International Energy Agency

# Efficiency Indicators –Industry exercises

# Industry

# Industry

**Q1.** Calculate the national aggregated energy intensity (TFC/GDP, for 1990 & 2010). Describe its trend in one sentence.

*Note: GDP is the sum of the value added (VA) across all sectors.*

| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | **3491** | **4525** | **1093** | **1487** | | | |
| **Services** | **646** | **1120** | **643** | **1115** | | | |
| **Industry** | **2688** | **3225** | **375** | **310** | | | |
| Food products | 216 | 264 | 42 | 39 | | | |
| Textiles | 26 | 61 | 8 | 16 | | | |
| Wood | 69 | 100 | 5 | 7 | | | |
| Paper and printing | 364 | 512 | 18 | 24 | | | |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | | | |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | | | |
| Basic metals | 552 | 642 | 18 | 20 | | | |
| Machinery | 151 | 182 | 129 | 61 | | | |
| Transport equipment | 78 | 71 | 36 | 33 | | | |
| Construction | 5 | 7 | 11 | 13 | | | |
| Mining and quarrying | 273 | 350 | 36 | 38 | | | |
| Other manufacturing | 165 | 186 | 21 | 18 | | | |
| **Others** | **157** | **179** | **75** | **62** | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | | | |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | | | |

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| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | **3491** | **4525** | **1093** | **1487** | **3.2** | **3.0** | |
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$$\text{Energy intensity} = \frac{\text{Energy consumption}}{\text{Value added}}$$

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|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | 3491 | 4525 | 1093 | 1487 | 3.2 | 3.0 | -5% |
| **Services** | 646 | 1120 | 643 | 1115 | | | |
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| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | | | |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | | | |

**Energy intensity**

$$= \frac{\text{Energy consumption}}{\text{Value added}}$$

**Intensity change**

$$= \frac{\text{En. intens.}_{2010} - \text{En. intens.}_{1990}}{\text{En. intens.}_{1990}}$$

**Answer:** Energy Intensity decreased by 5% between 1990 and 2010.

# Industry

**Q2.** Calculate the energy intensity of each sub-sector (1990 & 2010). List the top three energy-intensive sub-sectors as of 2010.

| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | **3491** | **4525** | **1093** | **1487** | **3.2** | **3.0** | **-5%** |
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| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | 3491 | 4525 | 1093 | 1487 | 3.2 | 3.0 | -5% |
| **Services** | 646 | 1120 | 643 | 1115 | | | |
| **Industry** | 2688 | 3225 | 375 | 310 | | | |
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| Other manufacturing | 165 | 186 | 21 | 18 | | | |
| **Others** | 157 | 179 | 75 | 62 | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | | | |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | | | |

$$\text{Energy intensity} = \frac{\text{Energy consumption}}{\text{Value added}}$$

# Industry

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| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | **3491** | **4525** | **1093** | **1487** | **3.2** | **3.0** | **-5%** |
| **Services** | **646** | **1120** | **643** | **1115** | **1.0** | **1.0** | |
| **Industry** | **2688** | **3225** | **375** | **310** | **7.2** | **10.4** | |
| Food products | 216 | 264 | 42 | 39 | 5.1 | 6.8 | |
| Textiles | 26 | 61 | 8 | 16 | 3.1 | 3.7 | |
| Wood | 69 | 100 | 5 | 7 | 13.0 | 14.9 | |
| Paper and printing | 364 | 512 | 18 | 24 | 20.3 | 21.7 | |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.2 | 19.4 | |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | 20.6 | 20.7 | |
| Basic metals | 552 | 642 | 18 | 20 | 30.7 | 32.4 | |
| Machinery | 151 | 182 | 129 | 61 | 1.2 | 3.0 | |
| Transport equipment | 78 | 71 | 36 | 33 | 2.2 | 2.2 | |
| Construction | 5 | 7 | 11 | 13 | 0.5 | 0.5 | |
| Mining and quarrying | 273 | 350 | 36 | 38 | 7.5 | 9.3 | |
| Other manufacturing | 165 | 186 | 21 | 18 | 7.9 | 10.3 | |
| **Others** | **157** | **179** | **75** | **62** | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | 5.2 | 7.5 | |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | 0.1 | 0.1 | |

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List the top three energy-intensive sub-sectors as of 2010.

| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | 3491 | 4525 | 1093 | 1487 | 3.2 | 3.0 | -5% |
| **Services** | 646 | 1120 | 643 | 1115 | 1.0 | 1.0 | |
| **Industry** | 2688 | 3225 | 375 | 310 | 7.2 | 10.4 | |
| Food products | 216 | 264 | 42 | 39 | 5.1 | 6.8 | |
| Textiles | 26 | 61 | 8 | 16 | 3.1 | 3.7 | |
| Wood | 69 | 100 | 5 | 7 | 13.0 | 14.9 | |
| **Paper and printing** | 364 | 512 | 18 | 24 | 20.3 | 21.7 | |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.2 | 19.4 | |
| **Other non-metallic mineral products** | 253 | 294 | 12 | 14 | 20.6 | 20.7 | |
| **Basic metals** | 552 | 642 | 18 | 20 | 30.7 | 32.4 | |
| Machinery | 151 | 182 | 129 | 61 | 1.2 | 3.0 | |
| Transport equipment | 78 | 71 | 36 | 33 | 2.2 | 2.2 | |
| Construction | 5 | 7 | 11 | 13 | 0.5 | 0.5 | |
| Mining and quarrying | 273 | 350 | 36 | 38 | 7.5 | 9.3 | |
| Other manufacturing | 165 | 186 | 21 | 18 | 7.9 | 10.3 | |
| **Others** | 157 | 179 | 75 | 62 | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | 5.2 | 7.5 | |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | 0.1 | 0.1 | |

$$\text{Energy intensity} = \frac{\text{Energy consumption}}{\text{Value added}}$$

**Answer:**

1. Basic metals (32.4 MJ/$)
2. Paper and printing (21.7 MJ/$)
3. Non-metallic mineral products (20.7 MJ/$)

# Industry

**Q3.** Calculate and describe energy intensity trends of each sub-sector between 1990-2010. Which sub-sector became less intensive?

| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | **3491** | **4525** | **1093** | **1487** | **3.2** | **3.0** | **-5%** |
| **Services** | **646** | **1120** | **643** | **1115** | **1.0** | **1.0** | |
| **Industry** | **2688** | **3225** | **375** | **310** | **7.2** | **10.4** | |
| Food products | 216 | 264 | 42 | 39 | **5.1** | **6.8** | |
| Textiles | 26 | 61 | 8 | 16 | **3.1** | **3.7** | |
| Wood | 69 | 100 | 5 | 7 | **13.0** | **14.9** | |
| **Paper and printing** | 364 | 512 | 18 | 24 | **20.3** | **21.7** | |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | **14.2** | **19.4** | |
| **Other non-metallic mineral products** | 253 | 294 | 12 | 14 | **20.6** | **20.7** | |
| **Basic metals** | 552 | 642 | 18 | 20 | **30.7** | **32.4** | |
| Machinery | 151 | 182 | 129 | 61 | **1.2** | **3.0** | |
| Transport equipment | 78 | 71 | 36 | 33 | **2.2** | **2.2** | |
| Construction | 5 | 7 | 11 | 13 | **0.5** | **0.5** | |
| Mining and quarrying | 273 | 350 | 36 | 38 | **7.5** | **9.3** | |
| Other manufacturing | 165 | 186 | 21 | 18 | **7.9** | **10.3** | |
| **Others** | **157** | **179** | **75** | **62** | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | **5.2** | **7.5** | |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | **0.1** | **0.1** | |

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|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | 3491 | 4525 | 1093 | 1487 | 3.2 | 3.0 | -5% |
| **Services** | 646 | 1120 | 643 | 1115 | 1.0 | 1.0 | 0.05% |
| **Industry** | 2688 | 3225 | 375 | 310 | 7.2 | 10.4 | 45% |
| Food products | 216 | 264 | 42 | 39 | 5.1 | 6.8 | 32% |
| Textiles | 26 | 61 | 8 | 16 | 3.1 | 3.7 | 20% |
| Wood | 69 | 100 | 5 | 7 | 13.0 | 14.9 | 15% |
| **Paper and printing** | 364 | 512 | 18 | 24 | 20.3 | 21.7 | 7% |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.2 | 19.4 | 37% |
| **Other non-metallic mineral products** | 253 | 294 | 12 | 14 | 20.6 | 20.7 | 0.4% |
| **Basic metals** | 552 | 642 | 18 | 20 | 30.7 | 32.4 | 5% |
| Machinery | 151 | 182 | 129 | 61 | 1.2 | 3.0 | 156% |
| Transport equipment | 78 | 71 | 36 | 33 | 2.2 | 2.2 | 0.2% |
| Construction | 5 | 7 | 11 | 13 | 0.5 | 0.5 | 4% |
| Mining and quarrying | 273 | 350 | 36 | 38 | 7.5 | 9.3 | 23% |
| Other manufacturing | 165 | 186 | 21 | 18 | 7.9 | 10.3 | 30% |
| **Others** | 157 | 179 | 75 | 62 | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | 5.2 | 7.5 | 44% |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | 0.1 | 0.1 | 12% |

**Intensity change**

$$= \frac{\text{En. intens.}_{2010} - \text{En. intens.}_{1990}}{\text{En. intens.}_{1990}}$$

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| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | 3491 | 4525 | 1093 | 1487 | 3.2 | 3.0 | -5% |
| **Services** | 646 | 1120 | 643 | 1115 | 1.0 | 1.0 | 0.05% |
| **Industry** | 2688 | 3225 | 375 | 310 | 7.2 | 10.4 | 45% |
| Food products | 216 | 264 | 42 | 39 | 5.1 | 6.8 | 32% |
| Textiles | 26 | 61 | 8 | 16 | 3.1 | 3.7 | 20% |
| Wood | 69 | 100 | 5 | 7 | 13.0 | 14.9 | 15% |
| **Paper and printing** | 364 | 512 | 18 | 24 | 20.3 | 21.7 | 7% |
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**Intensity change**

$$= \frac{\text{En. intens.}_{2010} - \text{En. intens.}_{1990}}{\text{En. intens.}_{1990}}$$

**Answer:** None of the sub-sectors improved its energy intensity during the period.

# Industry

**Q4.** Do results of Q1 & Q3 confirm or contradict each other? Explain why.

| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | | % |
| | 1990 | 2010 | 1990 | 2010 | 1990 | 2010 | 1990-2010 |
| **Total** | **3491** | **4525** | **1093** | **1487** | **3.2** | **3.0** | **-5%** |
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| Machinery | 151 | 182 | 129 | 61 | 1.2 | 3.0 | 156% |
| Transport equipment | 78 | 71 | 36 | 33 | 2.2 | 2.2 | 0.2% |
| Construction | 5 | 7 | 11 | 13 | 0.5 | 0.5 | 4% |
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Shares

| Energy consumption (TFC) | | Value added | |
|---|---|---|---|
| PJ | | Bn,2005$ PPP | |
| 1990 | 2010 | 1990 | 2010 |
| 100% | 100% | 100% | 100% |
| 18% | 25% | 59% | 75% |
| 0% | 0% | 0% | 0% |
| 77% | 71% | 34% | 21% |
| 6% | 6% | 4% | 3% |
| 1% | 1% | 1% | 1% |
| 2% | 2% | 0% | 0% |
| 10% | 11% | 2% | 2% |
| 15% | 12% | 3% | 2% |
| 7% | 7% | 1% | 1% |
| 16% | 14% | 2% | 1% |
| 4% | 4% | 12% | 4% |
| 2% | 2% | 3% | 2% |
| 0% | 0% | 1% | 1% |
| 8% | 8% | 3% | 3% |
| 5% | 4% | 2% | 1% |
| 0% | 0% | 0% | 0% |
| 5% | 4% | 7% | 4% |
| 4% | 4% | 3% | 2% |
| 0% | 0% | 4% | 3% |

# Industry

**Q4.** Do results of Q1 & Q3 confirm or contradict each other? Explain why.

| *Sectors of the economy* | Energy consumption (TFC) | | Value added | | Energy intensity | | Intensity change |
|---|---|---|---|---|---|---|---|
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| Machinery | 151 | 182 | 129 | 61 | 1.2 | 3.0 | 156% |
| Transport equipment | 78 | 71 | 36 | 33 | 2.2 | 2.2 | 0.2% |
| Construction | 5 | 7 | 11 | 13 | 0.5 | 0.5 | 4% |
| Mining and quarrying | 273 | 350 | 36 | 38 | 7.5 | 9.3 | 23% |
| Other manufacturing | 165 | 186 | 21 | 18 | 7.9 | 10.3 | 30% |
| Others | 157 | 179 | 75 | 62 | | | |
| Agriculture, forestry and fishing | 154 | 177 | 30 | 24 | 5.2 | 7.5 | 44% |
| Electricity, gas, steam, air conditioning, and water supply | 3 | 3 | 45 | 39 | 0.1 | 0.1 | 12% |

Shares

| Energy consumption (TFC) | | Value added | |
|---|---|---|---|
| PJ | | Bn,2005$ PPP | |
| 1990 | 2010 | 1990 | 2010 |
| 100% | 100% | 100% | 100% |
| 18% | 25% | 59% | 75% |
| 0% | 0% | 0% | 0% |
| 77% | 71% | 34% | 21% |
| 6% | 6% | 4% | 3% |
| 1% | 1% | 1% | 1% |
| 2% | 2% | 0% | 0% |
| 10% | 11% | 2% | 2% |
| 15% | 12% | 3% | 2% |
| 7% | 7% | 1% | 1% |
| 16% | 14% | 2% | 1% |
| 4% | 4% | 12% | 4% |
| 2% | 2% | 3% | 2% |
| 0% | 0% | 1% | 1% |
| 8% | 8% | 3% | 3% |
| 5% | 4% | 2% | 1% |
| 0% | 0% | 0% | 0% |
| 5% | 4% | 7% | 4% |
| 4% | 4% | 3% | 2% |
| 0% | 0% | 4% | 3% |

**Answer:** Aggregated energy intensity decreased due to structural changes. (i.e. share of services sector, which has very low energy intensity, increased from 59% to 75%.)

# Industry*

**Q5.** If the **best-available-technology (BAT)** were adopted, what industrial sub-sector would have the largest energy saving?

| | Energy consumption | | Value added | | BAT | Energy saving potential |
|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | PJ |
| | 1990 | 2010 | 1990 | 2010 | 2010 | 2010 |
| **Industry** | | | | | | |
| Food products | 216 | 264 | 42 | 39 | **4.6** | |
| Textiles | 26 | 61 | 8 | 16 | **0.8** | |
| Wood | 69 | 100 | 5 | 7 | **7.2** | |
| Paper and printing | 364 | 512 | 18 | 24 | **14.7** | |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | **14.0** | |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | **21.4** | |
| Basic metals | 552 | 642 | 18 | 20 | **25.4** | |
| Machinery | 151 | 182 | 129 | 61 | **0.5** | |
| Transport equipment | 78 | 71 | 36 | 33 | **1.1** | |
| Construction | 5 | 7 | 11 | 13 | **0.2** | |
| Mining and quarrying | 273 | 350 | 36 | 38 | **6.4** | |
| Other manufacturing | 165 | 186 | 21 | 18 | **2.3** | |

# Industry*

**Q5.** If the **best-available-technology (BAT)** were adopted, what industrial sub-sector would have the largest energy saving?

| | Energy consumption | | Value added | | BAT | Energy saving potential |
|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | PJ |
| | 1990 | 2010 | 1990 | 2010 | 2010 | 2010 |
| **Industry** | | | | | | |
| Food products | 216 | 264 | 42 | 39 | 4.6 | |
| Textiles | 26 | 61 | 8 | 16 | 0.8 | |
| Wood | 69 | 100 | 5 | 7 | 7.2 | |
| Paper and printing | 364 | 512 | 18 | 24 | 14.7 | |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.0 | |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | 21.4 | |
| Basic metals | 552 | 642 | 18 | 20 | 25.4 | |
| Machinery | 151 | 182 | 129 | 61 | 0.5 | |
| Transport equipment | 78 | 71 | 36 | 33 | 1.1 | |
| Construction | 5 | 7 | 11 | 13 | 0.2 | |
| Mining and quarrying | 273 | 350 | 36 | 38 | 6.4 | |
| Other manufacturing | 165 | 186 | 21 | 18 | 2.3 | |

**Energy saving potential**

**=**

**BAT ∗ Value added**

**–**

**Actual Energy consumption**

# Industry*

**Q5.** If the **best-available-technology (BAT)** were adopted, what industrial sub-sector would have the largest energy saving?

| | Energy consumption | | Value added | | BAT | Energy saving potential |
|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | PJ |
| | 1990 | 2010 | 1990 | 2010 | 2010 | 2010 |
| **Industry** | | | | | | |
| Food products | 216 | 264 | 42 | 39 | 4.6 | -84.4 |
| Textiles | 26 | 61 | 8 | 16 | 0.8 | -47.6 |
| Wood | 69 | 100 | 5 | 7 | 7.2 | -51.3 |
| Paper and printing | 364 | 512 | 18 | 24 | 14.7 | -165.4 |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.0 | -155.7 |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | 21.4 | 9.7 |
| Basic metals | 552 | 642 | 18 | 20 | 25.4 | -138.4 |
| Machinery | 151 | 182 | 129 | 61 | 0.5 | -151.3 |
| Transport equipment | 78 | 71 | 36 | 33 | 1.1 | -34.9 |
| Construction | 5 | 7 | 11 | 13 | 0.2 | -4.0 |
| Mining and quarrying | 273 | 350 | 36 | 38 | 6.4 | -108.6 |
| Other manufacturing | 165 | 186 | 21 | 18 | 2.3 | -144.6 |

**Energy saving potential**

**=**

**BAT ∗ Value added**

**–**

**Actual Energy consumption**

**Answer:** Paper and printing (Potential saving of 165.4 PJ)

# Industry*

**Q6.** Energy intensity of cement industry is lower than BAT. Can we conclude that the country's cement production is highly energy efficient? Explain why.

*Note: consider that clinker production is part of cement production process. Clinker-to-cement ratio should be around 0.75-0.85 unless clinker is imported/exported.*

| | Energy consumption | | Value added | | BAT | Energy saving potential |
|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | PJ |
| | 1990 | 2010 | 1990 | 2010 | 2010 | 2010 |
| **Industry** | | | | | | |
| Food products | 216 | 264 | 42 | 39 | 4.6 | -84.4 |
| Textiles | 26 | 61 | 8 | 16 | 0.8 | -47.6 |
| Wood | 69 | 100 | 5 | 7 | 7.2 | -51.3 |
| Paper and printing | 364 | 512 | 18 | 24 | 14.7 | -165.4 |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.0 | -155.7 |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | 21.4 | 9.7 |
| ***Cement*** *(Physical production, Mt)* | 159 | 189 | *48* | *52* | 3.8 GJ/t | |
| ***Clinker*** *(Physical production, Mt)* | 84 | 97 | *23* | *25* | 3.1 GJ/t | |
| Basic metals | 552 | 642 | 18 | 20 | 25.4 | -138.4 |
| Machinery | 151 | 182 | 129 | 61 | 0.5 | -151.3 |
| Transport equipment | 78 | 71 | 36 | 33 | 1.1 | -34.9 |
| Construction | 5 | 7 | 11 | 13 | 0.2 | -4.0 |
| Mining and quarrying | 273 | 350 | 36 | 38 | 6.4 | -108.6 |
| Other manufacturing | 165 | 186 | 21 | 18 | 2.3 | -144.6 |

| | | | | |
|---|---|---|---|---|
| *clinker-to-cement ratio* | | | | |

# Industry*

**Q6.** Energy intensity of cement industry is lower than BAT. Can we conclude that the country's cement production is highly energy efficient? Explain why.

*Note: consider that clinker production is part of cement production process. Clinker-to-cement ratio should be around 0.75-0.85 unless clinker is imported/exported.*

| | Energy consumption | | Value added | | BAT | Energy saving potential | Energy intensity | |
|---|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | PJ | MJ/US$PPP | |
| | 1990 | 2010 | 1990 | 2010 | 2010 | 2010 | 1990 | 2010 |
| **Industry** | | | | | | | | |
| Food products | 216 | 264 | 42 | 39 | 4.6 | -84.4 | 5.1 | 6.8 |
| Textiles | 26 | 61 | 8 | 16 | 0.8 | -47.6 | 3.1 | 3.7 |
| Wood | 69 | 100 | 5 | 7 | 7.2 | -51.3 | 13.0 | 14.9 |
| Paper and printing | 364 | 512 | 18 | 24 | 14.7 | -165.4 | 20.3 | 21.7 |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.0 | -155.7 | 14.2 | 19.4 |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | 21.4 | 9.7 | 20.6 | 20.7 |
| ***Cement*** *(Physical production, Mt)* | 159 | 189 | *48* | *52* | 3.8 GJ/t | | 3.3 | 3.6 |
| ***Clinker*** *(Physical production, Mt)* | 84 | 97 | *23* | *25* | 3.1 GJ/t | | 3.7 | 3.9 |
| Basic metals | 552 | 642 | 18 | 20 | 25.4 | -138.4 | 30.7 | 32.4 |
| Machinery | 151 | 182 | 129 | 61 | 0.5 | -151.3 | 1.2 | 3.0 |
| Transport equipment | 78 | 71 | 36 | 33 | 1.1 | -34.9 | 2.2 | 2.2 |
| Construction | 5 | 7 | 11 | 13 | 0.2 | -4.0 | 0.5 | 0.5 |
| Mining and quarrying | 273 | 350 | 36 | 38 | 6.4 | -108.6 | 7.5 | 9.3 |
| Other manufacturing | 165 | 186 | 21 | 18 | 2.3 | -144.6 | 7.9 | 10.3 |

| | | | | |
|---|---|---|---|---|
| *clinker-to-cement ratio* | | | | |

# Industry*

**Q6.** Energy intensity of cement industry is lower than BAT. Can we conclude that the country's cement production is highly energy efficient? Explain why.

*Note: consider that clinker production is part of cement production process. Clinker-to-cement ratio should be around 0.75-0.85 unless clinker is imported/exported.*

| | Energy consumption | | Value added | | BAT | Energy saving potential | Energy intensity | |
|---|---|---|---|---|---|---|---|---|
| | PJ | | Bn,2010$ PPP | | MJ/US$PPP | PJ | MJ/US$PPP | |
| | 1990 | 2010 | 1990 | 2010 | 2010 | 2010 | 1990 | 2010 |
| **Industry** | | | | | | | | |
| Food products | 216 | 264 | 42 | 39 | 4.6 | -84.4 | 5.1 | 6.8 |
| Textiles | 26 | 61 | 8 | 16 | 0.8 | -47.6 | 3.1 | 3.7 |
| Wood | 69 | 100 | 5 | 7 | 7.2 | -51.3 | 13.0 | 14.9 |
| Paper and printing | 364 | 512 | 18 | 24 | 14.7 | -165.4 | 20.3 | 21.7 |
| Chemicals and chemical products | 535 | 557 | 38 | 29 | 14.0 | -155.7 | 14.2 | 19.4 |
| Other non-metallic mineral products | 253 | 294 | 12 | 14 | 21.4 | 9.7 | 20.6 | 20.7 |
| ***Cement*** *(Physical production, Mt)* | 159 | 189 | *48* | *52* | 3.8 GJ/t | | 3.3 | 3.6 |
| ***Clinker*** *(Physical production, Mt)* | 84 | 97 | *23* | *25* | 3.1 GJ/t | | 3.7 | 3.9 |
| Basic metals | 552 | 642 | 18 | 20 | 25.4 | -138.4 | 30.7 | 32.4 |
| Machinery | 151 | 182 | 129 | 61 | 0.5 | -151.3 | 1.2 | 3.0 |
| Transport equipment | 78 | 71 | 36 | 33 | 1.1 | -34.9 | 2.2 | 2.2 |
| Construction | 5 | 7 | 11 | 13 | 0.2 | -4.0 | 0.5 | 0.5 |
| Mining and quarrying | 273 | 350 | 36 | 38 | 6.4 | -108.6 | 7.5 | 9.3 |
| Other manufacturing | 165 | 186 | 21 | 18 | 2.3 | -144.6 | 7.9 | 10.3 |
| *clinker-to-cement ratio* | | | *0.47* | *0.48* | | | | |

**Answer:** Production of clinker is very low compared to cement, which indicates that clinker may be imported. This explains why energy intensity of cement is very low.

***Questions?***

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