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Intelligent Energy  **Europe**

Energy saving concepts for the European ceramic industry

CERAMIN



Contract number
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**Energy consumption figures of different ceramic branches
and EU-countries**

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1 Introduction

The objective of this report is to collect data about energy consumption of the EU ceramic-industry and to identify the ceramic branches and sub-branches with the highest energy consumption. For this report mainly the partner-countries of CERAMIN

Poland, Germany, France, United Kingdom, Italy and Spain are taken into consideration. For detailed data about each partner look <http://www.ceramin.eu/partners.htm>.

Further countries (e.g. Netherlands, Austria and Portugal) will be considered as far as data are available.

CERAMIN, the name of the project comes from ceramics and minimum. The name of the proposed label is: EEE – which shall award Extraordinary Energy Efficient ceramic products and production. The result of the report will be used to make suggestions about the choice of the sub-branches considered for the EEE-Label.

2 Classification of ceramic sub-branches

The division of the ceramic branch into sub-branches refers mostly to BREF Ceramic Manufacturing Industry, December 2006 (*BREF... Best available Techniques REFerence document*) as shown below :

1.5.1.1 Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)

1.5.1.2 Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)

1.5.1.3 Roofing tiles

BREF summarizes these sub-branches to

1.5.1 “Bricks and roof tiles”.

For the objectives of CERAMIN it is necessary to divide them into the above written sub-branches. Sometimes when no divided data are available this class will be used as sum.



- 1.5.2 Vitrified clay pipes
- 1.5.3 Refractory products
- 1.5.4 Expanded clay aggregates
- 1.5.5 Wall and floor tiles
- 1.5.6 Table- and ornamental ware (household ceramics)
- 1.5.7 Sanitary ware
- 1.5.8 Technical ceramics
- 1.5.9 Inorganic bounded abrasives

3 Procedure for data collecting and data from the partner - countries

All partners of the CERAMIN project had a template – table available with the request to fill it in with all reachable data (look Attachment 1). Objective of the request was to get a lot of data that can be analysed by general ceramic knowledge.

The Attachments 2 to 7 are showing the results.

The years of data collecting vary from 2002 to 2006. If different years from the some source were considered, average data were calculated.

In a lot of cases only data for CO₂-emissions were available. For these numbers the energy consumption was calculated by the assumption that only natural gas is used and the assumption that this gas is responsible for 0,05 tonsCO₂ per GJ.

The data are mostly originated from the national authority responsible for CO₂-trading. For that reason it has to be taken into consideration which companies have to take part in CO₂-trading in which country. The European decree demands: All companies that

- 1. Have a production of more than 75 tons of ceramic products per day*
- AND/OR*

2. Have a firing aggregate (kiln) with more than 4 cubic meters volume and have more than 300 kg ceramic products per cubic meter.

have to take part in CO₂-trading.

According to the AND/OR written in capitals different EU-countries have different national rules for CO₂-trading. These rules influence the number of companies (and the data) reported by the respective country. In table 1 the four possibilities and the rules of each country are listed if available. Possibility 2 is among these possibilities the strongest one and possibility 1 the weakest.

Possibility 1	companies that fulfil item 1 AND 2 have to take part	UK, I, PL
Possibility 2	companies that fulfil item 1 OR 2 have to take part	F
Possibility 3	companies that fulfil item 1 have to take part	
Possibility 4	companies that fulfil item 2 have to take part	D

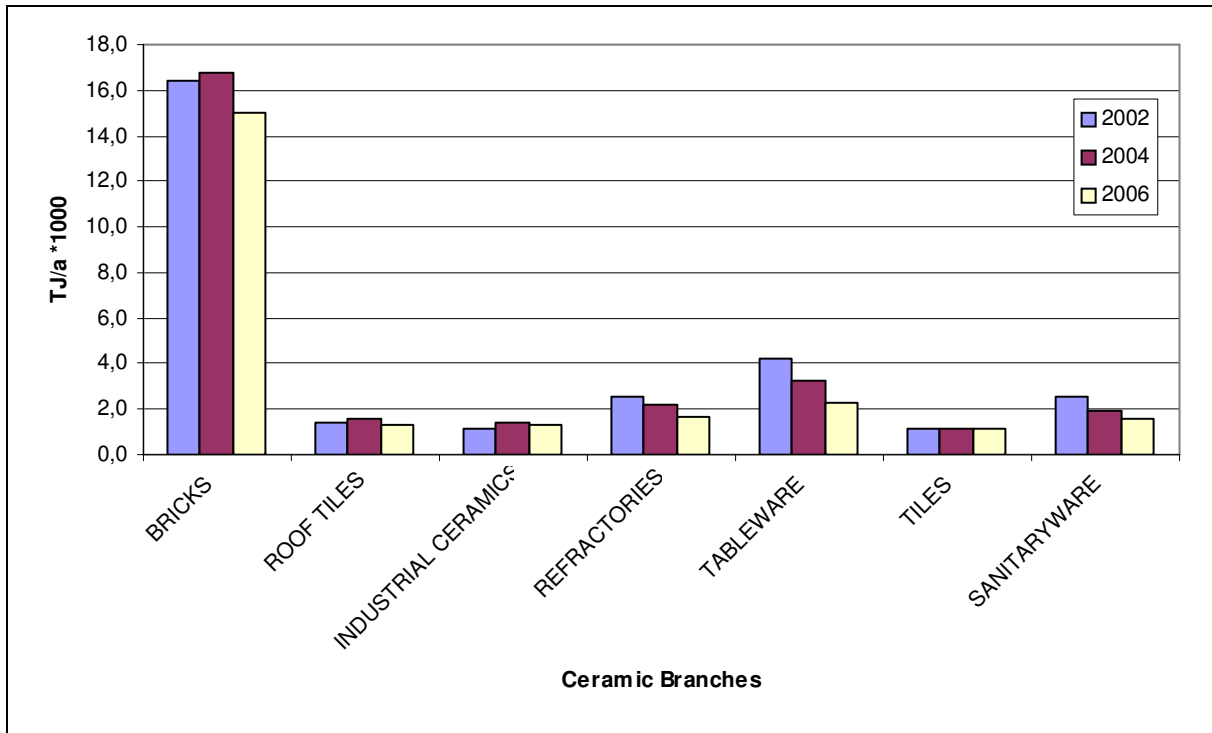
Table1: Different use of the European decree about CO₂-trading in the partner - countries

The classification of the companies from the general classification “Ceramics” to the sub-branches defined in Chapter 2 was done by the knowledge of the respective company, by checking their Internet site or by a personal phone call.

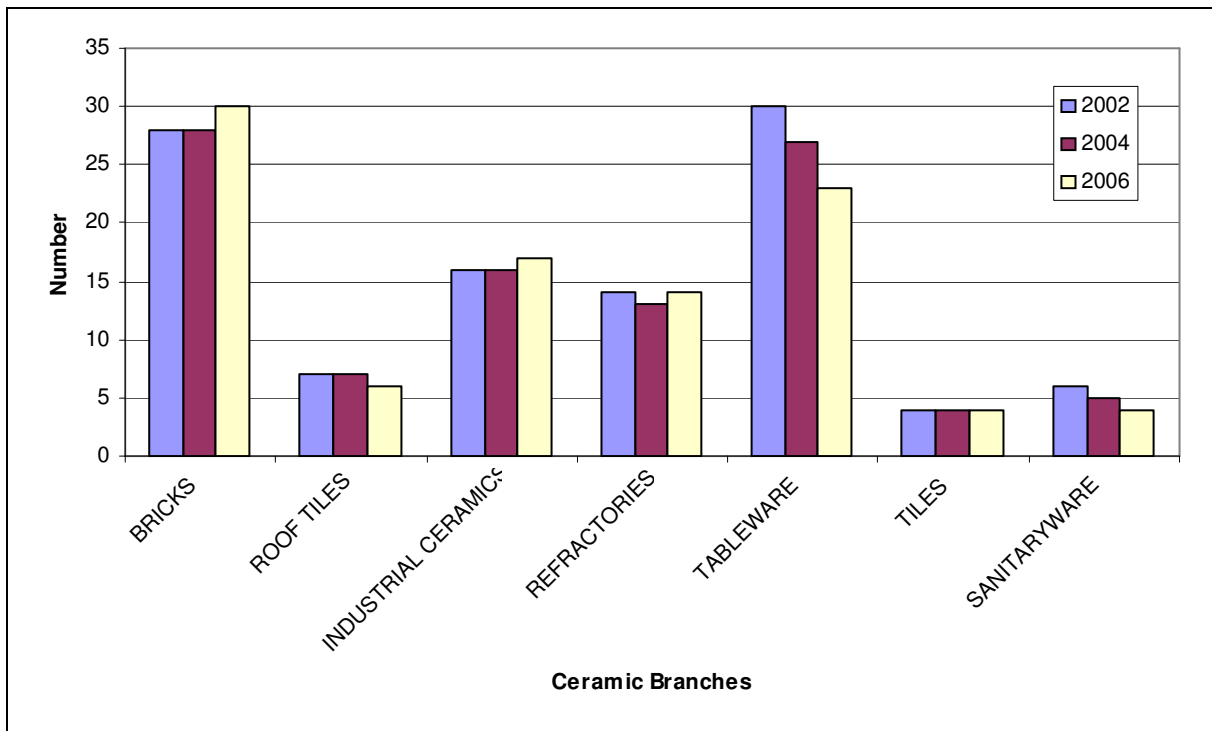
3.1 United Kingdom (Annex 2)

Pictures 1 and 2 show the (fuel-) energy consumption level of the British ceramic industry. For tableware, sanitary ware and refractories a decreasing energy consumption level is shown. Especially for tableware the decreasing level of energy consumption is due to a decreasing production level. The decreasing energy consumption level of refractories branch could be due to technical improvements. Because of a not decreasing European market for refractories, it is assumed that the British production level of refractories remained on at least the same level from 2002 to 2006.

The brick production uses among the British ceramic branches by far the most fuel energy followed by sanitary ware and refractories, taking into account that the European table ware production, as the British, will further decrease their production capacities.



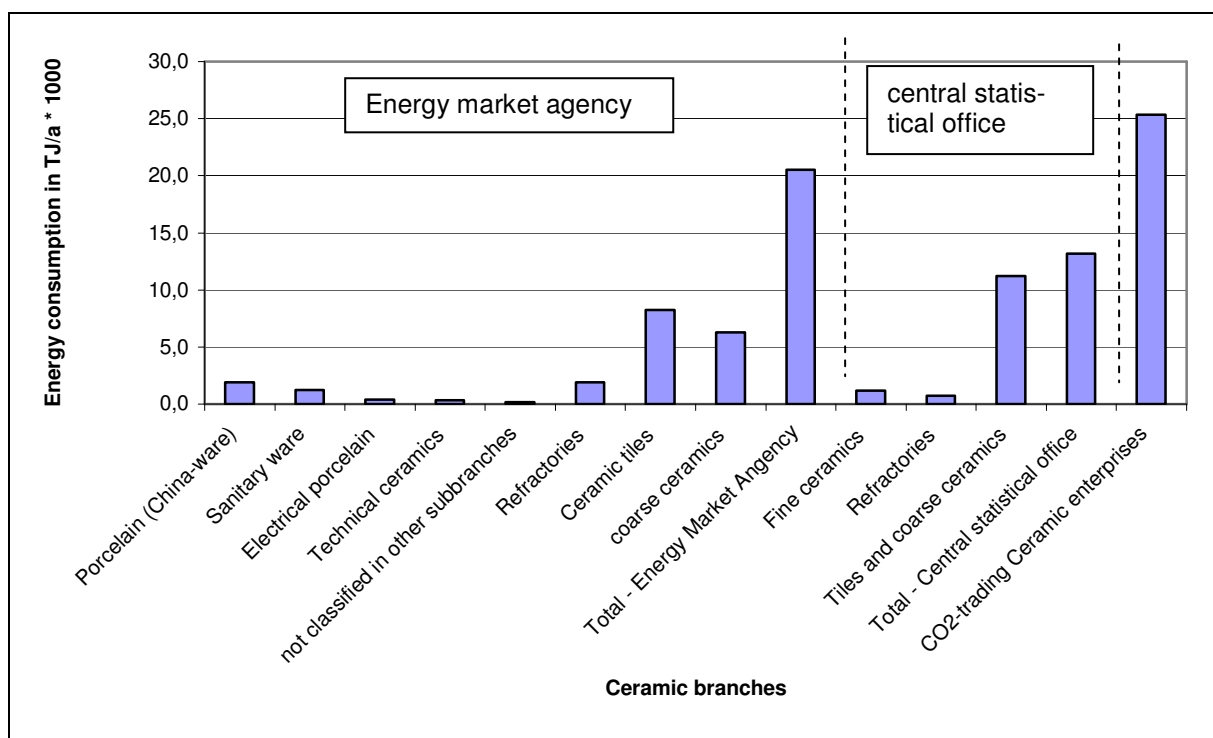
Picture 1 (Fuel-) Energy consumption of the ceramic industry in the UK in 2002-2006



Picture 2: Number of enterprises of British ceramic industry in 2002-2006

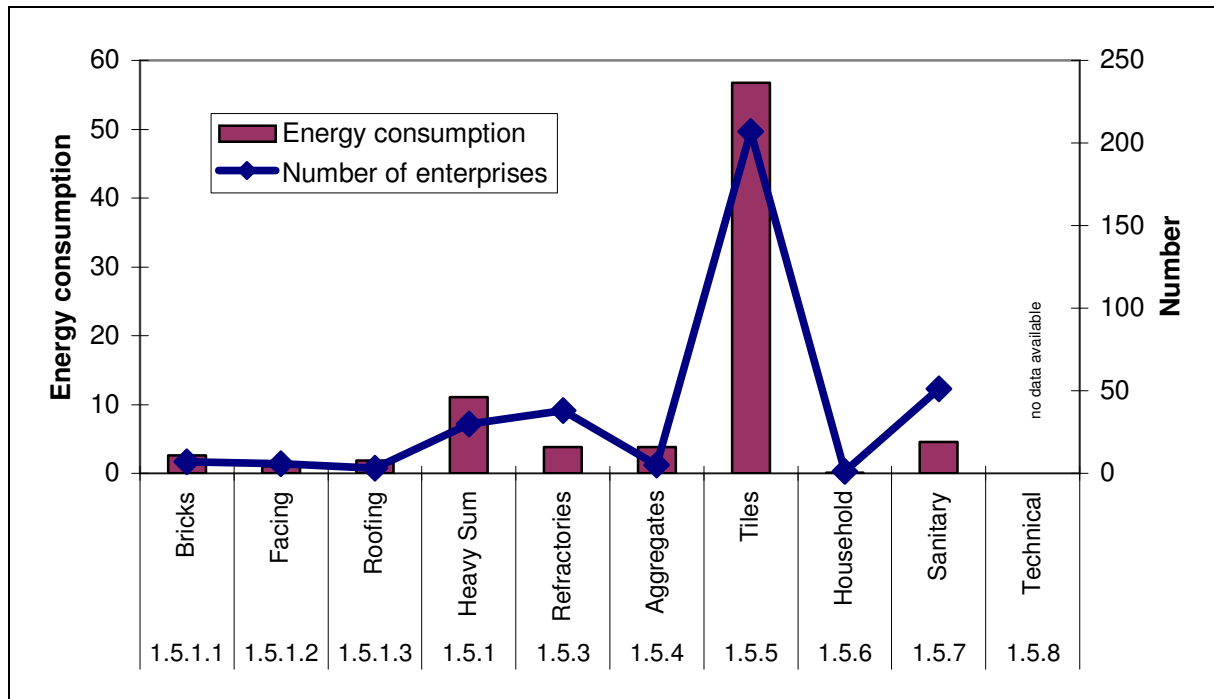
3.2 Poland (Annex 3)

Only data from 2005 are available. The best subdivision into sub-branches was done by the Energy Market Agency (see Annex 3). This data represent a lot of polish ceramic production, although not all, as the last bar in picture 3 shows. According to picture 3 tiles and coarse ceramics production are the main consumers of energy in the ceramics industry in Poland.



Picture 3: Energy consumption of Polish ceramic sub-branches in 2005

3.3 Italy (Annex 4)



Picture 4: Energy consumption in Italian ceramic sub-branches

For the heavy ceramics industry of Italy data about companies that have to take part in CO₂-trading are available (possibility 1, refer to table 1). The CO₂-values allocated for 2005 and 2006 are reported. Normally these data are originated from the CO₂-Emissions and therefore they represent the energy consumption of the reporting period from 2002-2004. For a lot of enterprises no clear classification into the coarse ceramic sub-branches defined in chapter 2 are possible because of their broad production spectrum. The expanded clay aggregates industry has a surprisingly high share of energy compared to coarse ceramics (1.5.1.). The very well developed and strong Italian tile industry share a high amount of energy compared to the other branches. The data of tile industry, refractories, household ware and sanitary ware are estimated.



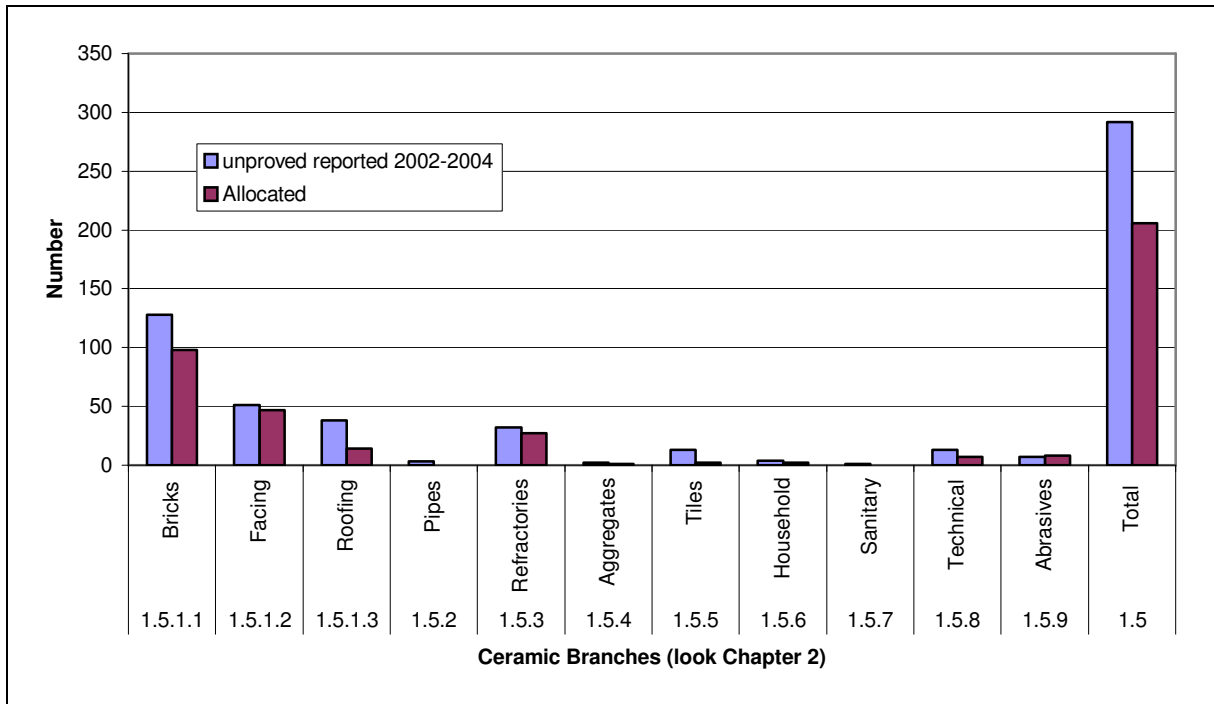
3.4 Germany (Annex 5)

The German data have his origin mostly in data published by the Deutsche Emissionshandelsstelle (www.dehst.de). In Germany only companies that fulfil *Possibility 4* according to chapter 3 have to take part in CO₂-trading.

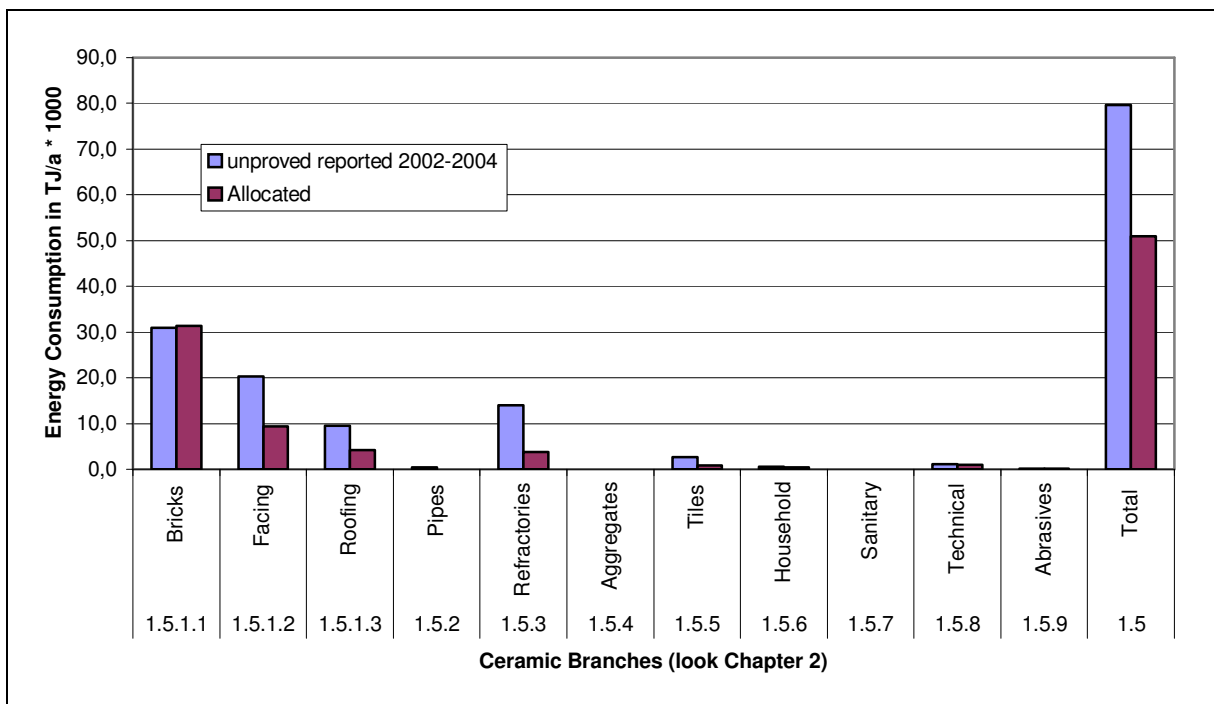
The first rows of the table in Annex 5 are originated by an unproved data collection initiated in 2004 to get information about the companies that have to take part in CO₂-trading and to allocate the free of charge emission rights. The information given by the respective companies was published without prove. For that reason some CO₂-emission-numbers are wrong and what is important as well, a lot of companies, which are not forced to take part in CO₂-trading, report their CO₂-emissions. In numbers: 292 companies report their data and only 206 are forced to take part in CO₂-trading. According to the EU and the German regulations about CO₂-trading some branches are completely not considered (and allocated) for CO₂-trading (e.g. a big share of the roof tile production, all of tile production).

Pictures 5 and 6 show the comparison of the unproved and later allocated CO₂-emissions. The unproved numbers were used for the table and figures that show the whole European situation (Chapter 4), because of the broader spectrum of branches considered.

The differences between allocated and verified CO₂-emissions are due to not operating at full (or allocated) capacity, with a slow increase from 2005 to 2006 and presumable with further increase to 2007 due to the economical development in Germany.



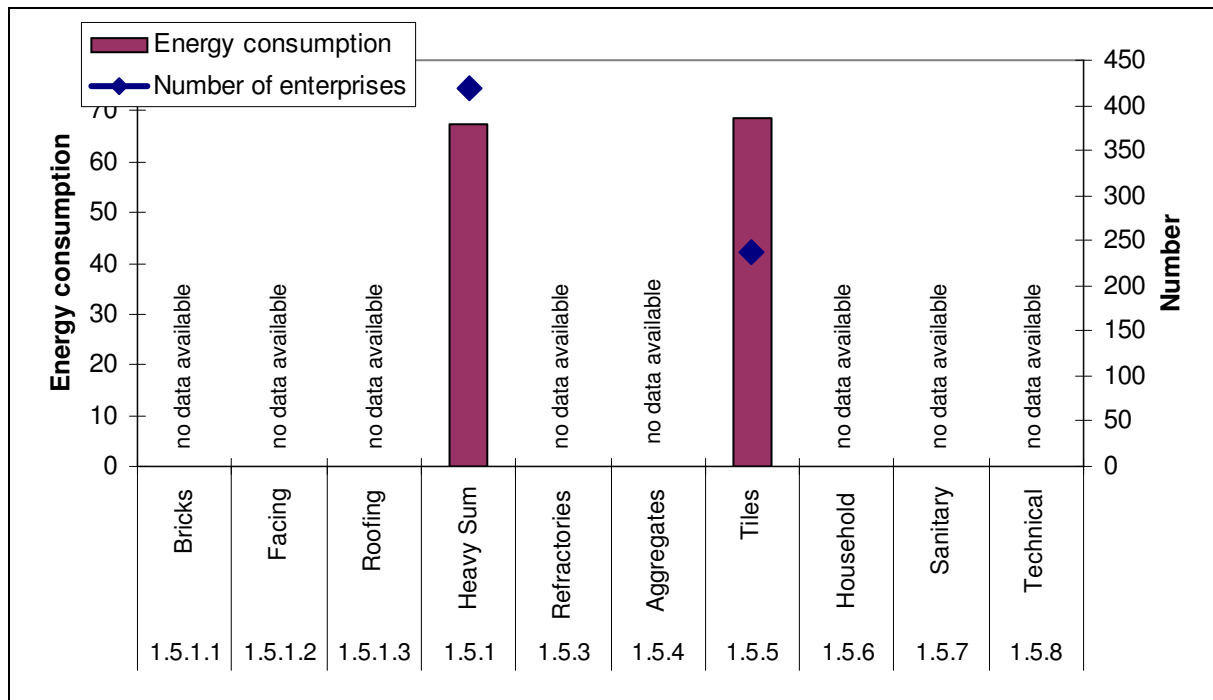
Picture 5: Number of German ceramic companies, divided into sub-branches



Picture 6: Energy consumption of German ceramic companies, divided into sub-branches

3.5 Spain (Annex 6)

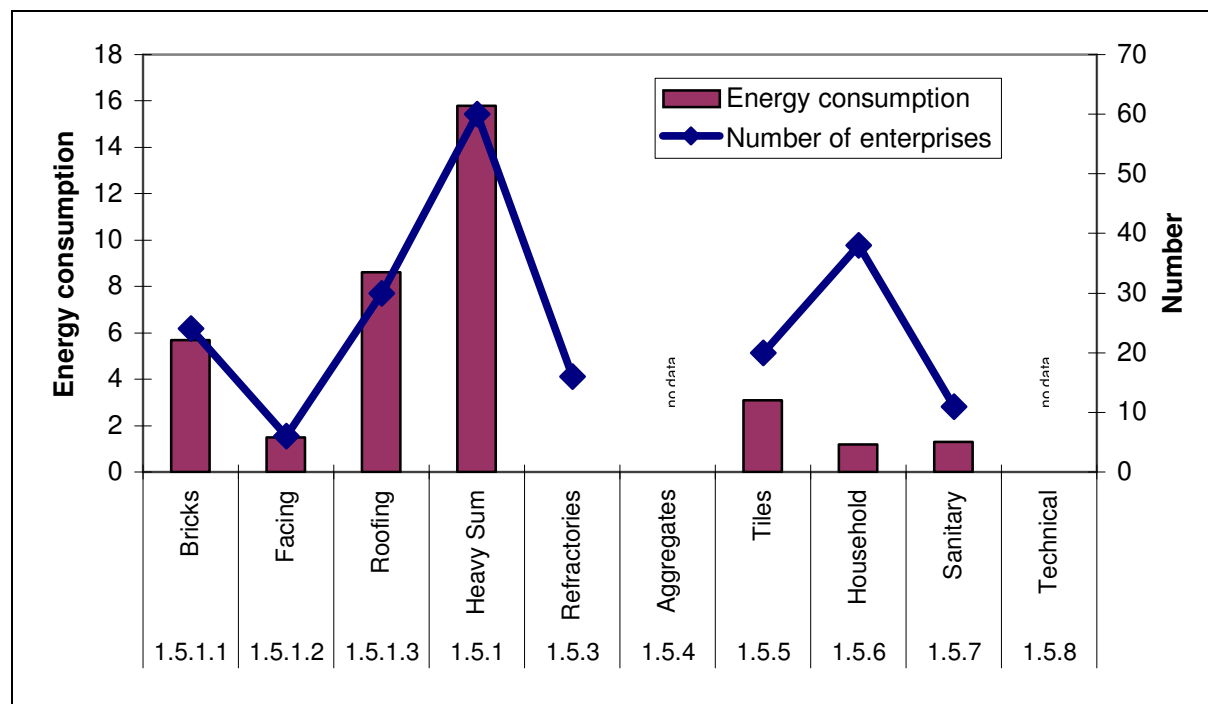
Picture 7 shows the energy consumption data for Spain. For the heavy ceramics industry and the tile producing industry the greatest amounts of energy consumption compared with the other considered EU-countries are reported. That is due to the really strong Spanish ceramic industry but it can be also due to the source of data: the Spanish brick manufactures association and the Spanish tile manufactures association, respectively. The data of these both authorities cover the whole branch and not only the huge manufactures. Unfortunately there are no data available that divide the heavy ceramics products into their sub groups and there are no data available for the other –but presumable smaller sub-branches.



Picture 7: Energy consumption of Spanish ceramic companies, divided into sub-branches

3.6 France (Annex 7)

Picture 8 shows the energy consumption data for the ceramic sub-branches of France. The data are calculated from real production data and estimated (average) specific energy consumption data for each sub-branch.



Picture 8: Energy consumption of French ceramic companies, divided into sub-branches

3.7 Austria, Netherlands, Portugal and further countries

For Austria, the Netherlands and Portugal the data of verified emissions for 2005 and 2006 were used. These data are published on the European-CO₂-register ([Community Independent Transaction Log \(CITL\)](#)). Only for Austria the respective companies could be classified according to chapter 2. Due to only native language Internet-sites of the Dutch and Portuguese companies no classification was possible – only the sums are listed in Summary of Energy consumption of the European ceramics industry (Chapter 4, Annex 10)

4 Summary of European Energy consumption in the ceramic industry divided into sub-branches

In Annex 8 all summarized data are listed. Annex 9 and 10 show the data graphically.

According to the Annex 9, tiles and heavy ceramics sub-branches are the ones with the greatest energy consumption. The difference between these two sub-branches is smaller than expected. The very strong tile industries of Italy and Spain are responsible for that. Beside these two branches the refractories have mentionable energy consumption, mainly due to German factories. The numbers of this sub-branch might be much higher if the strong French refractories branch could be also taken in account (16 French companies, but there is no energy consumption data available so far). Additionally, the division between refractories and technical ceramics is sometimes a bit difficult, because differences are mainly defined by the application of the product (refractory: support high temperature processes, technical ceramics: electrical, medicine, engineering use)

From the technical point of view the energy consumption for heavy ceramics products and tiles are high due to huge production amounts and the reasonable high energy consumption of refractories is due to high kiln temperatures. That means a small decrease of energy consumption per unit of heavy ceramics or tiles has great effects on the whole energy consumption of the sub-branch. For refractories respectively technical ceramics the situation is more complicated due to mostly sophisticated and special products.

Concerning the allocation of energy use in the EU-countries it can be stated that the consortium consist of the main European “ceramic countries” among them Italy, Spain and Germany are the main players.

5 Suggestion of sub-branches for the EEE-Label

The following branches will be viewed within the EEE-Labeling:

1. Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)
2. Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)
3. Roofing tiles



4. Refractory products
5. Wall and floor tiles

6 Suggestion of criteria for EEE-Label

Procedure

- Asking each company for its yearly CO₂-emission report
or (if the are not forced to take part in GHG-emission trading)
Asking the respective company to fill in the respective national forms for the CO₂-emission report on voluntary basis only for the EEE-Label

Advantages

- No effort for the development of new forms or questionnaires
- Clear rules defined by EU-authorities for the verification of data
- Verified energy consumption data PLUS production data (because of the carbon-content of most ceramic bodies)
- Very low effort for the respective company and the CERAMIN-Partner
- Reliable data
- Low barriers for the respective company, because the data are mostly public
- The EEE-Label is an added value for the respective company concerning CO₂-trading

Microsoft Excel - EnergyConsumptionTemplateReport.xls

Datei Bearbeiten Ansicht Einfügen Format Extras Daten Fenster ?

F16 =

Please fill in your Name

Subbranch Energy-Consumption-Sheet per Country CERAMIN

Date of submission

Please give the accurate or estimated number of enterprises, that are summed up for the energy consumption data.

Please use a unit in each line. Common unit is: kt. If Energy consumption is known not urgent to fill in.

Which association or company delivered the data OR from which paper/web page do you have collected the data?

Internet-address of the company or paper you have the data collected from.

Partner:

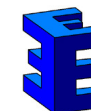
Date:

Country:

If you submit data of 2 countries please use separate sheets for each country

Subbranch-Name	Subbranch-Definition	Number of Enterprises concerned	Energy Consumption per year	CO2-Emissions per year	Year	Source-Name	Source - e-mail	Source-Internet
A7	B7	C7	D7	E7	F7	G7	H7	I7
Name of Subbranch. E.g. roof tiles, sanitary ware. Shall defined in column "Subbranch definition"	Please define the subbranch. Best way by national or international regulations. E.g." EN 1344 - Clay pavers". Or define it by verbal description, please delimit it from other subbranches.			Please use a unit in each line. Most common is TJ. If CO2-Emissions are known not urgent to fill in.			Year of concerning. If you have got several years please fill in several lines.	E-mail address of the company or paper you have the data collected from.

Annex 1: Template for collection of energy consumption data



Annex 2

Partner: CERAM
Date: 15. 3. 07
Country: UNITED KINGDOM

Subbranch-Name	Subbranch-Definition	Number of Enterprises concerned	FUEL Energy Consumption per year kWh	Energy Consumption TJ/a*10 ³	Fuel CO ₂ -Emissions tonnes per year	Year	Source-Name	Source-Internet
BRICK	Red clay building bricks	28	4.550.630.538	16,4	873.266	2002	British Ceramic Confederation	www.ceramfed.co.uk
ROOF TILES	Roof Tiles	7	396.455.569	1,4	76.080	2002	British Ceramic Confederation	www.ceramfed.co.uk
INDUSTRIAL CERAMICS	Alumina, Zirconia etc products for wear resistance and other applications	16	323.048.779	1,2	61.250	2002	British Ceramic Confederation	www.ceramfed.co.uk
REFRACTORIES	Refractory ceramics for high temperature applications	14	710.565.918	2,6	134.723	2002	British Ceramic Confederation	www.ceramfed.co.uk
TABLEWARE	All forms of tableware - earthenware, stoneware, porcelain, bone china etc.	30	1.160.651.290	4,2	216.345	2002	British Ceramic Confederation	www.ceramfed.co.uk
TILES	Glazed & unglazed wall and floor tiles	4	316.566.865	1,1	59.008	2002	British Ceramic Confederation	www.ceramfed.co.uk
SANITARYWARE	Vitreous china & fireclay ceramic sanitaryware	6	711.273.494	2,6	132.581	2002	British Ceramic Confederation	www.ceramfed.co.uk
BRICK	Red clay building bricks	28	4.659.605.596	16,8	894.178	2004	British Ceramic Confederation	www.ceramfed.co.uk



ROOF TILES	Roof Tiles	7	433.223.119	1,6	83.136	2004	British Ceramic Confederation	www.ceramfed.co.uk
INDUSTRIAL CERAMICS	Alumina, Zirconia etc products for wear resistance and other applications	16	380.824.493	1,4	72.204	2004	British Ceramic Confederation	www.ceramfed.co.uk
REFRACTORIES	Refractory ceramics for high temperature applications	13	618.659.334	2,2	117.298	2004	British Ceramic Confederation	www.ceramfed.co.uk
TABLEWARE	All forms of tableware - earthenware, stoneware, porcelain, bone china etc.	27	910.745.581	3,3	169.763	2004	British Ceramic Confederation	www.ceramfed.co.uk
TILES	Glazed & unglazed wall and floor tiles	4	327.210.856	1,2	60.992	2004	British Ceramic Confederation	www.ceramfed.co.uk
SANITARYWARE	Vitreous china & fireclay ceramic sanitaryware	5	533.019.583	1,9	99.355	2004	British Ceramic Confederation	www.ceramfed.co.uk
BRICK	Red clay building bricks	30	4.160.949.376	15,0	798.486	2006	British Ceramic Confederation	www.ceramfed.co.uk
ROOF TILES	Roof Tiles	6	365.731.802	1,3	70.184	2006	British Ceramic Confederation	www.ceramfed.co.uk
INDUSTRIAL CERAMICS	Alumina, Zirconia etc products for wear resistance and other applications	17	364.361.643	1,3	69.083	2006	British Ceramic Confederation	www.ceramfed.co.uk
REFRACTORIES	Refractory ceramics for high temperature applications	14	475.302.965	1,7	90.117	2006	British Ceramic Confederation	www.ceramfed.co.uk
TABLEWARE	All forms of tableware - earthenware, stoneware, porcelain, bone china etc.	23	641.092.910	2,3	119.500	2006	British Ceramic Confederation	www.ceramfed.co.uk
TILES	Glazed & unglazed wall and floor tiles	4	326.056.090	1,2	60.777	2006	British Ceramic Confederation	www.ceramfed.co.uk



SANITARYWARE	Vitreous china & fireclay ceramic sanitaryware	4	448.818.963	1,6	83.660	2006	British Ceramic Confederation	www.ceramfed.co.uk
BRICK	Red clay building bricks	28,7		16,0			Average 2002; 2004; 2006	
ROOF TILES	Roof Tiles	7		1,4			Average 2002; 2004; 2007	
INDUSTRIAL CERAMICS	Alumina, Zirconia etc products for wear resistance and other applications	16		1,3			Average 2002; 2004; 2008	
REFRATORIES	Refractory ceramics for high temperature applications	14		2,2			Average 2002; 2004; 2009	
TABLEWARE	All forms of tableware - earthenware, stoneware, porcelain, bone china etc.	27		3,3			Average 2002; 2004; 2010	
TILES	Glazed & unglazed wall and floor tiles	4		1,2			Average 2002; 2004; 2011	
SANITARYWARE	Vitreous china & fireclay ceramic sanitaryware	5		2,0			Average 2002; 2004; 2012	

**Annex 3****Partner: ISiC****Date: 19.02.2007****Country: POLAND**

Subbranch (name according to polish PKWiU classifications) <i>PKWiU - Polish Classification of Products and Services</i>	Subbranch (code according to polish PKWiU classifications)	Number of Enterprises concerned (accurate)*	Energy Consumption per year [GJ]*	Production value [PLN]**	Year	Source-Name	Source-Internet
Porcelain (China-ware)	26.21	15	1.895.678	465.928.200	2005	*	*
Sanitary ware	26.22	6	1.231.061	464.686.900	2005	*	*
Electrical porcelain (electroceramics)	26.23	5	367.590	133.373.100	2005	*	*
Technical ceramics (except electroceramics)	26.24	3	335482	10.919.900	2005	*	*
Ceramic ware not classified in other subbranches	26.25	3	168.633	28.374.000	2005	*	*
Refractories	26.26	9	1.931.909	707.590.200	2005	*	*
Ceramic tiles	26.30	23	8.267.079	1.700.854.700	2005	*	*
Bricks, roof tiles and other ceramic building materials	26.40	40	6.299.038	847.690.700	2005	*	*



	Total	104	20.496.471	2.959.577.700	2005		
Porcelain, Sanitary ware, Electrical and technical ceramics	26.21-26.26	9	1.204.000		2005	**	**
Refractories	26.26.	5	728.000		2005	**	**
Tiles and coarse ceramics	26.30-.26.4	35	11.236.000			**	**
	Total	49	13.168.000		2005	**	**
ceramic enterprises, that have to take part in CO ₂ -trading	26.2.- 26.4	79	25.361.120		2005	***	***

* Source:

Name: Agencja Rynku Energii SA - ARE SA (The Energy Market Agency)
E-mail: biuro@are.waw.pl
Internet: www.are.waw.pl

**Source:

Name: Główny Urząd Statystyczny GUS (Central Statistical Office)
E-mail: dane@stat.gov.pl
Internet: www.stat.gov.pl

***Source:

Polish national Administration of the Emissions Trading Scheme
E-mail: pawel.figat@kashue.pl
Internet: www.kashue.pl



Annex 4

Partner: ETA - Renewable Energies

Date: 08.06.2007

Country: ITALY

Subbranch-Name		Subbranch-Definition	Number of Enterprises concerned	Energy Consumption per year TJ/a*10 ³	CO2-Emissions tons/a	Average of Years	Source-Name	Source-Internet
1.5.1.1	Bricks	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)	7	2,6	129.757	2002-2004	Ministry of Environment	www.minambiente.it
1.5.1.2	Facing	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)	6	1	50.241	2002-2004	Ministry of Environment	www.minambiente.it
1.5.1.3	Roofing	Roofing tiles	3	1,9	95.336	2002-2004	Ministry of Environment	www.minambiente.it
1.5.1	Heavy Sum	Bricks and roof tiles (Sum!)**	30	11,1	555.252	2002-2004	Ministry of Environment	www.minambiente.it
1.5.3	Refractories	refractory products	38	3,8		2006	Confindustria Ceramica*	www.confindustriaceramica.it
1.5.4	Aggregates	Expanded clay aggregates	5	3,8	187.784	2002-2004	Ministry of Environment	www.minambiente.it
1.5.5	Tiles	wall and floor tiles	207	56,7		2006	Confindustria Ceramica*	www.confindustriaceramica.it
1.5.6	Household	table- and ornamental ware (household ceramics)	1	0,1	5.742	2002-2004	Confindustria Ceramica*	www.confindustriaceramica.it



1.5.7	Sanitary	sanitary ware	51	4,6		2006	Confindustria Ceramica*	www.confindustriaceramica.it
1.5.8	Technical	technical ceramics***						
1.5.9	Abrasives	inorganic bounded abrasives***						

* data estimated

** Only companies that are under the regulations of CO2-trading are considered

*** no data available



Annex 5

Partner: Keramik-Institut

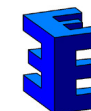
Date: 31.05.2007

Country: GERMANY

Subbranch-Name	Subbranch-Definition	Number of Enterprises concerned	specific energy consumption MJ/kg	Energy Consumption ³ TJ/a*10 ³	CO2-Emissions tons/a	Year	Source-Name	Source-Internet
1.5.1.1	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)	128		30,9	1.545.154	2002-2004*	DEHST ²	www.Dehst.de
1.5.1.2	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)	51		20,3	1.017.527	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.1.3	Roofing tiles	38		9,5	472.756	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.2	Vitrified clay pipes	3		0,4	17.587	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.3	refractory products	32		14,0	711.358	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.4	Expanded clay aggregates	2		0,0	2.274	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.5	wall and floor tiles	13		2,7	133.167	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.6	table- and ornamental ware (household ceramics)	4		0,5	23.545	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.7	sanitary ware	1		0,1	3.139	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.8	technical ceramics	13		1,1	56.978	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.9	inorganic bounded abrasives	7		0,2	7.695	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5	<i>Total - ceramics</i>	292		79,7	3.991.180	2002-2004 ¹	DEHST ²	www.Dehst.de
1.5.1.1	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)	98		31,4	1.568.542	Allocation	DEHST ²	www.Dehst.de



1.5.1.2	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)	47		9,3	466.021	Allocation	DEHST ²	www.Dehst.de
1.5.1.3	Roofing tiles	14		4,2	210.909	Allocation	DEHST ²	www.Dehst.de
1.5.2	Vitrified clay pipes	0		0,0	0	Allocation	DEHST ²	www.Dehst.de
1.5.3	refractory products	27		3,7	187.323	Allocation	DEHST ²	www.Dehst.de
1.5.4	Expanded clay aggregates	1		0,0	631	Allocation	DEHST ²	www.Dehst.de
1.5.5	wall and floor tiles	2		0,8	41.120	Allocation	DEHST ²	www.Dehst.de
1.5.6	table- and ornamental ware (household ceramics)	2		0,4	18.046	Allocation	DEHST ²	www.Dehst.de
1.5.7	sanitary ware	0		0,0	0	Allocation	DEHST ²	www.Dehst.de
1.5.8	technical ceramics	7		1,0	50.569	Allocation	DEHST ²	www.Dehst.de
1.5.9	inorganic bounded abrasives	8		0,1	7364	Allocation	DEHST ²	www.Dehst.de
1.5	<i>Total - ceramics</i>	206		51,0	2.550.525	Allocation	DEHST ²	www.Dehst.de
1.5	<i>Total - ceramics</i>				1.775.165	2005 ¹⁰	DEHST ²	www.Dehst.de
1.5	<i>Total - ceramics</i>				1.883.097	2006 ¹⁰	DEHST ²	www.Dehst.de
1.5.1.1	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)		1,0 - 2,2	12 - 28 ⁴		unknown	VDI 2585 ⁸	www.beuth.de
1.5.1.2	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)		1,6 - 3,0			unknown	VDI 2585 ⁸	www.beuth.de
1.5.1.3	Roofing tiles		1,8 - 2,8			unknown	VDI 2585 ⁸	www.beuth.de
1.5.3	refractory products		3,2 - 9,7	2,9-8,9 ⁶		unknown	VDI 2585 ⁸	www.beuth.de
1.5.5	wall and floor tiles		2,2 - 3,9			unknown	VDI 2585 ⁸	www.beuth.de
1.5.6	table- and ornamental ware (household ceramics)		3,5 - 25	0,2-1,8 ⁷		unknown	VDI 2585 ⁸	www.beuth.de



1.5.7	sanitary ware		5,2			unknown	VDI 2585 ⁸	www.beuth.de
1.5.1.1	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)		1,4	17 ⁴		2004	Enser ⁹	enser.partner@t-online.de
1.5.1.2	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)		2,5			2004	Enser ⁹	enser.partner@t-online.de
1.5.1.3	Roofing tiles		3,3			2004	Enser ⁹	enser.partner@t-online.de
1.5.7	sanitary ware	9	3,1 - 9,2			1999	DFIU ⁵	www-dfiu.wiwi.uni-karlsruhe.de
1.5.5	wall and floor tiles	35	2,1 - 6,3			1999	DFIU ⁵	www-dfiu.wiwi.uni-karlsruhe.de
1.5.1.1	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)		1,4	17 ⁴		1999	DFIU ⁵	www-dfiu.wiwi.uni-karlsruhe.de
1.5.1.3	Roofing tiles		1,9 - 2,8			1999	DFIU ⁵	www-dfiu.wiwi.uni-karlsruhe.de

¹ Average numbers between the signed years, all companies that has reported their CO2-emissions on a unproved basis

² Umweltbundesamt, Deutsche Emissionshandelsstelle, Postfach 33 00 22, 14191 Berlin,

³ energy consumption calculated by 0,05 tonsCO2 per GJ (natural gas)

⁴ calculated by approx. 12.762 kt production in 1999, source look foot note 5

⁵ Deutsch-Französisches Institut für Umweltforschung, Universität Karlsruhe (TH), Hertzstraße 16, 76187 Karlsruhe

⁶ calculated by approx. 918 kt production in 1999, source look foot note 5

⁷ calculated by approx. 72 kt production in 1999, source look foot note 5

⁸ VDI 2585 "Emission control ceramic industry", Association of German Engineers

⁹ Enser, H: Contemporary energy consumption, ZI 6/2005, p. 46-56

¹⁰ verified emissions for the signed year



Annex 6

Partner: CRIA
Date: 25.06.2007
Country: Spain

Subbranch-Name	Subbranch-Definition	Number of Enterprises concerned	Energy Consumption per year TJ/a*10 ³	CO2-Emissions tons/a	Average of Years	Source-Name	Source-Internet
1.5.1.1	Bricks	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C) ***					
1.5.1.2	Facing	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C) ***					
1.5.1.3	Roofing	Roofing tiles***					
1.5.1	Heavy Sum	Bricks and roof tiles (Sum!)**	420	67,3	2005	Hispalyt	www.hispalyt.es
1.5.3	Refractories	refractory products***					
1.5.4	Aggregates	Expanded clay aggregates***					
1.5.5	Tiles	wall and floor tiles	237	68,4	2005	Ascer	www.ascer.es
1.5.6	Household	table- and ornamental ware (household ceramics) ***					



1.5.7	Sanitary	sanitary ware***						
1.5.8	Technical	technical ceramics***						
1.5.9	Abrasives	inorganic bounded abrasives***						

** Only companies that are under the regulations of CO2-trading are considered

*** no data available

**Annex 7****Partner: Société Française de Céramique (SFC)****Date: 25.07.2007****Country: France**

Subbranch-Name	Subbranch-Definition	**Number of Enterprises concerned	* Energy Consumption per year (TJ/a*10 ³)	CO2-Emissions tons/a	Average of Years	Source-Name	Source-Internet	
1.5.1.1	Bricks	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C)	24	5,7		2005/2006	SFC	www.ceramique.fr
1.5.1.2	Facing	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C)	6	1,5		2005/2006	SFC	www.ceramique.fr
1.5.1.3	Roofing	Roofing tiles	30	8,6		2005/2006	SFC	www.ceramique.fr
1.5.1	Heavy Sum	Bricks and roof tiles (Sum!)	60	15,8		2005/2006	SFC	www.ceramique.fr
1.5.3	Refractories	refractory products	16	on standby		2005/2006	SFC	www.ceramique.fr
1.5.4	Aggregates	Expanded clay aggregates						
1.5.5	Tiles	wall and floor tiles	20	3,1		2005/2006	SFC	www.ceramique.fr
1.5.6	Household	table- and ornamental ware (household ceramics)	38	1,2		2005/2006	SFC	www.ceramique.fr
1.5.7	Sanitary	sanitary ware	11	1,3		2005/2006	SFC	www.ceramique.fr



1.5.8	Technical	technical ceramics***						
1.5.9	Abrasives	inorganic bounded abrasives***						

* : These datas are calculated about the real production of ceramic products and an aproximatively specific energy about the different types of products

** : Sum of number of enterprises belonging to 1.5.1.1 and 1.5.1.2 is 30, individual numbers of these two subbranches are estimated

*** no data available



Annex 8

Date: 20.06.2007
Country: SUMMERY

Subbranch-Nr. ¹	Abbrev. Name	Subbranch-Definition ^{1,2}	Energy consumption TJ/a * 1000									
			2005	2002,2004, 2006 ⁴	2002-2004 ⁴	2005-2006	2002-2004 ⁴	2005	2006	2005-2006		
			Poland	United Kingdom	Germany	France	Italy	Spain	Austria	Netherlands	Portugal	Sum
1.5.1.1	Bricks	Masonry bricks, lightweight bricks, (kiln temperature mostly < 1000 °C) ²		16,0	30,9	5,7	2,6		4,2			53,7
1.5.1.2	Facing	Facing bricks, paving bricks (kiln temperature mostly > 1050 °C) ²			20,3	1,5	1		0,1			21,4
1.5.1.3	Roofing	Roofing tiles ²		1,4	9,5	8,6	1,9		0,9			13,7
1.5.1	Heavy Sum	Bricks and roof tiles (Sum!) ³	6,3	17,4	60,7	15,8	11,1	67,3	5,2			100,7
1.5.2	Pipes	Vitrified clay pipes			0,4							0,4
1.5.3	Refractories	refractory products	1,9	2,2	14,0		3,8		0,2			18,3
1.5.4	Aggregates	Expanded clay aggregates			0,0		3,8					3,8
1.5.5	Tiles	wall and floor tiles	8,3	1,2	2,7	3,1	56,7	68,4				12,2
1.5.6	Household	table- and ornamental ware (household ceramics)	1,9	3,3	0,5	1,2	10					5,8
1.5.7	Sanitary	sanitary ware	1,2	2,0	0,1	1,3	4,6					3,3



1.5.8	Technical	technical ceramics	0,0	1,3	1,1						2,4
1.5.9	Abrasives	inorganic bounded abrasives			0,2						0,2
1.5	Total		19,6	27,4	79,7		81,3		10,6	4,1	152,4

¹ according to BREF Ceramic

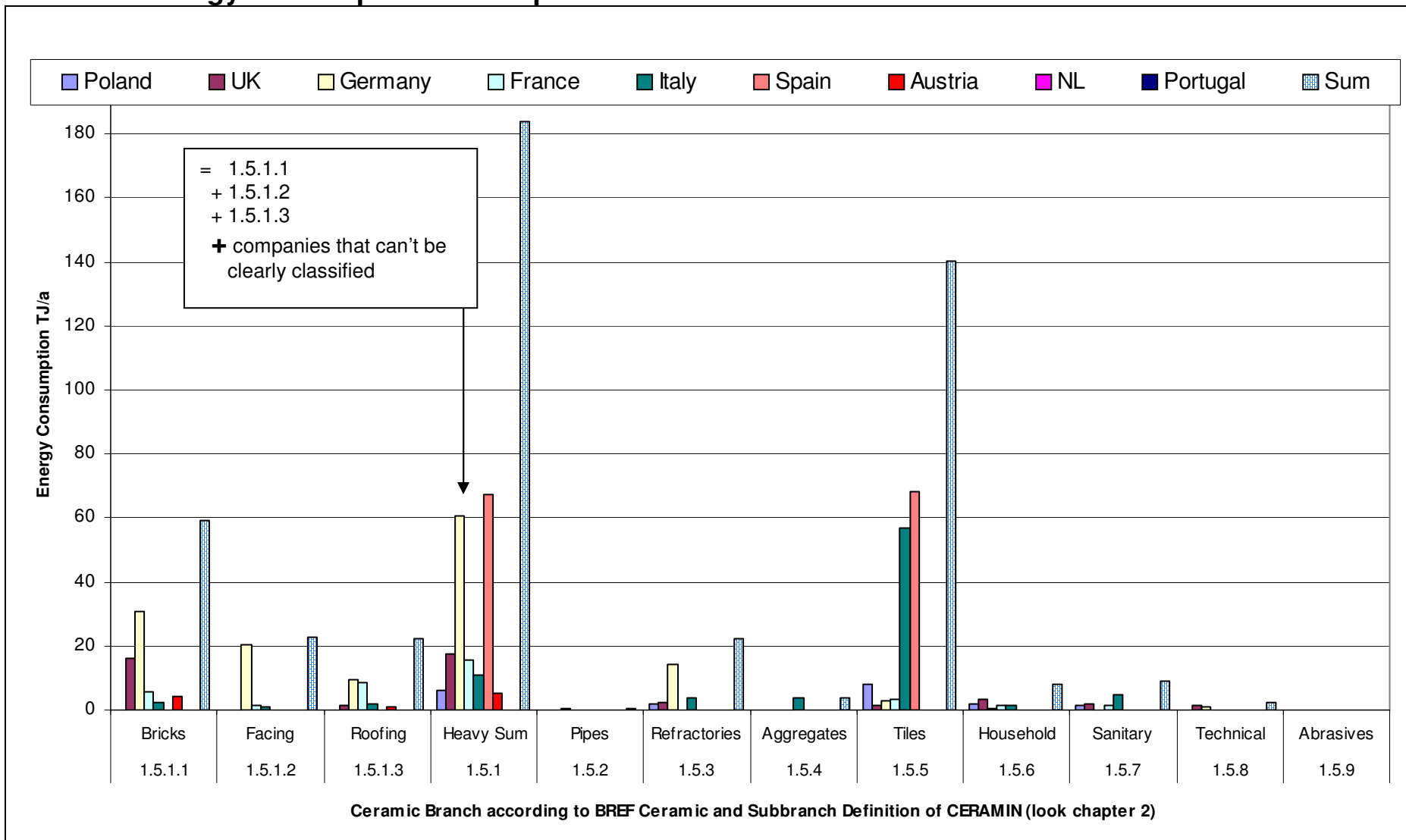
² Nr. 1.5.1. From BREF Ceramic has been divided into these groups, because of the different specific energy use of the respective groups

³ Sum can vary from addition of 1.5.1.1+1.5.1.2+1.5.1.3 because of some factories doesn't allow a clear classification.

⁴ Average numbers between the signed years, all companies that has reported their CO₂-emissions on a unproved basis



Annex 9: Energy consumption of European ceramic industries sub-branches





Annex 10: Energy consumption and number of ceramic enterprises of different EU-countries (calculated from CO₂-emissions)

