

## General Discussion

### ► Geography and Demography

Portugal is a small, peripheral country located in the South westernmost tip of Continental Europe. With a surface area of approximately 96,000 sq.kms, it enjoys a temperate climate, with relatively mild temperatures throughout the year.

Throughout the decade, the Portuguese population has stabilized at close to 10 million inhabitants. However, the decades-long process of urbanisation has proceeded, with most population centering around the two major cities of Lisbon (approx 2.5 million in the metropolitan area) and Oporto (approx. 1.5 million in the MA). This process of urbanisation has been set in motion since the early 1960s, as the process of industrialisation and mechanisation of agriculture proceeded. This process of urban growth has not been matched by a capacity to build infrastructure at the same pace, leading to the development of large suburbs. In fact, according to the latest Census Reports (2001), the third, fourth and fifth largest cities in the country are now suburbs of Lisbon and Oporto. Conversely, small and medium-size cities in Portugal have remained mostly stable, in some cases losing further population during the decade.

Demographically, two large movements must be referred to: the surge of emigration in the 1960s, reaching a peak of approximately 150,000 emigrants in 1970, which contributed to the development of the financial system and the internationalisation of the Portuguese economy, by providing a sustained source of foreign currency throughout the 1960s and 1970s. Most of these emigrants have established themselves in France, Luxembourg, and, to a lesser extent, South Africa, Venezuela and the United States.

The second important event in demographic terms has been the end of the colonial war and the independence of former colonies, which led to the influx in 1976 and 1977 of approximately 1 million inhabitants, some 10% increase in the population. This population increase, more than the rural exodus itself, has contributed to the very rapid growth of the metropolitan areas.

## ► Economic Growth and Economic Structure

Portugal has experienced relatively rapid growth since the 1960s, partly interrupted in the 1970s, with the occurrence of the two oil shocks, the nationalisation of assets in the post-revolutionary period of 1974 and ensuing chaotic macro-management of the economy (Portugal negotiated two separate adjustment packages with the IMF in 1977 and 1982). This relative unsettled period came to a close in 1985. From 1985 until today, Portugal has generally experienced relatively high growth rates of 3-4% p.a., with the exception of two years in that period.

In 1986, Portugal joined the European Community, and has since been a recipient of Structural Funds. These funds have been used to cover the relative scarcity of capital in Portugal for infrastructural projects. The growth of infrastructure since 1985 has been impressive, in particular in the fields of transport infrastructure (particularly roads), but also in telecommunications, health care and general public services.

Despite these massive inflows of structural funds, Portugal has recovered only slowly from a century-long gap between GDP per capita levels. Nevertheless, GDP per capita has risen from approximately 55% to 75% of the EU15 average, over the period from 1985 to today. This progress was starkly made noticeable, when the European Commission announced that, in accordance with its own numbers, the area of Lisbon and the Tagus Valley (home to approximately 1/3 of the population) would, as of 2000, no longer qualify for Objective 1 assistance (underdeveloped areas), as its income was over 90% of the EU15 average.

The rapid growth of the 1990s has resulted in increased wealth, but also in increased environmental stress. In many instances, the lack of appropriate planning regulations has led to extremely high stresses on local ecosystems, as well as to increased overall demands on energy and environmental inputs. In particular, the massification of road transport, and the under-investment in railways and public transportation systems (with the notable exceptions of the Lisbon underground and bus system), in conjunction with the consumption-led growth in welfare has led to a doubling of the number of cars in less than ten years, with an expectation that these rates of growth should maintain in the next decade. The resulting increase in CO<sub>2</sub> emission is startling – approximately 70% more CO<sub>2</sub> from cars since 1990.

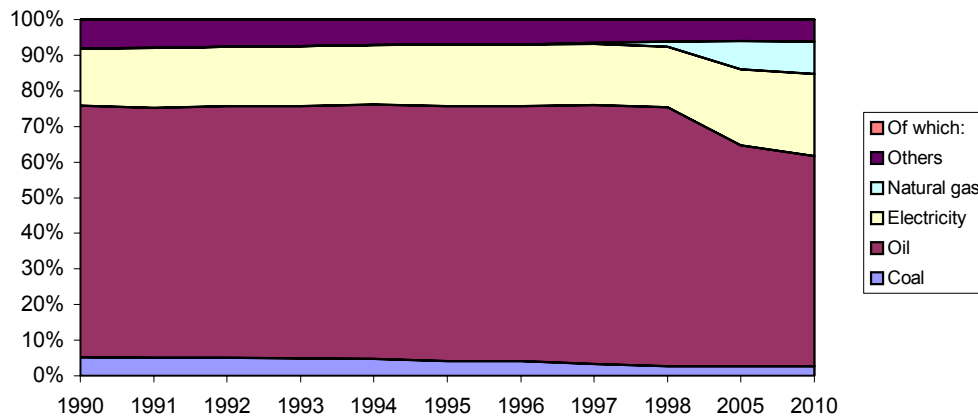
More recently, in 2000 and 2001, the economy has declined sharply. Analysts relate this decline to structural deficiencies in the economy, namely the growth of the public administrative sector and the overhang of the public sector borrowing needs (public sector expenditure is now more than 50% of GDP, according to estimates, and, more importantly, the structural problems of low levels of factor productivity, in particular, energy and labour productivity).

In fact, despite compulsory education of 9 years, most of the current workforce is poorly equipped in terms of skills and Portugal has been criticized for not raising the levels of labour productivity (currently under the European average), in spite of the massive investments in infrastructure.

## ► Energy System

The high growth experienced throughout the decade has been accompanied by a related increase in energy demand. In fact, energy intensity has, despite attempts (critics would say half-hearted ones) at establishing energy conservation guidelines, such as the RCCTE (regulation on building requirements) and the RGCE (general regulation on energy efficiency), increased, in contrast to almost all other nations in the OECD.

**Structure of final energy consumption**



### **Electricity:**

Following European energy directives, the electricity system has been decoupled between a “linked system” and an independent production system. The “linked system” provides the mainstay of the electricity grid, and has recently been further unbundled between the former electricity monopoly – Electricidade de Portugal (EDP) and REN (national grid). However, this separation has not yet resulted in different ownership, and it is widely acknowledged that EDP is, for most practical purposes, a powerful incumbent. ERSE, the regulator, has provided independent regulation, leading to increased downward pressure on prices, in particular to industrial consumers. This in turn has resulted in higher growth of electricity consumption, already sped up by the increased acquisition of electrical appliances (in particular, air conditioning systems). Electricity consumption has therefore grown at a higher rates than economic growth, at world-high levels.

The “linked system” produces electricity essentially from hydro electrical plants (in the revolutionary period of nationalisation, most independent hydro electrical plants were taken over by the newly formed EDP) and coal-fired power plants (Sines-900MW, Carregado-600MW, Pego-600MW). Over the past decade, capacity has grown essentially due to the opening of new hydro electrical plants (Lindoso, in the north, and the opening of a new coal-fired power plant in Pego. This latest plant does not form part of the “linked system” and is partly owned by the British company PowerGen.

Of particular interest to the national effort to limit greenhouse gas emissions has been the recent decision to adapt at least one generator in Carregado and the northern power plant at Tapada do Outeiro (near Oporto) to natural gas.

**Natural Gas:**

This intention has been stimulated by the very recent (in European terms) construction of the distribution network for natural gas. This is a recent addition to the Portuguese fuel mix. A large proportion of energy investment in the past few years has gone into the building of the natural gas infrastructure. The previous Government intended to supplement this support to the gas infrastructure with support to conversion of turbines and other end-use equipment to gas-fired uses. In particular, there is a general appreciation of the potential role that conversion of current co-generation facilities to natural-gas may have in improving energy performance in most sectors. The merging of the Algerian-Iberian with the EuroSiberian grid will in the future enlarge the diversity of origins of the natural gas. Natural gas consumption is expected to take off in the current decade, and the residential grid in metropolitan areas has in fact been upgraded (from LPG) ahead of schedule. The grid and the distribution networks are the property of Galpenergia, the Portuguese gas and oil holding, partly owned by the Portuguese government.

**Electricity generating capacity (in MW)**

	31.12.96	31.12.97	31.12.98
<b>Hydroelectricity</b>	<b>4428</b>	<b>4438</b>	<b>4501</b>
- Public Sector	4276	4277	4332
- Independent producers	152	161	169
<b>Thermal</b>	<b>4942</b>	<b>4993</b>	<b>5275</b>
- Public Sector	4 165	4 169	4 393
- Independent producers	777	824	882
<b>Wind (public sector)</b>	<b>18</b>	<b>29</b>	<b>48</b>
<b>Geothermal</b>	<b>8</b>	<b>8</b>	<b>8</b>
<b>Total</b>	<b>9396</b>	<b>9468</b>	<b>9832</b>

The numbers on wind generating capacity are necessarily outdated due to the very recent increase in capacity currently at about 150MW, and expected to reach 3000 MW by the end of the current decade. Use of natural gas for electricity production has only taken off in 1999.

**Renewable energy:**

The development of renewable energy sources, despite the ambitions of successive governments, has been relatively small over the decade. Wind power has not seen any major increase in capacity, and the much expected boom in small scale hydro did not take place, partly because of environmental constraints (as with wind), but also due to the uncertain income.

RES has been supported since 1986 by a feed-in tariff remotely related to the amount of CO2 displaced from average capacity in the grid. Unfortunately, for most of the period, the "environmental premium" awarded to RES has been relatively small. The situation has improved considerably in the last two years, due to a strong administrative hike in the environmental premium, generally regarded to be the main driver behind the current boom in wind and small-scale hydro projects.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	2005	2010
% Domestic production in Primary Energy Consumption	12,37	12,25	9,33	11,26	11,62	9,57	12,65	11,07	10,45	10,18	
<b>Coal</b>	<b>0,70</b>	<b>0,67</b>	<b>0,51</b>	<b>0,46</b>	<b>0,33</b>						
<b>Hydroelectricity</b>	<b>4,88</b>	<b>4,76</b>	<b>2,46</b>	<b>4,30</b>	<b>5,12</b>	<b>3,82</b>	<b>6,72</b>	<b>5,54</b>	<b>5,19</b>	<b>5,22</b>	<b>5,11</b>
<b>Other</b>	<b>6,79</b>	<b>6,82</b>	<b>6,36</b>	<b>6,50</b>	<b>6,18</b>	<b>5,75</b>	<b>5,92</b>	<b>5,52</b>	<b>5,26</b>	<b>4,96</b>	<b>4,84</b>
Primary Energy Intensity(toe/10 <sup>9</sup> PTE 95) (4)	1139	1119	1172	1171	1178	1213	1171	1220	1252	1025	937

Final Energy Consumption Total	12590	12744	13204	13308	13929	14345	15034	15963	17030	18256	19611
<b>Coal</b>	<b>658</b>	<b>656</b>	<b>663</b>	<b>647</b>	<b>657</b>	<b>600</b>	<b>632</b>	<b>526</b>	<b>448</b>	<b>500</b>	<b>536</b>
<b>Oil</b>	<b>8898</b>	<b>8935</b>	<b>9327</b>	<b>9426</b>	<b>9959</b>	<b>10263</b>	<b>10753</b>	<b>11595</b>	<b>12382</b>	<b>11324</b>	<b>11549</b>
<b>Electricity(2)</b>	<b>2014</b>	<b>2145</b>	<b>2206</b>	<b>2234</b>	<b>2318</b>	<b>2477</b>	<b>2600</b>	<b>2747</b>	<b>2911</b>	<b>3882</b>	<b>4529</b>
<b>Natural gas</b>								<b>49</b>	<b>238</b>	<b>1443</b>	<b>1795</b>
<b>Others(3)</b>	<b>1020</b>	<b>1008</b>	<b>1008</b>	<b>1001</b>	<b>994</b>	<b>1005</b>	<b>1049</b>	<b>1047</b>	<b>1051</b>	<b>1107</b>	<b>1202</b>
<b>Of which:</b>											
<b>Final use as inputs</b>	<b>1701</b>	<b>1296</b>	<b>1307</b>	<b>1223</b>	<b>1321</b>	<b>1469</b>	<b>1266</b>	<b>1425</b>	<b>1562</b>	<b>1300</b>	<b>1300</b>
Final Energy Intensity(toe/10 <sup>9</sup> PTE 95) (6)	756	771	784	807	821	815	844	862	886	753	681
Population ('000 inhabitants)	9873	9865	9869	9892	9912	9921	9934	9957	9979	10112	10173
FEI/capita (toe/inhabitant)	1,66	1,68	1,80	1,77	1,82	1,93	1,92	2,07	2,19	2,28	2,48
Annual rate of change		1991/ /1990	1992/ /1991	1993/ /1992	1994/ /1993	1995/ /1994	1996/ /1995	1997/ /1996	1998/ /1997	2005/ /1998	2010200 5
<b>GDP</b>		<b>3,1</b>	<b>2,2</b>	<b>-1,4</b>	<b>2,5</b>	<b>2,9</b>	<b>3,2</b>	<b>3,5</b>	<b>3,5</b>	<b>3,7</b>	<b>3,6</b>
<b>PEC</b>		<b>1,2</b>	<b>7,1</b>	<b>-1,4</b>	<b>3,2</b>	<b>6,0</b>	<b>-0,4</b>	<b>7,8</b>	<b>6,2</b>	<b>0,8</b>	<b>1,8</b>
<b>FEC</b>		<b>1,2</b>	<b>3,6</b>	<b>0,8</b>	<b>4,7</b>	<b>3,0</b>	<b>4,8</b>	<b>6,2</b>	<b>6,7</b>	<b>1,0</b>	<b>1,4</b>