG) (United Nations, 1992).

Following the Paris Agreement, Portugal has committed to achieving carbon neutrality by 2050. In 2019, Portugal's total GHG emissions were estimated at 63.63 kilo-tonnes CO_2 equivalent, 5.4% less than the previous year, but 8.1% higher than the 1990 baseline. Emissions estimates show a decrease of 25.9%, far from the national GHG emissions reduction target of 45% to 55% by 2030 (MoFA, 2017).

Another important issue is the impact of climate change on water resources in Portugal. Therefore, the effects of the lack of availability of water supply on the Portuguese electricity system and hydropower up to 2050 must be carefully considered. Teotónio et al. (2017) and Carvalho et al. (2014) discussed the hypothesis of reducing hydropower production, which may be reduced by up to 41% by 2050. Even in this context, hydropower will remain one of the cheapest and most reliable sources of energy in the energy mix, although over time it will lose this comparative advantage over other energy sources, mainly due to the impacts of climate change and water scarcity.

SDG14 – Life below water. Biodiversity, soil, water, air, climate, are components that are at the heart of environmental impact analyses. Therefore, the existence of environ-mental analysis and assessment frameworks must address environmental factors in an ecosystem approach by considering relevant conceptual frameworks (Honrado et al., 2013; Sousa et al., 2018).

Within this context, coastal zones and consequently aquatic life are affected by significant changes in the natural environment, mainly due to physical processes that are more intense because of climate change. The European Commission has therefore proposed a series of recommendations on sustainable coastal zone management and suggested to European countries with coastal zones to develop specific strategies. In this respect, Portugal has responded to the request by implementing a specific national strategy, including EU guidelines, national legislation and implementation techniques (Olsen et al., 2011; Alves et al., 2013).

These measures are a consequence of Portugal's geographical position, which is why the sustainability and monitoring of ocean water is a key strategic responsibility for what is to be the planet in the 2030s. Therefore, the national approach to the 2030 Agenda tar-gets in the field of ocean water is under the aegis of an integrated maritime policy, aimed in particular at monitoring marine litter pollution levels, as well as sustainable maritime spatial planning ensure the development of economic and social activities in a sustainable way (United Nations, 1982).

Equally important, this approach also includes the creation of marine protected areas of an appropriate size to ensure the management of stocks resulting from fishing activities in a sustainable manner (MoFA, 2017).

SDG15 – Life on land. Terrestrial life is particularly represented by the existence of forests because they have a series of vital functions for humankind, but also being a special habitat for biodiversity, as well as their role in coastal protection, soil and water conservation. SDG 15 aims to conserve but also re-store terrestrial ecosystems because of their importance in the sustainability of the planet. Portugal has a high area of forests, representing in 2015, 36.1% of the national geographical area, this figure also reflects an improvement of 0.6 percentage points compared to 2010, which is equivalent of an additional 60,000 hectares in the national forest area (MoFA, 2017).

The main problem facing Portugal, like all European countries in the southern region, is that of fires. This is a real problem and fire prevention in forest areas is an important tool in protecting land (Turco et al., 2019).

Moreover, fires are a rising global threat, a factor directly responsible for land degradation, especially in southwestern Mediterranean Europe, because as fires become recurrent, their intensity, and size is increasing, which is why we are increasingly identifying real disasters with negative effects on ecosystem renewal. Wildfires, and in particular forest fires, are currently the main drivers of land degradation in forest areas in the Mediterranean regions. This phenomenon is very likely to increase in the coming years because of climate change, as we can already see happening in many parts of the world, with negative effects on society and economic development. From this point of view, Portugal is a country prone to such hazards (Ferreira-Leite et al., 2016; Molina-Terrén et al., 2019).

SDG16 – "Peace, justice and strong institutions" – aims to develop an inclusive and peaceful society, based on respect for human rights and equal access to justice. Therefore, for Portugal, the implementation of legal mechanisms adaptive to the con-text of sustainability of the economy, society and the environment, in all types of public and private organizations is a necessity. Adaptable, flexible, participatory and perceptive legal instruments are currently the most innovative strategy to improve the future of people's lives for Portugal and for all countries in the world (Cartaxo et al., 2017).

SDG17 – "Partnerships for the goals". Portugal is one of the European countries that has understood that sustainable development relies on partnerships between governments as well as between the private and public sectors. Therefore, partnerships are based on shared principles, values and visions to achieve the Sustainable Development Goals by 2030 and beyond.

Through national supervisory mechanisms, Portugal is directly involved in auditing supervisory institutions on their compliance with regulations.

In the same vein, Portugal is constantly working to strengthen domestic resource mobilization, including through international support for the country's development, but also to improve domestic capacity to collect taxes and other revenues. Thus, between 2010 and 2019, this domestic capacity to collect local taxes has been on an improving trend, even though a steep decrease has been observed in 2020, from 69.2% in 2019 to 58.0% in 2020, due to expenditure generated by the pandemic (MoFA, 2017).

2. Research methodology

The research undertaken on the assessment of the current state of implementation of the SDGs in Portugal, as well as the potential for the country to reach its proposed 2030 targets is based on the latest data available from the European Statistical Office – Eurostat (Eurostat, 2021b). The research methodology was based on forecasting the values of the indicators until 2030 (using the ARIMA methodology) and quantifying the evolution of indicators with the help of dynamic indices, to acquire a more accurate image of the potential to achieve the assumed SDGs targets.

The base year for the analysis was selected as 2015, the year of adoption of the 2030 Agenda. Using dynamic indicators, all specific indicators of the 17 SDGs with published data (120 indicators) were considered for analysis. In order to make the analysis more relevant, but also to increase the accuracy of forecasts up to 2030 by eliminating potential short-term deviations, the trends in indicator values were calculated based on data published since 2007.

The autoregressive integrated moving average model (ARIMA) is a generalization of the ARMA model originally developed by Box and Jenkins. SPSS software allows estimation of exponentially smoothing ARIMA models, univariate or multivariate, based on the best-fitting ARIMA model for a set of dependent variables.

The autoregressive moving average (ARMA) methodology was originally proposed by Box and Jenkins (Box & Jenkin, 1976; Box et al., 1994; Abraham & Ledolter, 1983; Brockwell & Davis, 2002), and is essentially based on the integration of an autoregressive model (AR) with a moving average (MA).

In univariate time series modeling, a commonly used approach are the autoregressive models. Such models involves applying the linear regression function on the current value of the data series against a previous value (or several previous values) of the same data series, according to the following Eq. (1):

$$S_t = \alpha + \beta_1 S_{t-1} + \beta_2 S_{t-2} + \ldots + \beta_p S_{t-p} + \varepsilon_t, \tag{1}$$

where S_t – the time series; $\alpha = \left(1 - \sum_{i=1}^{p} \beta_i\right)\gamma$, with γ denoting the process mean; p – the order of AR model; ε_t – white noise.

The moving average (MA) model is also used in the analysis and modelling of univariate time series data, considering the linear regression of the most recent value of the data series against white noise (or random shocks) of a previous value (or several previous values) of the same data series. In this approach, it is assumed that the random shocks for a given time are based on the same distribution of data, usually considered a normal distribution. Eq. (2) describes MA approach:

$$S_t = \mu + W_t - \beta_1 W_{t-1} - \beta_2 W_{t-2} - \ldots - \beta_q W_{t-q}, \tag{2}$$

where S_t – the time series; μ – the mean of the series; W_{t-i} – white noise terms; $\beta_1, \ldots, \beta_q$ – the parameters of the model; q – order of MA model.

To estimate dynamic indices (Baltac, 2015; Box & Jenkin, 1976; Box et al., 1994), the ratio of the index considered at one point in time (I_n) to the value of the index in base period (I_1) was determined according to the following formula (3):

$$D_{n/1} = \frac{I_n}{I_1} \times 100, \tag{3}$$

where I_n – current index value; I_1 – base index value.

For each of the 17 SDGs, all available indicators were considered for the analysis, comparing the values calculated for Portugal with the average value recorded at EU-27 level. According to the methodology described previously, for each specific indicator of each of the 17 SDGs, values for the year 2020 have been forecast (if no values have been published for this year), as well as for the years 2025 and 2030. The medium and long term trend in the evolution of each specific indicator was also analyzed, including the likelihood that in 2030 the values of the indicators projected for Portugal will be equal to or better than the EU average.

3. Research results and discussion

To gain a more specific overview of the extent of potential achievement of the specific SDG targets, we have applied the methodological framework described previously to forecast the evolution of specific indicator values for 2030, highlighting the values for the years 2020, 2025 and 2030, considered to be revealing for the analysis of the medium and long-term trends.

In terms of dynamic analysis, we have estimated the evolution of dynamic indices for the three key periods mentioned (D_{2020}, D_{2025} and D_{2030}), using 2015 as a baseline. The results obtained from the analysis gave us a snapshot of the dynamics of the adjustment rate between the value of the indicators calculated for Portugal and the average value of the indicators at the level of the 27 EU Member States, providing a new dimension to our research.

A third phase of our research involved the prediction of the long-term trend for the indicators that were considered for the analysis, so the research results provide us with additional information on the potential evolution of the values of the SDG indicators calculated for Portugal, i.e. convergence or divergence from the trend of similar indicators calculated as an average of all EU countries up to the 2030 horizon. For each SDG, all the results obtained from the research have been summarized in Tables 2–18.

In order to get an outlook on the estimated potential for Portugal to reach or exceed the EU average of SDG indicators up to 2030, we have consolidated the key results in Table 1.

As can be noted, the results of our research indicate that it is very likely that Portugal will not fully meet the targets for any of the 17 SDGs by 2030, with the highest achievement estimated for SDG5 (85.71%), followed by SDG4 (83.33%). At the opposite pole of performance is SDG17 (20%), followed right next to it by SDG2 and SDG9 (28.57%). These results do not suggest that Portugal is not able to reach the quantitative targets agreed at national and/or European level (where these have been clearly defined), but underline the necessity for greater efforts by all relevant parties to step up efforts to correct negative deviations and meet the proposed targets.

Regarding SDG 1 indicators, Portugal is expected to show a positive evolution, reaching in 2030 values at least equal with the EU average for nine of the 12 indicators analyzed (75%), which represents a significant performance.

Table 1. Achievement of the Sustainable Development Goals in Portugal by 2030

Sustainable Development Goal	No. of indicators	No. of indicators to reach the EU average by 2030	% of achievement
SDG 1 "End poverty in all its forms everywhere"	12	9	75.00%
SDG 2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"	7	3	42.86%
SDG 3 "Ensure healthy lives and promote well-being for all at all ages"	11	5	45.45%
SDG 4 "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"	6	5	83.33%
SDG 5 "Achieve gender equality and empower all women and girls"	7	6	85.71%
SDG 6 "Ensure availability and sustainable management of water and sanitation for all"	4	3	75.00%
SDG 7 "Ensure access to affordable, reliable, sustainable and modern energy for all"	8	5	62.50%
SDG 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all"	9	5	55.56%
SDG 9 "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation"	7	2	28.57%
SDG 10 "Reduce inequality within and among countries"	11	8	72.73%
SDG 11 "Make cities and human settlements inclusive, safe, resilient and sustainable"	9	4	44.44%
SDG 12 "Ensure sustainable consumption and production patterns"	6	2	33.33%
SDG 13 "Take urgent action to combat climate change and its impacts"	5	3	60.00%
SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"	3	2	66.67%
SDG 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"	3	2	66.67%
SDG 16 "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels"	7	4	57.14%
SDG 17 "Strengthen the means of implementation and revitalize the global partnership for sustainable development"	5	1	20.00%
TOTAL	120	69	57.50%

Very positive developments are forecast for SDG_01_10A-People at risk of poverty or social exclusion and SDG_01_30-Severely materially deprived people, with a significant improvement by 2030, as well as for SDG_07_60-Population unable to keep home adequately warm, which has a similar projected development.

Furthermore, the forecasted gaps and potential negative trend for the indicators SDG_01_60-Population living in a dwelling with a leaking roof, damp walls, floors or foundations, or rot in the window frames of the upper floor, which do not seem to reach the EU average, but also SDG_03_60-Self-reported unmet need for medical examination and care and SDG_11_10-Overcrowding rate that show divergent evolution compared to the EU developments, which may lead to widening existing gaps between conditions in Portugal compared to the European average level (Table 2).

In contrast to the highly encouraging results recorded for SDG 1, for the specific SDG 2 indicators research results indicate a relatively low degree of convergence towards the EU-27 average, of only 28.57%.

Table 2. SDG 1 – No poverty

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_01_10 (%)	EU	23.8	22.0	22.0	22.0	0.92	0.92	0.92	DOWN	YES
	PT	26.6	19.8	17.8	15.8	0.74	0.67	0.59		
SDG_01_10A (%)	EU	23.3	19.7	15.3	10.8	0.85	0.66	0.46	DOWN	YES
	PT	26.6	17.1	8.3	–0.8	0.64	0.31	–0.03		
SDG_01_20 (%)	EU	17.4	17.1	17.0	17.0	0.98	0.98	0.98	DOWN	YES
	PT	19.5	16.2	12.5	8.9	0.83	0.64	0.45		
SDG_01_20A (%)	EU	15.6	15.4	15.2	15.2	0.99	0.97	0.97	DOWN	YES
	PT	18.1	15.6	11.8	7.9	0.86	0.65	0.44		
SDG_01_30 (%)	EU	8.4	6.3	10.3	14.3	0.75	1.23	1.70	DOWN	YES
	PT	9.6	4.6	2.7	0.8	0.48	0.28	0.08		
SDG_01_40 (%)	EU	10.5	8.5	8.5	8.5	0.81	0.81	0.81	DOWN	YES
	PT	10.9	5.1	–0.3	–5.7	0.47	–0.03	–0.52		
SDG_01_41 (%)	EU	9.7	9.8	10.3	10.9	1.01	1.06	1.12	SIDEWAY	YES
	PT	10.9	9.5	10.4	10.4	0.87	0.95	0.95		
SDG_01_60 (%)	EU	15.3	12.9	11.2	9.4	0.84	0.73	0.62	DOWN	NO
	PT	28.1	25.2	25.1	25.1	0.90	0.89	0.89		
SDG_03_60 (%)	EU	3.3	2.2	2.2	2.2	0.65	0.65	0.65	UP	NO
	PT	3.0	1.6	3.3	3.3	0.53	1.10	1.10		
SDG_06_10 (%)	EU	2.2	1.6	0.9	0.3	0.71	0.43	0.15	DOWN	YES
	PT	0.9	0.4	–0.1	–0.6	0.44	–0.12	–0.68		
SDG_07_60 (%)	EU	9.6	8.2	8.2	8.2	0.85	0.85	0.85	DOWN	YES
	PT	23.8	17.5	8.1	–1.3	0.74	0.34	–0.05		
SDG_11_10 (%)	EU	18.1	17.3	16.7	16.1	0.95	0.92	0.89	DOWN	NO
	PT	10.3	9.0	6.3	3.5	0.87	0.61	0.34		

The analysis of the results suggests a moderate improvement of the current situation, with an expected growth above the EU average for SDG_02_20-Agricultural factor income per annual work unit and a greater than average decrease of SDG_02_51-Harmonised risk indicator for pesticides.

For the remaining seven indicators, the estimates indicate lower performance than the European average, as is the case for SDG_02_10-Obesity rate or SDG_02_40-Area under organic farming, being areas that require special attention from policy makers (Table 3).

Table 3. SDG 2 – Zero hunger

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_02_10 (index)	EU	51.6	52.9	54.5	56.1	1.03	1.06	1.09	UP	NO
	PT	53.5	56.3	59.5	62.1	1.05	1.11	1.16		
SDG_02_20 (index)	EU	113.7	131.5	150.9	168.0	1.16	1.33	1.48	UP	YES
	PT	116.4	142.0	168.8	194.1	1.22	1.45	1.67		
SDG_02_30 (million euro)	EU	2605.0	3067.5	3043.7	3043.7	1.18	1.17	1.17	SIDEWAY	NO
	PT	18.4	16.0	16.0	16.0	0.87	0.87	0.87		
SDG_02_40 (%)	EU	6.6	8.6	10.4	12.1	1.31	1.58	1.85	UP	NO
	PT	6.5	7.1	7.7	8.5	1.09	1.18	1.30		
SDG_02_51 (index)	EU	97.0	75.9	60.5	44.7	0.78	0.62	0.46	DOWN	YES
	PT	93.0	65.3	41.0	16.2	0.70	0.44	0.17		
SDG_02_60 (ktonne)	EU	3295.7	3213.8	3221.6	3229.7	0.98	0.98	0.98	SIDEWAY	NO
	PT	47.4	47.4	47.4	47.4	1.00	1.00	1.00		
SDG_06_40 (mg per liter)	EU	21.3	22.3	23.3	24.3	1.05	1.09	1.14	UP	YES
	PT	16.8	17.1	18.5	18.5	1.02	1.10	1.10		

To achieve an appropriate level of health and well-being for Portuguese nationals, SDG 3 aims to achieve 11 specific indicators. By 2030, Portugal is forecast to reach convergence towards the European average for five of the eleven indicators, which represents a 45% degree of achievement.

Among the indicators with notable performance, SDG_03_30-Smoking prevalence and SDG_08_60-Persons killed in accidents at work is forecast to follow a steep descending trend, outperforming the EU-27 average. In addition, in the same positive regard, we can underline the evolution of SDG_03_20-Share of people with a health status perceived as good or very good, which is estimated to follow a positive progression, with a growth rate above the EU average.

However, a number of indicators can be mentioned that require more attention in monitoring and correcting potential negative deviations, given their direct effect on the overall health level of the Portuguese population. Thus, the indicator SDG_02_10-Obesity rate presents seriously pessimistic expectations, with a forecasted long-term upward trend, or the indicator SDG_11_40-People killed in road accidents, for which research results estimate a reduction, but not at the same decrease rate as the European average (Table 4).

Table 4. SDG 3 – Good health and well-being

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_03_11 (years)	EU	62.8	64.6	64.6	64.6	1.03	1.03	1.03	SIDEWAY	YES
	PT	56.5	59.0	59.0	59.0	1.04	1.04	1.04		
SDG_03_20 (% of population aged 16 or over)	EU	66.7	68.4	69.0	69.8	1.03	1.04	1.05	UP	YES
	PT	46.5	51.3	53.4	55.5	1.10	1.15	1.19		
SDG_03_30) (percentage of population aged 15 and over)	EU	27	25	24	23	0.93	0.89	0.85	DOWN	YES
	PT	26	21	17	14	0.81	0.65	0.54		
SDG_03_41 (no. per 100000 persons)	EU	3.1	2.2	1.4	0.6	0.70	0.44	0.18	DOWN	YES
	PT	6.8	4.1	1.6	–1.0	0.60	0.23	–0.14		
SDG_03_42 (rate)	EU	262.1	236.0	211.6	187.0	0.90	0.81	0.71	DOWN	NO
	PT	228.6	215.0	200.8	186.5	0.94	0.88	0.82		
SDG_03_60 (percentage of population aged 16 and over)	EU	2.8	1.8	1.8	1.8	0.66	0.66	0.66	SIDEWAY	NO
	PT	2.4	2.2	2.4	2.4	0.92	0.98	0.98		
SDG_02_10] (index)	EU	51.6	52.9	54.5	56.1	1.03	1.06	1.09	UP	NO
	PT	53.5	56.3	59.5	62.1	1.05	1.11	1.16		
SDG_08_60 (number per 100000 employees)	EU	2.0	1.6	1.2	0.9	0.79	0.62	0.45	DOWN	YES
	PT	3.5	1.8	0.4	–1.1	0.52	0.10	–0.32		
SDG_11_20 (%)	EU	18.3	16.3	13.8	11.2	0.89	0.75	0.61	SIDEWAY	NO
	PT	23.0	25.1	24.6	24.6	1.09	1.07	1.07		
SDG_11_40 (rate)	EU	5.5	4.3	0.3	–3.7	0.78	0.05	–0.68	DOWN	NO
	PT	5.7	5.3	3.9	2.4	0.93	0.68	0.42		
SDG_11_50 (μg/m3, for particulates less than 2.5 μm)	EU	15.8	13.6	13.6	13.6	0.86	0.86	0.86	SIDEWAY	NO
	PT	10.3	9.3	10.1	10.1	0.90	0.98	0.98		

SDG 4 is the chapter in which Portugal is expected to excel by 2030, being projected to perform at or above the EU average for five of the six indicators (83.33%).

Remarkable results are expected to be achieved for SDG_04_10-Early leavers from education and training, SDG_04_20-Tertiary educational attainment and SDG_04_70-Share of individuals having at least basic digital skills, considerably outperforming the European average expected for 2030.

Unfortunately, in the case of SDG_04_40-Underachievement in reading, maths or science, research results suggests a divergent trend compared to the development of EU Member States, i.e. a worsening of performance in Portugal compared to a slight improvement at EU level. It is obvious that this fact calls for increased attention in order to implement corrective measures as soon as possible to re-duce the existing gaps (Table 5).

Table 5. SDG 4 – Quality education

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_04_10 (percentage of population 18–24 years)	EU	11.0	9.9	8.1	6.2	0.90	0.73	0.56	DOWN	YES
	PT	13.7	8.9	–1.7	–12.3	0.65	–0.13	–0.90		
SDG_04_20 (percentage of population 30–34 years)	EU	36.5	40.5	45.0	49.4	1.11	1.23	1.35	UP	YES
	PT	33.1	41.9	46.7	53.8	1.27	1.41	1.62		
SDG_04_31 (%)	EU	91.9	93.0	94.0	95.0	1.01	1.02	1.03	UP	YES
	PT	88.7	92.7	96.1	99.7	1.04	1.08	1.12		
SDG_04_40 (% of 15-year-old students, reading)	EU	20.0	21.2	21.1	21.0	1.06	1.05	1.05	UP	NO
	PT	17.2	18.0	21.1	22.5	1.05	1.23	1.31		
SDG_04_60 (percentage of population aged 25–64 years)	EU	10.1	9.2	9.2	9.2	0.91	0.91	0.91	SIDEWAY	YES
	PT	9.7	10.0	10.1	10.1	1.03	1.04	1.04		
SDG_04_70 (%)	EU	54.0	56.5	59.1	61.8	1.05	1.09	1.14	UP	YES
	PT	48.0	52.9	58.3	63.6	1.10	1.21	1.32		

For SDG 5 – "Gender equality", as for SDG 4, research results indicate a high probability that indicator values will have a favorable development compared to the EU-27 average by 2030, with an overall performance rate of 85.71%.

We can note an extremely favorable development for SDG_05_30Gender employment gap, for which a reduction close to zero is forecast by 2030. If we also take into account, the positive evolution regarding SDG_05_60-Positions held by women in senior management positions, we can affirm that Portugal can stand out in a model of good practices at European level, and can be a model to follow in terms of reducing gender gaps (Table 6).

For SDG 6, the forecasts calculated for Portugal indicate a fairly high convergence rate (75%) with the average values at EU level, for the year 2030. It should also be mentioned that for three of the specific SDG6 indicators Eurostat has no reports for Portugal.

The only indicator for which we forecast a slightly lower performance than the EU average is SDG_14_10-Bathing sites with excellent water quality, for which the trend is positive, as for the European average, but the growth rate is slightly slower, which may lead to widening gaps in the long and very long term, if corrective action is not taken (Table 7).

Regarding SDG 7 – Access to modern, reliable, sustainable and affordable energy for all – the dynamic indicator estimates and trend analysis suggest a 62.50% achievement of the targets for five out of the eight specific indicators.

The most encouraging projections relate to indicators SDG_07_11-Final energy consumptio and SDG_07_60-Population unable to keep warm enough, for which a downward trend is foreseen, coupled with an encouraging dynamic, which shows a better performance than the average of the other EU Member States.

Table 6. SDG 5 – Gender equality

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_05_20 (percentage of average gross hourly earnings of men)	EU	15.5	14.1	14.0	14.0	0.91	0.90	0.90	SIDEWAY	YES
	PT	16.0	13.0	13.0	13.0	0.81	0.81	0.81		
SDG_05_30 (%)	EU	11.5	11.1	9.7	8.2	0.97	0.84	0.71	DOWN	YES
	PT	6.7	5.9	3.2	0.6	0.88	0.48	0.09		
SDG_05_40 (percentage of inactive population 20–64 years)	EU	19.6	18.7	19.5	19.5	0.95	0.99	0.99	DOWN	YES
	PT	13.8	14.9	11.7	8.4	1.08	0.85	0.61		
SDG_05_50 (%)	EU	28.2	32.7	36.6	40.5	1.16	1.30	1.44	UP	NO
	PT	34.3	39.5	43.7	47.8	1.15	1.27	1.39		
SDG_05_60 (%)	EU	22.2	29.5	35.2	41.0	1.33	1.59	1.85	UP	YES
	PT	13.5	26.6	44.9	62.5	1.97	3.32	4.63		
SDG_04_10 (percentage of population 18–24 years)	EU	11.0	9.9	8.1	6.2	0.90	0.73	0.56	DOWN	YES
	PT	13.7	8.9	–1.7	–12.3	0.65	–0.13	–0.90		
SDG_04_20 (percentage of population 30–34 years)	EU	36.5	40.5	45.0	49.4	1.11	1.23	1.35	UP	YES
	PT	33.1	41.9	46.7	53.8	1.27	1.41	1.62		

Table 7. SDG 6 – Clean water and sanitation

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_06_10 (%)	EU	2.2	1.6	0.9	0.3	0.71	0.43	0.15	DOWN	YES
	PT	0.9	0.4	–0.1	–0.6	0.44	–0.12	–0.68		
SDG_06_20 (%)	EU	–	–	–	–	–	–	–	N/A	N/A
	PT	–	–	–	–	–	–	–		
SDG_06_30 (mg O_2/liter)	EU	–	–	–	–	–	–	–	N/A	N/A
	PT	–	–	–	–	–	–	–		
SDG_06_40 (mg NO_3 /liter)	EU	21.3	22.3	23.3	24.3	1.05	1.09	1.14	UP	YES
	PT	16.8	17.1	18.5	18.5	1.02	1.10	1.10		
SDG_06_50 (mg PO_4 per liter)	EU	0.06	0.05	0.01	–0.02	0.81	0.20	–0.41	N/A	N/A
	PT	–	–	–	–	–	–	–		
SDG_06_60 (%)	EU	7.7	7.7	7.7	7.7	0.92	0.92	0.92	DOWN	YES
	PT	18.0	8.4	5.9	2.8	0.47	0.33	0.15		
SDG_14_40 (%, coastal water excellent)	EU	87.0	90.1	94.1	98.2	1.04	1.08	1.13	UP	NO
	PT	89.6	94.0	96.7	99.8	1.05	1.08	1.11		

Moreover, it should be mentioned that for the remaining three specific SDG7 indicators for which the forecast suggests slightly lower performance than EU average, with minimal involvement of all stakeholders in the coming years, the results of the indicators could be easily corrected so that Portugal can fully achieve its proposed targets (Table 8).

It is worth highlighting that Portugal's concerns regarding sustainable energy are visible, given that the six months of Portugal's rotating EU presidency have been spent with the climate emergency and the measures to be adopted to limit the current effects as a priority.

Portugal has also adopted in 2020 the National Energy and Climate Plan (NECP). This plan sets precise objectives and targets for a 10-year horizon for greenhouse gas emissions and removals, increasing energy efficiency and security, together with concrete measures to support the achievement of the targets. In this respect, we expect that the future evolution of the SDG 7 targets will be positive, which could be a model of good practice for other European countries.

The potential targets for SDG 8 specific indicators are most likely to be achieved for more than half of the indicators, more specifically for five of the nine indicators considered (55.56%). The analysis shows better and less good results, but more attention and commitment is certainly needed at the Portuguese level to adopt measures to correct potential negative developments.

Among the indicators for which we forecast a positive evolution we can mention SDG_08_20-Young people neither in employment nor in education and training for which a faster downward trend than the European average is expected, SDG_08_40-Long-term unemployment rate which has a real potential for reduction or even elimination, or SDG_05_40-Inactive population due to caring responsibilities whose values are less than half of the EU average.

Table 8. SDG 7 – Affordable and clean energy

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_07_10 (index)	EU	90.4	88.5	85.1	81.6	0.98	0.94	0.90	DOWN	YES
	PT	87.1	86.1	82.3	78.5	0.99	0.95	0.90		
SDG_07_11 (index)	EU	92.1	92.4	90.9	89.1	1.00	0.99	0.97	DOWN	YES
	PT	84.1	82.6	76.1	69.5	0.98	0.90	0.83		
SDG_07_20 (KGOE)	EU	552	546	528	507	0.99	0.96	0.92	SIDEWAY	YES
	PT	266	293	293	293	1.10	1.10	1.10		
SDG_07_30 (Euro per KGOE)	EU	7.7	8.4	9.0	9.7	1.08	1.17	1.25	UP	NO
	PT	7.1	7.6	7.8	8.1	1.06	1.10	1.14		
SDG_07_40 (%)	EU	17.8	20.7	24.0	27.4	1.16	1.35	1.54	UP	YES
	PT	30.5	32.8	36.9	41.1	1.07	1.21	1.35		
SDG_07_50 (imports percentage in total energy consumption)	EU	56.0	57.5	58.0	58.0	1.03	1.04	1.04	DOWN	NO
	PT	76.3	72.1	69.5	66.1	0.95	0.91	0.87		
SDG_07_60 (%)	EU	9.6	8.2	8.2	8.2	0.85	0.85	0.85	DOWN	YES
	PT	23.8	17.5	8.1	–1.3	0.74	0.34	–0.05		
SDG_13_20 (index)	EU	88.8	83.5	78.9	74.4	0.94	0.89	0.84	DOWN	NO
	PT	86.9	82.2	79.8	76.8	0.95	0.92	0.88		

Some of the most pessimistic evolutions are anticipated for SDG_08_30-Employment rate indicator which, due to the forecasted negative trend, require immediate and increased attention from the Portuguese responsible institutions in order to reverse the trend and increase employment (Table 9).

Analysis and forecasting of the progress of specific SDG 9 indicators suggests a more pessimistic situation for Portugal, only for two out of the seven indicators there is a chance to match a certain level of performance, which suggests a degree of achievement for this SDG of only 28.57%.

An interesting case to follow, and which obviously needs more attention, concerns the projected evolution of SDG_09_10-Gross domestic expenditure on R&D and SDG_09_30-R&D personnel which have opposite trends. Thus, based on the multi-annual trends analyzed, the share of R&D expenditure in GDP is anticipated to be on a downward trend, but the number of personnel involved in R&D activities is expected to increase, a phenomenon that will obviously create tensions and require intervention by the responsible authorities and, implicitly, the adoption of corrective measures.

We can also mention the possibility of turning a negative estimate into a success, by increasing at a higher rate the share of rail and inland waterways activity in total freight transport (SDG_09_60), the results of the analysis suggesting that Portugal has unused growth potential for this indicator (Table 10).

Table 9. SDG 8 – Decent work and economic growth

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_08_10 (euro)	EU	25,950	26,380	26,381	26,381	1.02	1.02	1.02	UP	NO
	PT	16,620	17,070	17,912	18,292	1.03	1.08	1.10		
SDG_08_11 (% of GDP)	EU	20.6	22.3	25.0	27.4	1.08	1.22	1.33	UP	NO
	PT	15.5	19.1	20.4	20.5	1.23	1.32	1.32		
SDG_08_20 (percentage of population aged 15–29 years)	EU	15.2	13.7	13.7	13.7	0.90	0.90	0.90	DOWN	YES
	PT	13.2	11.0	11.0	11.0	0.83	0.83	0.83		
SDG_08_30 (percentage of population aged 20–64 years)	EU	69.1	72.5	73.0	73.4	1.05	1.06	1.06	DOWN	NO
	PT	69.1	74.7	67.7	60.7	1.08	0.98	0.88		
SDG_08_40 (% of active population)	EU	4.8	2.4	1.4	0.4	0.50	0.29	0.08	DOWN	YES
	PT	7.2	2.3	–0.1	–2.6	0.32	–0.02	–0.36		
SDG_08_60 (per 100,000 employees)	EU	2.0	1.6	1.2	0.9	0.79	0.62	0.45	DOWN	YES
	PT	3.5	1.8	0.4	–1.1	0.52	0.10	–0.32		
SDG_01_41 (%)	EU	9.7	9.8	10.3	10.9	1.01	1.06	1.12	SIDEWAY	YES
	PT	10.9	9.5	10.4	10.4	0.87	0.95	0.95		
SDG_05_40 (percentage of inactive population aged 20–64 years)	EU	19.6	18.7	19.5	19.5	0.95	0.99	0.99	DOWN	YES
	PT	13.8	14.9	11.7	8.4	1.08	0.85	0.61		
SDG_12_20 (index)	EU	130.8	135.2	137.8	139.2	1.03	1.05	1.06	SIDEWAY	NO
	PT	129.7	127.1	127.8	127.8	0.98	0.99	0.99		

Table 10. SDG 9 – Industry, innovation and infrastructure

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_09_10 (% of GDP)	EU	2.1	2.3	2.4	2.6	1.07	1.15	1.23	DOWN	NO
	PT	1.2	1.3	0.9	0.5	1.06	0.74	0.42		
SDG_09_30 (% of active population)	EU	1.2	1.4	1.5	1.7	1.15	1.28	1.40	UP	NO
	PT	1.0	1.2	1.3	1.5	1.23	1.39	1.55		
SDG_09_40 (per million inhabitants)	EU	141.0	147.2	154.1	160.4	1.04	1.09	1.14	UP	NO
	PT	13.6	24.2	30.9	37.6	1.78	2.27	2.76		
SDG_09_50 (percentage of total inland passenger-km)	EU	17.6	17.3	17.4	17.4	0.98	0.99	0.99	SIDEWAY	NO
	PT	11.1	11.6	11.6	11.6	1.05	1.05	1.05		
SDG_09_60 (percentage of total inland freight tonne-km)	EU	25.8	24.7	24.5	24.5	0.96	0.95	0.95	UP	NO
	PT	14.1	15.3	17.5	19.8	1.09	1.24	1.40		
SDG_12_30 (g CO_2/km)	EU	119.1	108.7	90.0	71.2	0.91	0.76	0.60	DOWN	YES
	PT	105.7	95.2	76.3	57.5	0.90	0.72	0.54		
SDG_17_60 (% of households)	EU	21.9	59.3	99.1	138.9	2.71	4.52	6.34	UP	YES
	PT	47.2	86.6	118.4	150.2	1.83	2.51	3.18		

In Portugal, for SDG 10 the analysis results would suggest an above average level of performance, given that positive results are expected to appear for only eight of the 11 indicators included in the analysis (72.73%).

The best results are forecast for SDG_10_41-Income distribution, for which a solid downward trend is forecast, but also for SDG_10_50-Income share of the bottom 40% of the population, for which an upward trend is expected, at a growth rate outpacing the similar rate of EU countries included in the analysis, which gives Portugal the possibility to exceed the EU average by 2030.

As regards the indicators with less good results, we can mention SDG_10_20-Adjusted gross disposable income of households per capita for which a stationary trend is expected in contradiction with the European growth trend, but also SDG_10_30-Relative median at-risk-of-poverty gap, for which more consistent efforts are obviously needed to remedy the existing disparities compared to the proposed targets (Table 11).

SDG 11 is one of the goals where Portugal does not perform best, as only four of the nine indicators analyzed are estimated to reach the targets and convergence with the EU average, which represents an achievement rate of only 44.44%.

The most important non-achievements are related to SDG_11_40-People killed in road accidents for which a downward trend is forecast, similar to the results anticipated for the rest of EU countries, but the pace of decrease is not fast enough, which places Portugal well above the EU average. The same divergent situation is also estimated for SDG_11_20-Population living in households considering that they suffer from noise, where the values recorded by Portugal suggest an increasing trend, opposite to the forecast decreasing pattern for EU Member States until 2030.

Table 11. SDG 10 – Reduced inequalities

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_10_10 (Real expenditure per capita, in PPS_EU28)	EU	27,500	29,700	31,662	33,623	1.08	1.15	1.22	UP	NO
	PT	21,300	23,577	25,236	26,896	1.11	1.19	1.26		
SDG_10_20 (PPS per inhabitant)	EU	21,479	23,251	24,903	26,555	1.08	1.16	1.24	SIDEWAY	NO
	PT	17,630	18,751	18,751	18,751	1.06	1.06	1.06		
SDG_10_30 (percentage distance to poverty threshold)	EU	25.4	25.6	25.6	25.6	1.01	1.01	1.01	SIDEWAY	YES
	PT	29.0	24.4	24.4	24.4	0.84	0.84	0.84		
SDG_10_41 (Quintile share ratio)	EU	5.2	5.1	5.1	5.1	0.98	0.98	0.98	DOWN	YES
	PT	6.0	5.0	4.4	3.9	0.83	0.74	0.64		
SDG_10_50 (% of income)	EU	20.9	21.1	21.2	21.2	1.01	1.01	1.01	UP	YES
	PT	19.4	21.0	22.0	23.0	1.08	1.13	1.19		
SDG_10_60 (no. per million inhabitants)	EU	2739	933	933	933	0.34	0.34	0.34	UP	YES
	PT	84	87	182	236	1.04	2.17	2.81		
SDG_01_10A (%)	EU	23.3	19.7	15.3	10.8	0.85	0.66	0.46	DOWN	YES
	PT	26.6	17.1	8.3	–0.8	0.64	0.31	–0.03		
SDG_01_20A (%)	EU	15.6	15.4	15.2	15.2	0.99	0.97	0.97		
	PT	18.1	15.6	11.8	7.9	0.86	0.65	0.44	DOWN	YES
SDG_04_10A (%)	EU	10.0	8.6	6.7	4.8	0.86	0.67	0.48	DOWN	YES
	PT	13.5	8.7	–1.9	–12.5	0.64	–0.14	–0.92		
SDG_08_20A (%)	EU	14.4	12.8	12.8	12.8	0.89	0.89	0.89	SIDEWAY	YES
	PT	12.8	10.8	10.8	10.8	0.84	0.84	0.84		
SDG_08_30A (%)	EU	69.6	73.3	72.5	71.8	1.05	1.04	1.03	DOWN	NO
	PT	69.2	74.8	67.8	60.8	1.08	0.98	0.88		

However, there are also encouraging results for this goal, where we can mention SDG_11_10-Overcrowding rate, which has a strong downward trend forecast, with values estimated to be about 5 times lower than the EU average in 2030. A relatively positive situation is also expected for SDG_11_50-Exposure to air pollution, particulates < 2.5 μm, but it is certain that more attention is required from the competent authorities in order to get more involved in accelerating the reduction of pollution, given the stationary medium-term trend suggested by the results obtained (Table 12).

Portugal's performance in achieving the targets proposed by SDG 12 do not indicate a favorable trend, the results obtained suggesting a percentage of achievement of the proposed targets of only 33.33%, for only two of the six specific indicators (SDG_12_30 and SDG_12_50) are expected to reach satisfactory levels of performance.

Table 12. SDG 11 – Sustainable cities and communities

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_11_10 (% of population)	EU	18.1	17.3	16.7	16.1	0.95	0.92	0.89	DOWN	YES
	PT	10.3	9.0	6.3	3.5	0.87	0.61	0.34		
SDG_11_20 (%)	EU	18.3	16.3	13.8	11.2	0.89	0.75	0.61	UP	NO
	PT	23.0	25.1	24.6	24.6	1.09	1.07	1.07		
SDG_11_31 (sqm per capita)	EU	680.6	724.7	805.8	819.6	1.07	1.18	1.20	UP	YES
	PT	621.2	704.8	761.3	819.9	1.14	1.23	1.32		
SDG_11_40 (rate)	EU	5.5	4.1	–0.6	–5.3	0.75	–0.11	–0.96	DOWN	NO
	PT	5.7	5.3	3.9	2.4	0.93	0.68	0.42		
SDG_11_50 (μg/m^3 for particulates less than 2.5μm)	EU	15.8	13.6	13.6	13.6	0.86	0.86	0.86	SIDEWAY	YES
	PT	10.3	9.3	10.1	10.1	0.90	0.98	0.98		
SDG_11_60 (percentage of total waste generated)	EU	44.9	49.9	55.5	61.2	1.11	1.24	1.36	UP	NO
	PT	29.8	33.6	40.0	46.3	1.13	1.34	1.55		
SDG_01_60 (%)	EU	15.3	12.9	11.2	9.4	0.84	0.73	0.62	SIDEWAY	NO
	PT	28.1	25.2	25.1	25.1	0.90	0.89	0.89		
SDG_06_20 (%)	EU	–	–	–	–	–	–	–	N/A	N/A
	PT	–	–	–	–	–	–	–		
SDG_09_50 (percentage of total inland passenger-km)	EU	17.6	17.3	17.4	17.4	0.98	0.99	0.99	SIDEWAY	NO
	PT	11.1	11.6	11.6	11.6	1.05	1.05	1.05		
SDG_16_20 (% of population)	EU	13.2	10.8	9.1	7.3	0.82	0.69	0.55	DOWN	YES
	PT	10.5	6.6	4.1	1.4	0.63	0.39	0.14		

Analysis suggests a worrying development for indicators SDG_12_41-Use rate of circular materials and SDG_12_61-Gross value added in the environmental goods and services sector. The research results suggest that there are predicted potential significant divergences between Portugal's expected performance and the evolution of average values at European level, which will widen the existing gaps (Table 13).

In terms of performance on the specific indicators of SDG 13 – "Take urgent action to combat climate change and its impacts" – Portugal is expected to perform positively, even though degree of target achievement is just over half, i.e. 60%.

The best results are registered for SDG_07_40-Share of RE in gross final energy consumption, for which 2030 estimates show double the EU average performance, but it should be noted that the growth rate of the EU averages is higher than the projected growth rate for Portugal, indicating that the gap will narrow over time, possibly even leading to sub-optimal results in the long term if no supporting measures are taken.

In terms of potential shortcomings, mention should be made of SDG_13_10-Greenhouse gas emissions, which urgently requires more attention to correct the projected growth trend up to 2030, which diverges considerably from the evolution of the average values of

this indicator among EU countries, which will increase the existing gap to values that will be difficult to correct in the future. Also, with regard to SDG_13_20-Green-house gas emissions intensity of energy consumption, action is needed to accelerate the pace of reduction of GHG emissions intensity to at least the EU average level in the near future (Table 14).

Regarding the degree of achievement for SDG 14 targets in Portugal, data was only made available for three indicators, and research results suggests that for two of the three indicators (SDG_14_10 and SDG_14_40) it is estimated that a noticeably increased level of performance can be attained in 2030 than in the baseline period.

Table 13. SDG 12 – Responsible consumption and production

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_12_20 (index)	EU	130.8	135.2	137.8	139.2	1.03	1.05	1.06	SIDEWAY	NO
	PT	129.7	127.1	127.8	127.8	0.98	0.99	0.99		
SDG_12_30 (g CO_2/km)	EU	119.1	108.7	90.0	71.2	0.91	0.76	0.60	DOWN	YES
	PT	105.7	95.2	76.3	57.5	0.90	0.72	0.54		
SDG_12_41 (percentage of material input for domestic use)	EU	11.2	12.0	12.9	13.7	1.07	1.15	1.22	SIDEWAY	NO
	PT	2.1	2.3	2.0	2.0	1.11	0.95	0.95		
SDG_12_50] (kg per capita)	EU	1,735	1,807	1,837	1,876	1.04	1.06	1.08	DOWN	YES
	PT	1,123	1,186	1,136	1,118	1.06	1.01	1.00		
SDG_12_61 (% of GDP)	EU	2.2	2.4	2.6	2.8	1.09	1.18	1.27	DOWN	NO
	PT	2.4	2.3	2.0	2.0	0.96	0.82	0.82		
SDG_07_30 (Euro per KGOE)	EU	7.7	8.4	9.0	9.7	1.08	1.17	1.25	UP	NO
	PT	7.1	7.6	7.8	8.1	1.06	1.10	1.14		

Table 14. SDG 13 – Climate action

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_13_10 (GHG emissions in CO_2 equivalent, base year 1990)	EU	77.1	72.4	64.9	57.5	0.94	0.84	0.75	UP	NO
	PT	100.9	106.4	104.1	104.1	1.05	1.03	1.03		
SDG_13_20 (Index, 2000 = 100)	EU	88.8	83.5	78.9	74.4	0.94	0.89	0.84	DOWN	NO
	PT	86.9	82.2	79.8	76.8	0.95	0.92	0.88		
SDG_13_60 (%)	EU	36.4	42.6	44.8	46.1	1.17	1.23	1.27	UP	YES
	PT	57.7	64.7	83.7	102.7	1.12	1.45	1.78		
SDG_07_40 (%)	EU	17.8	20.7	24.0	27.4	1.16	1.35	1.54	UP	YES
	PT	30.5	32.8	36.9	41.1	1.07	1.21	1.35		
SDG_12_30 (g CO_2 per km)	EU	119.1	108.7	90.0	71.2	0.91	0.76	0.60	DOWN	YES
	PT	105.7	95.2	76.3	57.5	0.90	0.72	0.54		

A special case is the results reported by the analysis of the indicator SDG_14_60-Marine waters affected by eutrophication, which are expected to remain below the EU aver-age until 2030, but the train diversity and the accelerated growth rate for Portugal suggested by the analysis lead us to view with some skepticism the likelihood that these values will remain below the EU average in the future, which is why we cannot consider this indicator as having been met (Table 15).

Regarding SDG 15, the achievement of the targets set is reasonably good, with research suggesting the possibility of reaching the targets for two of the three indicators analyzed (66.67%). It should be noted that for two other indicators (SDG_06_30 and SDG_06_50) Eurostat does not report data for the period analyzed.

The only indicator for which a less favorable evolution is expected until 2030 is SDG_15_41-Soil sealing index. However, its evolution can be easily changed, requiring only a little concern from the responsible stakeholders, as the forecast indicates an up-ward trend, similar to the trend at European level, but at a very slightly higher growth rate. An intervention by the authorities could make Portugal record positive results on this indicator as well, leading to the full achievement of the SDG 15 targets (Table 16).

Table 15. SDG 14 – Life below water

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_14_10 (km^2)	EU	286145	505394	728366	953079	1.77	2.55	3.33	UP	YES
	PT	31885	52116	82186	112999	1.63	2.58	3.54		
BSDG_14_40 (%, coastal water excellent)	EU	87.0	90.1	94.1	98.2	1.04	1.08	1.13	UP	YES
	PT	89.6	94.0	96.7	99.8	1.05	1.08	1.11		
SDG_14_60 (km^2)	EU	29,031	12,126	17,668	17,668	0.42	0.61	0.61	UP	NO
	PT	8,816	7,194	9,105	11,479	0.82	1.03	1.30		

Table 16. SDG 15 – Life on land

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_15_10 (% of land area)	EU	41.9	43.1	44.6	46.1	1.03	1.06	1.10	UP	YES
	PT	46.6	53.0	59.5	66.3	1.14	1.28	1.42		
SDG_15_20 (%)	EU	18	18	18	18	1.00	1.00	1.00	SIDEWAY	YES
	PT	21	21	21	21	1.00	1.00	1.00		
SDG_15_41 (index)	EU	104.5	109.3	112.2	115.8	1.05	1.07	1.11	UP	NO
	PT	104.3	109.3	112.3	115.9	1.05	1.08	1.11		
SDG_06_30 (mg O_2 /liter)	EU	–	–	–	–	–	–	–	N/A	N/A
	PT	–	–	–	–	–	–	–		
SDG_06_50 (mg PO_4 per liter)	EU	0.06	0.05	0.01	–0.02	0.81	0.20	–0.41	N/A	N/A
	PT	–	–	–	–	–	–	–		

Table 17. SDG 16 – Peace, justice and strong institutions

Indicators		2015	2020	2025	2030	I_{2020}	I_{2025}	I_{2030}	Trend	Int.
SDG_16_10 (no. per 100,000 persons)	EU	0.76	0.53	0.30	0.08	0.70	0.40	0.10	DOWN	NO
	PT	1.01	0.69	0.49	0.29	0.68	0.48	0.28		
SDG_16_20 (% of population)	EU	13.2	10.8	9.1	7.3	0.82	0.69	0.55	DOWN	YES
	PT	10.5	6.6	4.1	1.4	0.63	0.39	0.14		
SDG_16_30 (euro per inhabitant)	EU	88.8	98.5	106.6	114.8	1.11	1.20	1.29	UP	YES
	PT	60.9	65.0	62.9	62.9	1.07	1.03	1.03		
SDG_16_40 (percentage for very good or fairly good)	EU	50	54	57	60	1.08	1.15	1.21	UP	NO
	PT	33	48	43	43	1.45	1.32	1.32		
SDG_16_50 (index)	EU	77	76	76	76	0.99	0.98	0.98	SIDEWAY	NO
	PT	64	61	63	63	0.95	0.98	0.98		
SDG_16_60 (% of population, EP)	EU	40	48	50	50	1.20	1.25	1.25	UP	YES
	PT	43	55	102	140	1.28	2.37	3.26		
SDG_16_60 (% of population, EC)	EU	36	45	47	47	1.25	1.31	1.31	UP	YES
	PT	42	54	109	157	1.29	2.60	3.74		

For SDG 16, analysis of the evolution of the values for the seven specific indicators shows that for four of them it is possible to reach adequate performance levels, suggesting a satisfactory degree of fulfilment of the SDG targets set of 57.14% compared to EU-27 average level.

In addition, due to its relevance, the SDG_16_60 indicator – Population trusting the EU institutions – was analyzed at the level of the two European institutions included in the survey (European Parliament and European Commission), to capture potential differences in perception among EU citizens. The results suggest that the level of growth in both European institutions is increasing steadily, indicating that Portuguese society has a positive appreciation of the actions of the European institutions, together with the re-performance over time (Table 17).

As regards the indicators connected with the implementation of SDG 17, our research revealed that just one out of five specific indicators (namely SDG_17_60) is forecasted to meet the average value at EU level by 2030, which represents only a 20% achievement rate.

Special attention is called for with regard to SDG_17_40-General government gross debt which follows an increasing trend and may reach unsustainable imbalances in the very distant future. It is obvious that the adjustment of these imbalances requires a careful involvement of all the factors involved, given the complexity of this indicator (Table 18).

Table 18. SDG 17 – Partnerships for the goals

Indicators		2015	2020	2025	2030	D_{2020}	D_{2025}	D_{2030}	Trend	Int.
SDG_17_10 (% of GNI)	EU	0.42	0.50	0.49	0.52	1.19	1.17	1.25	SIDEWAY	NO
	PT	0.16	0.17	0.17	0.17	1.06	1.06	1.06		
SDG_17_30 (Million euro)	EU	760,654	851,791	1,005,965	1,120,415	1.12	1.32	1.47	SIDEWAY	NO
	PT	10,010	10,911	10,685	10,685	1.09	1.07	1.07		
SDG_17_40 (% of GDP)	EU	84.7	90.1	100.8	111.6	1.06	1.19	1.32	UP	NO
	PT	131.2	135.2	221.8	308.4	1.03	1.69	2.35		
SDG_17_50 (% of total taxes)	EU	6.2	6.1	6.0	6.0	0.98	0.98	0.98	DOWN	NO
	PT	7.0	6.9	6.2	5.6	0.98	0.89	0.79		
SDG_17_60 (% of households)	EU	21.9	59.3	99.1	138.9	2.71	4.52	6.34	UP	YES
	PT	47.2	86.6	118.4	150.2	1.83	2.51	3.18		

Conclusions

The importance we attach to the principles of sustainable development in the current context is undisputed, especially when we are witnessing a series of climatic, social and economic imbalances with a major impact on contemporary society.

Through our research, we aimed to provide a unique perspective on the prospects for the implementation of the SDGs in Portugal, given the need for information and studies that contribute to bridge this knowledge gap. We also aimed to assess Portugal's sustain-able development potential for the 2030 horizon, as well as to highlight the strengths and weaknesses in terms of achieving positive results for specific indicators of SDG implementation.

Research results indicate a positive situation, demonstrating unequivocal evidence of steady progress for almost all indicators analyzed, with very few exceptions. Analyzing the results obtained from the research, we can state that Portugal presents a relatively good situation, obtaining favorable results for 69 of the 120 indicators analyzed, which leads to an above average achievement of the objectives, i.e. 57.50%.

Portugal also shows that there is still untapped potential for improvement. With a relatively small effort by the responsible institutions, the expected negative developments in the medium and long term could be corrected and the results achieved would be better, leading relatively easily to an achievement of over 60% of the SDGs.

Equally, efforts that are more substantial are needed to accelerate the pace of implementation of the SDGs, in particular for SDGs 2, 3, 9, 11, 12 and 17, for which performance is estimated to be below the optimal level of implementation.

On the other hand, there is a particularly good record of accomplishment in achieving the targets of SDG 1, SDG 4, SDG 5 and SDG 10, which puts Portugal in a position to be a model of good practice in terms of quality of education, poverty reduction and gender equality. Portugal's progress in these areas in recent decades is spectacular and it is very likely that the high level of trust in the European institutions is also linked to this progress

achieved through the contribution of structural and cohesion funds accessed through the European Union.

Set side by side, the results obtained in Portugal with more recent research results published for EU countries, we can note the extremely favorable position in which Portugal finds itself. Comparing the results obtained for Portugal with the results obtained by a similar study for the implementation status of SDGs in Spain (Boto-Álvarez & García-Fernández, 2020), we observe that for Portugal it is estimated that 57.50% of the assumed targets will be achieved, compared to only 42.20% in Spain, for the 2030 horizon.

Comparing Italy's performance in terms of sustainable development and the degree of achievement of the SDGs (Dello Strologo et al., 2021), we note that here again Portugal's performance is superior, with Italy forecasting a percentage of achievement of the SDG targets of only 41.67%, relatively similar to the results reported in Spain. Similar research has also been published for Bulgaria and Romania (Ionescu et al. 2021; Firoiu et al., 2019), with results for these rates suggesting target attainment of 36.28% and 37.38% respectively.

As can be seen, comparing the results obtained by the present research with the results obtained by similar published studies, where the estimated percentage of achievement of the targets is in the 37–42% range, suggesting a relatively even distribution of sustainable performance across EU Member States. The results obtained by the present research place Portugal in a very good position among European countries in terms of sustainable development performance.

One thing is certain, however, and that is that there is a great need for studies examining the degree of implementation of the SDGs and the medium and long-term prospects in European countries and beyond. The need for knowledge is all the greater as the climate emergency is constantly having a negative impact on the economy and contemporary society, and the measures adopted are not living up to expectations. Even if United Nations Climate Change Conference 2021 – COP26 (United Nations, 2021) achieves encouraging results and more than 90% of the world's GDP is now covered by net-zero commitments, there is a need for strong action and a continued commitment to provide support and solutions to ensure the fastest and most efficient transition to a low-carbon economy.

On the other hand, the results of the research should also be viewed in light of the inherent limitations of such a study. A first existing constraint relates to the availability and accuracy of the data used in the evaluation models. At the same time, the methodological framework can be brought into question, even if the most efficient forecasting methods have been used, to maximize the accuracy of the results. Research results may open up new opportunities for further extension and deepening of the analysis, providing the necessary data to develop specific models assess the efficiency and effectiveness of measures to achieve the SDG targets, or to measure direct or indirect effects of public policies and targeted measures that are considered for implementation, aiming ultimately to build a more inclusive and sustainable society.

Author contributions

The authors contributed equally to this paper.

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