FORESIGHT PORTUGAL 2030

Evolution Scenarios
for Portugal

Volume 01

FUNDAÇÃO
CALOUSTE GULBENKIAN

Calouste Gulbenkian Foundation
Av. de Berna, 45A – 1067-001 Lisboa
Tel. 21 782 3000 | https://gulbenkian.pt/

Title: Foresight Portugal 2030 | Volume 01 – Evolution Scenarios for Portugal
Coordination: José Félix Ribeiro
Design and layout: Zestbooks / Finepaper

1.ª Edition: July 2021

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PREFACE

The last decade presented Europe and Portugal with a set of challenges that contributed to increasing our doubts about the future: the economic and financial crisis, followed by austerity policies that undermined our confidence in the future of the economy; the refugee crisis, which accelerated the growth of emerging radical movements; and the pandemic, which challenged our ability to respond and the resilience of the population, and is still unresolved.

To all these already very serious problems, we can add the specific Portuguese situation related to the difficulty in creating wealth and jobs, which generates social inequalities that are hard to overcome due to the scarcity of opportunities. In the European context, Portugal is a country with high levels of poverty, serious difficulties in growth and excessive dependence on the State and the exterior.

At a time of such great uncertainty as we have experienced in the last decade, foresight exercises become a fundamental instrument to better prepare for the future. It was with this in mind that, as part of the Future Forum, the Calouste Gulbenkian Foundation decided to promote the "Foresight Portugal 2030" exercise, which began in 2019 with the conviction that public policies can always be improved to the benefit of the country and the Portuguese.

Three scenarios were built up, all of them plausible: "confidence in continuity", "the search for a new space in Europe" and "Portugal 4D — digitalisation, diversity, dynamism and distinction". We know that each of these scenarios has advantages and challenges. We are also aware that these exercises are affected by the emergence of uncontrollable surprise elements.

The ultimate goal of "Foresight Portugal 2030", however, is the creation of a reference framework that gives rise to informed choices; that provides a roadmap to think about the country strategically in the medium term; that helps Portugal to grow politically and economically and to assert itself in an increasingly complex Europe; that helps Portugal to be an international player with ambitious and realistic goals; and that moves our country forward on the path of technological modernisation and the fight against climate change.

The decade 2020-2030 will be fundamental for the future of nations, since the economic, technological and energy paradigm is changing rapidly. The Calouste Gulbenkian Foundation and the Future Forum wish to contribute to turning these transformations into opportunities for Portugal.

I would like to thank the coordinator of this project, José Félix Ribeiro, who, with the generous help of a number of specialists and institutions, including IPRI-NOVA, and the tireless collaboration of the Future Forum team, has made it possible to publish this work, which we believe can be very useful for all those who want to think and plan the future of our country.

Isabel Mota
President, Calouste Gulbenkian Foundation

1. PRESENTATION AND EXECUTIVE SUMMARY

José Félix Ribeiro
Coordinator of the "Foresight Portugal 2030" project

The "Foresight Portugal 2030" project falls within the area of reflection and foresight of the Gulbenkian Future Forum. The Forum is aligned with the mission of providing the Calouste Gulbenkian Foundation (CGF) with an integrated space for analysis, reflection and action on the societal challenges facing Portugal, Europe and the world, both in the present and in the medium and long term, paying particular attention to the debate and the creation of critical mass on disruptive issues related to the future.

The aim of the Future Forum with this project has been to continue the reflection activities already developed by CGF, particularly regarding the future of Europe, but also to strengthen CGF's position as a centre for prospective thinking and analysis in Portugal.

The project began in November 2019 and was defined as a foresight project focused on the development of contrasted (though always plausible) scenarios for the evolution of Portugal by 2030.

The "Foresight Portugal 2030" project is thus a double foresight exercise: exploratory foresight and strategic foresight.

- **EXPLORATORY FORESIGHT** focuses on issues that Portugal does not control, but that will exert a very significant influence in the short and medium term, not only on Portuguese economy and society, but also on the contextual environment of the country and, of course, on the evolution of the European Union.
- **STRATEGIC FORESIGHT** seeks to identify different paths of evolution by 2030, corresponding to different priorities and options on the part of Portuguese society and authorities, taking into account different European developments.

To carry out this project, various thematic studies were conducted in certain areas that were considered fundamental, with the aim of understanding both the external (international and european), and the internal (national) elements, that may have greater influence on the evolution of the country by 2030. These studies were organised into two work phases, according to three scales of analysis (World, Europe and Portugal):

PHASE 1

Exploratory foresight (the World and Europe) and starting point (Portugal): November 2019 to December 2020

a) WORLD (macro framework): addressing the major trends at various levels that will continue over the period 2020-2030, namely: demographics; environment and climate; energy and water resources; technologies (civil and military); geo-economics, geopolitics and strategy.

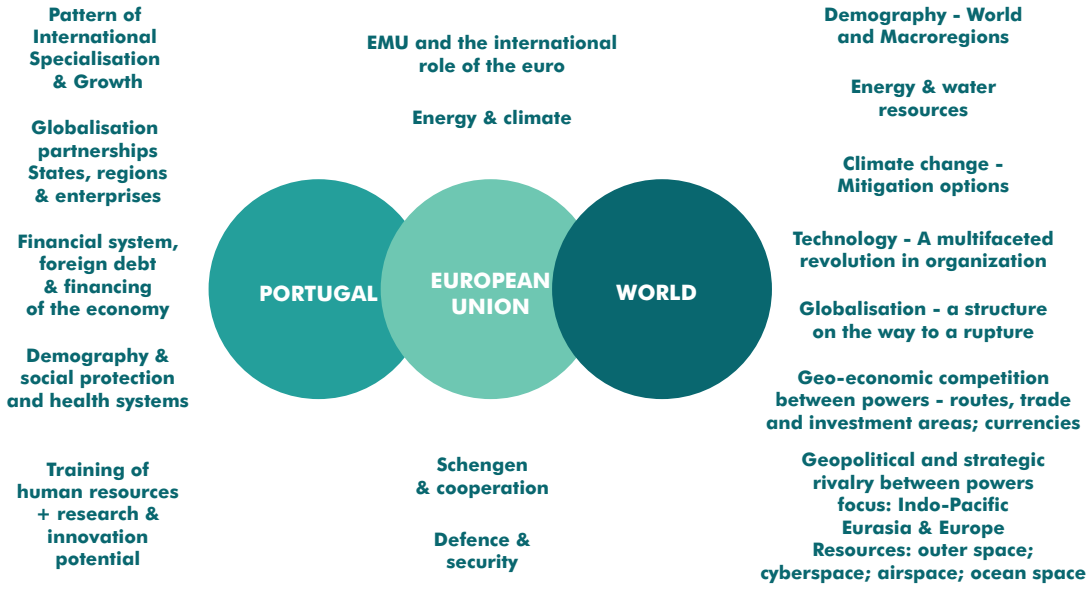
b) EUROPE (contextual environment): addressing the following themes: i) impact of possible developments of the International system on the European system; ii) dynamics and patterns of convergence and divergence within the European Union; iii) anticipation of possible contrasted trajectories in three major areas that are at the heart of the uncertainties about the evolution of the European Union itself by 2030: economic/financial model and management of the euro; security and defence; cooperation policy and management of migratory flows.

c) PORTUGAL (starting point): analysis of recent developments in the Portuguese economy and society and anticipation of possible challenges facing Portugal in the following areas:
(i) demographic trends and their impact on the availability of human capital; (ii) social security and protection system, with a particular focus on the pension system; (iii) health system: future morbidity patterns, requirements in prevention and technological innovation; iv) financial system, banks and capital markets; and household wealth and corporate capitalisation; v) euro area reform, priorities for intra-EU transfers (including structural funds) and long-term management of Portugal's external debt; vi) investment pattern and future international specialization; vii) Portugal — new frontiers for the economy by 2030: aeronautics, outer space, deep ocean; viii) environment and natural risks.

The preparation of this first phase of the project gathered the collaboration of specialists, each of them writing thematic studies on the areas listed. These experts collaborated individually (academics, consultants, renowned specialists with recognised work on the topics in question), or within the framework of the institution in which they conduct their professional activity (as in the case of the four contributions from members of the Portuguese Institute for International Relations — IPRI-NOVA). The complete list of these experts may be consulted at the end of this volume.

Figure 1. EXPLORATORY FORESIGHT AND STARTING POINT (PORTUGAL)

Thematic areas selected for specialist inputs



PHASE 2

Strategic foresight: January 2021 to June 2021

The second phase of the project, based on the reflection carried out in the previous phase, consisted in the preparation of three contrasted scenarios for Portugal's evolution up to 2030, taking into account different external developments and different internal options. One of the main results of "Foresight Portugal 2030" is the possibility of systematising the issues that will influence the evolution of Portugal, Europe and the World in the medium and long term, providing CGF and all its possible users with an instrument to monitor and anticipate international developments, as well as to reflect on possible options in key areas for the Portuguese economy and society. The final beneficiaries of this project are considered to be policy makers in general, academia and all those interested in foresight issues applied to Portugal, Europe and the World.

At the end of the phase 2 of the project, in July 2021, a peer review workshop was held with a group of 10 experts who had access to the main documents produced, and made valuable contributions which were collected and used for completing the project. The complete list of these experts may be consulted at the end of this volume.

The final result of this project is organised in three volumes:

VOLUME 1: **PRESENTATION OF THE "FORESIGHT PORTUGAL 2030" PROJECT WITH SCENARIOS FOR THE EVOLUTION OF PORTUGAL UP TO 2030**

a) Presentation and executive summary of the "Foresight Portugal 2030" project.
b) Invitation to prospective reflection: the decade 2021-2030 in a long term context. A brief reflection by João Caraça on past eras. This text focuses on the beginning and the end of Modernity and the importance of energy sources for the development of civilization, looking ahead to the 2030s and 2040s and the main challenges and questions facing humankind in periods that are expected to be especially troubled. It forms an introductory text for the framework of the remaining documents.
c) Construction of scenarios for Portugal's evolution in economic, technological and social terms in the period 2020-2030, indicating and describing the three selected scenarios:

- **SCENARIO 1** Confidence in continuity.
- **SCENARIO 2** With ability, in the search for a new space in Europe.
- **SCENARIO 3** Portugal 4D — digitalisation, diversity, dynamism and distinction.

It also includes:

- Possible link between the scenarios for Portugal and the scenarios for the EU presented in volume 2: "World and European Framework".
- **Wild Card:** any process of change in the management of the external debt to the European Union.

VOLUME 2: **WORLD AND EUROPEAN FRAMEWORK**

This volume presents the world and European framework that shaped the project's scenario building exercise, addressing different, varied issues, such as global demographics, climate change, the global energy sector and the new phase of globalisation, among others. Issues associated with the world "board" are also addressed, particularly current and foreseeable forms of power distribution and rivalries between powers, by building four exploratory scenarios on possible developments in the world by 2030. This volume ends with the contextualisation and presentation of three scenarios for the evolution of the European Union.

VOLUME 3: **PORTUGAL – POINT OF DEPARTURE**

This third and final volume provides a portrait of Portugal's current situation in multiple areas, constituting the basis ("raw material") from which the scenarios for the evolution of Portugal up to 2030 were drawn up. It addresses various aspects such as demographics and human capital, the optimisation of human resources, the social protection system, the health system, the financial system, international specialization, the digital agenda and infrastructures, the innovation ecosystem, territorial enhancement, environmental sustainability and the potential of natural resources.

2. FOCUS AND TIME FRAME OF SCENARIO BUILDING FOR PORTUGAL

Scenarios are used to think about the future(s) and escape the short-term trap. On the basis of the scenarios a vision can be built that provides strategic guidance for planning; this vision can be based on one of the scenarios or a combination of more than one of them as long as the necessary internal coherence is ensured.

Focus of the scenario building exercise

In the context of the ongoing transformations in the international system, in the world economy and in the European Union guidelines, which give rise to tensions and challenges, what options can Portugal take at various levels to achieve a more diversified and influential international presence in the future, reaching, in this case, in an articulated manner, the following objectives:

- Resume growth, after decades of near stagnation.
- Contribute to mitigating and adapting to climate change, without slowing growth.
- Promote social cohesion in a context of stronger intergenerational solidarity.

Timeframe for scenario building: 2020-2030

We consider that the period 2020-2030 will clearly be a period of transition marked by the shock between, on the one hand, the limitations on the growth of solutions and activities that come from previous periods and, on the other, expansion challenges in connection with a new wave of growth, based on a new technical-economic system and a new world geo-economy and geopolitics, which will probably only stabilise by 2050.

It will supposedly be a turbulent period, in which we will not be able to continue to rely on the same growth factors, nor maintain the same public policy guidelines, which, to date, have not managed to pull Portugal out of a long period of near stagnation. The challenge posed by this decade is, therefore, to prepare ourselves to prosper as a country, supporting what is genuinely new and what will structure the coming decades.

3. THE "FORESIGHT PORTUGAL 2030" PROJECT AND THE COVID-19 CRISIS

After the beginning of the "Foresight Portugal 2030" project, the Covid-19 pandemic spread worldwide, unleashing a violent economic shock that paralysed a large part of the world economy and had a profound impact on the Portuguese economy and society.

The depth of this crisis required the European Union to launch a vast support programme for Member States, materialised in the launch of national Recovery and Resilience Plans, using European funds. The response to this shock involved emergency actions, something that should not be confused with the need to continue to change the trajectory of recent decades, so that Portugal reaches 2030 in a much better position to grow and thrive, supported by the forces of change that also remain structural in the post-Covid-19 period: demographics, technological innovation, change of energy paradigm, new configuration of globalisation.

4. AN INVITATION TO PROSPECTIVE REFLEXION: THE YEARS 2021-2030 IN A LONG TERM CONTEXT

João Caraça
Senior Advisor, Calouste Gulbenkian Foundation

All ages are felt by those who live in them as periods of passage, as times of transition between what has been and what is to come, particularly when they are the stage for violent convulsions of a social or environmental nature, or when they witness the course of deep revolutions in the infrastructure of society — with the adoption of new technologies or major behavioural or institutional changes. In such times, there is a sense that the present is no more than a bridge between the past and the future.

The troubles we are going through at the present time do not stem from the deepening of Modernity, but rather from the crisis provoked by its possible impending collapse. European expansion throughout the world came about at the cost of the proliferation of machines in every sector of intensive materialisation — defence, transport, energy, construction.

Later, machines invaded the globe and, more recently, they have become sophisticated, taking on artificial characteristics that mimic intelligence. Machines have become indispensable to the functioning of contemporary civilizations on the planet.

When we think of the possibilities opening up for Portugal by 2030, we really have to take into account the experiences, ruptures and trends that have occurred and which have driven our collective past. It is this context that we try to decipher in order to provide a framework for the paths to follow.

The future is not written anywhere, so the best we can do to not be afflicted by it, is to construct it, that is, anticipate it. However, we must bear in mind the need to extend the horizon we have chosen by one more generation (2030-2050), in order to take due account of the effort and impact of contemporary ideas and actions.

When we look at the Modernity period as a whole, we see it as articulated in two phases: the first (the 17th and 18th centuries) and the second (the 19th and 20th centuries), both of which revolved around a major turning point — the intensive use of fossil-based energy sources.

In continuing past practices during the first phase of Modernity, Europeans used biological (humans, animals), solar (agriculture), water (mills, water wheels), wind (windmills, sailing ships) energy sources, i.e., renewable energy sources of low energy density.

This first phase was characterised by great ocean-crossing navigations, which

were the basis for European expansion around the world, supported by the innovative use of gunpowder in artillery. European nations were transformed by the spread of the printing press and the establishment of the principles of the nation state, the expansion of trade and the globalisation of plants.

It also saw the emergence and establishment of a new way of doing science — modern science, as well as a new geometric vision of the world — and the legitimacy of basing on reason the rights of freedom, equality and fraternity among peoples.

In the transition to the 18th century, the use of coal as a fuel increased. This was the beginning of a real revolution in the field of energy sources (later continued with the use of oil and natural gas).

Fossil-based energy sources enable a high density of energy flow, which in turn enables the processing of materials and the constituents of nature on a hitherto unseen scale. It was the radical increase in available energy intensity that enabled the economic development and growth of the most advanced countries.

This second phase of Modernity saw the industrial revolution, the flourishing of industrial and (later) financial capitalism — based on the capacity to appropriate fossil energy sources and means of production.

The great transformation of industrial societies in Europe incorporated the strengthening of the structures and institutions of the nation state, the development of colonial empires, as well as a global socio-economic change through the primacy of the market concept, the triumph of the discoveries of modern science and the invention and wide-scale introduction of electricity.

The 20th century brought signs that the second phase of Modernity was coming to an end. The invention of nuclear weapons (which changed the global defence strategy of nations) and the promotion of the imprecise concept of "governance"; the opening of a new frontier of development — outer space; the introduction of the Internet and the possibility, for the first time in human history, to digitalise images in an expeditious way; these are some of the defining features of a new (American) hegemony which today is struggling to hold on.

Already in this century, there is a clear drift from modern science to techno-science (with its "miracles" and its dysfunctions); the disappearance of the concept of employment (which accompanied the period of industrial development); the continuous privatisation of public affairs; and the acritical and trivialising role of the media.

All these drastic changes together point to a replacement of Modernity's central goal — "progress" — by another imprecise and restrictive notion of "sustainability", which generates a compulsive vital anguish, a symptom of the huge crisis of values we are going through in the West.

What can we anticipate in the 2050 horizon?

Perhaps we should admit that, taking into account the changes that the world has undergone during the last 75 years, the importance gained by the Asian nations in world affairs will be an important factor of geo-strategic polarisation in the coming decades.

The growing connectivity among different peoples, the growth of the world population, the aspirations for better living conditions, salubrity and social justice in vast regions, the various reactions provoked by the climate change that the globe is experiencing, as well as the worsening of conflicts over the possession of natural resources, reflect the unlikelihood of imposing a world hegemonic order.

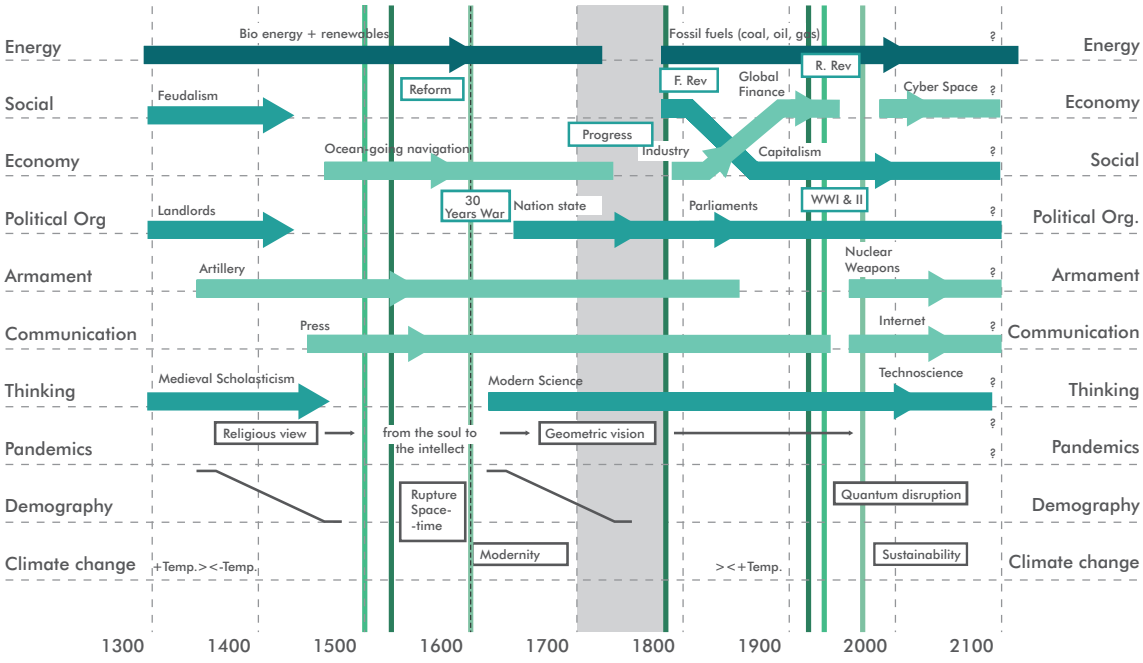
The level of materiality attained by the developed countries (as well as the ambitions of the emerging powers) presupposes an activity based on the use of high-intensity energy sources: i) either the continued and intensified exploitation of sources of fossil origin; ii) or the production of energy from controlled nuclear fusion; and, moreover, production based on some innovation in the field of energy sources as revolutionary or more revolutionary than this. High energy intensity is the key to our civilisational capacity. All major revolutions in human history have also been revolutions in the field of energy use.

On the other hand, a new wave of radical innovations should emerge in the middle of this period leading up to 2050. Competition for technological and commercial leadership will not squander the challenges opened up by cyberspace. Large platforms and organisations, as well as financial funds, will reconfigure themselves in order to optimise their material accretion, domination of economic territory and anticipatory capacity.

At the same time, misinformation may become toxic if societies do not take care of the mental and moral health of their members from an early age. Families today are as disarmed in this struggle as those of the Ancien Régime. **Will the mechanisms for creating and communicating knowledge remain at the mercy of the great resource hoarders, or will a widespread empowerment movement emerge that will impose a new institutional framework for education?**

With a fragmenting world order, the need for security and control of the established powers will increase with the immensity of the flood of data that will be produced, appropriated and regulated. **Will we witness the development of a new field of application of unrestrained violence?**

Figure 2. THE DECADE 2021-2030 WITHIN AN EXTENDED TIME CONTEXT



What can Europe do and, particularly, what will it do? And what path will the Portuguese follow into this 21st century? The prospective study "Foresight Portugal 2030", which the CGF's Future Forum engaged in good time, may be a friendly, enlightening and motivating companion in these first steps we are now taking.

II The External Scenario-Building Framework

MACRO ENVIRONMENT — THE WORLD SYSTEM AND THE GLOBAL ECONOMY

The economy, society and the international relevance of Portugal in the period 2021-2030 will be influenced not only by the impact of the Covid-19 pandemic (still present in the economy), but also by a set of processes that are underway and/or will develop during that period, which Portugal — strongly influenced by them — cannot control. We refer to these processes as predetermined elements, since they are present (as risks, challenges and/or opportunities) in each of the scenarios that were constructed and are defined by the way in which Portugal may address them in the pursuit of its objectives (the focus of scenario building). Part of this process takes place in the international system and in the world economy, while another, with a more intense, direct influence on Portugal, takes place in the European Union space.

"Volume 2: World and European environment" contains the description and a brief analysis of those processes.

THE IMPACT OF COVID-19 ON THE ECONOMY: A NOTE

"Contrary to the positive trends of recent years, the pandemic status of COVID-19 decreed by the World Health Organisation in March 2020 had as an immediate consequence the abrupt paralysis of industrial activity and international trade, forcing a downward revision of economic growth forecast for 2020. Although it is still difficult to estimate the full extent of the impact of this global public health emergency, the WTO (2020) puts forward a forecast contraction in world trade in the order of 13% to 32%, to which must be added a no less pessimistic estimate from the United Nations Conference on Trade and Development (2020), of a reduction in FDI (Foreign Direct Investment) flows of 30% to 40%. Portugal will not be unaffected by the economic recession that is forecast for the coming years, with the INE, I.P., in its February 2021 flash estimate, confirming a 7.6% contraction in GDP in 2020, the most negative value in our democratic period."

Source: *Resolution of the Council of Ministers No. 20/2021, which approves the "Internationalization 2030 Programme"*

In this macro environment we highlight five types of processes: demographic, technological, geoeconomic, environmental/energy and geoeconomic-geopolitical-strategic.

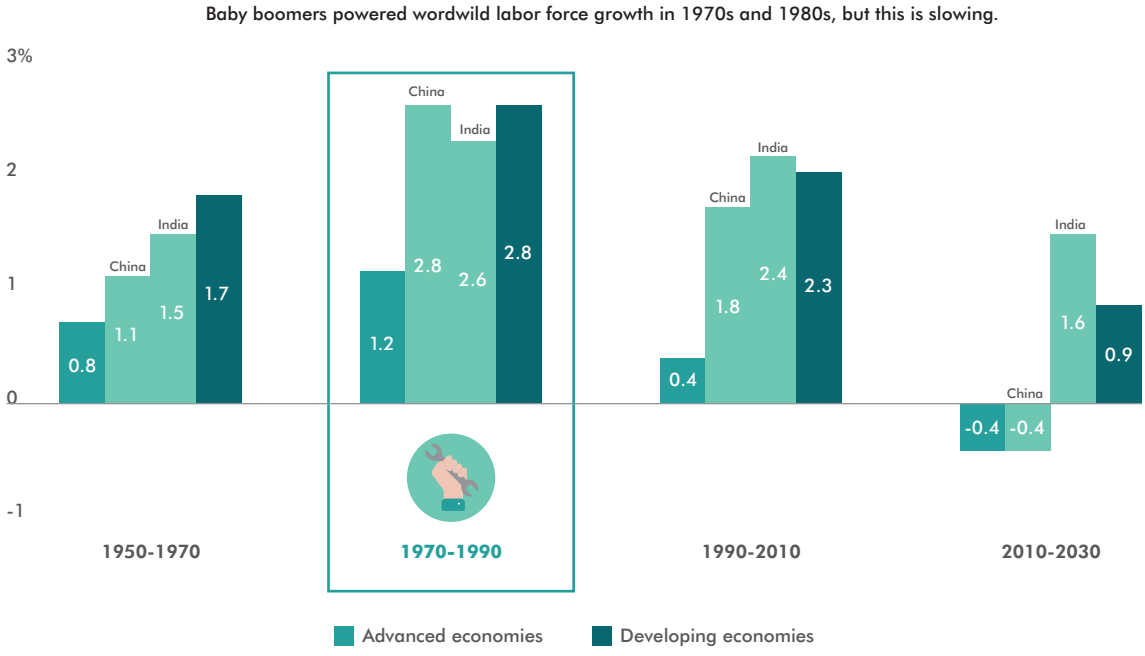
1.1. Demographics: A demographic shock with multiple consequences

The 1960s, '70s and '80s were characterised by strong growth in the working-age population, both in developed economies (with the baby boomer generation entering the labour market) and in developing and emerging economies, notably China.

This demographic dynamic has in turn provided a foundation for globalisation and the accompanying internationalisation of production, based on the industrial revolutions in the Asia Pacific region.

The next decade is likely to be very different, with the growth of the working-age population forecast to decline dramatically in both developed economies and China (in the latter case as a result of the one-child policy).

Figure 3. ZOOM — EVOLUTION OF WORLD DEMOGRAPHICS



Source: *"Labor 2030: The Collision of Demographics, Automations and inequallity,* Bain Consulting, *2017*

Demographic trends in developed economies have three distinct consequences for economic dynamics:

a) The impact on current pension and health systems caused by the ageing of the population, directly increasing public expenditure (which may also increase indirectly whenever States have to intervene to cover financing deficiencies in private institutions, responsible, for example, for pension systems).

b) The deflationary impact that population ageing may generate in the economy, as seen in the case of Japan, where the age

groups that have saved and accumulated assets during their active life will gradually consume those savings (which mostly exist in the form of bank deposits), and this reduction in deposits may slow down the granting of credit. These age groups will also cease to drive demand in key sectors of the economy, such as: construction, home equipment, the automobile sector, etc., from which demand of a similar size in the younger (less numerous) generations will also be absent, causing a trend to lower prices in companies in these sectors in order to increase physical sales, contributing to a general decline in prices.

c) The need for significant productivity gains. The reduction in the working-age population, and in the population as a whole, can only be compatible with the maintenance of growth in developed economies if these significant gains in productivity occur, requiring the early adoption of new emerging technologies as part of a new techno-economic system demanding adequate qualification of human resources.

1.2. The development of the new techno-economic system

A new techno-economic system is being developed through the combination of new technologies in various functional areas and the development of synergies between them, which means that this new techno-economic system under development will enhance economic growth in the coming decades through productivity gains.

We saw earlier that the possibility of economic growth at world level in this demographic context of population ageing and reduction in the working-age population, **will depend on large-scale productivity gains, including in sectors such as education, training and health** — in the latter case with a stronger disease prevention component.

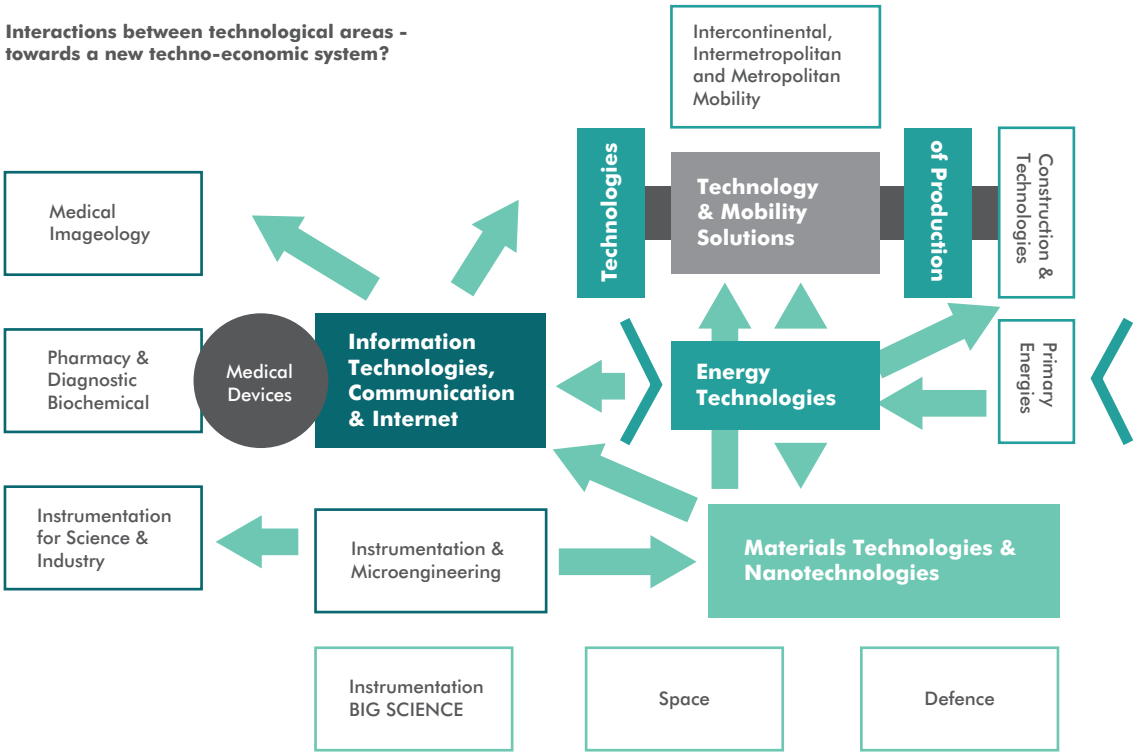
The 5th techno-economic system under development[1] offers vast opportunities for productivity gains in economies (see digitalisation), while it also opens up expanded opportunities for mitigating climate change — if we include 4th generation nuclear energy, hydrogen obtained without CO_2 emissions (and usable in stationary applications and mobility) and new generations of batteries. At the same time, experimental development of nuclear fusion in compact equipment is also taking place (see the case of the US Nuclear Fusion Industries Associations).

[1] The analysis of the succession of techno-economic systems is covered in Volume 2.

But this 5th techno-economic system also allows the diffusion of carbon materials that will replace metals in various both structural and functional applications, freeing economies from the massive burning of fuels needed to process metals and increasingly valuing hydrocarbons (from natural gas to methane hydrates) as a solid state carbon source, as well as hydrogen.

In the figure below we can see the set of areas covered, areas in which technologies are being developed and consolidated — of which will survive as structuring technologies those that, arising from one of the areas referred to, will allow, through their combination with others emerging in other areas, the greatest gains in effectiveness (operational results against demographic, environmental, resource and strategic challenges) and efficiency (translated into business results encouraging continued investment in innovation).

Figure 4. **THE 5TH TECHNO-ECONOMIC SYSTEM (FUNCTIONAL AREAS IN WHICH IT INTERVENES)**



The 5th techno-economic system:

a) Organises societies and economies around cyberspace, enabling a new phase of globalisation. In this context, global platforms that bring together customers, service providers and content producers located all over the world, transaction communities whose algorithms developed by these platforms companies make it possible to organise.

b) It makes it feasible to increase the competitiveness of the services sector, made possible by the combination of digital connectivity — a key factor in the productivity gains of information-based services — and increased human capacity, thanks to the presence of cognitive interaction aids (forms of machine learning/artificial intelligence) in knowledge-intensive services sectors.

c) It enables physical production to be organised in a decentralised manner — moving beyond the current organisation in linear, single-sector production chains, distributed across the global space according to the combination of quality/cost of human labour, in favour of multi-sector production chains, based on the combination of additive manufacturing, robotics and artificial intelligence — bringing production and consumption closer together and potentially changing the pattern of international trade and supply chains completely.

d) It allows a transition period for the global energy paradigm to be organised, in which hydrocarbons will continue to be dominant at the basis of energy systems, but will gradually cease to be used directly as fuels, notably thanks to the growing role of hydrogen as an intermediate product with ever wider use (provided that hydrogen is obtained without CO_2 emissions and with the possibility of obtaining new carbon-based materials from this hydrocarbon: turquoise hydrogen). At the same time that a 4th generation of nuclear reactors — currently being deployed in the USA and the UK — will make it possible to overcome some of the main limitations of current nuclear power.

e) It puts carbon-derived materials and polymers at the centre of the new techno-economic system both in terms of structural materials and functional materials (carbon fibres, carbon nanotubes, graphene, etc.), including technical plastics and their composites, thus marking the gradual end of the metal ages.

f) It changes usage patterns and mobility solutions, while simultaneously reducing needs and introducing new and more sustainable — electric and autonomous — mobility solutions.

g) It updates the way healthcare is organised, the following being examples: a shift to a more predictive diagnostic paradigm (thanks to genomics); a greater focus on the prevention of some diseases such as oncological and neurodegenerative diseases; permanent and automatic monitoring of individual clinical parameters; the personalisation of treatments and more frequent recourse to organ replacement (not only to organ function correctors), the manufacture of which will become easier (see box below).

h) It accelerates a shift in agriculture and food, starting with the use of genetic engineering to improve plants in terms of productive income, ability to withstand natural stresses and resistance to pathogens (mainly using CRISPR-modality engineering), and also including the production of nutritional tissues obtained "in the laboratory" (e.g. tissues to replace meat of animal origin) and 3D manufacturing of ready-made foods.

i) It creates the conditions for a new phase in the exploration of outer space and opens up new possibilities in the exploration of the deep ocean, areas that stimulate the development of a number of technologies that involve this new techno-economic system.

j) It gives rise to new generations of military platforms, weapons and defence systems, which will change the way future conflicts are conducted.

COVID-19, THE 5TH TECHNO-ECONOMIC SYSTEM AND THE FUTURE OF HEALTH CARE

Covid-19 and the way it has been fought have introduced profound changes — albeit temporary — in the organisation of work, in the division of tasks between the family home space, the work space and the urban space. These changes, in turn, have accelerated the spread of digital technologies — teleworking, telelearning, teleconferencing, telemedicine, e-commerce, etc. In other words, a public health issue has determined an acceleration of the digitalisation of the economy and society.

Looking into the future, the question may arise as to the extent to which the demographic dynamics underway, the changes in morbidity patterns and the strong probability of new epidemic outbreaks, can be addressed with the increasing use of parallel advances occurring in telecommunications (e.g. 5G), as well as with massive data processing, with the possibility (through analytical technologies) of extracting a mass of behavioural pattern data to support decision-making, with advances in the use of sensors and their interconnection through the Internet of Things (IoT) and with the development of computing close to the place where data is collected — edge computing, as opposed to the current massive placement of data in the cloud — and with advances in machine learning and artificial intelligence. In geo-economic terms, the transformations that cyberspace and the global digital platform economy are bringing about in the more personalised provision of services and access to content should be highlighted.

Trends in demographics and health

In developed economies we are witnessing a central phenomenon in demographics, which is the ageing of the population, translated into:

- Extended life span in the over-80s population, subject to disabling neurological diseases (Parkinson's, Alzheimer's, etc.), without family structures being prepared to deal with this challenge.
- Baby boomers of the post World War II generation entering the phase of increased medication consumption, and the possible obligation to extend the working life of this generation to make up for the insufficient financial capacity of pension systems.
- Increased impact of chronic diseases on the working age population due to diseases acquired as a result of lifestyles (e.g. obesity) or environmental factors (e.g. allergies).
- Increased occurrence of diabetes and other diseases associated with obesity, as well as inflammatory diseases (e.g. rheumatoid arthritis) establishing themselves as major chronic diseases in the working-age population.

Diet, sedentary lifestyles, alcohol consumption, tobacco or drug consumption have an increasing impact on morbidity patterns, to which environmental impacts can be added in the form of allergies, respiratory diseases and others.

These dynamics, acting together in national health systems, make them difficult to finance — whether financed in part by taxes or in part by contributions from employees and employers to the health systems — posing challenges to national health systems currently in place whose format dates back to periods with different demographics and disease focus. It is notable that these health systems have (in conjunction with other societal developments) enabled a drastic reduction in infant mortality, the eradication of infectious diseases, the transformation of causes of death into chronic diseases, advances on multiple fronts in the fight against cardiovascular diseases, and responses to the growth of psychiatric illnesses, among several other advances.

In view of these developments, it is advisable that these health systems evolve towards earlier diagnosis of the aforementioned diseases, with a clear reinforcement of disease prevention, greater personalisation in treatment as well as a real search for definitive cures. Moreover, they require a review of the ways of responding to new pandemics that do not imply an almost total paralysis of economies.

How can the digitalisation of the economy and society contribute to the transformation of health systems in this direction? It is fair to assume that there will be changes during the next decade resulting from technological advances associated with digitalisation, examples of which are:

- Monitoring of individual health parameters will now be carried out permanently, in real time and connected with healthcare providers. Consumers will have at their disposal (and will be encouraged to use) a set of wearables for continuous capture of clinically relevant data — those related to clinical parameters, those that pro-

vide information on the user's activity profile or summarising environmental data with relevance as risk factors for disease.

- In addition to these wearables, fixed devices could be available in the residencies that periodically obtain information on blood pressure or body temperature, comparing it immediately with historical biometric data, for example.
- The availability of this personalised data (and integrated into a previously formatted profile) will enable everyone to closely monitor their own state of health and to share it with healthcare providers — public, private or mixed — to whom they entrust the predictive diagnostic functions, health advice and the prescription of any necessary treatment.
- Digitalisation also enables relevant health information on each user to circulate between the various levels of national health services — primary health care (health centres, family health units), specialised medicine, hospital care, etc. — in the respect for the rules of confidentiality.
- Digitisation also makes it possible to improve the relationship between users and healthcare providers, which can now be conducted remotely (telemedicine), using the digitalised results of diagnostic means and the permanent monitoring of data mentioned above.
- Most of the healthcare currently provided is considered by a number of experts to be highly algorithmic and predictable, which makes it possible that part of the healthcare to be provided in a personalised way may be done on the basis of advice from providers using artificial intelligence.

Speaking of these examples, it is interesting to mention the contribution that 5th generation mobile telecommunications (5G) can make to this transformation of healthcare due to their broadband access characteristics, high communication speed and reduced latency, allowing easy articulation with the Internet of Things and with edge computing.

Telemedicine, for example, which requires a communications network that can support near-real-time, high-quality video (without slowing down the network) will benefit from 5G and enable remote patient monitoring. The use of IoT-enabled devices will also be facilitated by increased data transfer capacity with the higher bandwidth made available by 5G and the ability to transfer bulkier blocks of data. This development can also facilitate the use of digital analytical technologies, as well as artificial intelligence, in areas such as making diagnoses or defining patient care plans, tasks that require higher data transfer speeds. And when the network has ultra-low latency levels, it could provide access to edge computing with multi-access, allowing fast data processing at the edge of the network.

Eventually, digitalisation may also bring into the group of entities that citizens can choose (to access healthcare) a new type of entities — the global digital platforms — that may become (subject to rules to be defined by public authorities) interconnectors between consumers and their data, artificial intelligence advice and different healthcare providers.

But the innovation brought about by this new techno-economic system also wreaks havoc with the "traditional economy", freeing up capital that can be channelled into what is truly new.

1.3. A geo-economic shock: cyberspace and the new phase of globalisation

Cyberspace — the virtual space made possible by the internet — organised by global digital platforms, is a process that relies on technological algorithmic innovation. The gigantic organisations that organise it aim to offer personalised services — breaking with the mass consumption of standardised products — through the loyalty of hundreds of millions of users of multiple services (many of them free or at very low cost), in exchange for access to individual data. This is a process that we could call a typical "creative destruction through technology".

Global digital platforms, by allowing economic agents to interact in real time, mark the beginning of the connected economy or platform economy era, a new phase of capitalism that translates into a great leap forward in market efficiency and economic growth potential. We indicate below six characteristics that can place global digital platforms at the centre of the geo-economy:

a) These platforms create consistent, global markets and aggregate both consumers and producers and consumers and businesses. They also centralise the supply and demand of decentralised activities and promote integration between different economic agents through the internet and real-time communication. These networked digital platforms are virtual and dematerialised spaces that offer products and services in the real world in a more efficient way.

b) These platforms are companies that act as marketplaces. They function as third parties, as digital intermediaries, and as the "visible hand" of the competent market functioning. They ensure:

- Connectivity between the physical space, the production of goods and services and the digital world of information, creating the conditions for intelligent information to be added to production.
- Efficiency of transactions and relationships between platform users (digital platforms tend to replace physical markets).
- Perfect information on market operation, with real-time prices that reflect the concrete conditions of supply and demand at any given moment (e.g. the prices of Uber-type platforms).
- Digital accounting, the recording of transactions and the processing of information occurring on platforms.

c) Platforms, as mentioned in the previous points, create markets and ensure the connectivity of the economy, but, during the economic process, they gather data and information on the market and on the economic agents that revolutionise the mode of production and the functioning of the entire economic system. Thus, these platforms produce the most valuable raw material of the 21st century: information.

d) The platforms do not only ensure the most efficient functioning of the markets through the permanent communication of the economic agents. In fact, during the continuous process of intermediation, they rediscover the economic agents, their tastes and preferences, which were not revealed in the physical markets, and this continuous rediscovery is permanently accumulated and can be systematically worked on and reinterpreted by artificial intelligence tools. As a consequence, platforms are instrumental:

- In the innovation process and for the continued reinvention of business models and economic relations based on the personalised monitoring of the behaviour of economic agents. Platforms act as incessant innovation laboratories, carrying out pilot projects that test in real time with target consumers, promote innovation in real time and speed up the transformation of economic activity as a whole.
- In the production chain of intelligence applied to the economy, because they are true factories of data production, they multiply information uninterruptedly and, in this way, feed artificial intelligence with an increasing volume of indispensable data for the continuous innovation of the new productive system.

e) Platforms change the scale at which the economy operates. The future of each platform depends on its capacity for growth. Competitive positioning, as a rule, is subordinate to the size and scale in which it operates, which implies, on the one hand, a relentless search to enter new countries and new markets, to add new activities, more clients, producers and suppliers and, on the other, the need to capture the users of competing platforms. The centralising logic of the platforms themselves is accompanied by a dynamic of geographical and productive market concentration, with a change in the strategic focus of the organisation of economic activity:

- From national markets to a global market.

- From sector and fragmented markets to more global markets, aggregating an increasing the number of sectors and activities.

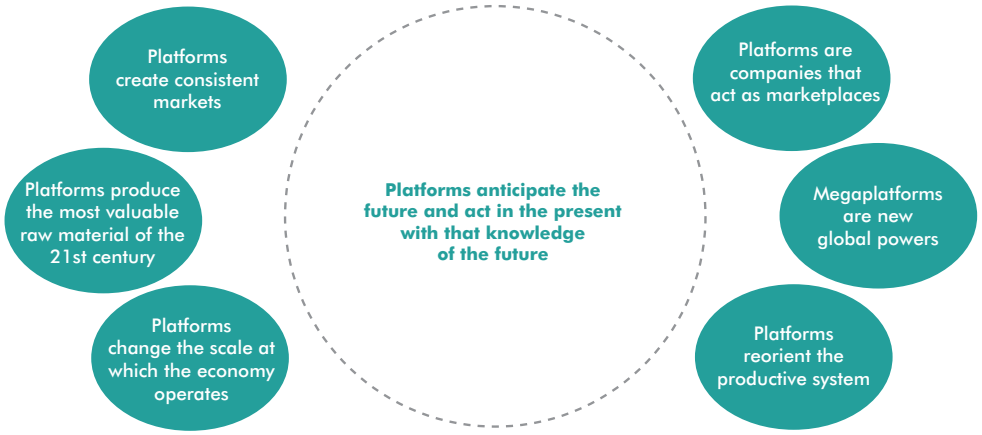
f) Platforms reorganise the production system, which evolves from a centralised, standardised and presential mode of production to decentralised, personalised and virtualised production, in which global digital platforms interact with production centres so that they can combine, for example, 3D printing and robotics, and respond in real time to the "orders" originating in the platforms' virtual markets.

g) The real risk is that, by 2030, the entire global economic activity could, directly or indirectly, be controlled by about ten megaplatforms, meaning that, on average, each of these platforms would control a turnover of $8 trillion dollars (or 80[12]), corresponding to twice the GDP of Germany in 2019. Possibly, the two largest platforms could be the size of the US economy, $21 trillion, or China, $14 trillion.

In short, economic activity in the future will be organised by platforms. The key to their success lies in the fact that they can "anticipate the future" and act in the present with knowledge of the "future".

Acting in the market based on predictive models of the behaviour of economic agents and consumers is the great competitive advantage these platforms have. They anticipate users' desires based on their behaviour, turn information into predictive intelligence and thus enrich, make markets more efficient and customers more satisfied. Platforms are the future because they are better able to understand the present.

Figure 5. FUNCTIONS UNDERTAKEN BY GLOBAL PLATFORMS IN THE GEO-ECONOMY



Source: *Manzoni, António, "Globalização digitalização e ciberespaço", Foresight Portugal 2030 Project, 2021*

A geo-economy based on cyberspace and relying on the action of global digital platforms is faced with a central problem: they overcome in their operation the physical borders that separate national states and make it possible to respond directly to the needs for goods, services and content of citizens of multiple states. However, this business-platform capacity can create permanent tension with national states.

1.4. An environmental shock: with profound energy and economic impacts

In economic terms, the decade from 2021 to 2030 will be marked by the commitments made by the international community in the Paris Agreement, in which it was decided to drastically reduce CO_2 emissions and implement an energy paradigm shift translated into the loss of importance of coal, oil and natural gas in the global energy mix.

FROM COMBATING COVID-19 TO MITIGATING CLIMATE CHANGE

During the partial or total lockdown that European countries implemented to fight the Covid-19 pandemic, it was noticeable how digital technologies made it possible to maintain professional activity from the family home, attend school, or order products that were brought to us at home, among other things.

On a global level, the fight against Covid-19 has also had another extraordinary impact besides spreading the use of digitalisation on a large scale: it has allowed CO_2 emissions to be reduced very significantly. But one of the main reasons to this reduction was the strict restriction of mobility, demonstrating that transport, especially land transport, is one of the most important CO_2 emitters.

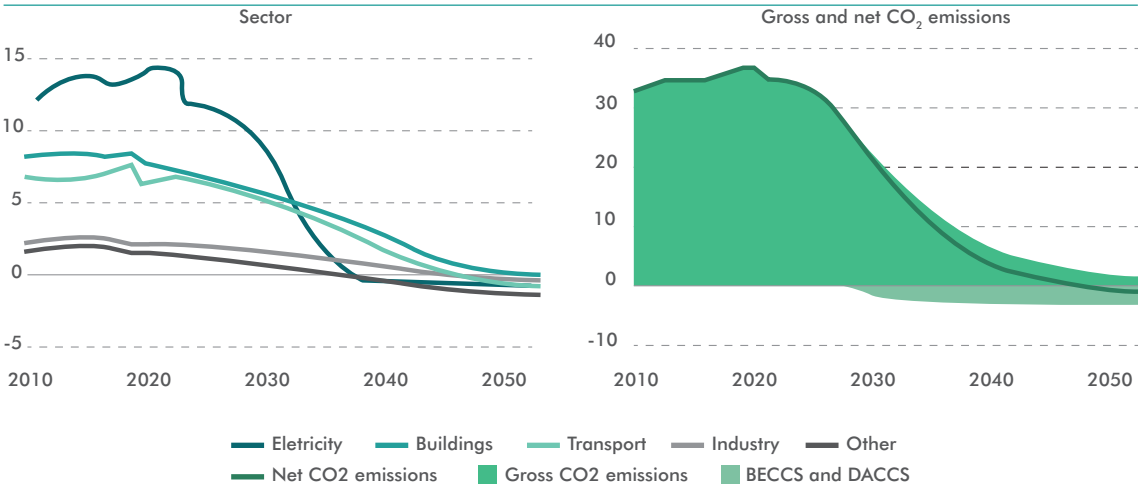
The recent experience of the Covid-19 crisis has shown a capacity to reduce CO_2 emissions — without making radical changes in transport technologies or solutions and industry — more significantly than what was being achieved on average in some countries. But what made this possible was the almost total paralysis of international mobility, the lockdown of people and the massive shutdown of activities worldwide, which is certainly not an acceptable programme for the post-Covid-19 period.

The reduction of CO_2 and other GHG (greenhouse gas) emissions required by 2050 (see: The International Energy Agency's Roadmap to Net Zero by 2050) will hit particularly hard the industries and services that characterised previous techno-economic systems, all of which were oil- and

coal-intensive, examples being thermal power, steel mills, oil refineries, mineral and fertiliser chemistry, petrochemicals and polymer chemistry, the automotive sector (passenger and freight) and aviation and civil aeronautics.

This process of closing down entire sectors will have to be done gradually. But the massive destruction of capital — most of it already amortised — that will be seen by 2030 will not be achieved by administrative decisions to make rapid closures, but will start by requiring companies to pay carbon bonds as a penalty for consumption.

Figure 6.1. GLOBAL NET-CO_2 EMISSIONS BY SECTOR, AND GROSS AND NET CO_2 EMISSIONS IN THE NEZ (NET ZERO)



Emissions from electricity fall fastest, with declines in industry and transport accelerating in the 2030's. Around 1.9 Gt CO_2 are removed in 2050 via BECCS and DACCS.

Notes: *Other=agriculture, fuel production, transformation and related process emissions and direct air capture. BECCS = bioenergy with carbon capture and storage; DACCS = direct air capture with carbon capture and storage. BECCS and DACCS include CO2 emissions captured and permanently stored.*

Source: *"Net zero by 2050 – A Roadmap for the Global energy Sector", International Energy Agency (IEA), 2021*

This reduction in emissions will be supported by drastically reducing the use of oil, natural gas and coal.

The destruction of capital required to reduce emissions reflected in the strategy proposed by the International Energy Agency may **generate a deflationary wave** in three ways:

a) A Financial way: centred on the fall in value of financial assets on the main world stock markets, where the oil, natural gas, automobile and chemical sectors still occupy a consolidated position, and on the balance sheets of European banks that hold assets in these sectors.

b) A Commercial way: through the prices in the energy product markets — the decisive shock of the reduction of emissions will be the contraction in the demand for oil and natural gas (and coal).

c) An Industrial way: public and private companies in these sectors, faced with this reduction in demand (and as has already happened during the Covid-19 crisis), will react by trying to increase physical sales, lowering the prices of fuel or the products they manufacture, indirectly contributing to the process of disinflation or deflation, while laying off workers and reducing production.

But this process of capital destruction will require, in developed economies and at the same time, an intense volume of investment in four areas:

a) Investment in CO_2 capture and sequestration facilities as a way to postpone the decommissioning of newer units in the most GHG emitting sectors: electricity (e.g. combined cycle natural gas thermal power plants) and industrial sectors (e.g. chemical/petrochemical; steel industry/metallurgy, cement and other building materials).

b) Investment in "cleaner" fuels from renewable energies (e.g. green hydrogen) that enable plants to remain in production that would otherwise have to close, while allowing internal combustion engine vehicles to remain in use for some time — the basis of the current road mobility sector.

c) Massive investment in new sources of clean electricity generation, from renewables to 4th generation nuclear energy, to replace coal–, oil– or natural gas-plants that will close.

d) Large-scale investment in electric mobility to reduce the share of the stock of vehicles still using traditional fuels.

This massive set of investments in the energy and materials base — to be co-funded by private financial institutions relying on state financial support — **will not, however, contribute to the significant increase in productivity of the economies, an increase that the demographic evolution already mentioned would require, and that the developing techno-economic system would allow.** This 5th techno-economic system may contribute to the achievement of several of the long-term objectives that are pursued to mitigate climate change. In fact:

a) The 5th system will accelerate the replacement of energy-intensive, CO_2 emitting metallic materials in steel and metallurgical plants with carbon-based structural and functional materials, and solutions are being developed to extract hydrogen from natural gas without emitting CO_2 — obtaining solid-state carbon as a complementary product.

b) The 5th system will enable greater use of solutions in the future with much higher energy density and without the current irregularity constraints of renewable energies, which are the basis on which the approach expressed in the IEA Roadmap for the global energy sector is based. Suffice it to recall the advances underway in 4th generation reactors in the US and the UK, and the interest of India and China in exploiting the thorium reactor sector is clear.

c) The 5th techno-economic system will simultaneously develop the competitive use of fuel cells. This development paves the way for electricity production in decentralised stationary solutions and for flow batteries, which will make it possible to store renewable electricity on an industrial scale for later access to centralised electricity grids.

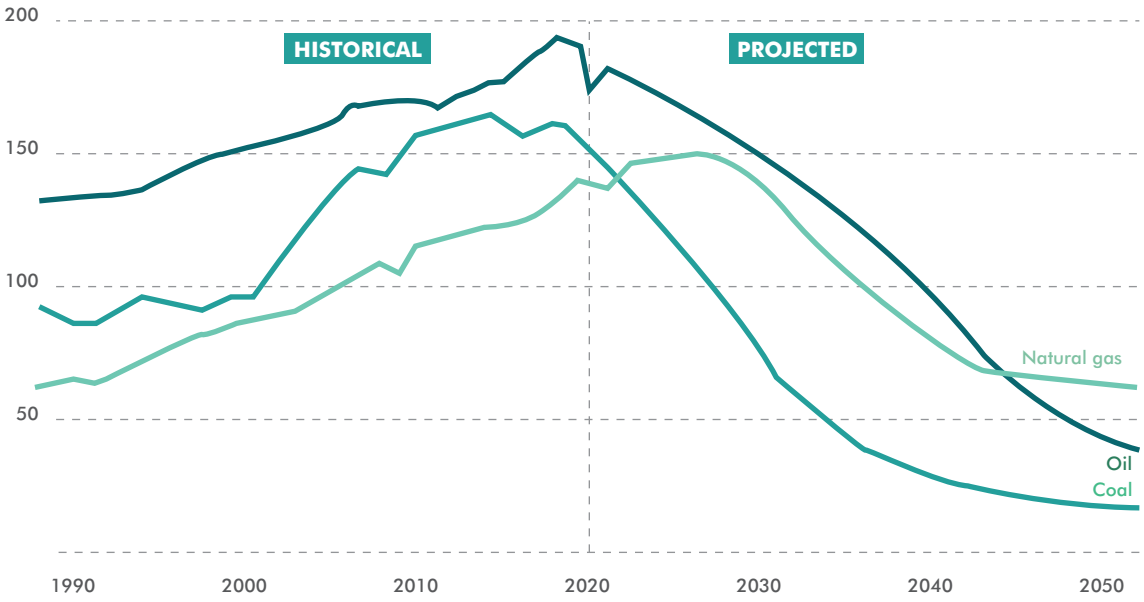
d) The 5th techno-economic system will spread mobility as a service, allowing more intensive use of vehicles for most journeys in metropolitan areas (instead of individual transport in one's own vehicle), and will leave other types of vehicles (e.g. SUVs) for family leisure functions outside metropolitan areas. It will transform road transport into a "green" and digitalised mode of transport by its relationship with 5G communications networks, for autonomous driving of trucks. It will also allow drones with electric propulsion to be used in multiple urban logistics tasks, reducing the need for families to travel to supermarkets to stock up on groceries.

e) If the demographic dynamics and the recessive effects of the closure of a significant part of CO_2 emitting sectors in developed economies are not accompanied by productivity gains resulting from strong investment in the technologies and sectors that drive the new techno-economic system, growth in developed economies will be weak.

f) If deflationary tensions resulting from the approach chosen to face the climate/energy nexus are added to this weak growth, it will be even more difficult to absorb the already accumulated public debt and that which the demographic dynamics may possibly generate.

The environmental shock we are referring to will also have major geopolitical impacts. The drastic reduction in the use of hydrocarbons envisaged in the IEA's 'NETZERO2050 Roadmap for the global energy sector' (see graph) will confront the oil and natural gas exporting economies (concentrated in the Persian Gulf and Eurasia, which includes Russia) with a radical drop in income that may give rise to responses of the greatest geopolitical relevance, all the more so as the Persian Gulf/Middle East and Central Asia involve Muslim societies for which such income is the almost exclusive basis of their economies.

Figure 6.2. **COAL, OIL AND NATURAL GAS PROCUCTION IN THE NZE**



Between 2020 and 2050, demand for coal falls by 90%, oil by 75%, and natural gas by 55%

Source: *"Net zero by 2050 – A Roadmap for the Global Energy Sector", International Energy Agency (IEA), 2021*

1.5 Intense geo-economic, geopolitical and strategic competition

The geo-economic transformation brought about by digitalisation and virtuality is not the only source of tensions in geo-economics. Factors of another nature — more traditional factors of competition between states — are calling into question the globalisation we knew from the period 1980 to 2010.

This previous globalisation had at its core the relationship of the US with Asia Pacific — a major exporter of industrial goods — and with the Persian Gulf — a major exporter of energy to Asia Pacific — , with decreasing importance as a supplier of US domestic energy consumption. The relationship was then based on the following structure:

- The US, the issuer of the main international currency (US dollar) that was used by the Asia Pacific (including China) and Persian Gulf states, presented constant current deficits with both these macro-regions.
- The current surpluses accumulated by Asia Pacific and the Persian Gulf (in dollars) were partly used to purchase US treasury bonds, becoming foreign exchange reserves of the respective central banks.

From 2013, the People's Republic of China (PRC) changed its external orientation and chose to engage in the organisation of an Asian economic space from which the US would be excluded and in which China would become the dominant economy. This new orientation unfolded in three types of initiatives:

- Support for the creation of a uniquely Asian trade and investment space: RCEP — Regional and Comprehensive Economic Partnership.
- The launch of major transport infrastructure projects (such as the Belt and Road Initiative) organising a synocentric economic area covering Eurasia and Southeast Asia.
- Competition to deprive the dollar of its predominance in intra-Asian transactions, replacing it with the Chinese currency.

In turn, the PRC and the US are competing for leadership in key technologies of the new techno-economic system we mentioned earlier (from digital platforms organising cyberspace, to artificial intelligence, robotics, micro and optoelectronics and biotechnology for civil and military purposes, among others).

A strategic competition between both powers has been added to this geo-economic/technological competition between the USA and the PRC, with China investing in the creation of a military industrial complex that will allow it to compete with the USA in armaments and defence systems of the future. This complex will drive the bulk of the defence modernisation of the PRC and make it a strong competitor in foreign arms markets.

The current international context is marked by the return of inter-power rivalry, played out at the geo-economic, technological, geopolitical and strategic levels (with different degrees of power at these levels by the US and China), also including India and Japan. On the other hand, Russia seeks to intervene in this rivalry with two more prominent "assets" — its military industrial and energy complex.

2. CONTEXTUAL ENVIRONMENT — THE EUROPEAN UNION: AMBITION AND UNCERTAINTIES

The European Union (EU) came out of the 2011-20 decade weakened by the crises within it (sovereign debt crisis in the euro area in 2011, migration and Schengen Area crises in 2015) and in its relations with the outside (Ukraine crisis in 2014), affecting the EU's relationship with Russia.

The end of the globalisation phase referred to above — and the transition to a period of intense rivalry between powers (on four distinct levels: technological, geo-economic, geopolitical and strategic, but interrelated in their respective international strategies) — has posed existential problems for the EU:

- On the one hand, the UK decided to leave the EU and seek a globalised international repositioning based on close collaboration with the US, Japan and India. This Indo-Pacific triangle is now the centre of gravity of power rivalry.
- On the other hand, none of the post-BREXIT EU Member States — in particular Germany and France — has the conditions or assets that make them relevant, on their own, to integrate the field of inter-power rivalry.

The European Union, struggling with fractures within itself (North-South and East-West) has been defining, with strong involvement from Germany and France, a new leap of regional integration in three areas:

a) To catch up technologically in key areas of the developing techno-economic system (namely in the broad so-called digital area), considering the US and China as its main competitors, with the development of an integrated industrial policy (and not only a common R&D policy, with programmes similar to Horizon 2020) with a strong degree of public protection already underway.

b) Refocusing the EU economy on its internal market, reducing its exposure to long supply chains — which it had created in the previous phase of globalisation — by triggering a major infrastructure investment project in the Single Market that can create a market with EU trade preference. As a unifying element of this new market and this new infrastructure, it opted for the climate/energy nexus.

c) To move towards the definition of a European defence policy (still with unclear outlines) where the industrial policy component will always be fundamental, implying the protection of defence and space industries.

With this reorientation, the EU is defining itself as something quite different from the previous EEC, where the priorities of trade policy, agricultural policy and cohesion policy prevailed.

The Covid-19 crisis has intruded on this process.

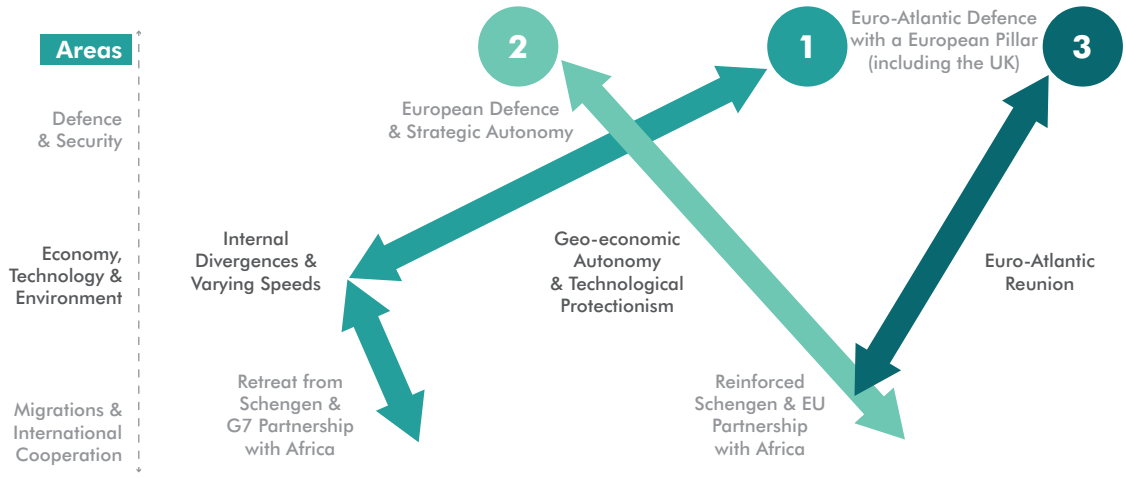
The first member state to be hit hard by the epidemic was Italy, which, from that moment on, saw a new crisis emerge, adding to its already decade-long stagnation, its banking system crisis and the high burden of its public debt (mainly placed internally). Without a major external intervention, Italy would be on the brink of an economic and political crisis that could reopen other crises in the euro area.

Italy has forced countries supportive of this new direction for the European Union to reinvent cohesion policy, now aimed at preventing further exits from the European Union (or US interventions in support of a key ally in Europe such as Italy).

This Covid-19 shock was strong enough to convince a first case of debt issuance on the international markets, an amount that was directly allocated to support those Member States most heavily affected by the pandemic or most economically hit by the widespread lockdowns. It was so strong that not even the "Hanseatic coalition" (which disagrees with the reorientation of the European Union under the influence of Germany and France) was able to stop this leap towards the mutualisation of sovereign debts, which may even be necessary to maintain the unity of the European Union around Germany and France.

The European Union we have today is quite different from the EEC which Portugal joined in 1986 and which, since then, has made available to Portugal under the cohesion policy volumes of aid of exceptional size and importance for the various governments.

Figure 8. EUROPEAN UNION — 3 SCENARIOS UP TO 2030



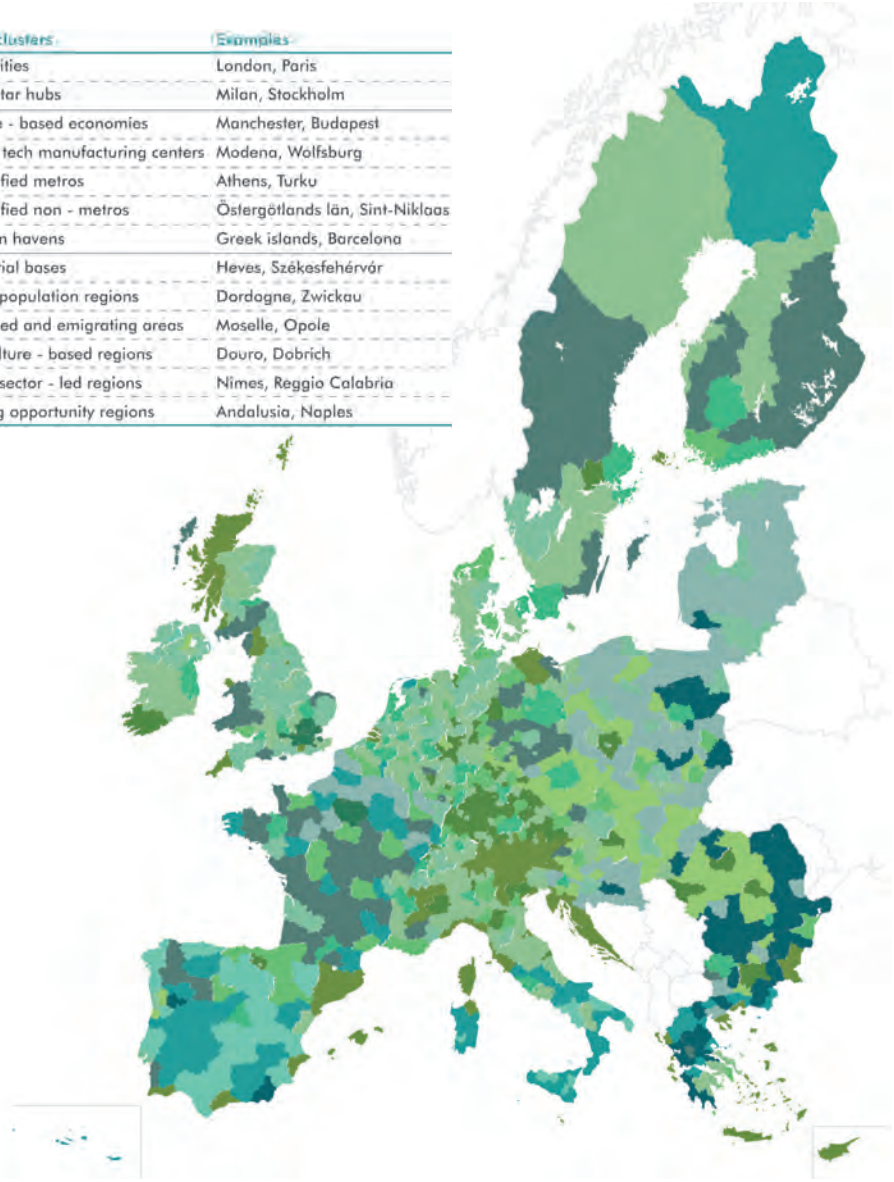
UNCERTAINTIES	SCENARIO 1	SCENARIO 2	SCENARIO 3
Defence & Security	Traditional Euro-Atlantic Defence	European Defence & Strategic Autonomy	Euro-Atlantic Defence with a European Pillar (including the UK)
Economy & Technologies	Internal Divergences & Varying Speeds	Geo-economic Autonomy & Technological Protectionism	External openness & Partnership with the US
Schengen Area & International Cooperation	Retreat from Schengen & G7 Partnership for Africa	Reinforced Schengen & EU Partnership with Africa	Reinforced Schengen & EU Partnership with Africa

3. PORTUGAL IN THE EUROPEAN MOSAIC: A VIEW OF PORTUGAL FROM THE OUTSIDE

The diversity of regional specialization and labour markets is one of the most striking features of the European Union. As can be seen in the following images, a McKinsey study carried out a regional assessment of the territories and segmented the European space into 13 different types of clusters, based on the type of productive specialization and the respective labour market. According to their dynamism, each of these clusters was grouped into one of the following categories: dynamic growth hubs, stable economies and shrinking regions.

Figure 9. REGIONAL CLUSTERS CONSIDERED IN THE ANALYSIS OF EUROPEAN LABOUR MARKETS

	Regional clusters	Examples
Dynamic growth hubs	Megacities	London, Paris
	Superstar hubs	Milan, Stockholm
Stable economies	Service - based economies	Manchester, Budapest
	High - tech manufacturing centers	Modena, Wolfsburg
	Diversified metros	Athens, Turku
	Diversified non - metros	Östergötlands län, Sint-Niklaas
	Tourism havens	Greek islands, Barcelona
Shrinking regions	Industrial bases	Heves, Székesfehérvár
	Aging population regions	Dordogne, Zwickau
	Educated and emigrating areas	Moselle, Opole
	Agriculture - based regions	Douro, Dobrich
	Public sector - led regions	Nimes, Reggio Calabria
	Trailing opportunity regions	Andalusia, Naples



Source: *McKinsey Global Institute – "The future of work in Europe – Automation workforce transitions, and the shifting geography of employment, Discussion paper, June 2020.*

Dynamic growth hubs bring together 20% of Europe's population

This category, comprising 48 cities/regions, includes two groupings with the highest GDP per capita in Europe. They share many characteristics, but differ in size and labour supply and include:

- **Megacities:** With over 10 million people, London and Paris are the largest metropolises in Europe, each having a young and highly

educated workforce. Workers are attracted by the concentration of high-growth industries (such as information and communication technologies; financial services and insurance; and professional, scientific and technical services). These cities are known for strong innovation capabilities and entrepreneurial dynamism.

- **Superstars Hubs:** Includes 46 cities/regions encompassing, for example, Amsterdam, Copenhagen, Madrid and Munich, which are among the fastest growing regions in Europe. They have had a positive annual net migration of seven per thousand people (the highest among all clusters), and real GDP growth of almost 3% per year. They also have a large presence of high growth activities, such as the financial and technology sectors.

Stable economies account for 50% of the European population

This group comprises five clusters covering urban and non-urban regions. Before the pandemic, they had above average GDP per capita and attracted new residents. These five clusters are as follows:

- **Service-based economies:** These 102 local economies — including, for example, Budapest (HUN), Lyon (FRA), Manchester (GBR) and Riga (LVA) — have a high share of employment in services such as wholesale and retail trade, and their workers have relatively high levels of tertiary education. Real GDP growth has been stronger than that of most other clusters.
- **High-tech manufacturing centres:** Over 70% of these 78 regions are in Germany, including Stuttgart and Wolfsburg. Manufacturing is the dominant activity and these regions produce a large number of high-tech patents. They have recorded the second highest real GDP growth of any cluster. Due to a strong commitment to vocational training, they nevertheless have lower than average levels of higher education.
- **Diverse metropolitan areas:** These 64 cities/regions have a mix of employment in industry and services and are attracting new residents. They include Bologna (ITA), Freiburg (DEU), Plymouth (GBR) and Katowice (POL). Their workers tend to be well qualified, although GDP growth has been modest.
- **Diverse non-metropolitan areas:** These 267 non-metropolitan areas and small towns include, for example, East Kent (GBR), Korinthia (GRC) and Mittelburgenland (AUT). They do not have a specific industry focus, but attract a positive inflow of workers.
- **Tourist paradises:** These 98 places, including the Algarve region (PRT), the island of Chios (GRC), Cornwall (GBR), the

island of Majorca (ESP) and Tyrol (AUT), have been magnets for visitors. Many are concentrated in the Mediterranean and Alpine regions. They have a high share of employment in catering and accommodation services, personal services and transport. Barcelona stands out in this cluster with particularly fast employment growth, by real GDP growth, together with its labour and innovation capabilities.

The declining regions, home to 30% of the European population

This group includes three types of groupings where the working age population is shrinking due to immigration, ageing or both. And in a more disaggregated way, six city/region clusters can be identified:

- **Industrial bases:** These 72 manufacturing centres, three-quarters of which are in Eastern Europe, have experienced high real GDP growth. But unlike the high-tech manufacturing centres, they produce few high-tech patent applications and have declining populations with lower levels of education.
- **Areas with skilled resources but strong outward migration:** The working-age population is eroding in these 85 places. They mainly include regions in Eastern Europe, for example Gorj (RMN), Maribor (SVN) and Opole (POL).
- **Regions experiencing "lost opportunities":** These 35 regions face high unemployment, negative net migration and weak business dynamics. Their labour force has low levels of secondary and tertiary education. They include for example Andalusia (ESP) and Naples (ITA).
- **Regions with an ageing population:** These 107 locations have a highly educated labour force, but also high old-age dependency ratios as ageing decreases their labour supply. They include Dordogne (FRA), West Cumbria (GBR), and Zwickau (DEU).
- **Agriculture-based regions:** These 58 agricultural regions are mostly in Eastern Europe. Their workforce has limited education and the second highest negative net migration rate (after pooling education and outward migration).
- **Public sector-supported regions:** The 81 local economies in this grouping have a high share of employment in the public sector, health and education. They include regions in the Iberian Peninsula, Southern Italy and Nîmes (FRA).

SUMMARY: PORTUGAL IN THE EUROPEAN MOSAIC

Portugal, in this description of the 'European Mosaic', is made up of seven different types of city/region:

- Two "diverse metropolises": metropolitan areas of Lisbon and Porto.
- One "tourist paradise": Algarve.
- An "industrial based" region: including Ave, Cávado, Minho-Lima and Sousa.
- An "agriculture-based" region: Douro and Trás-os-Montes.
- An 'ageing population' region: Alentejo Litoral.
- An extensive "public sector-led" region: located inland from North to South.
- A region experiencing "lost opportunities": Centro Litoral.

III The Internal Scenario Building Framework: The Scenario Building Process for Portugal

1. PORTUGAL — POINT OF DEPARTURE: PROBLEMS WE FACE WHICH JEOPARDISE THE FUTURE

We begin this section by quoting two documents by Vítor Bento ("Uma Ambição ao Nosso Alcance", Observador newspaper, 01/10/2020; and "Portugal: Dependência Financeira e Autonomia Estratégica", Grupo de Reflexão sobre a Estratégia Nacional — GREN, June 2021), which we consider to be a valuable approach to this starting point, expressing our gratitude to the author for giving permission to reproduce them.

The text "Uma Ambição ao Nosso Alcance", from October 2020, states that "When the Economic and Monetary Union began, Portugal had, in terms of GDP per capita (GDP pc) — measured in purchasing power parities (PPP) — 12 countries which today are part of the European Union (EU) lagging behind it. At the end of last year, and 21 years later, there were only eight, as Portugal was overtaken by five of the countries that joined the EU after the euro (Greece has since been overtaken by us). In the same period of time, and although our GDP pc has increased by 22% (at constant prices), Portugal has lost 6 percentage points (pp) compared to the European average.

This means that, although it is now richer in absolute terms, it has become poorer than the other EU countries taken together (i.e. the others have become richer). This situation has been caused by structural problems that have been neglected for too long and a misallocation of the country's resources, particularly capital, which is, incidentally, one of its scarcest resources.

We will start by highlighting two of these structural problems:

a) A business structure that is too concentrated in micro-enterprises, which absorb 45% of employment, generate little more than 20% of GVA and whose productivity is about 1/3 of the average of all the others — small, medium and large. While they absorb an enormous share of employment, these micro-enterprises do not have the dimension to optimise processes or to obtain economies of scale, which ends up resulting in sub-optimal productivity conditions.

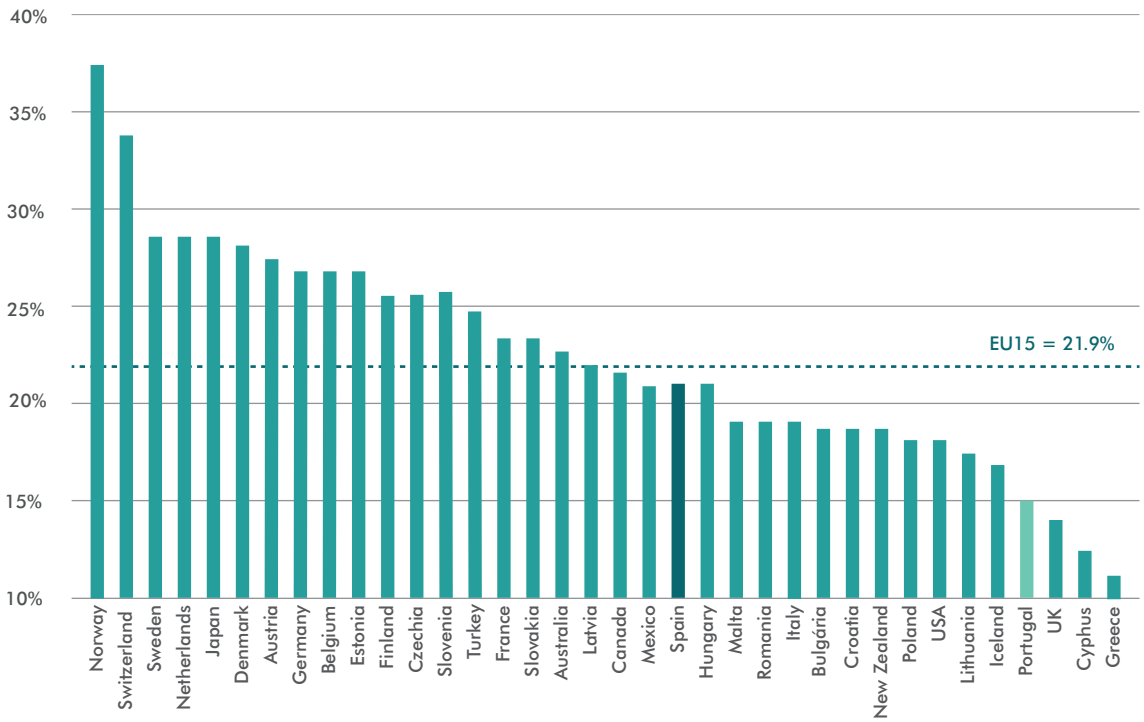
b) Despite the progress made in terms of schooling at various levels, human resources are still insufficiently qualified. The country has the fourth worst position in terms of the percentage of the adult population with education below the last level of secondary education in the OECD, which limits access to more qualified and, therefore, more productive and better paid jobs. These two situations — too many businesses without the minimum scale to ensure efficiency and low skilled employment — together with the still dominant sectoral pattern of specialization, are the main reason for the prevalence of low average productivity, low wages and high inequality in the country.

With 45% of employment in low-productivity businesses, it is inevitable that wages are low. Moreover, with almost half of all jobs being subject to low wages (due to low productivity), this eventually weighs in considerably on the labour market, exerting pressure — both on the labour supply and demand sides — for low wage levels to extend to other, larger business segments, therefore, causing the prevailing wage structure in the economy to be low-wage. However, the (truly) large businesses — which are a minority — can have productivity levels more in line with their foreign counterparts, and can pay wages more suitable to that level of productivity. But this covers a very small part of the labour market (10%?). As a result, there is a wide pay gap in the country, between a small minority which manage to enjoy world-class wages and a large majority trapped in the low-wage structure. It is this predominance of low wages which contributes greatly to the low levels of GDP per capita and, therefore, to the relative impoverishment of the country.

On the other hand, in "Portugal: Dependência Financeira e Autonomia Estratégica", of June 2021, the author highlighted an interconnected set of aspects that have characterised the Portuguese economy in the last two decades:

a) Portugal has one of the lowest savings rates among OECD[2] Member States

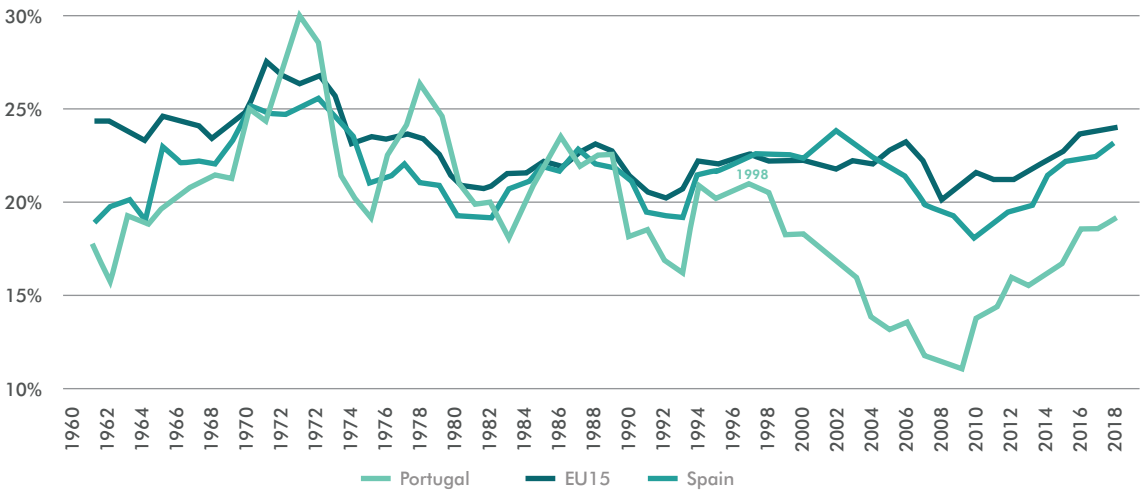
Figure 10. **AVERAGE SAVINGS RATES — 2000-2019 AVERAGE**



Source: *Vítor Bento, "Portugal: Dependência Financeira e Autonomia Estratégica", GREN. June 2021.*

[2] However, this was not always the case. In the 1960s — and even in the 1970s — and thanks in particular to emigrants' remittances, Portugal reached high levels of savings, in contrast with current levels — which fell sharply from 2000 to 2010 — and began a recovery this year, while still being at the lowest levels among the States in the sample.

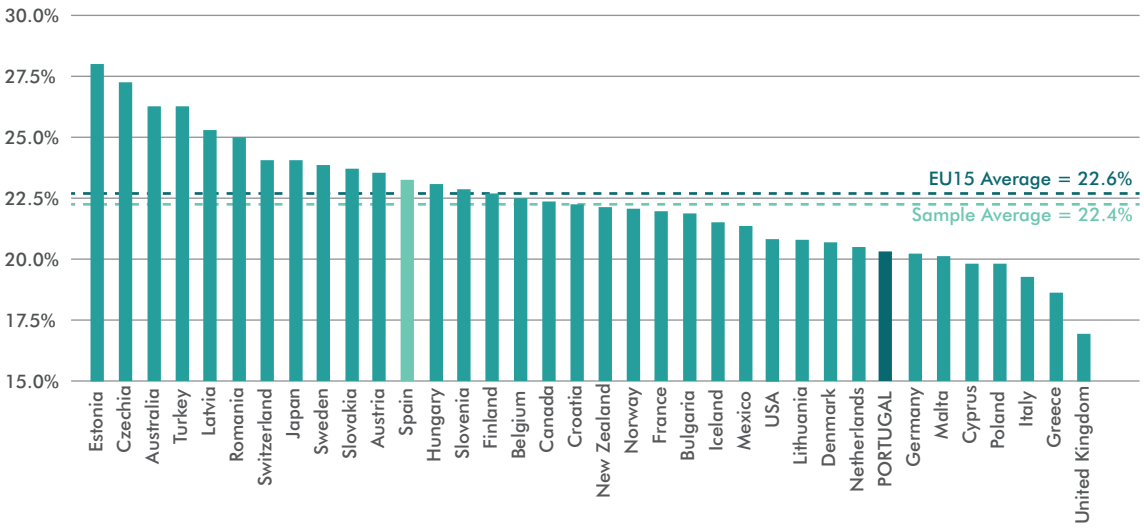
Figure 11. SAVINGS RATES



Source: *Vítor Bento, "Portugal: Dependência Financeira e Autonomia Estratégica", GREN. June 2021.*

b) Portugal is known to have a major capital shortage. If we look, for instance, at the capital per worker ratio, Portugal has a ratio which is less than 60% of the European average, 50% of the average of the EU15 group (countries that were part of the EU at the time of the creation of the euro) and more in line with Eastern European countries than with Western European countries. If we look at the capital stock of financial companies (albeit a different concept from the productive capital that goes into that ratio, but it helps to make an important point), we see that 1/3 is absorbed by micro-companies (which only contribute just over 20% of GVA), which is a clear under-utilisation of the economy's most scarce resource.

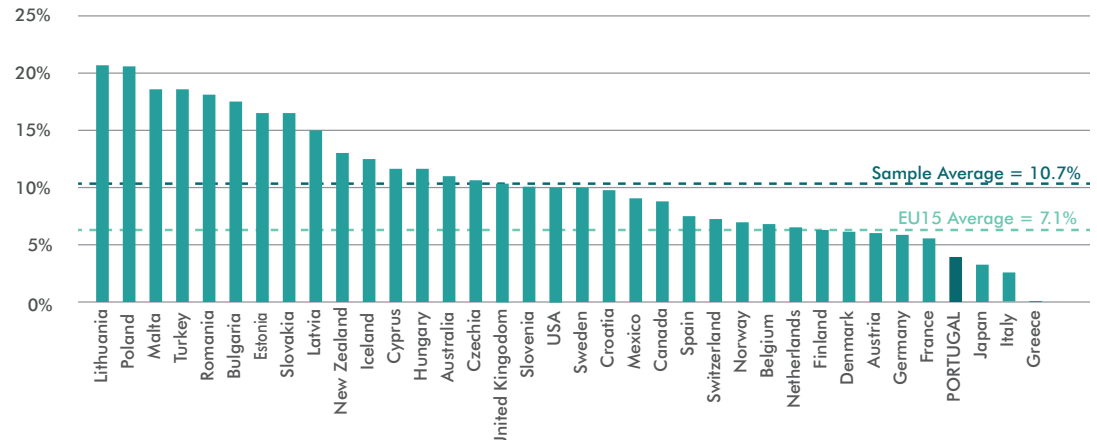
Figure 12. AVERAGE INVESTMENT RATES 2000-2019



Source: *Vítor Bento, "Portugal: Dependência Financeira e Autonomia Estratégica", GREN. June 2021.*

c) There is a shortage of capital, but at the same time there is a waste of capital, as reflected in the high volumes of low or non-productive investment undertaken since the creation of the euro. Over this period, only Greece and Italy have, on average, a worse investment efficiency (marginal capital efficiency) than Portugal. The average productivity of Portuguese investment over these two decades (4.8%) has hardly been enough to cover even the cost of capital. This waste can only be seen as responsible for the relative impoverishment of the country.

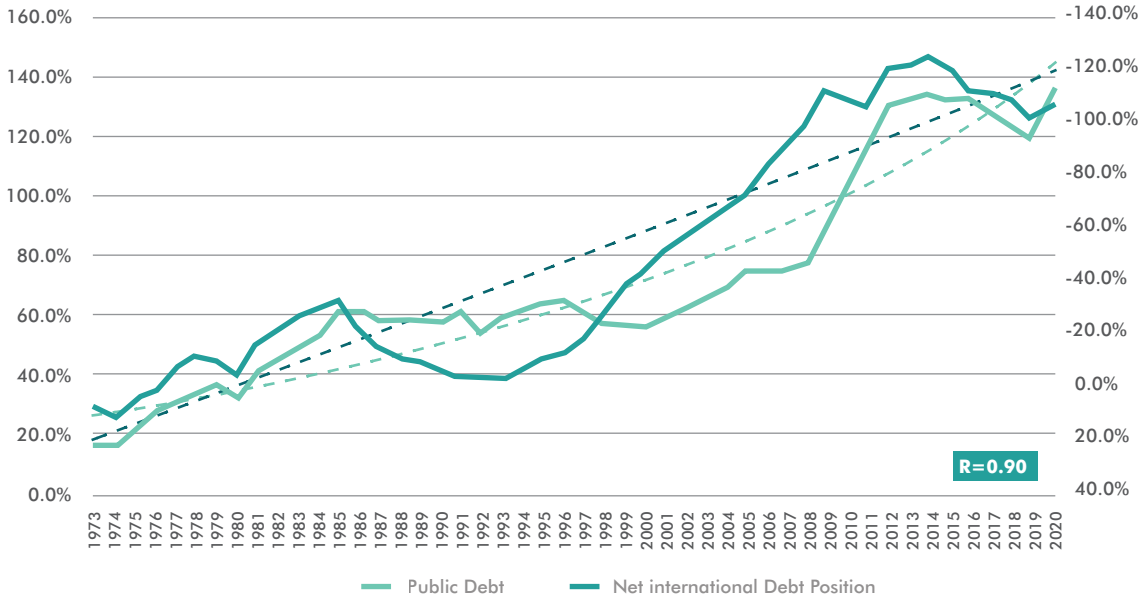
Figure 13. **MARGINAL EFFICIENCY OF CAPITAL — 2000-2019 AVERAGE**



Source: *Vítor Bento, "Portugal: Dependência Financeira e Autonomia Estratégica", GREN. June 2021.*

d) Portugal has been experiencing an accelerated deterioration of its external debt position in parallel with a strong growth of external public debt, which became more pronounced after 2000, until it was momentarily halted in 2011.

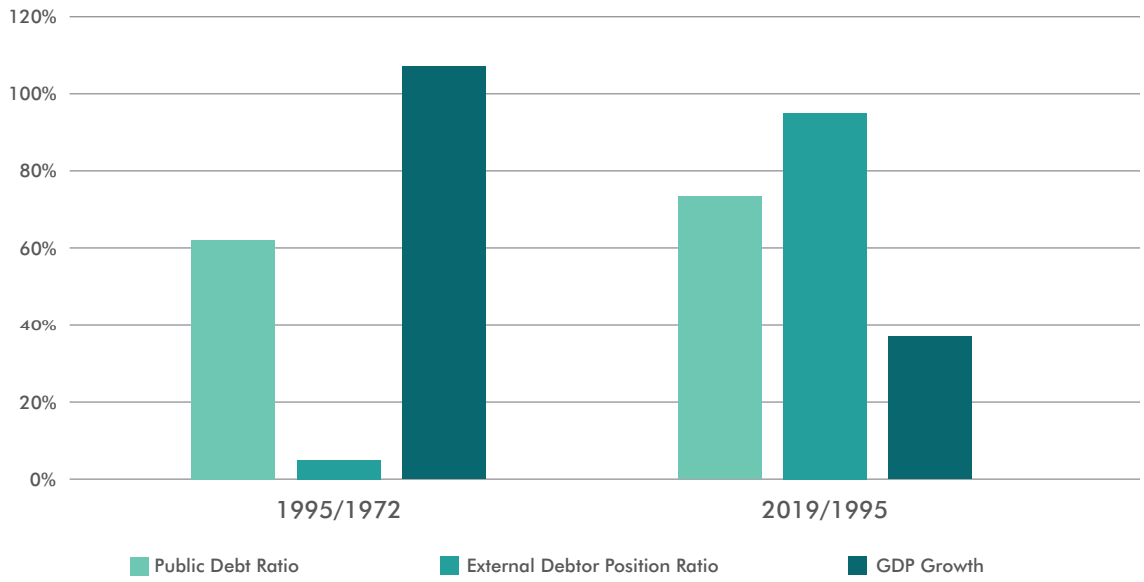
Figure 14. **DEBT POSITION OF PORTUGAL**



Source: *Vítor Bento, "Portugal: Dependência Financeira e Autonomia Estratégica", GREN. June 2021.*

e) If we compare the Portuguese economy in the period 1972-1995 with the period 1995-2019, it is evident that the growth rate of the economy has clearly declined, while the ratio of the country's external debt position has increased markedly.

Figure 15. PORTUGAL - DEBT AND GROWTH



Source: *Vítor Bento, "Portugal: Dependência Financeira e Autonomia Estratégica", GREN, June 2021.*

In the presentation "Portugal: Dependência Financeira e Autonomia Estratégica", held in June 2021, the author concluded the following:

"It can be stated that, at the beginning of the decade 2021-2030, Portugal:

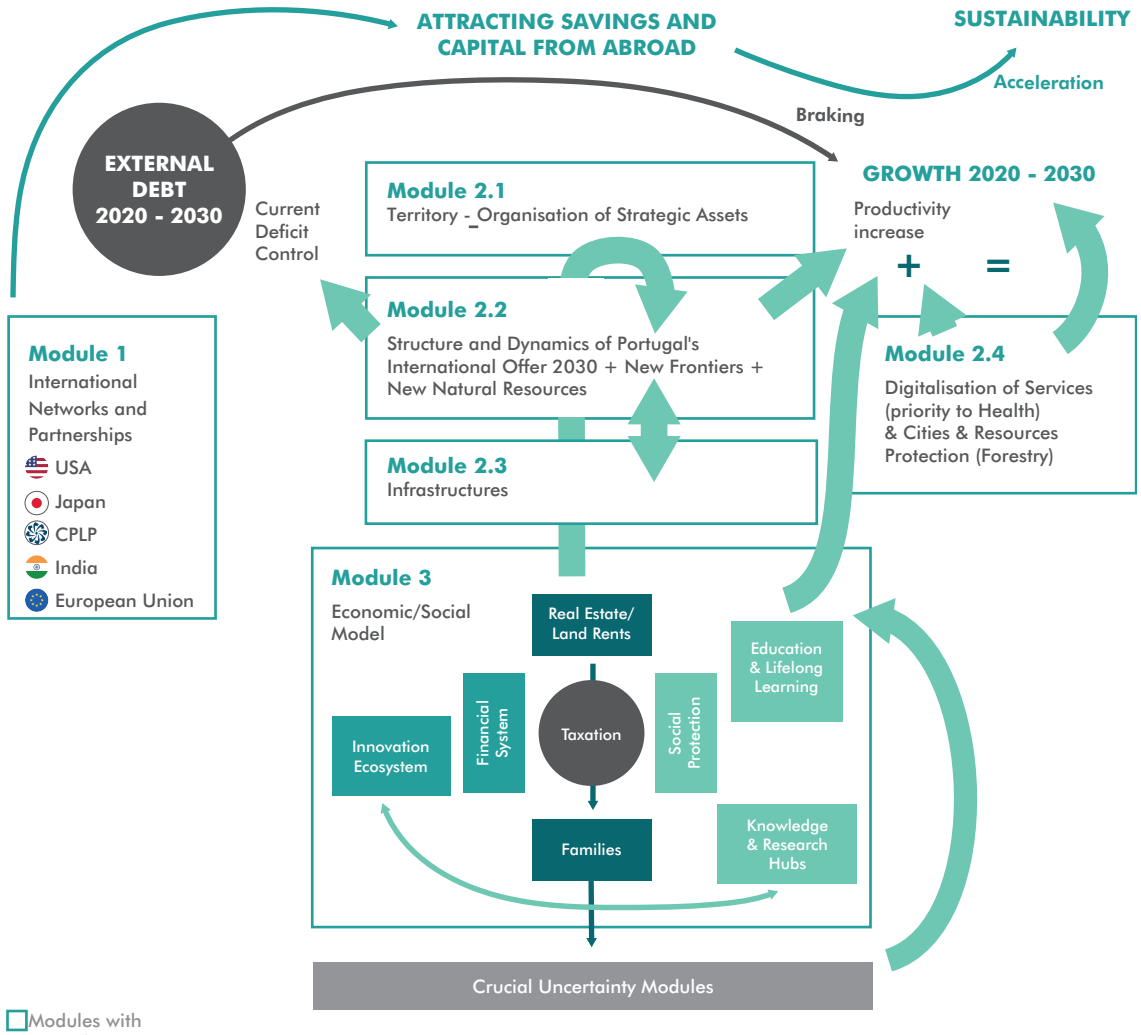
- Has its strategic autonomy highly limited by excessive debt.
- Has a structural lack of capital to autonomously sustain its development.
- It has limited own investment capacity and has been losing strategic control of key areas of the economy.
- It is dependent on the supervision of the ECB (which has indirectly ensured the financing of its public debt).
- It is subject to an unexpected financial squeeze.
- It is dependent on conditionality imposed by creditors or "supervisory entities."

2. THE STRUCTURE ON WHICH SCENARIO BUILDING IS BASED

We began by defining a structure for the scenario building that brings together what we consider to be the main elements of the internal dynamics, i.e. dependent on the internal options of various actors (State, social groups, companies), grouping them into **three distinct modules (1 – 2.1, 2.2, 2.3, 2.4 – 3),** and highlighting **two components that interact directly with one or more of these modules: external debt and demography. The crucial uncertainties from which the scenarios were built were defined around these modules.**

Each of the modules focuses on a given group of factors that are strongly interrelated and considered key to future dynamics, namely in terms of growth potential (sustained and sustainable), the management of external indebtedness, the attraction of savings and investment from abroad and the strengthening of cohesion and social mobility, as well as intergenerational relations (see the figure below).

Figure 16. STRUCTURAL ORGANISATION FOR THE CONSTRUCTION OF THE SCENARIOS



Brief note about the modules

MODULE 1 includes:

The set of relationships with other states, public entities and companies at the level of trade flows, the movement of people, international investment and external financing, which together organise Portugal's geo-economic integration.

MODULE 2 includes:

The international specialization of the Portuguese economy in terms of goods, services and content, a key factor of its growth; the dynamics of territorial enhancement based on i) its natural, human and historical resources; ii) its environmental quality; iii) its urban structure and its connection with the rural world; iv) the services on offer, in view of their potential to attract people, activities and companies. The investment priorities in infrastructure for the period 2020-2030, both in terms of international connectivity infrastructure and infrastructure used, especially on the internal level, with regard to transport, energy, telecommunications, water resources and water management, agriculture and forest planning and protection, as well as protection against natural risks. It also integrates the increasingly necessary investment in the digitalisation of sectors, cities and infrastructure.

MODULE 3 includes:

What we call the economic and social model, which includes the financial sector, the social protection sector, the education and training sector and, broadly speaking, the innovation ecosystem, taking into account household wealth. In this exercise we do not take into account public administration or issues concerning its reform. The basis of this module is demographics and its evolution by 2030.

2.1. The identification of predetermined elements in the evolution of this structure

We consider demographic evolution to be a predetermined element in this structure

a) Demographic evolution

We consider it fundamental to start by highlighting some of the most relevant aspects of both the demographic evolution of Portugal in recent decades and the scenarios that were built with a longer time frame (up to 2050), that will allow us to assess whether the trends that come to light in the period 2020-2030 will remain, should their evolution be influenced only by endogenous dynamics.

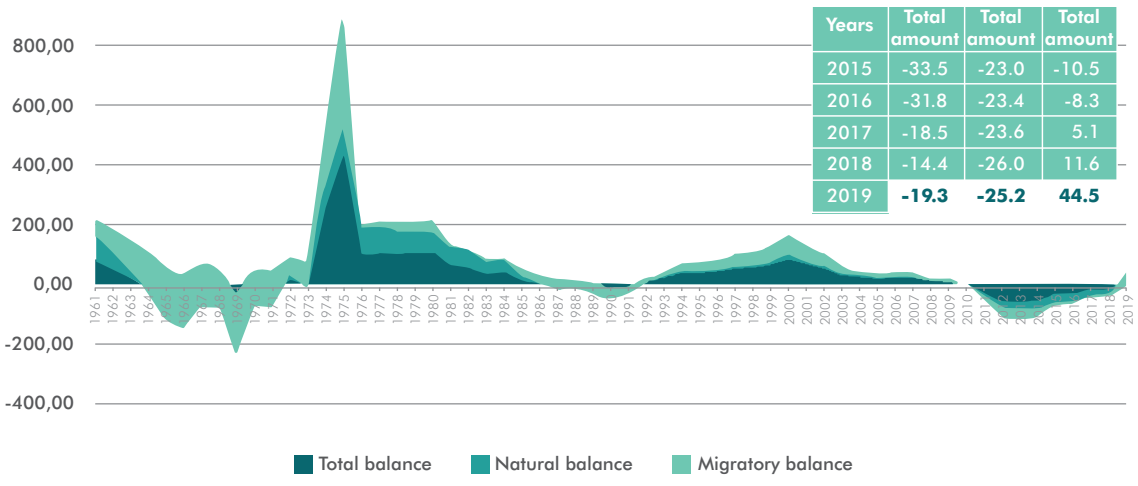
Verified demographic evolution

The estimates as at 31 December 2019 indicate that Portugal has 10,295,909 residents, 19,292 more than on the same date of the previous year (INE, 2020). However, since 2010 we have lost almost 331,000 residents, more than a third due to there having been fewer births than deaths and the remaining almost two-thirds by the difference between the total Portuguese emigrants and outgoing immigrants residing in Portugal compared to the total number of entries into the country. However, although migration mitigates some of the effects perceived as negative on the situation in Portugal, they are not sufficient to resolve the accumulated challenges of a post-transition society, triply aged, in which there is a lack of young people (0-14 years old, 1.4 million) and with the number of elderly (65+ years old, 2.3 million) relentlessly increasing.

Since 1970, the over-65 age group has doubled, while the youth group has halved. The average adult population is now over 45 years old, and the number of people of potential age to exit the labour market (aged 55 to 65) has not been offset for more than a decade by the number of people of potential age to enter the labour market (aged 20 to 34) (INE, 2020). This means that since 2010, the replacement of the active and contributing population is no longer ensured (see figure below).

The scant recovery in birth rates and immigration and the reduction in emigration since 2015 has not been enough to reverse the declining trend.

Figure 17. PORTUGAL, A TRIPLY AGED COUNTRY. NATURAL BALANCE, MIGRATION BALANCE (1960-2019) AND CHANGING AGE STRUCTURES



Years	Total amount	Total amount	Total amount
2015	-33.5	-23.0	-10.5
2016	-31.8	-23.4	-8.3
2017	-18.5	-23.6	5.1
2018	-14.4	-26.0	11.6
2019	**-19.3**	**-25.2**	**44.5**

Source: *Teresa Rodrigues, "Demografia, economia e proteção social – que desafios para 2030?", Foresight Portugal 2030 project, 2020.*

Where are we heading? How is the Portugal of the coming decades being shaped today?

Portugal faces the challenges of a society that lacks young people while having an ever-increasing number of elderly people. Since 1970, the under-15 population has halved and the number of residents over 65 has doubled, with one of the fastest growing groups being those over 75. The window of opportunity has closed: since 2005, the active/inactive ratio shrank and five years on the replacement of the active contributing population could no longer be guaranteed[3].

The forecast is that by the middle of the 21st century the very old population (85 or over) will triple, the over-65s will double, young people will be 26% fewer and the active and contributing population will be 33% fewer (the same as in 1940) and even seven years older than today (from an average age of 45 to 52). These figures lead us to think not just in terms of numbers but contexts.

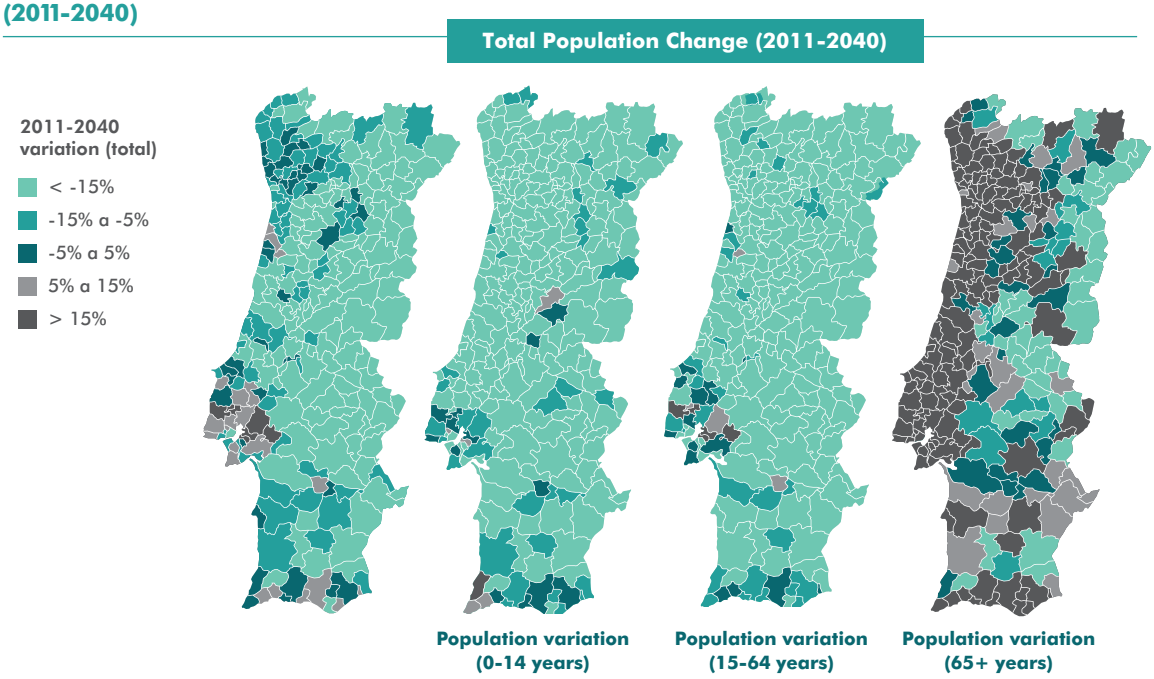
Existing projections are unanimous with regard to the declining trend in the total number of residents in the coming decades, albeit with regional differences that depend on the ageing process and the dynamics of migration. It took 110 years (from 1900 to 2011) for the population of Portugal to double, but it is expected to lose between 10% and 30% of its population (from the current 10.3 million to 8.4 million) in just 40 years. The decline will be consistent after 2025 and by 2050 the size of the population will be identical to that recorded in 1990 (8.4 million).

The reduction in population could reach 30% in rural and inland regions. By 2040, the total number of residents will be reduced in 236 municipalities, in 141 of which the reduction will be more than 15%. An increase of more than 15% is forecast in only 8. We will then be as many as we were in 1950 (Rodrigues, Ribeiro, 2018).

The following maps enable us to better picture the territorial demographic dynamics by 2040.

[3] Since 2010, the number at potential labour market exit age (55-65 years) exceeds the number of those at potential entry age (20-34).

Figure 18. **PORTUGAL. REGIONAL DYNAMICS OF TOTAL AGEING AND BY MAIN AGE GROUPS (2011-2040)**

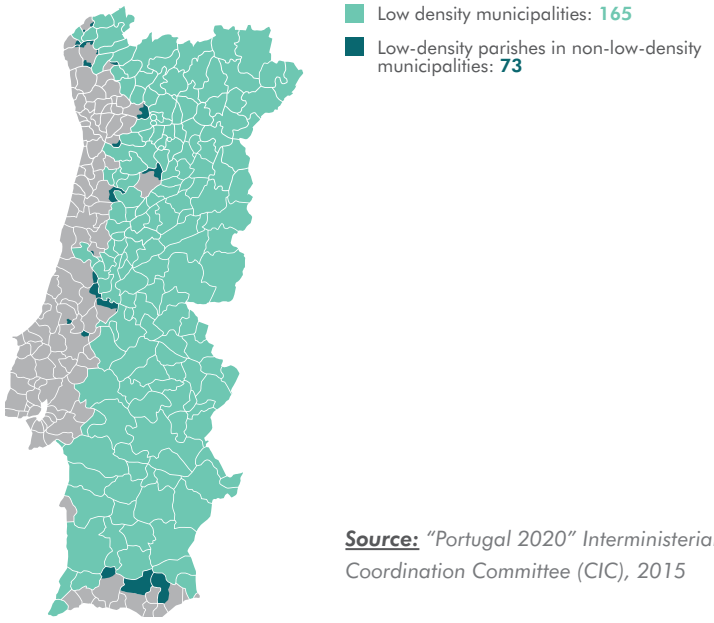


Source: *Teresa Rodrigues, "Demografia, economia e proteção social – que desafios para 2030?", Foresight Portugal 2030 project.*

The observation of the map (Figure 19) — which identifies the territories of the country that are currently considered low density — leads to the conclusion that the overwhelming majority of these territories will be characterised by an ageing population in the period 2020-2030.

The territories of low density and ageing population will constitute the majority of Portugal in 2030 — which is a fundamental finding, for example, when reflecting on the infrastructure investments to be made or initiated in the period 2020-2030.

Figura 19.
MUNICIPALITIES AND PARISHES CONSIDERED LOW DENSITY IN 2020



Source: *"Portugal 2020" Interministerial Coordination Committee (CIC), 2015*

3. IDENTIFICATION OF KEY UNCERTAINTIES AND THEIR RESOLUTION CONFIGURATIONS: KEY CHALLENGES AND OPTIONS FACING PORTUGAL

After joining the euro in 1999, Portugal experienced two decades of weak economic growth, at the same time as there was a rapid increase in the external indebtedness of the state and the financial sector, which largely directed this new external indebtedness towards financing real estate investment, household consumption and the financing of the state (central and local government), thus completing the financing that the state obtained through its own foreign indebtedness.

Only in this way could the state maintain its responsibilities in the existing social model and contribute to the infrastructure of the country, co-financed by European Union structural funds from 1986 onwards. At the same time, household debt increased, against a background of limited savings due to their low level of income, but this was offset by an increase in their assets.

In the current situation, tensions in Portuguese society and possible confrontations with the European authorities over servicing the public debt will tend to worsen if there is no continued upturn in growth that will both create jobs and give young people the opportunity to build a future.

However, the question of growth requires careful thought.

Growth, international specialization and sustainability

In a small open economy, such as the Portuguese economy, the economy's productivity, as well as its growth, depends very much on the added value of the activities that compete in external markets (in terms of goods, services, content or concepts). It is not enough to increase export revenues for the economy to grow, although this increase in gross revenues certainly contributes to reducing external deficits, external financing needs and the resulting level of external indebtedness.

However, for the economy to grow, it is fundamental that the activities which are most present in external markets are among those which generate the greatest added value. This is the true measure of competitiveness. And one we are still far from achieving.

In fact, sustained competitiveness depends on:

- The alignment of export activities of goods, services, content and concepts with the fastest growing flows of goods, services and data in world demand and international trade, taking into account the dynamics of technological innovation that run through the global economy.
- The position that the activities undertaken in Portugal occupy in the global value-added chains that organise those flows.
- The existence of internal multipliers of added value, which result from internal purchases between sectors, purchases which before would have been made abroad and which, when made endogenous, increase the "surface of internal generation of added value". The sectors which supply gross fixed capital formation are among those which, by expanding in Portugal, allow this surface to be enlarged (design and manufacture of equipment and vehicles, software development, etc.).

RECENT EVOLUTION OF PORTUGAL'S INTERNATIONAL SPECIALIZATION

Prior to the Covid-19 crisis, Portugal had been experiencing an evolution in its international specialization, whose elements should be noted:

- Dynamics of innovation in products, production processes and business models — involving a greater services component incorporated into industrial exports — in **clusters** with a long-standing export tradition (**agriculture and agro-foodstuffs, textiles and clothing, footwear, ceramics, wood and furniture, light mechanics**) and/or that are being organised from multicluster competences, as in the case of **sports and leisure goods**.
- Strong growth in exports from the **metal construction and shipbuilding megacluster**, including a **heavy metal and mechanical construction** segment, geared towards the manufacture and assembly abroad of large metal structures for buildings and collective equipment; the manufacture of equipment for the oil refining, petrochemical and other heavy chemical industries; the manufacture of towers and blades for wind power generation in wind farms located around the world; the manufacture of handling equipment (e.g. overhead cranes); **and a naval and sea construction (and repair) segment** currently oriented towards the manufacture of hotel ships (for river tourism); ships for exploration tourism in remote areas; ships for river passenger transportation; military ships (patrol boats, speedboats, etc.); and also the maintenance and partial construction of offshore structures for oil and natural gas exploration and the production of wind offshore or wave electricity.
- Strong growth of the mechanics, electrical and automation materials and robotics megacluster, which includes a for foundry and of metal part machining segment; a machine manufacture segment (tools for metalworking and machines for specific industries); an equipment segment for the production, transport and distribution of electricity (wind generators, transformers and circuit breakers); a

command and control systems segment for electrical networks and signalling systems for railway networks; and, more recently, an automation and robotics segment for industrial and logistics purposes.

- Consolidation of an **automotive cluster**, transformed by the greenfield investment that Volkswagen/Ford started with production in the early 1990s in Autoeuropa, which was followed by other investments for the manufacture of mechanical organs, metallic components, technical plastic components, moulds for the manufacture of plastic components and textiles for interiors.
- The transformation of the construction, engineering, public works and real estate megacluster into dynamic hubs for attracting savings and capital from abroad, an **exporter of engineering and construction management services and a provider of services abroad**, thanks to transport infrastructure concessions, the provision of urban services and the construction and operation of shopping centres.

The sustained growth in the **export of services**, in particular tourism, which has reinforced its importance in exports, with a greater differentiation of segments beyond sun/beach (which has been the basis for its growth since the 1960s), such as golf, surfing, water sports and a new component of residential tourism; and the formation of a megacluster of **remotely provided business services** (shared services, computer services, etc.) and the new generation of **skill centres and engineering centres** belonging to multinational companies, in several cases associated with industrial activities that were already established in Portugal.

However, despite the transformations carried out in the new millennium, Portugal still has today:

- A greater presence in international markets in sectors/segments with weak growth in the domestic demand of developed economies, while facing a radical change in the automotive sector, which was an important driver of exports, and uncertainties about the future dynamics of heavy metal construction/metalworking.
- A greater presence in some of these specialized sectors/segments that are also very vulnerable to competition from the large emerging economies and a growing number of developing economies.
- A presence in international markets that is still very much out of line with the change brought about by the new techno-economic system.

In other words, in the 2030 time frame, Portugal will not be able to grow if it remains focused exclusively on what it already exports (i.e. "more of the same"), even with improved versions.

Growth recovery will inevitably have to be based on a new wave of investment in the export of diversified and innovative goods, services, content and concepts.

To be sustained, growth recovery — bearing in mind the foreseeable demographic profile — must be based on investment that allows for a **substantial increase in factor productivity (knowledge/technology, skilled labour, capital and land).**

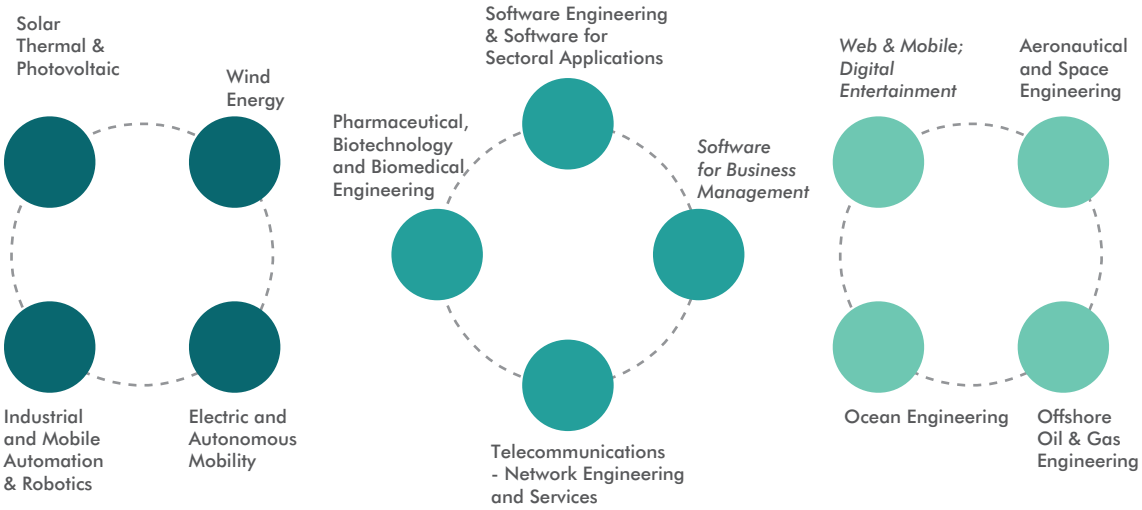
International specialization and protoclusters in technological areas

With regard to Portugal's failure to align its international specialization with the new techno-economic system, it should be noted, however, that **protoclusters** have emerged in the country in recent years — a group of companies — ranging from start-ups and SMEs to multinationals, organised around technologies and/or functions that set them apart from already consolidated activities in Portugal, and gear them towards the exploitation of external markets, with close links to knowledge hubs that were and are fundamental for their competitive deployment in the country.

The figure below identifies **protoclusters under development** (relating them to the two macro-regions where the export potential of the country is concentrated) in the North and Coastal Centre, and in the Lisbon Metropolitan Arch.

The Portuguese economy in the decade 2020-2030 must recover growth, and this requires a more diversified portfolio of external supply, with greater added value than Portugal currently has, a portfolio repositioned in segments with strong demand in developed economies and less exposed to competition from developing economies. To this end, new business investment and continued technological and organisational innovation are fundamental.

Figure 20. **PROTOCLUSTERS UNDER DEVELOPMENT IN PORTUGAL**



Source: *Cf. José Félix Ribeiro, "Noroeste Global", "Portugal no Centro" and "Uma Metrópole para o Atlântico", Calouste Gulbenkian Foundation, 2014, 2016 and 2017*

Investment: a critical variable for growth and sustainability

If we consider investment in the international supply of goods, services, contents and concepts, and add to it the new investment in network industries that organise the territory and support the functioning of society, we are making an investment that can be a multiplier of added value: in the case of Portugal, this investment would involve the development of the technological and industrial skills required to produce solutions in the areas of transport, electricity and communications, which are aligned with the possibilities opened up by the new techno-economic system.

These solutions should also be part of **climate change mitigation** and be placed on international markets. Moreover, if we think of the investment necessary to **adapt to climate change** (be it in the area of water resources, in the protection of estuarine areas with greater human concentration or in how to monitor the forest, prevent major fires and organise their combat with 21st century means), we will have other opportunities to use this investment as leverage to produce ourselves competitive solutions for abroad.

COUNTRIES AND THE DOUBLE DEMAND IN COMBATING CLIMATE CHANGE

Climate change will result in two major demands on countries:

- On the one hand, in terms of mitigating climate change, we will see the accelerated replacement of facilities — energy, industrial and transport infrastructure, largely depreciated — with new solutions, which will not directly contribute to increasing the productivity of economies but will reduce the contractionary impact of the destruction of capital that will be required.
- On the other hand, States will have to allocate huge amounts of investment to adapt to climate change, investments that will also have little influence on the growth of economies and their international specialization, although they will contribute to maintaining the safety and well-being of populations (from the management of water resources to protection against the risks of coastal erosion and rising sea levels in densely populated estuarine areas).

The Roadmap for Carbon Neutrality 2050 and the International Specialization of Portugal

a) This roadmap may be designed and its implementation planned to lead to the creation of endogenous entrepreneurial capacities for the development of innovative technologies in some of the segments we have just mentioned, which may give rise to new export streams of goods, services and concepts.

OR

b) The roadmap will only result in diverted investment (which would be necessary to diversify the international offer of the Portuguese economy) in favour of the implementation of solutions that will be imported from European Union economies which are already preparing to provide these solutions on a European scale.

Examples of innovative solutions, to be used early in Portugal and to be subsequently exportable, can be:

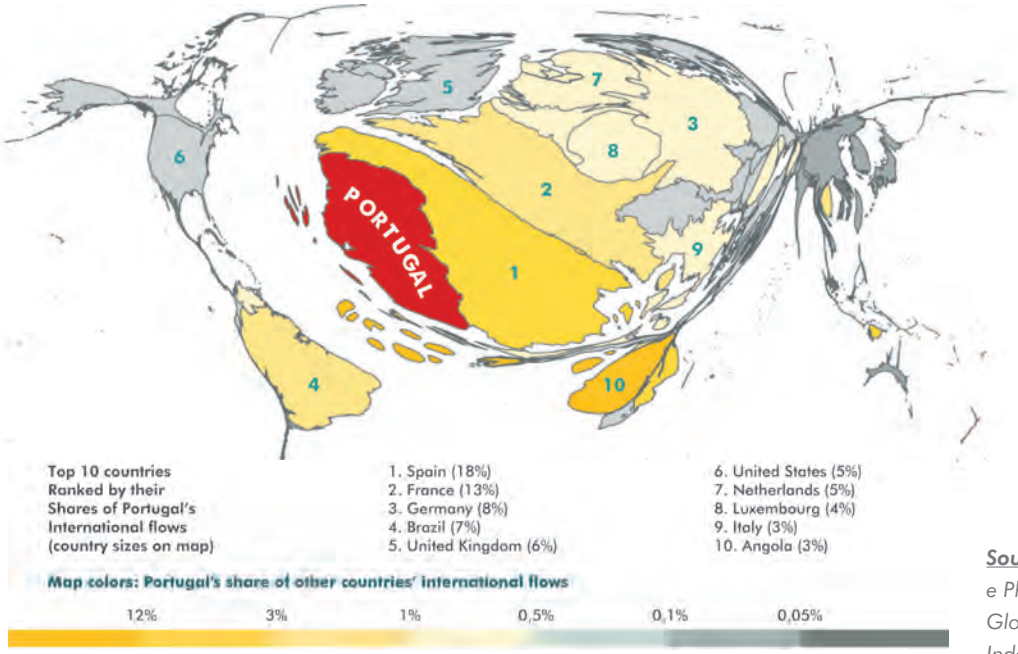
- The advance in large-scale storage solutions for electricity from renewable sources that allow modifying its access to the national electricity grid.
- The move towards decentralised production of electricity and heat in cities, using hydrogen obtained without CO_2 emissions or from natural gas (turquoise hydrogen) or by electrolysis of water using renewable electricity (green hydrogen).
- The use of electricity and water produced by fuel cells using methane or hydrogen, in the desalination of sea water or for use in the urban water cycle.
- A priority for investment in the early renewal of road haulage fleets using new forms of propulsion and autonomous driving; the use of hydrogen-powered buses in passenger transport and the large-scale deployment of drones and other electric-powered aerial platforms.

Geo-economic Integration and International Partnerships

Portugal currently has a geo-economic integration in terms of 4 types of international flows (trade, capital, data and people), which is clearly restricted to the European Union and, within this, concentrated in three Member States: Spain, France and Germany, as can be seen in this figure taken from the DHL Global Connectedness Index 2020. Outside the European Union, the relationships with the UK, the USA, Brazil and Angola are worth mentioning.

Figura 21. ***DHL GLOBAL CONNECTEDNESS INDEX 2020***

ROOTED MAP — PORTUGAL'S GLOBAL CONNECTIONS



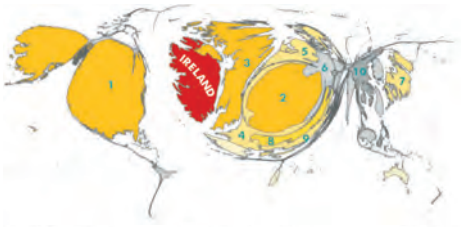
We have included (for comparison with the case of Portugal) the DHL Global Connectedness Index for four European States: Ireland vs. Spain and UK vs. Germany.

Source: *Steven Altman e Phillip Bastian, "DHL Global Connectedness Index 2020 – the State of Globalization in a Distancing World", DHL, 2021.*

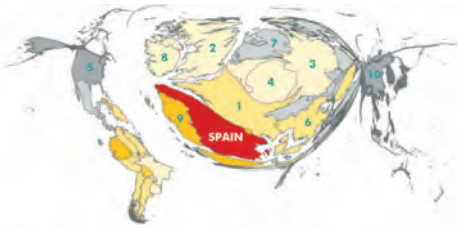
Figura 22. ***DHL GLOBAL CONNECTEDNESS INDEX 2020 — SOME EUROPEAN COUNTRIES TO COMPARE***

IRELAND *VERSUS* SPAIN

ROOTED MAP: IRELAND'S GLOBAL CONNECTIONS

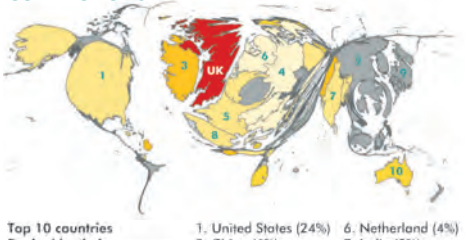


ROOTED MAP: SPAIN'S GLOBAL CONNECTIONS

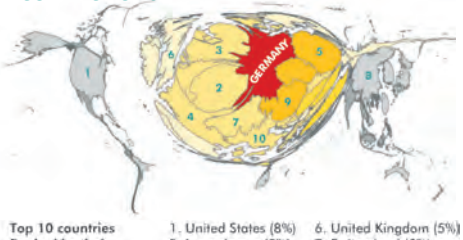


UNITED KINGDOM *VERSUS* GERMANY

ROOTED MAP: UNITED KUNGDOM'S GLOBAL CONNECTIONS



ROOTED MAP: GERMANY'S GLOBAL CONNECTIONS



Ireland and the UK are clearly distinct from Spain and Germany in that they have a much more diversified geo-economic integration outside Europe, with an emphasis on relations with the US.

The current type of geo-economic integration restricts Portugal to the European Union, and has limited opportunities for trade, investment and technology transfer with countries outside the European Union, such as the United Kingdom, USA, Japan and Israel, as well as partnerships for investment and technological collaboration with Portugal and with the Portuguese-speaking space by countries like Canada, India and the United Arab Emirates.

DHL GLOBAL CONNECTEDNESS INDEX 2020

For 19 years DHL has been publishing its DHL Global Connectedness Index, which assesses, for the world economy and for individual countries, the presence of trade, capital, data and people flows and identifies for countries the other countries with whom these relationships are strongest. This evaluation is completed by the analysis of the intensity of the presence of flows (DEPTH: which relates international flows to domestic flows) and the geographical scope of the backflows (BREADTH: which assesses the greater or lesser geographical distribution of these international flows).

Through the Community of Portuguese-speaking countries, the Lusophone space has been attracting a wide range of countries as Observer States (among which are several of the countries we have mentioned as potential partners of Portugal in the 2030 time frame), which could potentially transform it into an **international platform for technological, environmental and health innovation in Africa**.

Figure 23. **COMMUNITY OF PORTUGUESE SPEAKING COUNTRIES (CPLP)**

Figure 24. **ASSOCIATED OBSERVER STATES (AS OF JULY 2021) OF THE COMMUNITY OF PORTUGUESE SPEAKING COUNTRIES**

NORTH AMERICA	LATIN AMERICA	ASIA	MIDDLE EAST	AFRICA	EUROPEAN UNION	OTHER STATES
CANADA	ARGENTINA	INDIA	QATAR	IVORY COAST	SPAIN	UNITED KINGDOM
USA	CHILE	JAPAN	TURKEY	MAURITIUS	FRANCE	ANDORRA
	PERU			NAMIBIA	GREECE	GEORGIA
	URUGUAY			SENEGAL	ITALY	SERBIA
					IRELAND	
					LUXEMBOURG	
					SLOVAKIA	
					HUNGARY	
					CHECHNYA	
					ROMANIA	

ECONOMIC AND SOCIAL MODEL (FINANCIAL SYSTEM, SOCIAL PROTECTION SYSTEM AND INNOVATION ECOSYSTEM)

A financial system with limited capacity to support a substantial change in international specialization

Portugal has a financial system based on commercial banking — with its limitations in supporting business risk and its natural attraction to investment with real or "land" guarantees — which will hardly allow this change in the structure and dynamics of the international supply of the Portuguese economy. The current banking sector will have also difficulty financing the transformation of the services that organise the internal market, based on the intangibles of digitalisation (including the automation of services and the large scale integration of artificial intelligence in services).

We cannot ignore the fact that part of the financial sector in Portugal (banks and insurance) is today held by external capital, naturally unwilling to participate — even if it is in forms compatible with its regulatory framework — in investment projects that can effect a change in the country's international specialization.

A social protection system vulnerable to the demographic shock and still independent of investment financing in Portugal

Portugal also has a social protection system based on schemes of a corporatist nature (Social Security), financed mainly by employers and workers, or mainly publicly provided (National Health Service), financed by taxes. Demographic evolution (increase in the elderly population, reduction in the share of working age

population and young population) and a system focused on the treatment of disease and with little emphasis on prevention will make it even more difficult to sustain the funding schemes in their current forms.

In turn, the change in the general morbidity pattern — more chronic diseases amongst young people, more oncological and immune system diseases in adulthood and a much higher presence of disabling neurological diseases in the population after working age — will translate into increased demand for health services, possibly with more expensive treatments than those for diseases that were typical of the first thirty years following 1974. It should be noted that the corporatist or state nature in the area of personal risk protection slows the growth of institutional investors in the country that could intervene in the capital market of which Portugal is part (Euronext).

Portugal's model is aligned with most models in the Euro Area

It should be recalled that this pattern — which is shared by most Euro Area economies — has as a consequence the very weak interaction between the two types of systems (the financial system and the social protection systems), **generating financial systems with weak expression of the capital market, institutional investors and even investment funds with the capacity and interest in investing in longer return assets, to strengthen their own portfolios.**

Recalling the role of land income in economies

On the other hand, the analysis of land income in the most developed models of capitalism has long been abandoned, regardless of the fact that "land" is almost always at the origin of the type of financial crises that have hit traditional banking systems.

Note that when capital accumulation in an economy is based on the valuation of land - including: real estate, construction and public works, and investment in residential tourism - the possibility of growth based on business innovation that generates greater added value is seriously threatened.

In this context, it seems to be fundamental to attempt a simultaneous transformation of the financial system, the social protection systems and the institutional framework of the generation and raising of differential land income.

THE EXTERNAL DEBTS: A HEAVY LEGACY FOR CAPITAL ACCUMULATION IN PORTUGAL

Portugal adds a heavy legacy to these constraints we have mentioned: it has a very high external debt (sovereign debt, but also external debt of the financial sector and of the non-financial business sector) for the decade 2020-2030, whose ser-

vicing will absorb part of the growth we may achieve and will limit the capacity of the State to support a repositioning of Portugal in the global economy.

KEY UNCERTAINTIES AND THEIR CONFIGURATIONS

Lastly, we would again mention a set of **three key composite uncertainties**, i.e. involving structural factors which we believe are more interdependent, and which were therefore integrated into the three modules which make up the structure on which the scenario building is based (see chapter 3, point 2, above).

- **A key uncertainty around the preferential geo-economic integration that Portugal will follow in the reference period,** within a context of deep changes in the EU, and the configuration of the tensions and realignments in the international system. This uncertainty includes both privileged partnerships and the resulting international connectivity requirements.
- **A key uncertainty centred on the international supply of the Portuguese economy and its linkage to investments in infrastructure and the digitalisation of the economy, a key infrastructure in itself. In turn, the link with the territory/strategic assets enables sustainability factors to be addressed.**
- **A key uncertainty centred on the evolution of the social and economic model, which includes the social protection system,** and education and training systems.

For each of these three uncertainties, resolution configurations have been defined (two or three for each uncertainty), as individually shown in the figure below:

Figura 25. KEY UNCERTAINTIES AND THEIR RESOLUTION CONFIGURATIONS

Geo-Economic Integration and International Connectivity
- Focus on the European Union
- Euroglobal Network

International Specialization, Territorial Enhancement and Energy and Mobility Infrastructure
- Continuity
- Incremental Diversification
- Transformation (Hexagon of Opportunities)

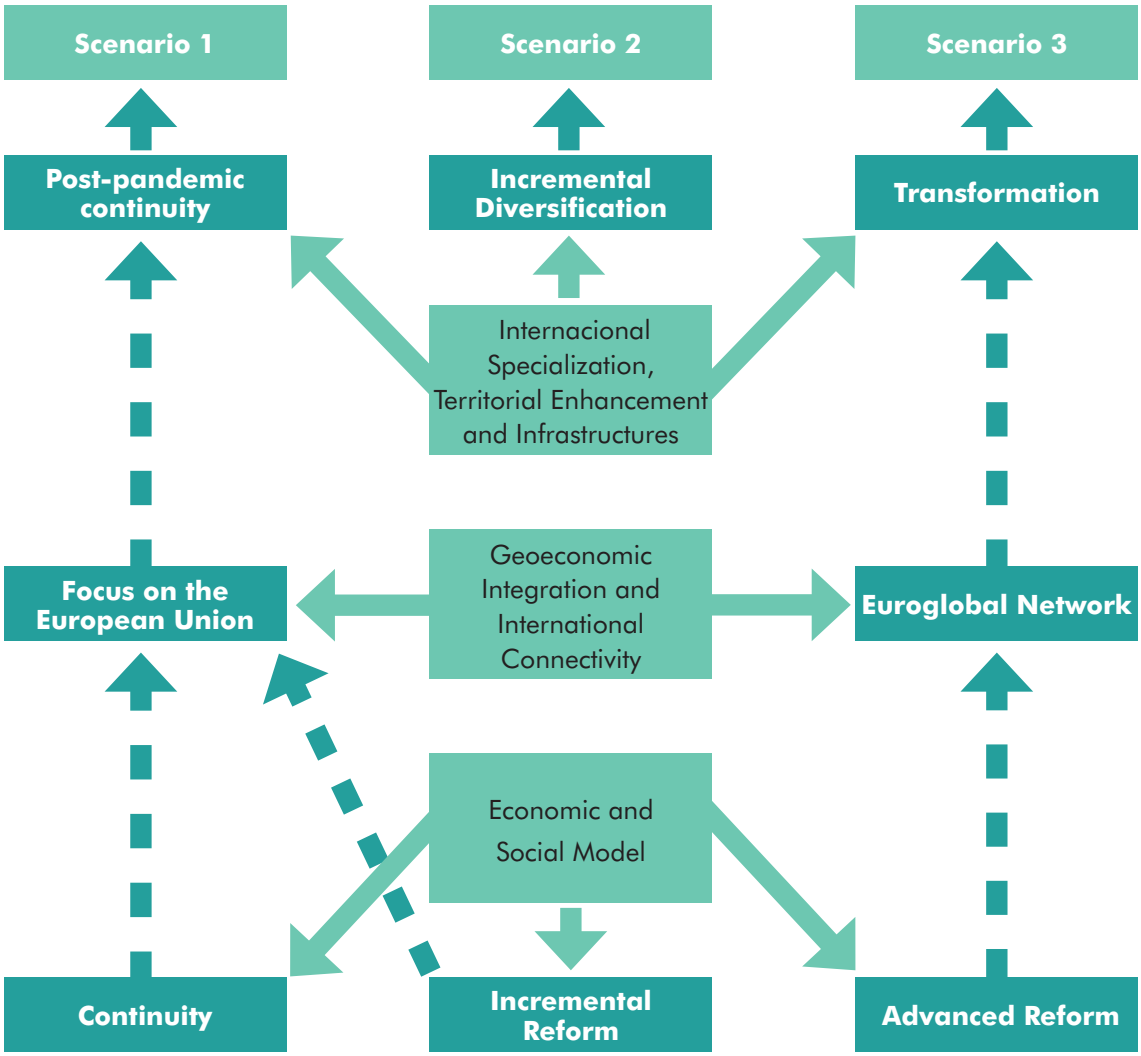
Social and Economic Model
- Continuity
- Incremental Reform
- Advanced Reform

IV Scenario Building Matrix and Selection of 3 Scenarios

In line with the above, our presentation of the three scenarios in the next pages follows the same descriptive order, namely:

- Geo-Economic Integration and International Connectivity
- Territorial Enhancement, International
- International Specialization and Infrastructure

Figure 26. RESOLUTION CONFIGURATIONS OF KEY UNCERTAINTIES AND SELECTED SCENARIOS



1.PRESENTATION OF THE 3 SELECTED SCENARIOS

SCENARIO 1: CONFIDENCE IN CONTINUITY

Figure 27. DOMINANT DYNAMICS – EXTENSION

CONTRASTING AXES	CONFIGURATION IN THE SCENARIO
Geo-Economic Integration and International Connectivity	FOCUS ON THE EUROPEAN UNION
Territorial Enhancement, International Specialization and infrastructures	POST-PANDEMIC CONTINUITY
Social and Economic Model	CONTINUITY

Geo-Economic Integration and International Connectivity

- External economic relations, including trade, investment and external indebtedness, would remain mostly centred on the EU area (assuming that its integration can progress at the financial and fiscal levels) and aligned with community sector policies, including the new industrial policy. Within the EU, Portuguese economic relations would remain bilaterally focused on Spain, although they would also include France and Germany. Outside the EU, relations with the Community of Portuguese Speaking Countries would continue to be targeted.

Territorial Enhancement, International Specialization. Digital Agenda and Infrastructure

a) Territorial Enhancement

- In Scenario 1 Portugal continues to envisage itself as a peripheral territory of the European "peninsula", which privileges geo-economic relations in the context of greater proximity – economic relations with Spain – which currently translates into the integration of the Portuguese economy in the economy of the Iberian space (mainly as far as the financial system is concerned), complemented by the relationship with France and Germany, with regard to foreign trade and investment.
- In this scenario, the country continues to organise itself so that its territory functions as a magnet for foreign industrial investment, in the typical manner of the internationalisation phase (which preceded the current phase of globalisation) and as a magnet for short-term visitors, based mainly on the offer of natural amenities and the cost of living in the country for the level of well-being on offer. It is also a magnet for new part-time and full-time residents, boosting the residential tourism segment. The latter aspect has become particularly evident over the past decade, in line with what Spain

had started to do much earlier, and has made it possible to attract, in addition to visitors, new European residents, many of them seniors.

- In this scenario, agriculture is mainly seen as an element of the country's international specialization, i.e. an activity that can reinforce its ability to supply the internal market, to increase exports and to respond to external supply shocks. Its instrumental role in the process of territorial enhancement and the fight against desertification and the abandonment of large stretches of the country (which become more prone to forest fires) is not seen as a priority. This approach does not take into account the fact that there is not one agriculture, but at least four different agricultures at its economic and social base, as mentioned in the box below.

PORTUGAL: THE "FOUR COEXISTING AGRICULTURES":

- "Agriculture as agribusiness", of large economic firms, capitalised, technologically equipped, part of international value chains, which aims to maximise the financial return on the application of its assets, from which Alqueva stands out.
- Large land-based agriculture, more parsimonious in terms of capital investment and focused on obtaining net incomes that ensure its economic viability, the preservation or increase of its assets and the well-being and prestige of its holders, is predominant in the rest of the Alentejo, in Leziria and Charneca of Ribatejo and in Beira Baixa. It also manages nearly all the cork oak and holm oak forests, the most important agroforestry systems in our country, from an economic and environmental point of view.
- Small and medium family farming integrated in the markets through the sale of most of its production, which aims to obtain cash and in kind revenue (self-consumption) to enable the continuity of its activity and contribute to the well-being of households; it stands out in areas such as those of the West and Ribatejo, of Beira Litoral and Beira Alta and of Minho, and even in parts of Trás-os-Montes and in Beira Interior, more propitious to small-scale intensive agriculture.
- Small-scale family farming which produces goods for household and proximity networks consumption, based on the care of the land. This is generally called subsistence agriculture. But it usually represents a minority source of family income and the reasons for its persistence go far beyond the sphere of necessity. It is a small-scale proximity farming: proximity production/consumption; proximity between people; proximity and care of the land, which prevents its abandonment and helps to protect the surrounding resources and landscape. Without it, neglect and rural fires, which have impoverished and harmed us, would be even more devastating."

Source: *Francisco Cabral Cordovil, "Agricultura e Política Agrícola", pp. 11 and 12, May 2021, available at: https://iniav.pt/images/publicacoes/livros-manuais/Agricultura_e_Poltica_Agrcola.pdf*

With regard to territorial cohesion, and without considering agriculture in this scenario of continuity, Portugal will seek to revitalise the low density regions on the mainland:

- Continuing to invest in the proactive role of public polytechnic and university higher education institutions in attracting and eventually retaining young people.
- Attracting residential tourism projects to areas where amenities, a rich heritage and cultural/artistic entertainment are combined with good proximity services.
- Making use of the emerging opportunities for remuneration of rural territories, through the green financial system, enhanced by the European taxonomy, which promotes new territorial development models.

However, the territories that do not participate in this functional attraction and territorial promotion rationale will increase the territorial cohesion gap.

In this scenario, territorial specialization processes are initiated at local government level where, driven by the achievement of carbon neutrality targets by 2050, attempts are made to mitigate climate change through sustainable mobility, energy efficiency and management of biowaste for economic use. At this level intermediate cities can be emphasised, which become specialised hubs for environmental sustainability, as a result of strategic choices and endogenous capabilities. However, the lack of uniformisation of measures in different sectors, such as urban regeneration and construction in general, makes the results asymmetric at national level, with implications for territorial cohesion.

The metropolitan areas of Lisbon and Porto, extending and securing their functional connections as a result of the complementarity between intermediate cities and relying on investments in the area of transport, present themselves as *driving regions for Portugal's international integration*.

b) Water resources and management

- In this scenario, the use of the main river basins to supply water to large urban regions continues, without diversification of primary water sources and with a limited role of the "circular economy" in the management of the urban water cycle that would allow for the expansion of secondary water supply, while still seeking to increase the capacity of the main basins to adapt to drought or flood risks.
- The fact that underground aquifers form the basis of irrigation systems in highly productive agricultural regions will remain largely ignored.

- Specific interventions will be carried out in the Alentejo and Algarve regions, where the limitations to the supply of water resources combine with an increasing intensity in the use of water by tourist activities in these two regions, and particularly by residential tourism (e.g. resorts integrated with golf courses).
- Investments will be made in the recovery of water supply networks in order to reduce losses, with a concomitant action focused on the adoption of behaviours to reduce water consumption patterns, with recourse, if necessary, to charging schemes.

c) International specialization

- This scenario comes as a continuity of Portugal's internationalised sector supply that characterised the last decades, although in a context where, after the Covid-19 shock and its impact on companies' cash flows, we will witness the likely postponement of investments or even the bankruptcy of businesses, when direct or indirect public support co-financed by European funds is no longer available.
- In this scenario, the development of the aforementioned proto-clusters does not deserve attention, because the State intervention is focused on supporting larger struggling companies, which may generate unemployment, regardless of their previous trajectory in terms of export growth, new investment and applied research projects.
- It is not surprising, therefore, that during the decade 2021-2030 Portugal's international supply remains focused on consolidated clusters, with little attraction of multinationals to develop them, including:

a) Industrial clusters based on endogenous natural resources (food and beverages; cellulose pulp and paper; wood and furniture; and ceramics and glass).

b) Industrial clusters based on imported raw materials (textiles, clothing and footwear; petrochemicals and industrial chemicals; and steelworks).

c) Metal construction/shipbuilding/heavy metalworking cluster and machinery cluster for sector applications and electrical equipment and material.

d) Precision mechanics/technical plastics cluster.

e) Automotive cluster (vehicle components, body, integration and assembly of vehicles).

f) Engineering, construction and public works services.

g) Diversified tourist services, whose demand will take time to recover from the Covid-19 shock.

Some of the industrial activities covered by these consolidated clusters will have a more limited sector dimension, due to the interaction of three factors:

a) Weak demand growth in European markets.

b) Intense competition from transition economies in Eastern Europe and/or developing and emerging economies.

c) Radical change in the type of products in European markets (notably the faster penetration of electric vehicles and the shift in renewable energy investment towards solar PV, offshore wind and large-scale electricity storage, after a period of concentrated investment in onshore wind and its direct connection to national grids).

It should also be noted that an increasingly significant share of the business incentives co-financed by the structural funds will be used up in the decade 2021-2030 in the area of business environmental sustainability/"ecological footprint", required at EU level, both from companies and banks financing them.

d) Infrastructure

This scenario — not very dynamic in terms of corporate investment in industry and services — stands out for having a very bulky infrastructure investment component, partly inherited from previous unfinished or even uninitiated projects. Among these, the following may be highlighted:

- Digital infrastructure: dominated by the ambiguity that delayed the set-up of 5G networks, hindering the digital shift of several activities and sectors. The solution found in this scenario is that each of the three mobile telecommunications operators has opted for a different technological partner, having involved Huawei, Nokia and Ericsson.
- Energy infrastructure: the continuation of large-scale investment in electricity generation based on onshore and offshore wind power and solar photovoltaic energy stands out, with a mode of connection and sale to the national electricity grid which, if maintained, will continue to imply higher costs of the electricity available in the country, with a negative impact on business costs and household spending.
- Transport infrastructure: the legacy of large-scale programmes stands out, namely the National Investment Plan (PNI) 2030 and,

in the railway sector, Railway 2020, to be partially implemented in the period 2020-2030, already integrated in the new draft National Railway Plan presented in 2021. This railway investment has a strong component targeting rail freight transport to Europe, in interconnection with the Spanish network. The Southern Sines-Badajoz-Madrid Corridor is worth mentioning and also the electrification and renovation of signalling and communications on the lines included in the Atlantic corridor of the trans-European networks (such as the Beira Alta Line). In the same context, it is also important to remember the investments planned for the North-South Lisbon-Porto Corridor, with a strong passenger transport component, which is intended to be high speed, and with a new layout that will enable congestion at the entrance of the metropolitan areas of Lisbon and Porto to be resolved. This scenario also includes renewal investments in urban passenger networks and in the Lisbon and Porto metros.

- It should be noted that the railway option does not have a significant internal multiplier impact in Portugal since the country no longer has any industrial capacity for manufacturing railway rolling stock (unlike Spain). However, it does have design and manufacturing capacities for the passenger carriages and information technology applied to the control and management of rail transport, for which it relies on technologically prepared companies.
- This scenario maintains the TGV project to Madrid within the 2030 time frame. However, should it be decided to build the

Figure 28.
MAPS OF THE NATIONAL RAILWAY PLAN (2020-2040)

Structure of the Network

Current railway network with tree structure
2021: Reopening of the Covilhã - Guarda line closes Beiras ring again
2023: HSL Evora - Elvas closes the ring around the Upper Alentejo
2030: HSL Porto - Lisbon and Braga - Valença creates network on the Atlantic Axis with North, West and Minho lines

Source: *"Plano Ferroviário Nacional - o que vai mudar?", Economia e Finanças, 2021*

Lisbon-Madrid TGV rail link without rapid progress being made in the construction of a new airport for Lisbon, and should TAP's ambitions for routes to North and South America be abandoned, the consequence will be that a significant part of the intercontinental flights from Portugal will be transferred to the Madrid airport hub.

- In terms of ports, the success that the "Strategy for Increasing the Competitiveness of the Continent's Commercial Ports Network — Horizon 2026" mainly covers the green shipping cluster and the onshore and offshore ship energy supply capacity (natural gas for example), allowing the port system to be strengthened in the international context. However, the emerging competition from the United Kingdom in the framework of its development as a maritime nation, with the capacity to attract in the North Atlantic, should be highlighted.

e) Digital agenda

- Of the three components for this agenda referred to in "Volume 3 — Portugal: Starting Point", this scenario is characterised by an investment in the digital literacy of the population and in digital upgrading, guaranteed by the adoption of cross-cutting policies to incorporate digital processes in companies and in the public administration sector, which will be co-financed in the start-up phase by European funds from the the Recovery and Resilience Plan (RRP).

Economic and Social Model

a) Financial System

- Scenario 1 is characterised by a recovered banking system with the support of financial intervention by the State, possibly necessary to manage the end of the moratoria granted since the first phase of the crisis generated by the Covid-19 pandemic. Commercial banking will continue to occupy the central position in the financial system, mostly composed of banks with Iberian or Sino-Angolan management.
- In this scenario, the financial system can rely on a Banco Português de Fomento (counting on European funds), which will play an important role in the capitalisation of companies, but, as a whole, the financial system will remain limited in its capacity to provide long-term credit for business investment or to finance innovation by companies without real guarantees.

- It is also characterised by the existence of restrictions on the broadening of the application fields of savings mobilised by insurers and pension funds, restrictions involving national entities (bonds and corporate shares).
- This scenario continues to see a State whose budget is absorbed by the financing of sovereign functions and the functions of social protection, human capital formation and health service provision, a State that needs to permanently rely on European Union structural funds to co-finance the majority of infrastructure expenditure and public incentive systems for investment and business innovation.

b) Social protection systems

- Scenario 1 is characterised by a clear political resistance to the introduction of institutional changes both to Social Security, of a corporatist nature, on a pay-as-you-go basis and relying on supplementary state funding, and to the National Health Service, of a public nature, financed by taxation, which has been faced with the growth of private provision of health care in the hospital area and in health insurance in recent decades, covering standardised risks of disease.
- Demographic evolution and the anticipated evolution of the morbidity pattern in society will translate into a greater frequency of supplementary state intervention to cover Social Security deficits and into the growth of health expenditure, which may require increasing budget allocations to strengthen the NHS financially.
- Given the growth of expenditure on social protection systems, budget deficits will be more difficult to avoid or to control, which points to the fact that, in this configuration, governments will tend to increase taxation on household wealth.
- This scenario would also see an increase in the role of private insurance companies in social protection domains, together with the gradual withdrawal of the young middle classes from the public systems, if there won't be any reform of these systems, which would lose human resources (and payers).

c) Optimisation of human resources

- In Scenario 1, one of the greatest problems faced by the country in terms of human resources would still be unsolved, which is the exceptionally high number, even in European terms, of young people not in education, employment or training (NEET). This happens despite the fact that there continue to be initiatives from public bodies aimed at mitigating this phenomenon, namely through the offer of training actions of various types (as happened before) and the introduction of vocational courses in secondary education. The results of this scenario will be more positive in terms of the range of vocational courses by polytechnic institutes, which also allow subsequent access to higher education courses in polytechnic education.

SCENARIO 2: WITH ABILITY, IN THE SEARCH FOR A NEW SPACE IN EUROPE

Figure 29. DOMINANT DYNAMICS – ADJUSTMENT

CONTRASTING AXES	CONFIGURATION IN THE SCENARIO
Geo-Economic Integration and International Connectivity	FOCUS ON THE EUROPEAN UNION
Territorial Enhancement, International Specialization and Infrastructures	INCREMENTAL DIVERSIFICATION
Social and Economic Model	INCREMENTAL REFORM

Geo-Economic Integration and International Connectivity

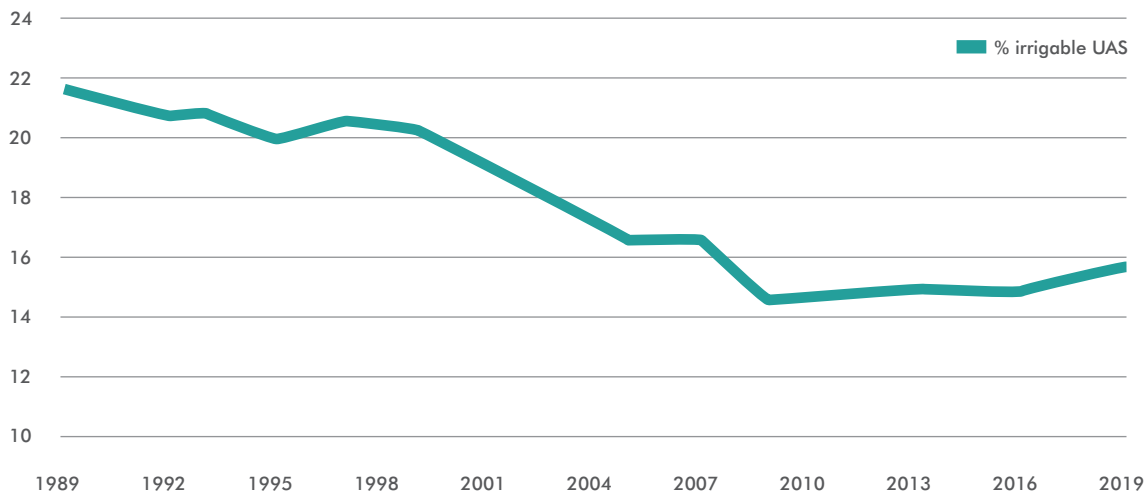
- Portugal's external economic relations — trade and investment — would remain mostly focused on the EU area and in complete and exclusive alignment with its sector policies, including the new industrial policy. Within the EU, closer relations would be established with the Nordic countries and the Benelux Member States (i.e. with states on the Atlantic seaboard which question the EU's protectionist refocusing). This scenario also presupposes a rapprochement with Italy.
- In terms of international connectivity, as we will refer to below, a central role will be given to short distance sea shipping and road-sea transport for future access to Europe beyond the Pyrenees.

Territorial Enhancement, International Specialization, Digital Agenda and Infrastructure

a) Territorial Enhancement

- In Scenario 2, Portugal is conceived as a territory with an extensive coastline, which encourages its relations with Northern Europe, North America and with the South Atlantic and Indian Ocean countries, with which it will naturally also want to have largely transcontinental air connections.
- Portugal is organising itself to attract tourists and new part-time or full-time residents, including a large component of teleworkers in cyberspace who might settle in the country in the future.
- In this scenario, agriculture is still seen mainly as an element of international specialization, and investments could eventually be made to reverse the decline in the irrigable area (see figure below), if we take into account a southern component around the Tagus project, also designed to transfer the irrigation system supply in the West and Ribatejo to surface waters. This scenario could also involve investments to recover part of the irrigable area lost in the North.

Figure 30. COLLAPSE OF IRRIGABLE AGRICULTURAL AREA IN PORTUGAL 1989-2019



Source: *Francisco Cabral Cordovil, "Agricultura e Política Agrícola", May 2021, available at: https://iniav.pt/images/publicacoes/livros-manuais/Agricultura_e_Poltica_Agrcola.pdf.*

In the last three decades, the regional distribution of the irrigable agricultural area of the Continent changed radically: the weight of the regions north of the Tagus (Entre Douro e Minho, Beira Litoral and Trás-os-Montes) fell from 54% to 30% and that of Alentejo and Ribatejo went from 30% to 57% of the total. This was due to the 60% reduction in the irrigable area in the North (from 469,000 to 190,000 hectares) and the 40% increase in the South, especially in the Alentejo where the area more than doubled (from 113,000 to 233,000 hectares). The collapse in the North occurred with the complacency of public institutions, while the great expansion in the South was due to huge investments in collective infrastructure by the State for the benefit of landowners and agricultural producers.

- In this Scenario 2, as in Scenario 1, the issue of territorial cohesion will be addressed, focusing on different factors of competitiveness and attractiveness. We stress the tangible and intangible heritage which, by its uniqueness, diversity and ability to differentiate the territory, will become more significant levers for attracting new residents (teleworkers, senior citizens and other new residents), who will be encouraged to settle in different regions instead of those traditionally more attractive to migrants.
- In parallel, Portugal is preparing the development of the bio-economy, alongside the traditional productive sectors. This decision, which depends on the quality of the ecosystems, is based on the geographical and environmental diversity, as well as on the extensive biodiversity identified in the North Atlantic as a result of the expansion of the continental shelf.

- The metropolitan arcs and intermediate cities would begin to identify new functional contexts: the advent of digital twins, as a system virtualisation technology, which provides the territories with the necessary tools for their management and interaction, even enabling a more active response to the risks arising from climate change.
- Within local authorities, open data policies are adopted for the promotion of smart cities, allowing the involvement and training of human resources specialising in the development of applications in the urban environment.

b) Water resources and management

- Future growth in this scenario includes a stronger component of water-intensive activities — agriculture and agro-industries, pulp and paper industries, residential tourism — often concentrated in regions with limited primary supply of water resources. This growth would be accompanied by greater technological and organisational innovation in the efficiency of water use and management.
- The policy of constituting strategic water reserves will be a priority policy with regard to the storage of surface water and underground aquifers, whose protection will require significant strengthening in terms of regulation, monitoring and penalising undesirable practices, all the more demanding in this scenario because it would see a strong growth in water-intensive activities.
- The selective expansion of available water resources in international river basins will also take place by possibly resorting to the transfer of surface water originating elsewhere in the country — such as, for example, the mobilisation of water resources from the North and Centre of the country to feed the Alvito dam (Sabugal/Meimoa/Alvito sequence).
- There will be improvements in the quality of water supply networks and in the efficiency of its end use through the introduction of new technologies (smart water) for residential and tourist use.

c) International specialization

- This second scenario is characterised by taking a new direction, as it seeks to integrate the Portuguese economy in value chains of the future, considered priorities by EU industrial policy. Examples include self-driving cars and the digitalisation of mobility; the hydrogen chain and its application in areas of decentralisation of electricity production and electric mobility; and electricity storage solutions at various scales of size.
- Another of its distinctive features is the reinforced centrality and diversification that will be attributed to the international presence of the Portuguese economy in the services sector, in particular, services rendered to businesses from Portugal (see below under B.4. Digital Agenda) and tourist services, with a more diverse offer and a strong component of residential tourism.
- This scenario also presupposes a change in the relative importance of consolidated industry-based clusters, which will continue to depend heavily on European markets. It is true that for some it will be difficult to gain market share, given the competition from developing and emerging economies. Nevertheless, other clusters may also see opportunities open up abroad, especially in the African continent. In this context, the following can be mentioned as characterising this scenario:

a) Profound transformation of the energy sector and the chemical industry activities most closely associated with it, involving:

I) Regression of installed petroleum refining and intermediate petrochemical capacity, while greater capacity would be deployed to process imported liquefied natural gas.

II) Installation of a hydrogen production unit by electrolysis of water, running on electricity produced by large-scale solar photovoltaic plants (in the south of the country). This unit would initially be geared towards exports to Northern Europe — an orientation partly explained by the difficulty of internal penetration of hydrogen and, in the period 2020-2030, by the resistance of dominant companies in the market.

III) Installation of a lithium refinery aimed at moving up the battery value chain.

IV) Evolution towards new segments of industrial chemistry, namely fibres with structural use (like aramid fibres) and new categories of polymer for technical applications, as well as new uses for cellulose fibres.

b) Development of ocean-related industries:

I) Strengthening of shipbuilding, both due to the success of the ship design and construction segment for river tourism and exploration tourism, and also with the integration of shipbuilding companies in European consortia developing autonomous ships for short sea shipping.

II) Development of a set of offshore activities, capitalising on the exploratory investments made in the last 15 years (offshore wind, wave energy for electricity production and ocean aquaculture).

c) Diversifying activities in industries based on cellulose resources towards new applications for cellulose fibres in the textile sector and paper (including, in this case, "paper electronics").

d) Strengthening of the industrial machinery and electrical material sectors, together with the reinforcement of automation and robotics and an articulation of this group with the modernisation of the production processes of the user sectors.

e) Growth of the cluster of equipment and devices for leisure and fitness: two-wheeled vehicles; recreational boating and canoeing; ultralight aircraft and recreational aviation.

f) Concentration of initiatives for the development of an integrated offer of solutions for the operation of cities in terms of energy, environment, mobility and proximity digitalisation, as well as innovation in construction technologies and their materials — integrated offer capable of bringing together subsidiaries of multinational companies operating in Portugal and Portuguese companies in industry, services and technologies. One possible focus would be projects in Africa, aimed at larger cities with greater needs, co-financed by multilateral agencies (namely benefiting from the "lusophone compact" available from the African Development Bank).

d) Digital agenda

- Besides including investment in the population's digital literacy and in digital upgrading as in the previous one, this scenario is understood as prioritizing the adoption of transversal policies to incorporate digital processes in companies and in public administration, and it already includes what is called digital growth. The latter has two components: i) more companies providing digital services abroad and present in the "data economy" and ii) the large-scale attraction of cyberspace teleworkers. In this context, Scenario 2 already envisages a specific visa policy, as well as the real estate supply of coworking spaces in competitive price conditions and a taxation of income from telework for cyberspace in attractive conditions.

d) Infrastructure

- Communications and audiovisual broadcasting infrastructure would be a priority in Scenario 2, both as a condition for proximity support and for the reduction of mobility needs in the internal market, and for access to cyberspace, a decisive space for corporate international competitiveness. In this scenario, the installation of 5G networks using the technology of the European Ericsson-Nokia consortium, which has installed part of the 5G network in Singapore, would go ahead, simultaneously reinforcing the presence of both companies in the area of telecommunications technologies in Portugal.
- As part of the energy infrastructure, namely electricity, this scenario considers a priority investment in high-capacity storage plants for electricity produced from renewable energies. Wind and solar farms would be connected to the electricity grid in this way, through these storage plants, eliminating the inconvenience of irregularity. This change would be accompanied by a change in the conditions of sale of these energies to the national grid, allowing for lower electricity prices.
- This scenario is characterised by a much greater emphasis on investment in adaptation to the impact of climate change, particularly with regard to the management of water resources

and the water and wastewater treatment industries, as well as **planning responses to the risks of flooding in the main estuarine regions, transferring to this priority area of Water Resources amounts of investment currently planned for the internal transport sector.**

- In this scenario, the key innovation in terms of infrastructure for international connectivity is the introduction of short sea shipping in trade relations with Northern Europe (already recommended by the European Commission for the Portuguese case) as a fundamental means of transporting cargo to Europe, including the road-sea mode (RO-RO ships) which would be fundamental to serve the Northern region.
- Portugal will foster Special Economic Zones close to its port hubs, stimulating territorial specialization on the one hand, and attracting foreign investment on the other.
- The Special Economic Zones, aligned with and integrated into territorial, environmental, social, economic and fiscal public policies, will amplify the results and enhance new alternatives to the "Strategy for Increasing the Competitiveness of the Continent's Commercial Ports Network — Horizon 2026".
- Although timidly, Lisbon and the Atlantic seaboard will compete with other European and North Atlantic cities and maritime regions. The Atlantic seaboard presents itself and is globally justified as a regional economic space, a gateway region with an Iberian dimension, broadening the range of partners in its trade transactions and flows. This increases Portugal's visibility in the world, ensuring the attraction of new global partners beyond Europe.
- There would therefore be a concentration of rail investment for goods in the Southern Corridor, allowing connection to the Community of Madrid and, if possible, to the communities of the Spanish Mediterranean seaboard (i.e. linking with the Spanish Mediterranean Corridor).
- Internally, the decision would be maintained to intervene in the Northern railway line (also with a view to moving it away from the Tagus, taking into account the risks of flooding that can be anticipated over the coming decades). In this case there would be an access to Lisbon using the current Western Line and maintaining the current route along the Tagus for regional services. In this scenario, investment in the Lisbon and Porto metro networks would be maintained.
- The implementation of the Lisbon-Madrid TGV line would be postponed and priority would be given to the construction of a new airport in Lisbon in the area of the Alcochete firing range. TAP would also maintain flights to North and South America, as well as flights within the EU and to Africa.

Economic and Social Model

a) Financial system

- Scenario 2 is characterised by the presence of Banco Português de Fomento in the European network of development banks, which would play a complementary role in the future financing of corporate investment, namely investment oriented to external markets, through its credit facilities.
- This scenario is also characterised by a number of changes that point to a new business model for commercial banks, increasingly capitalising on the momentum of the capital markets, as exemplified by:

a) The maintenance of the commercial banks' involvement in mortgage lending, whilst creating the conditions for it to be sold to other financial system entities, existing or to be created, that are more inclined to manage long-term risks (for example, property investment funds).

b) Boosting the secondary mortgage market as a segment of the bond market, where mortgage-backed bonds created by previous bank loans and currently on the banks' balance sheets are traded.

- Strengthening the role of the capital market in financing the economy:

a) Increasing the number of institutional investors capable of providing liquidity to the capital markets, in their various segments.

b) Increasing the presence of Portuguese companies on Euronext (which brings together the stock markets of Lisbon, Paris, Brussels, Amsterdam, London, Dublin and Oslo) as the country's capital market, tapping into its different strengths and the diversification of the market segments in which it operates, including the mortgage-backed bonds segment, which would be of great interest to Portugal.

c) Promoting the existence of financial funds involved in the reconfiguration of the business fabric (mergers, acquisitions, takeovers, etc.) and in supporting investment, as well as new digital platforms for direct funding.

d) Encouraging the creation of bond instruments by securitisation of corporate credit, namely of SMEs, customers of a single bank or of several banks associating themselves.

b) Social protection systems

- Scenario 2 is characterised by the reinforcement of the capitalisation component of social security, through the creation of non-occupational pension funds, under a defined contribution regime, which would act as complementary to the existing regimes and whose management would belong to fund management companies.
- Along these lines, it would also entail the mainstreaming of reverse mortgages (which would make it possible to monetise).
- real estate assets to be used by their holders, for instance, to reinforce protection against illness.
- Scenario 2 also includes a double evolution of the National Health Service, namely:

a) The reform of primary health care (PHC), strengthening its focus on disease prevention and health promotion, accompanied by a change in the relationship between users and PHC family doctors and specialist doctors, thanks to the use of digitalisation (permanent monitoring of users' medical parameters, digital access to providers by users and digital interaction between PHC family doctors and specialist doctors operating in hospitals).

b) Greater collaboration between the SNS and the networks of private insurers, in order to promote greater accessibility, speed and efficiency in access to specialist medicine.

c) Optimisation of human resources

- In this scenario a three-pronged initiative would be undertaken:

a) Advance with a reskilling programme for young people with higher education, but without employability prospects, and in successive phases launch applications for professions and/or skills with strong demand in the labour market. Simultaneously, certified training programmes would be launched, in whose design and result assessment companies would be involved, for whom such training and/or skills are fundamental.

b) Continue with existing programmes for training in those same professions and/or skills in polytechnic education, which have been in demand, and have them periodically re-evaluated by a corporate jury.

c) In order to reduce the number of young people not in education, employment or training, this scenario would launch a programme open to young people who have left secondary education enabling them to attend courses designed in conjunction with multinational companies in the information technology sector, with quality certification by these companies.

SCENARIO 3: PORTUGAL "4D" — DIGITALISATION, DIVERSIFICATION, DYNAMISM AND DISTINCTION

Figure 31. DOMINANT DYNAMICS – REPOSITIONING

CONTRASTING AXES	CONFIGURATION IN THE SCENARIO
Geo-Economic Integration and International Connectivity	EUROGLOBAL NETWORK
Territorial Enhancement, International Specialization and Infrastructures	TRANSFORMATION
Social and Economic Model	ADVANCED REFORM

Geo-Economic Integration and International Connectivity

- Scenario 3 comprises a type of geo-economic insertion that takes advantage of a vast, diversified network of extra-European bilateral relations, including, in North America, the USA and Canada, in Asia, Japan, India and Thailand and, in the Middle East, the United Arab Emirates and Israel. Within the EU, this option will be accompanied by the strengthening of bilateral relations with Member States interested in a Euro-Atlantic partnership, namely with the Nordic countries and the Benelux Member States in the North, Italy in the South, and the Three Seas Initiative Member States (Baltic, Black Sea and Eastern Mediterranean) in the East.
- In parallel, Portugal supports the transformation of the Community of Portuguese Speaking countries into a platform for technological, environmental and public health openness and modernisation in Africa, rather than a protected economic space. It has a wider set of Observer States, in which several of the States mentioned in the previous point are included, and which could contribute to the dynamics of this platform of international cooperation (it should be recalled that currently this set of Observer States already includes the USA, Japan and India; the United Kingdom, France, Italy, Spain and Luxembourg; Turkey and Qatar; Namibia, Mauritius, Ivory Coast and Senegal; Argentina, Chile, Peru and Uruguay).

Territorial Enhancement, International Specialization, Digital Agenda and Infrastructure

a) Territorial Enhancement

- In Scenario 3 Portugal is conceived as a territory of archipelagic configuration, valuing the interaction of the autonomous regions

and their specific geo-economic strengths with the regions driving the internationalisation of mainland Portugal.

- At the same time it organises itself to make its territory attractive for people, events and talents from outside, identifying two groups:

a) A diversified group that includes foreigners attending Portuguese universities; non-residents who choose to use specialised health services in which Portugal excels for their quality and innovation; senior citizens who choose Portugal to reside part-time or permanently; creative people who enhance the offering in terms of the arts, shows and entertainment contents in the country during longer stays.

b) An entirely new group that involves workers in cyberspace living in Portugal and exporting cyberservices from here. In the period 2020-2030, this subgroup should allow an increase of foreign residents in Portugal in the order of hundreds of thousands, assuming, since the early years of the decade, coordinated policies on immigration (visas), tax treatment, availability of coworking spaces, etc.

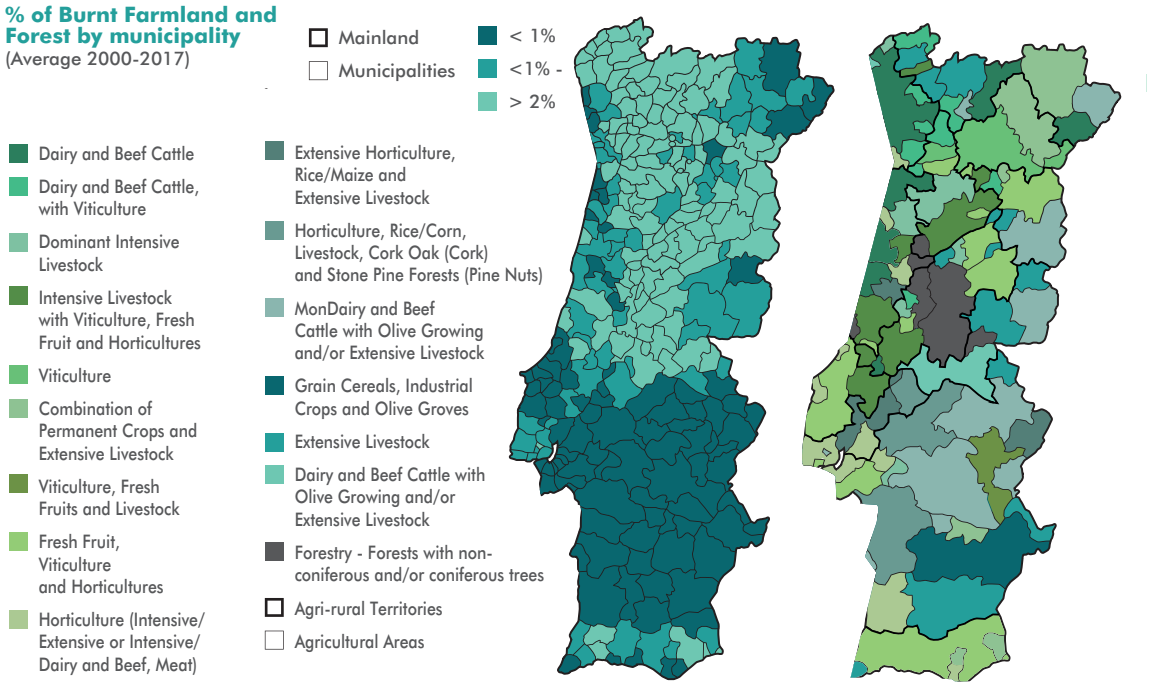
- In this context, the Portuguese territory is organising itself to enhance its low density regions on the mainland and in the autonomous regions as attractive regions for new residents and tourists, having a symbolic, diligently built capital (based on the environment, the historical heritage, animation, arts and culture), being safe for holding international events, ensuring good quality in health services, excellent digital connectivity and access to infrastructure for international connectivity. The Alentejo, Beira Interior, Dão-Lafões, Trás-os-Montes and Alto Douro, and the autonomous regions of Madeira and Azores should be prime areas for this new attracting role of the territory.
- In this scenario, we would see the mobilisation of the "four agricultures", with their own specificities, to obtain three results:

a) A mosaic of a varied range of sold specialities in the internal and external market, capitalising on regional specialization and intensifying the optimisation of the regions with Protected Designation of Origin (see map below).

b) An improvement in the income of innovative farmers, in whatever region they may find themselves.

c) A reversal of the human desertification trend, land abandonment and multiplication of fires, as shown in the following map:

Figura 31. BURNT AGRICULTURAL AND FORESTRY AREA AND AGRICULTURAL PRODUCTION SPECIALIZATION



Source: *J. C. Rolo and F. C. Cordovil, "Rural, Agriculturas e Políticas", Ed. Animar, p. 26, 2014.*

In this context, the current dimension of the territory and the development of bio-economy, associated with the growing concern with food safety, will position Portugal as a diversified supplier of high quality food specialities and as a creative and varied gastronomic space, also internationally known for its chefs.

— In the metropolitan arcs of Lisbon and Porto, this scenario will:

a) Consolidate and increase the framework of international functional relationships, supported by the functional complementarity of the intermediate cities.

b) Combine a clear reduction in centre-periphery commuting with a more equitable redistribution of workplaces, facilitated by digitalisation, which enables the repositioning of multiple business units, while investing in the expansion of proximity services in suburban areas, where there will be an ageing resident population.

c) Transform the functioning of the physical urban space (transport, energy and communications) in order to achieve a decentralised and sustainable supply of electricity and heat, a re-

duction in the mobility needs of people to access the services of central government, local authorities and infrastructure services (utilities). This would be possible thanks to cyberspace and a clear expansion of mobility as a service, based on fleets of electric vehicles (with or without autonomy), but accessible through online rental, existing alongside all-electric public transport.

d) Apply augmented reality and virtual reality to urban environment management, supported by digital twin systems and open data policies, facilitating the development of new applications to support activities in the urban environment, from construction to distribution, mobility, etc.

b) Water resources and management

We would highlight the following elements in this scenario:

- A policy of making strategic water reserves as a priority policy — both in terms of surface water storage and underground aquifers — whose protection would have to warrant significant reinforcement in terms of regulation, monitoring and sanctioning of undesirable practices.
- A selective expansion of available water resources in international river basins, possibly by transferring surface water originating domestically elsewhere — such as, for example, mobilisation of water resources from the North and Centre of the country to feed the Alvito dam (Sabugal/Meimoa/Alvito sequence), which would play an important role in this goal.
- A diversification of primary and secondary water sources, particularly regarding the water supply of large urban and tourist centres, in two ways:

  a) Management of the urban water cycle in major metropolises, ensuring greater reintegration of waste water, with a breakdown of priority applications for this water, adopting a circular economy approach to water of which the so-called "water factory" is an example.

  b) Application of desalination systems, possibly starting with coastal regions with high tourist activity and adopting innovative solutions in terms of environmental sustainability and costs as they become more widespread.

- Investing in improving the quality of water supply networks and the efficiency of its end use by introducing new technologies (smart water) for residential and tourist use.

- The dissemination of innovative technologies for more efficient use of water in the agricultural sector (meters, drop-by-drop systems, probes for measuring soil moisture and the use of weather stations to gauge the state of the weather) and the development of platforms for collecting and analysing this data and sending alerts to computers and mobile phones (territory internet).

c) International specialization

In Scenario 3, the international supply of the Portuguese economy will be based on **four structuring components,** assuming the strengthening of most of the protoclusters identified in "Volume 3: Portugal — Starting Point" for the year 2019 and of some consolidated clusters:

1st component: Includes **four clusters** in interdisciplinary technological areas, oriented towards the exploration of new frontiers, and may contain large-scale multi-year projects carried out in international partnerships:

- **Aeronautics** pole: having three components — drones, new airships and aeronautical manufacturing (partial in certain types of aircraft and complete in other types).
- **Outer space** pole: space engineering projects included in national programmes for the development of space services provided from Portugal, to be implemented in the framework of international cooperation, having as possible partners the European Space Agency and North American companies.
- **Deep ocean** pole: underwater engineering and mobile robotics projects (including autonomous underwater vehicles), aimed at understanding the resource base on the continental shelf, preparing for its sustainable exploitation and protecting the submarine cable networks that support cyberspace. Possible partners would include Japan, the USA and Norway.
- **Energy** pole with two strands:

  a) Sustainable hydrogen: programme to develop sustainable ways of obtaining hydrogen, combining:

  I) A solution based on the use of natural gas to obtain hydrogen and solid state carbon, without CO2 emissions (turquoise hydrogen) and opening up opportunities for the deployment of new carbon-rich materials. Possible partners include Germany (KIT — Karlsruhe Institute of Technology, and the Wintershall Dea company) and the United Arab Emirates.

  II) A solution based on the use of renewable energies (wind, in this case) in possible collaboration with VESTAS to obtain hydrogen by electrolytic means, using water stored in dams.

b) Batteries: battery development programme for multi-purpose stationary uses — focusing on flow batteries/redox batteries technology, an option aligned with Scenario 2, where renewable electricity storage plants were referred to for its linkage with the national grid. These types of batteries could also be used to support 5G telecommunications networks.

2nd component: construction of two industrial platforms for innovation and export:

a) An industrial engineering platform in the era of 3D manufacturing and the development and production of innovative energy and mobility solutions, including those based on the 'hydrogen economy' (see below under 'infrastructure' for examples).

b) A secure design and manufacturing platform for healthcare products (equipment, devices and consumables), participating in the relocation of these activities outside the Asia Pacific (namely China) by leading multinationals in the sector.

3rd component: continue the development of two platforms of export services:

- One of the platforms focuses on offering services provided to businesses at a distance in the digital age, at various levels of complexity. One of the objectives of this component is to attract global cyberspace operators, notably from the US, to:

a) Install research centres in Portugal in advanced computing and data science and artificial intelligence (for example, in the area of health services), strengthening national competences in these areas.

b) Transform Portugal into a work base for employees of these operators and their ecosystems, which may, by the end of the 2030s, involve hundreds of thousands of cyber-workers operating from Portugal.

c) Articulate the Portuguese exporting industrial base with more tradition as a supplier of the global platforms present in electronic retail.

Figura 33. DIGITAL ECOSYSTEM IN SCENARIO 3

- The other platform, focusing on tourism and leisure and health services for non-residents, also seeks to attract international investors in healthcare and transform Portugal into a territory sought after by tens of thousands of new full-time and part-time senior residents.

4th component: renew the natural resource base, promoting biodiversity through bio-industries alongside the change in food habits and food industries in the sector, taking into account the role of the four agricultures mentioned above.

Note that in this Scenario 3, the Portuguese Speaking Countries and their network of Observer States may act as an international cooperation platform for technological, environmental and public health modernisation in Africa, with a reinforced participation of Portugal in areas such as:

- New solutions for water supply, sanitation and hygiene in rural areas and large urban centres.
- New goods transport solutions (including new dirigibles and drones).
- 3D printing manufacturing solutions, including in construction.
- Renewable energies with electricity storage and organisation of regional networks.
- Digitalisation of payments and transactions.
- Development of treatments for viral diseases.

d) Infrastructure

- In the period 2020-2030, this Scenario 3 also directs a much higher volume of investment to climate change adaptation, particularly with regard to water resources and water management, coastal protection and intervention in estuarine areas with higher concentration of population and assets.
- In addressing the issue of infrastructure, this scenario takes into account the foreseeable demography in the 2040 horizon and the foreseeable geography of low density areas, and seeks to reduce investments in means of transport and infrastructure heavy on fixed capital. At the same time, it adopts technological solutions that will begin to deploy from the 2020s onwards and may become structuring solutions in the following decades. It also ensures the creation of a market for the supply of new solutions in energy, mobility and communications, as previously mentioned.

The following components stand out:

- Telecommunications and audiovisual infrastructure: Scenario 3 considers telecommunications and audiovisual infrastructure to be a priority, in order to ensure proximity services in the internal market, and also to ensure the international connectivity of the territory. With regard to 5G networks, we would highlight the following two priorities:

  a) To prepare the introduction of 5G technology in terms of development and implementation, based on a partnership to be established with a consortium that includes the European companies Nokia and Ericsson, seeking in this way to expand their telecommunications engineering units already installed in Portugal, defining priority uses for 5G networks, namely:

  I) Supporting the circulation of driverless lorries along the country's main transport axis, Lisbon-Braga.

  II) Supporting the large-scale circulation of autonomous vehicles (including drones) in metropolitan areas.

  III) Supporting the transformation of primary health care, through the generalisation of devices for monitoring clinical parameters for individual use, and through digital connectivity between users and health care providers.

  IV) Supporting the creation of metropolitan monitoring and warning systems for natural risks, and of forest monitoring, prevention and fire fighting systems (territory internet).

  b) Energy infrastructure: Scenario 3 points to a change in the energy paradigm:

  I) Maintaining a structural component of natural gas use and in its transformation into hydrogen and solid carbon without CO_2 emissions.

  II) Promoting the large-scale use of fuel cells (in possible combination with gas microturbines) for the decentralised generation of electricity and heat from methane or hydrogen in metropolitan areas served by natural gas networks.

  III) Accelerating the decentralised production of electricity incorporated in buildings (solar and wind) and the materials that cover them, using advances in solar windows.

IV) Reducing dependence on centralised electricity grids — more vulnerable to cyber-attacks; a central issue in economies and societies organised around cyberspace.

- Transport infrastructure and operators, where we would highlight the following options regarding international connectivity:

  a) In the shipping sector, based on the development of short sea shipping, **including the creation of a national shipowner that subsumes the various small container shipping operators, in articulation with long sea shipping operators.** In support of shipping, Portugal would take on a role in changing the fuels used in ships, becoming a supplier of natural gas and/or hydrogen-rich synthetic fuels.

  b) In maintaining the option for the Southern Corridor, in the connection between Sines-Lisbon-Setúbal and the Community of Madrid, for the transport of goods in terms of railway infrastructure for the transport of goods.

  c) In traditional air transport, involving a new airport in the Lisbon Metropolitan Area and the pursuit of TAP's Euro-Atlantic strategy.

  d) In the early use of the new generation of airships for the transport of goods, in particular to Europe, with Beja Airport being targeted as the base of operations for these airships.

  However, the implementation of the Lisbon-Madrid TGV line will be postponed and priority will be given to the construction of a new airport in Lisbon in the area of the Alcochete firing range, and TAP will also maintain flights to North and South America, in addition to flights within the EU and to Africa.

- As in Scenario 2, the decision to intervene on the Lisbon - Oporto - Braga line in mainland Portugal will be maintained, not only in the terms currently considered, but also in its move away from the river Tagus (taking into account the risks of flooding that can be anticipated within the coming decades), incorporating an access to Lisbon using the route of the current Western Line and maintaining its current route along the Tagus for regional services. Scenario 3 would also continue to invest in the Lisbon and Porto metros.
- But the **innovative component** of this scenario is based on four vectors:

a) In supporting the transformation of road transport (now green and digital), through changes in the vehicle fleet with new, less polluting propulsion (fuel cells + hydrogen), with advances in driving autonomy and in the joint displacement of vehicles in formation (platooning), inviting companies such as Daimler, in Europe, and General Motors (and others) of the USA to collaborate in this transformation.

b) In the generalisation of buses powered by fuel cells in passenger transport in metropolitan areas, taking into account the experience already accumulated by Portuguese manufacturers.

c) In the offer of individual transport by online rental and in experimentation with corporate solutions of mobility as a service, using electric vehicles and with the introduction of the first solutions of autonomous vehicles, for individual use of minibuses.

d) In the use of drones in metropolitan goods distribution functions, opening the space for urban air transport solutions in electric propulsion vehicles.

Economic and Social Model

- Scenario 3 assumes innovations in the economic and social model to facilitate medium and long term investment, relying on savings and private and public national capital, and not only on national co-funding of projects that can be financed by EU funds. Possible innovations to be considered are those related to the financial and tax system, social protection systems and systems for the enhancement of human resources.
- Although very competitiveness-oriented, this scenario has the particularity to attribute a fundamental concern for the solidarity between generations.

a) Financial system

This scenario:

- Views the new financial institution as having the involvement of public capital, but regards it differently than in Scenario 2, considering it as an investment bank resulting from the partnership of commercial banks, aimed at multiplying the use by businesses of capital markets. It thus creates new financial instruments, available to individual companies and groups of companies, which mobilise capital in Portugal and abroad for investment in areas previously selected by groups of companies.
- It aims to modify corporate taxation, changing the current bias in favour of corporate indebtedness and moving from a regime of taxation of corporate profits (which are the raw material for growth) to one that:

  a) Exempt from taxation profits channelled to increase the share capital of companies.

  b) Apply very low taxes on corporate profits invested by shareholders in loans to companies ("suprimentos"), leaving the dividends and profits distributed to shareholders to be taxed as income.

  c) Does not tax capital gains made on the stock exchange (contrary to what should happen with capital gains on property transactions).

- In this scenario, the State takes on the role of promoter and coordinator in the exploration of new frontiers. In effect, if we want to include participation in the exploration of new frontiers in the possible transformations of the Portuguese economic structure, such as activities in outer space from the Azores, activities in the deep ocean, also from the Azores and the mainland, or the hydrogen and natural gas economy without CO_2 emissions. We are facing investments that require preparations to be made at various levels. This type of investment requires a different approach to other types of investment in innovation, which could be embodied in a three--pronged approach:

  a) The constitution of a sovereign wealth fund designed to finance all interventions in new frontiers, with the possibility of studying various modalities for the constitution of this fund (the issue of a perpetual loan in which the repayment of the principal is not contracted but only the payment of interest or income by the State); the allocation of mineral wealth of greater value to secure loans obtained abroad, etc.

  b) The creation, in terms of operational bodies, of agencies dedicated to each of these areas (as is already the case today with the Portuguese Space Agency), which would be participated in by the sovereign wealth fund, and which would be responsible for choosing international partners for each of the three areas.

  c) Granting of a State guarantee to finance larger investment projects included in the activity of these agencies, involving private Portuguese companies.

- In Scenario 3, and at **local level**, municipalities, associated with private entities, could be co-promoters of projects in regional spaces, with the opportunity for investors to participate in capital markets. Among others:

  a) Integrated projects to enhance metropolitan areas, including housing projects, innovative solutions in energy, mobility, telecommunications and services associated with higher education, research and innovation clusters, and in partnership with metropolises abroad. Projects to be financed in international capital markets, with the guarantee of the expected increase in revenues for the consortia of city councils involved.

b) Integrated projects for the enhancement of areas of great environmental, landscape and historical heritage value, located in demographically depressed areas, in partnership with foreign metropolises, attracting companies and qualified human resources and new part-time or permanent residents (also associating the use of secondary residences).

b) Social protection systems

- Under this scenario, social protection systems would see a number of changes, some of which have already been mentioned in Scenario 2, as follows:

a) The strengthening of the capitalisation component of social security, through the creation of non-occupational pension funds, under a defined contribution regime. These would be complementary to the existing schemes and would be managed by pension fund management companies.

b) The mainstreaming of reverse mortgages, making it possible to monetise property assets for use by their holders, for example to strengthen protection against illness.

c) Making it possible for owners of secondary residences to place them on the local accommodation market, enjoying tax exemptions on rental operations if they use the revenue obtained to reinforce coverage of health risks or occupational pensions.

- This scenario, however, also considers other specific innovations, such as:

a) The future link of the SNS, as a group of publicly-owned health care providers, whose operation could be occasionally outsourced, with the existence of **a universal health insurance scheme.** This would cover the financing of the most significant part of citizens' health expenditure with the providers of their choice, on condition that they bear individual responsibility, through the management of their health, as attested by the providers.

b) The premiums of this universal health insurance are the responsibility of families, co-financed during the working lives of their members by employer contributions and relying on state subsidies, differentiated according to family income. **The State would also act as reinsurer**

for insurance companies providing this universal insurance, in view of a number of very costly disease treatment cases, to be defined in advance.

c) Optimisation of human resources

This scenario could not only include initiatives, as referred to in Scenario 2 regarding young people holding degrees of low employability and young people who have not completed secondary education, but is also defined by a new approach towards higher education, research and the innovation ecosystem.

- First and foremost, it is based on a new imperative of internationalisation. It is worth remembering that, with the support of the EEC/EU structural funds, the Portuguese State launched, from 1986 onwards, a large advanced training programme in new technological areas and in the basic sciences on which they are based. This training programme took place in foreign universities, namely in the USA and the United Kingdom, and was accompanied by investment in the equipment of research centres in these areas in Portugal.
- If these two programmes had not existed, neither Portugal nor its universities would be the same as they are today.
- Notwithstanding, we are in the process of developing a new wave of technologies aimed at a broad spectrum of areas that will shape a new techno-economic system.
- Therefore, we believe that Scenario 3 requires, on the one hand, a new advanced training programme abroad, geared towards this set of core scientific and technological areas. On the other hand, it is high time that Portuguese universities, currently vying for students at home and abroad, increased the invitation to professors from universities where advances are being made in such sectors in order to support teaching and research in Portugal, whether face to face or online.

In any case, the configuration of advanced change underlying this scenario requires organised partnerships between Portuguese universities and research centres and universities leading the development of those scientific and technological areas worldwide, where Portuguese students could graduate and from which guest teachers could be invited to teach also in Portugal.

This Scenario 3 includes a new type of investment in education: the creation of art and performance schools, implemented in partnership with internationally renowned entities, and the incentive to devise courses linking the arts and technology.

d) Balance and solidarity between generations

Scenario 3 envisages a decrease of pressure from the reduction in working-age young and adult populations and an increase in the population out of the labour force in two ways:

- Growth based on productivity gains and contribution fees to social protection schemes resulting from the improvement in the quality of jobs. This generates an increase in taxation volumes.
- Employment policies that allow for an increase in the effectively active population, avoiding the waste of youth unemployment and increasing the participation of older adults in the labour market, in activities adapted to active life cycles. The measures proposed for this purpose combine demographic changes with reforms in pension systems, the restructuring and flexibility of the labour market:

  a) Policies targeting the entry of young people into the labour market.

  b) Policies to prevent older workers from early leaving

  c) Measures promoting both groups through a change in employment and intergeneration patterns

2. SUMMARY OF THE SCENARIOS COMPARED

Summary matrix of the three compared scenarios for Portugal
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 1: Confidence in continuity
Geo-economic Integration	FOCUS ON THE EUROPEAN UNION	Portugal's geo-economic integration as a peripheral continental country, part of the Iberian space and dependent on the EU in terms of international trade, tourism, direct investment, foreign debt and transfers of European public funds. Bilateral relations focusing on Europe (Spain, Germany, France), and growing in Asia, albeit centred on the People's Republic of China.
International Connectivity		Markedly continentalised international connectivity, but with substantial investment in the road-to-rail modal shift, as a European requirement.
Territorial Enhancement	CONTINUITY	Internationalisation of the economy based on the metropolitan arcs of the North and Lisbon, but maintaining the objective of boosting low-density regions on a dual basis: ■ A dynamic role for medium-sized cities on the continent, namely those where public higher education institutions are located (Bragança, Vila Real, Viseu, Guarda, Covilhã, Castelo Branco, Évora and Beja). ■ Attraction of residential tourism to areas where amenities, rich heritage and cultural/artistic activities are combined with good proximity services. These approaches, however, do not cover all the low density regions, with an impact on territorial cohesion.
International Specialization		International specialization based on traditional export supply, with a loss of dynamism in some more recent industrial sectors (such as the automotive), in business services provided abroad (lack of human resources in engineering) and a temporary contraction in tourism as a result of the Covid-19 crisis. State support will be geared towards the recovery of traditional sectors with a higher volume of employment, including under sector reindustrialisation projects. Failure to leverage the potential of protoclusters created over the past 15 years.

Summary matrix of the three compared scenarios for Portugal
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 1: Confidence in continuity
Digital Agenda	CONTINUITY	Digital agenda centered in investment in the digital literacy of the population and in digital upgrading, by the adoption of cross-cutting policies to incorporate digital processes in companies and in public administration, initially co-financed by European funds.
Infrastructure		Strong investment in infrastructure as required by the EU green policies: ■ Investment in solar and offshore wind power continues, although within an institutional framework which leads to an increase in the price of electricity. ■ In mobility, it is worth highlighting a hefty investment in the construction of a national railway network and in the railway connection to Northern Europe for freight transport via the Atlantic corridor, with a future Lisbon-Madrid high-speed connection being considered. Investment in metro systems in the metropolitan areas of Lisbon and Porto.
Financial System		Recovery of the banking system after the Covid-19 crisis, where commercial banking with Iberian management continued to stand out, maintaining its centrality in the Portuguese financial sector, the financial system struggling to finance longer return projects and innovation projects with inherent risk, the dependence on European public funds for most infrastructure expenditure, as well as in terms of incentives for investment and business innovation.
Social Protection System		Continuity of the current social security model and the National Health Service, facing increasing difficulty in terms of financial sustainability as a result of changes in demographics, in the current youth employment profile, in morbidity profiles and in the costs of technological innovation in the health area.
Optimisation of Human Resources		Inability to solve the problem of the excessive number of NEETs, despite the initiatives of public bodies (offering training actions similar to those of the past and creating vocational courses in secondary education).

Summary matrix of the three compared scenarios for Portugal
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 2: With ability, in the search for a new space in Europe
Geo-economic Integration	FOCUS ON THE EUROPEAN UNION	Geo-economic Integration based on privileged relations with the EU on trade, investment, foreign debt and public transfers, albeit building a privileged bilateral relationship with European states on the Atlantic seaboard and Italy.
International Connectivity		International connectivity rather based on short sea shipping to Europe, in terms of goods transport and passenger air transport to Europe, the Americas and Asia.
Territorial Enhancement	INCREMENTAL DIVERSIFICATION	Territorial dynamics close to that of Scenario 1 regarding the central role of the metropolitan arcs, but with the reinforcement of maritime and air links of any of these metropolitan arcs. As for the boosting factors in low density regions, they would be the same as in Scenario 1, attributing greater importance to the role of medium-sized cities and the services they are able to provide to attract new residents, new visitors and new skill-intensive activities to their regions.
International Specialization		International specialization geared towards higher economic complexity thanks to three components: ■ Greater alignment with the EU's new industrial policy, seeking to participate in at least three future value chains, involving, in a number of cases, partnerships with multinationals. ■ Growth in consolidated clusters, such as industrial machinery and equipment, electrical machinery, robotics and automation, leisure and fitness equipment, while we will see a reduction in the importance of consolidated clusters that remain dependent on the European market and hold on to unsophisticated products and services. ■ Development of new offshore activities – wind energy, wave energy, ocean aquaculture and evolution in shipbuilding, ships for various tourist segments, partnership to develop and build ships for short sea shipping with a high degree of autonomy.
Digital Agenda	CONTINUITY	A more comprehensive digital agenda than in Scenario 1, with a dominant component of digital growth: e-commerce increasingly used domestically, more companies providing digital services abroad, and more start-ups present in the "data economy". Priority on investment in communications and audiovisual broadcasting infrastructure to support proximity and to reduce mobility needs through intensive use of cyberspace (5G networks).

Summary matrix of the three compared scenarios for Portugal
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 2: With ability, in the search for a new space in Europe
Infrastructure	CONTINUITY	Reduction in the infrastructure investment initially planned for the transport area, with a transfer to the management of adaptation to the impact of climate change (water resources — protection of underground aquifers, interconnection between river basins, urban water cycle, efficiency in water use), from irrigation agriculture to tourism, protection of coastal areas and preparation of detailed plans for investment in the protection of estuarine regions — with emphasis on the Tagus estuary. Concentration of the new railway investment in three areas: major intervention on the Northern Line with new accesses to the metropolitan areas of Lisbon and Porto; railway link for goods from the Sines-Setúbal-Lisbon port complex to the Community of Madrid; complete electrification and renovation of signalling and communications on the Beira Alta and Beira Baixa lines and introduction of services aimed at boosting tourism in low-density regions (e.g. Beiras and Alto Douro). Central role of road transport serving the rapid growth of domestic e-commerce (renewal of fleets with improvements in CO_2 emissions, creation of platforms for intelligent management of goods transport, ensuring deliveries within 24 hours for the whole country, flexible schedules and sharing of routes with small hauliers, etc.).
Financial System		Incorporation of Banco Português de Fomento, as part of the European network of development banks; role of private financial funds in reshaping the business fabric. Evolution towards a new business model for commercial banks in greater coordination with capital markets; increase in institutional investors with the capacity to provide liquidity to capital markets; increase in the Portuguese presence in EURONEXT.
Social Protection System		Reinforcement of the capitalisation component of social security through the creation of occupational pension funds; double evolution of the SNS — reform of primary health care and greater coordination with approved networks of private insurers.
Optimisation of Human Resources		Professional reskilling of young people without employment prospects on a large scale; widening of the offer made by the polytechnics of courses of a professional nature, but which can give access to higher education courses; bringing NEETs back into education through courses designed in close collaboration with companies and also courses certified by multinational technology companies.

Summary matrix of the three compared scenarios for Portugal
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 3: Portugal "4D"– digitalisation, diversity, dynamism
Geo-economic Integration	FOCUSING EUROGLOBAL NETWORK	Geo-economic integration characterised by a much stronger economic relationship – trade, investment, technology and talent attraction – with thriving and innovative non-European economies – USA, Canada, Japan, India, Israel and United Arab Emirates. Within the EU, relations with the partners already mentioned in Scenario 2. Reinforcement of the role of the Community of Portuguese-Speaking Countries, which would evolve towards stimulating international cooperation platforms for African technological and environmental modernisation.
International Connectivity		In terms of international connectivity, this scenario would be based on the maritime space and airspace, as well as on a gradual integration of Portugal into the ecosystem of the US global operators in cyberspace.
Territorial Enhancement	TRANSFORMATION	In this scenario, the territory stands out as an attraction factor for new visitors, new residents, new activities and talents. In this new logic of change, integrated projects to enhance metropolitan areas and integrated projects to enhance areas of great environmental value, landscapes and historical heritage located in low-density areas, would be carried out to attract activities, qualified human resources and new permanent or part-time residents.
International Specialization		In terms of international specialization, this scenario is characterised by the transformation of the Portuguese economy through the combination of two processes: ■ Development of four areas of new frontiers — aeronautics: new dirigibles and drones for urban use, in low density territories and in maritime space surveillance; outer space: CubeSat satellites and Earth observation services; oceans: robotics technology, automation and autonomous underwater vehicles; sustainable energy: installation of a unit for obtaining hydrogen based on natural gas without CO_2 emissions and dissemination of its use in the production of electricity and heat in metropolitan spaces and in the total renovation of the road transport sector. ■ Creation of two industrial platforms: one for the design and manufacture of 3D printing equipment and the other for the manufacture of hospital equipment and medical devices.

Summary matrix of the three compared scenarios for Portugal

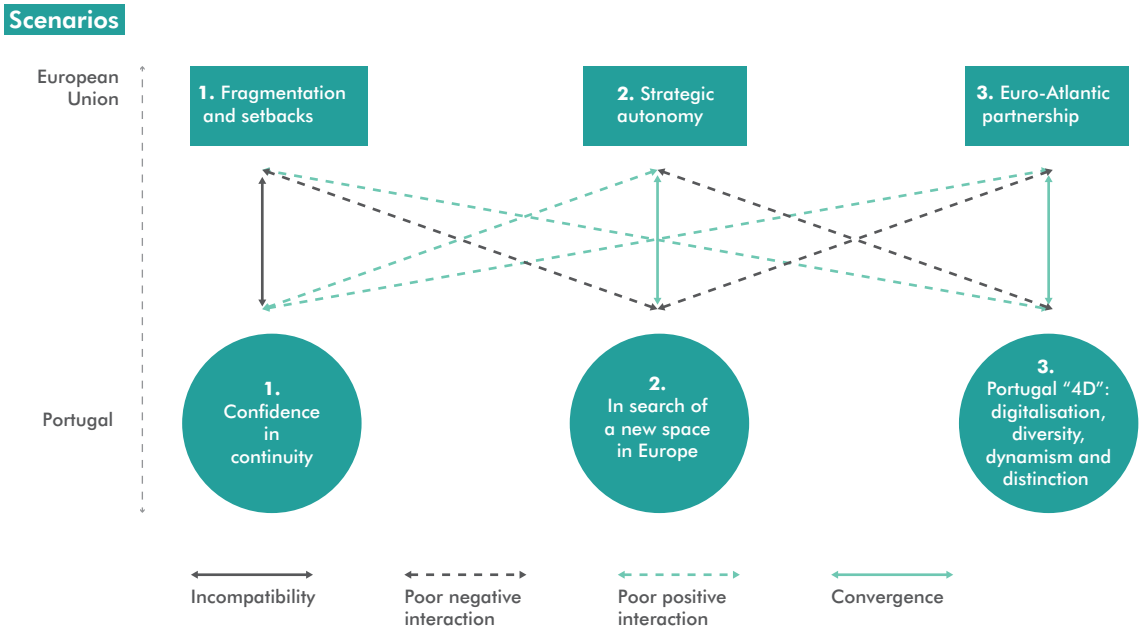
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 3: Portugal "4D"– digitalisation, diversity, dynamism
Digital Agenda	TRANSFORMATION	As far as the digital agenda is concerned, there will be a combination of the digital upgrading guaranteed by the adoption of cross-cutting policies to incorporate digital processes in companies and in public administration, digital growth with more companies providing digital services abroad and present in the "data economy", as well as a new component of disruptive innovation with the creation of a hub of skills in advanced computing/big data/data science and artificial intelligence in health, in partnership with US technology companies, relying on the attraction of cyberspace teleworkers on a very significant scale through the enactment of competitive and favourable legislative measures, in terms of visas and taxation.
Infrastructure		In terms of infrastructure, investment in heavy means of transport/ infrastructure would be reduced in favour of the renewal of road transport — green and digital renewal — and the development of short sea shipping (with the creation of a national operator). In rail terms, the construction of the Lisbon-Madrid TGV would not go ahead. A new Lisbon airport, to be located at the current Alcochete firing range, would be built. A rail link would also be installed to transport goods from the Sines-Setúbal-Lisbon port complex to the Madrid Community. On the domestic front, there would be a major intervention in the Lisbon-Braga corridor, electrification and improvement of signalling and communications on the Beira Alta and Beira Baixa lines and the expansion of the metro networks in the metropolitan areas of Lisbon and Porto. In this scenario the energy paradigm is changed based on the production of hydrogen (and solid state carbon) from natural gas without CO_2 emissions (turquoise hydrogen), as well as the use of fuel cells, running on hydrogen, for the decentralised production of electricity in metropolitan areas, and the use of solar windows and new photovoltaic coating materials for the production of electricity incorporated into buildings. In the transport sector, the innovative component focuses on reducing pollution from the road fleet through new propulsion systems ("fuel cells") and autonomous driving, combined with 5G, as well as the diversification of mobility as a service offer in metropolitan areas. *(Cont. on page 114)*

Summary matrix of the three compared scenarios for Portugal
"Foresight Portugal 2030" project

VECTORS	IDENTITY MATRIX	SCENARIO 3: Portugal "4D"– digitalisation, diversity, dynamism
Infrastructure	TRANSFORMATION	*(cont.)* Diversification of primary and secondary water sources of water, particularly with regard to the water supply of major urban and tourist centres, in two ways: (i) management of the urban water cycle in major metropolises, ensuring greater reintegration of waste water, with a breakdown of priority applications for this water, adopting a "circular economy" approach to water of which the so-called "water factory" is an example.; (ii) application of desalination systems, possibly starting with coastal regions with strong tourist activity and adopting innovative solutions in terms of environmental sustainability and costs as they become more widespread.
Financial System	ADVANCED REFORM	Requirement for a different type of financing of the economy. In the financial system, the role of the capital market would be reinforced, as would the role of specialised financial funds and the creation of new financial instruments available to companies for investment in innovation, while the State would take on the role of promoter and coordinator in the exploration of new frontiers (aeronautics, outer space, deep ocean, turquoise hydrogen), organising international partnerships and resorting, if necessary, to the establishment of State loans on favourable terms (e.g. perpetual loans).
Social Protection System		In social protection systems, there would be a reinforcement of the capitalisation component of social security complementing the existing shared scheme, the generalisation of the reverse mortgage system, and, in the area of health, the link between the SNS institutional supply and the private sector, with the possible creation of universal health insurance. Priority would be given to an integrated approach involving greater employability of young people on a full-time basis, on the one hand and, on the other, part-time work opportunities for pensioners who wanted to earn a pension supplement in activities different from those developed in their previous professional life.
Optimisation of Human Resources		In terms of education/training, this scenario would be characterised by a new approach to higher education, research and the innovation ecosystem, requiring a new wave of advanced training abroad, in a predefined set of scientific and technological areas, as well as the establishment of partnerships of Portuguese universities and research centres with international centres of reference in those areas.

3. PORTUGAL'S SCENARIOS VIS-À-VIS THE 3 EUROPEAN UNION SCENARIOS



Portuguese Scenarios

1) "Confidence in continuity": Interaction with the European Union scenarios

- Fragmentation and retreat scenario: incompatibility with a continuity scenario in Portugal, highly reliant on structural funds and other EU financial support.
- Strategic autonomy scenario: poor positive interaction, since Portugal, relying on a more cohesive but also more demanding EU - that may be forced to channel new support to peripheral states in order to strengthen unity and a leading role abroad.
- Euro-Atlantic Partnership Scenario: poor positive interaction, althought Portugal could benefit from the opening of US markets to products from its traditional exporting sectors.

2) "With ability, in the search for a new space in Europe": Interaction with the scenarios for the European Union

- Fragmentation and retreat scenario: poor negative interaction. It may be difficult for Portugal to find a new space in Europe, if Europe is fragmented.
- Strategic autonomy scenario: convergence. Opportunities open up for Portugal to find a space in which it would play a greater role.

- Euro-Atlantic partnership scenario: poor negative interaction. Portugal risks being unable to seize the opportunities of a Euro-Atlantic partnership if it remains exclusively focused on its relationship within the EU.

3) Portugal "4D": Digitalisation, diversification, dynamism and distinction": Interaction with the European Union scenarios

- Fragmentation and retreat scenario: This scenario offers increased protection against a EU fragmentation and retreat scenario as Portugal would be able to rely on other world partners.
- Strategic autonomy scenario: incompatibility. Portugal seeks to strengthen its non-European relationship, including with the US, while the EU "closes off", in order to achieve strategic autonomy in relation to the US.
- Euro-Atlantic partnership scenario: Portugal's strong compatibility with its Euroglobal approach would clearly benefit from a Euro-Atlantic partnership.

4. WILD CARD: WHAT IF THE PUBLIC DEBT TO THE EU WERE TO BE REFORMULATED?

Looking ahead, wild cards are plausible events that are currently considered unlikely, but which, should they occur, would, in this case, change the Portuguese growth outlook by 2030. Therefore, **From the various conceivable wild cards, we opted for the following:**

Given the difficulties in implementing the new EU guidance, and in a context of weak European growth as in recent decades, a new approach on cohesion policy could be proposed for the states that have benefited from it until now and which, following accession to the euro and the sovereign debt crisis, have seen their foreign debts explode, an approach which converges with a new approach to managing the foreign public debt of these Member States.

This new approach could take up aspects of proposals already made in recent years, including the creation of a redemption fund, a proposal made in 2011 by a group of German economists, once its cross-compliance has been agreed upon in advance.

Thus, the European Union Member States that so wished could use part of the structural funds to which they had access under the cohesion policy to pay part of their liabilities towards this redemption fund from which they could benefit.

List of participants in the various phases of the project

List of experts (in alphabetical order) who contributed with texts and documents in 1st and 2nd phase of the project

- Ana Seixas Palma, Specialist in Mineral Resources
- Ana Sepúlveda, President of 40+Lab and Specialist in Longevity Economics
- António Manzoni, Senior Economist of the Association of Construction and Public Works and Services Companies (AECOPS)
- Bárbara Rosa Santos, Member of the Gulbenkian Future Forum Team
- Catarina Mendes Leal, Director of Services at the Directorate-General of Economic Activities (DGAE)
- Fátima Azevedo, Economist and Foresight Officer at the Office of International Studies and Relations of the Ministry of Finance (GPEARI)
- João Caraça, Consultant to the Calouste Gulbenkian Foundation
- Joana Chorincas, Member of the Gulbenkian Future Forum Team
- João Costa Pinto, Vice-Chair of the Board of Directors of Fundação Oriente
- João Ramos Ricardo, Engineer and Consultant in Management and Innovation
- José Félix Ribeiro, Consultant of the Calouste Gulbenkian Foundation and Coordinator of the "Foresight Portugal 2030" project
- Leonor Sopas, Guest Assistant Professor of Economics at the Faculty of Economics and Management of the Portuguese Catholic University (Porto)
- Miguel Ângelo Fonseca, Architect/Town Planner at the Lisbon University School of Architecture
- Miguel Teixeira Coelho, Economist, Professor and Director of Banco Empresas Montepio (BEM)

In partnership with the Portuguese Institute for International Relations (IPRI-NOVA):

- Carlos Gaspar, Professor of International Relations at the Faculty of Social and Human Sciences of Universidade Nova in Lisbon, Board Member of IPRI-NOVA and Advisor to the Board of Directors of Fundação Oriente
- Joana Castro Pereira, Associate Researcher of IPRI-NOVA
- Nuno Severiano Teixeira, Professor of International Relations at the Faculty of Social and Human Sciences of Universidade Nova in Lisbon and President of IPRI-NOVA
- Teresa Rodrigues, Professor of International Relations at the Faculty of Social and Human Sciences of Universidade Nova in Lisbon, and Board Member of IPRI-NOVA

List of contributors (in alphabetical order) who were part of the scenario-building team (2nd phase of the project)

- António Manzoni, Senior Economist of the Association of Construction and Public Works and Services Companies (AECOPS)
- Bárbara Rosa Santos, Member of the Gulbenkian Future Forum Team
- Gonçalo Pistacchini Moita, Executive Coordinator of Gulbenkian Future Forum
- João Caraça, Consultant to the Calouste Gulbenkian Foundation
- Joana Chorincas, Member of the Gulbenkian Future Forum Team
- José Félix Ribeiro, Consultant of the Calouste Gulbenkian Foundation and Coordinator of the "Foresight Portugal 2030" project
- Miguel Ângelo Fonseca, Architect/Town Planner at the Lisbon University School of Architecture
- Teresa Rodrigues, Professor of International Relations at the Faculty of Social and Human Sciences of Universidade Nova in Lisbon, and Board Member of IPRI-NOVA

List of experts (in alphabetical order) who contributed to the peer review workshop

- António Costa Silva, Professor at the Higher Technology Institute, Chairman of the Board of Directors of Partex and Coordinator of the Recovery and Resilience Plan (RRP)
- Bruno Maçães, International Relations Consultant and former Secretary of State for European Affairs
- Daniel Bessa, Economist, Professor at the University of Porto and former CEO of Cotec
- José Tavares, Member of the Scientific Committee of Gulbenkian Future Forum, Professor at the Nova School of Business and Economics, and Research Fellow at the Centre for Economic Policy Research in London
- Raquel Vaz-Pinto, Member of the Scientific Committee of Gulbenkian Future Forum, Consultant of the Calouste Gulbenkian Foundation, Researcher at IPRI-NOVA and Guest Assistant Professor at the Faculty of Social and Human Sciences of Universidade Nova in Lisbon
- Ricardo Borges de Castro, Associate Director of the European Policy Centre, Specialist in Prospective and International Relations
- Ricardo Cabral, Professor at ISEG
- Sónia Ribeiro, Guest Assistant Professor at the Lisbon Catholic University and Member of SAER
- Teresa Sá Marques, Professor at the University of Porto
- Vítor Bento, Economist, Professor, President of the Portuguese Bank Association, former Chairman of the Board of Directors of SIBS – Sociedade Interbancária de Serviços SA