

## 5. Energy efficiency trends in the tertiary sector

### 5.1. Overall energy and economic trends

The tertiary or service sector comprise public and private services. The share of the sector in the final energy consumption has increased slightly in the EU-15 (13 % in 2004 vs. 12.5 % in 1990)

The energy consumption has grown on average slower than the value added over the period 1990-2004 (1.4%/year compared to 2.4%/year, i.e. an elasticity of the energy consumption<sup>84</sup> to the valued added of 0.4); however, since 2000 it follows the economic growth: 2.1 % and 2 % annual growth respectively.

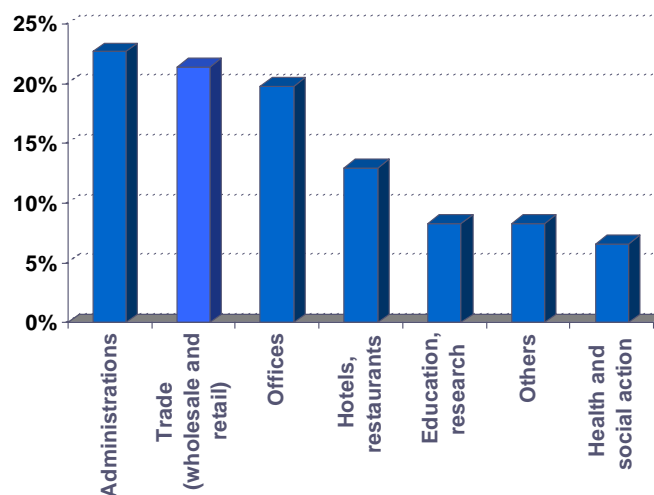
Electricity consumption in services is growing very rapidly, twice faster than the valued added since 2000 and 30% more rapidly over the period 1990- 2004, due to new needs in particular from information and communication technologies and air conditioning.

Thermal uses (space heating, water heating and cooking) represent about two third of the energy used in the sector, followed by office equipment and lighting (respectively 15 and 14%). Air conditioning has still a minor role, which is, however, growing rapidly (about 5 %).

#### **Administrations, trade and offices absorb about 2/3 of energy consumption of services**

Three sub-sectors are responsible for about two thirds of the energy consumed by services: administrations (23 %), wholesale/retail trade (21 %), and private offices (20 %). Hotels/restaurants (13 %), education /research (8 %) and health/social action (7 %) consume considerably less energy (**Figure 5-1**)<sup>85</sup>.

**Figure 5-1: Service sector final consumption by sub-sector (EU-15)**



<sup>84</sup> Energy consumption under normal climate conditions.

<sup>85</sup> The service sector is by far the least well-known energy-consuming sector. Only a few countries publish statistics by sub-sector. Therefore, this breakdown of the energy consumption by sub-sector is a rough estimate. This estimate is made for the year 2001 and is based on a representative sample, covering about 7-9 countries for each sector with 74-80 % of the EU-15 energy consumption in the service sector.

## 5.2. Trends in energy intensity and unit consumption<sup>86</sup>

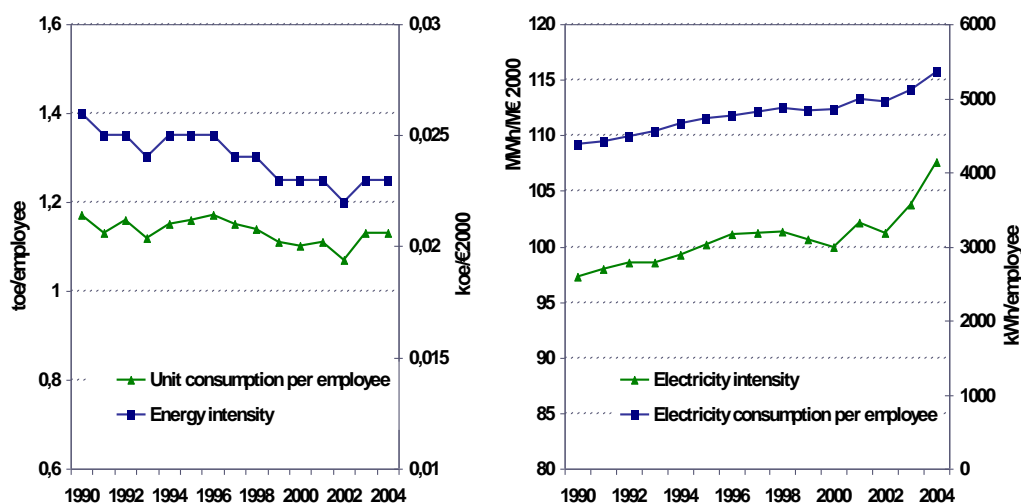
**Energy intensity decreased on average by 1 %/year over the period 1990-2004; the unit consumption per employee only by 0.3 %/year**

The final energy intensity of the service sector (in toe per unit of value added) decreased by about 1.4 %/year over the period 1990-2000 and has remained more or less stable since 2000 (**Figure 5-2**). Between 1990 and 2004, the average reduction was 1 %/year. In contrast, the unit energy consumption per employee decreased by only 0.6 %/year until 2000 with a subsequent increase (0.7 %/year): as a result, there is only a slight reduction in the unit consumption between 1990 and 2004 (- 0.3 %/year).

**Electricity intensity increased rapidly by 0.7 %/year from 1990 to 2004; on average, employees consumed 1000 kWh more in 2004 than in 1990.**

Electricity intensity has increased rapidly since 2000 by 1.9 %/year while unit electricity consumption has risen even faster by about 2.5 %/year (right-hand side of **Figure 5-2**). Over the whole period 1990-2004, electricity intensity and unit electricity consumption increased by 0.7 %/year and 1.5 %/year, respectively. In other words, electricity intensity increased at half the speed of the electricity consumption per employee. This trend can be explained by the increase in labour productivity. On average, employees consumed 22 % more electricity (or about 1000 kWh) than they did in 1990 (5400 kWh/employee vs. 4400 kWh/employee).

**Figure 5-2: Service sector intensity and unit consumption trends EU-15**

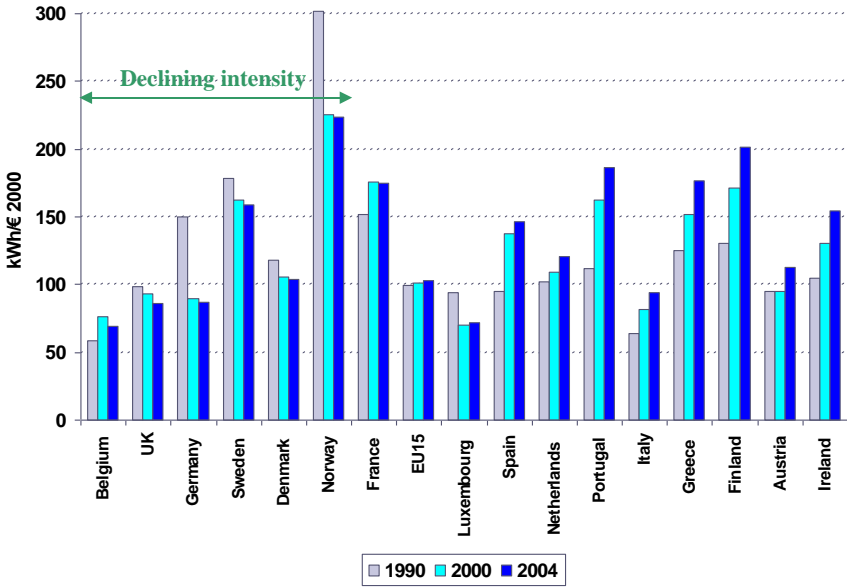


<sup>86</sup> All indicators are climate corrected. In contrast to other sectors, where energy efficiency improvements are measured in a more refined way by constructing a bottom-up energy efficiency index based, this is not possible in the service sector, at least at the level of the European Union, given the scarcity of statistics. In this section, rather aggregate indicators, such as energy intensity or unit consumption, are therefore still used to approximate progress in energy efficiency.

**Some countries have reached a point at which electricity consumption and activity are decoupled**

The service sector's electricity intensity is increasing rapidly in most countries and in the EU-15 as a whole. Indeed, there has been a constant expansion in electricity use, which is expected to increase still further, in particular due to information and communication technologies and the diffusion of air conditioning. However, some countries are showing saturation tendencies if not an actual decrease in electricity intensity in recent years (**Figure 5-3**). There has been a reduction of this intensity in Belgium, the UK, Germany, Sweden, Denmark and Norway, and stabilisation in France and Luxembourg. On the other hand, this intensity is growing rapidly in Ireland, Finland, Greece, Italy, Portugal, Spain and the Netherlands. For some countries with an intensity level below the other EU-15 countries this development reflects their efforts to 'catch up'. In addition, the diffusion of air conditioning and electric heating may partially explain the over-proportional increase in electricity intensity in the southern European countries. The development in Ireland may be explained by the high economic growth rate there, which might have led to a marked growth in electrical equipment in services. As a result of these counterbalancing trends, there is a moderate increase in the EU-15 average.

**Figure 5-3: Service sector electricity intensity in EU-15 countries**

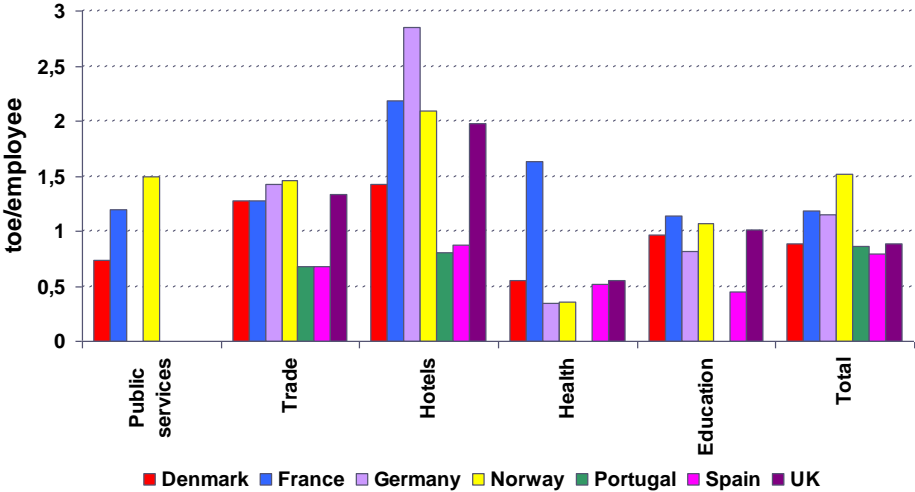


### 5.3. Energy consumption trends by sub-sector

There are small differences in unit consumption across the different types of services

Figure 5-4 shows the unit consumption per employee for the most important branches of the service sector: public services, wholesale and retail trade, hotels/restaurants, health/hospitals and education. Not enough data was available for private offices. Unlike the industrial sector, the spread of unit consumption across the sub-sectors is less significant. This implies that the impact of structural changes is less relevant in this sector. Nevertheless, some trends do emerge: First, hotels/restaurants seem to have consistently higher unit consumption than other sectors. Second, the cases of Spain and Portugal seem to suggest that climate has some influence on energy consumption, but otherwise most countries lie in a similar range. Third, the majority of branches (with the exception of hotels/restaurants) show a unit energy consumption of around 1 toe/employee.

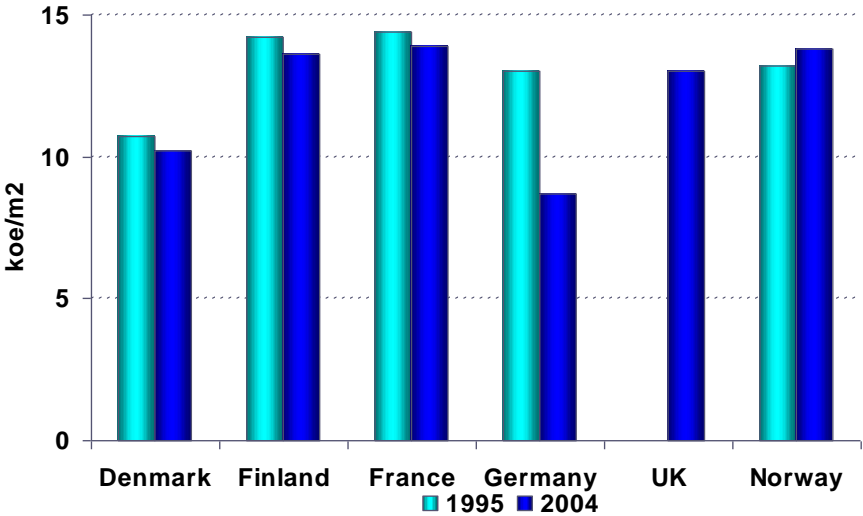
Figure 5-4: Unit consumption per employee in some branches of services



**Thermal building codes seem to have had substantial impacts on reducing the fuel consumption of service sector buildings**

All EU-15 countries have thermal building regulations not only for residential buildings but also for service sector buildings. As building regulations are an important measure in the service sector, suitable indicators are necessary to show the progress achieved by introducing this type of measure. **Figure 5-5** shows the energy consumption for space heating per square metre for the existing stock of buildings, which is the most suitable indicator to measure the impact of thermal building codes<sup>87</sup>. The drawback is that only five countries (plus Norway) provide such data. There has been a reduction in most countries; in Germany quite a significant one.

**Figure 5-5: Space heating consumption per square metre<sup>88</sup>**



<sup>87</sup> The large impact of this policy measure would be even clearer if only new buildings in the service sector were considered. However, the data situation for new buildings in the service sector is even poorer than it is for existing ones.

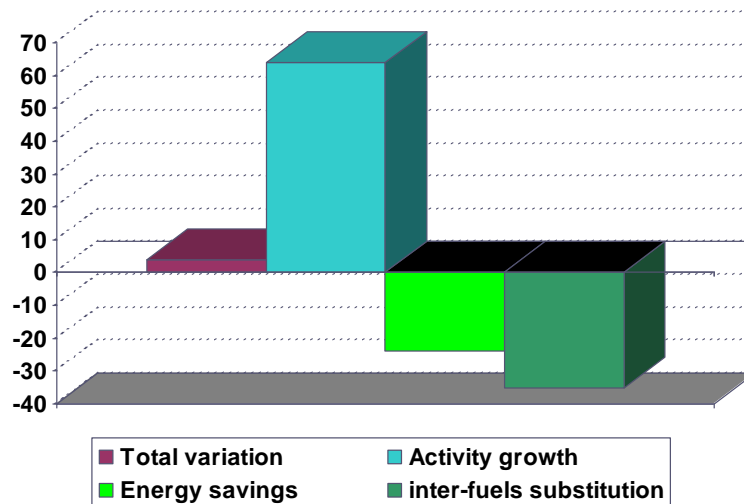
<sup>88</sup> Values are climate corrected. UK value for 2001.

## 5.4. CO<sub>2</sub> emissions

### Increased electricity penetration and the substitution of gas for oil contributed around 60 % of the reduction in CO<sub>2</sub> emissions

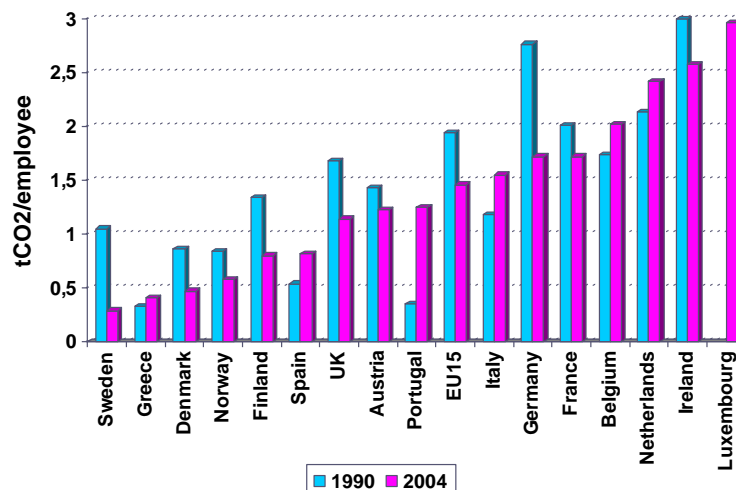
CO<sub>2</sub> emissions in the service sector only represent 5 % of direct CO<sub>2</sub> emissions in the EU-15 (13 % including the indirect emissions from the electricity consumed in the sector). These emissions were only 5 Mt CO<sub>2</sub> above the 1990 level (+3 %), even though the value added had increased by 40 % which would otherwise have implied an increase of 64 Mt CO<sub>2</sub> (**Figure 5-6**). Therefore, CO<sub>2</sub> savings at the level of consumers have almost completely offset the impact of economic growth. Nearly 60 % of these savings are linked to a switch to natural gas and the increased use of electricity. If we take indirect CO<sub>2</sub> emissions from electricity production into account, total CO<sub>2</sub> emissions increased by 13 % instead of 3 %.

**Figure 5-6: Variation in CO<sub>2</sub> emissions in services (EU-15) (1990-2004)**



CO<sub>2</sub> emissions per employee fell by 25 % in the EU-15 as a whole, with different trends among countries (**Figure 5-7**).

**Figure 5-7: CO<sub>2</sub> emission per employee in services for the EU-15 service sector**



## 5.5. Conclusions

- A decoupling of energy consumption and economic growth can be seen in the service sector until 2000, with a rapid reduction in energy intensity. However, energy consumption and value added have been growing at the same rate since 2000.
- Electricity intensity in the service sector is decreasing in some EU-15 countries, but due to the large increases in some countries, mainly in Southern Europe, the overall EU-15 average is still increasing slightly.
- Based on the limited country data on heating consumption per square metre, thermal building regulation seems to have had a substantial impact on reducing the energy consumption of service sector buildings.
- Administrations, trade and private offices are the largest sub-sectors of the service sector in terms of energy consumption. There are minor differences in the unit energy consumption per employee among most sub-sectors.
- CO<sub>2</sub> emission reductions mainly due to the increasing use of electricity and fuel switches to gas have almost completely offset the effect of economic growth: direct emissions are only 3 % above their 1990 level despite a 40 % increase in the economic activity.
- The data situation is still fairly poor in the service sector and will have to be improved because of the growing energy demand in this sector.