ANNEX I

PRODUCT BENCHMARKS

1. Definition of product benchmarks and system boundaries without consideration of exchangeability of fuel and electricity

Product benchmark	Definition of products covered	Definition of processes and emissions covered (system boundaries)	Carbon leakage exposure	Benchmark value (allowances/t)
Coke	Coke-oven coke (obtained from the carbonisation of coking coal, at high temperature) or gas-works coke (by-product of gas-works plants) expressed as tons of dry coke. Lignite coke is not covered by this benchmark	All processes directly or indirectly linked to the process units coke ovens, H_2S/NH_3 incineration, coal preheating (defreezing), coke gas extractor, desulphurisation unit, distillation unit, steam generation plant, pressure control in batteries, biological water treatment, miscellaneous heating of by-products and hydrogen separator are included. Coke oven gas cleaning is included	yes	0,286
Sintered ore	Agglomerated iron-bearing product containing iron ore fines, fluxes and iron-containing recycling materials with the chemical and physical properties such as the level of basicity, mechanical strength and permeability required to deliver iron and necessary flux materials into iron ore reduction processes	All processes directly or indirectly linked to the process units sinter strand, ignition, feedstock preparation units, hot screening unit, sinter cooling unit, cold screening unit and steam generation unit are included	yes	0,171
Hot metal	Liquid iron saturated with carbon for further processing	All processes directly or indirectly linked to the process units blast furnace, hot metal treatment units, blast furnace blowers, blast furnace hot stoves, basic oxygen furnace, secondary metallurgy units, vacuum ladles, casting units (including cutting), slag treatment unit, burden preparation, BF gas treatment unit, dedusting units, scrap pre-heating, coal drying for PCI, vessels preheating	yes	1,328

		stands, casting ingots preheating stands, compressed air production, dust treatment unit (briquetting), sludge treatment unit (briquetting), steam injection in BF unit, steam generation plant, converter BOF gas cooling and miscellaneous are included		
Pre-bake anode	Anodes for aluminium electrolysis use consisting of petrol coke, pitch and normally recycled anodes, which are formed to shape specifically intended for a particular smelter and baked in anode baking ovens to a temperature of around 1 150 °C	All processes directly or indirectly linked to the production of pre-bake anodes are included	yes	0,324
Aluminium	unwrought non-alloy liquid aluminium from electrolysis	All processes directly or indirectly linked to the production step electrolysis are included	yes	1,514
Grey cement clinker	Grey cement clinker as total clinker produced	All processes directly or indirectly linked to the production of grey cement clinker are included	yes	0,766
White cement clinker	White cement clinker for use as main binding component in the formulation of materials such as joint filers, ceramic tile adhesives, insulation, and anchorage mortars, industrial floor mortars, ready mixed plaster, repair mortars, and water-tight coatings with maximum average contents of 0,4 mass-% Fe_2O_3, 0,003 mass-% Cr_2O_3 and 0,03 mass-% Mn_2O_3	All processes directly or indirectly linked to the production of white cement clinker are included	yes	0,987
Lime	Quicklime: calcium oxide (CaO) produced by the decarbonation of limestone ($CaCO_3$) as 'standard pure' lime with a free CaO content of 94,5 %. Lime produced and consumed in the	All processes directly or indirectly linked to the production of lime are included	yes	0,954

	same installation for purification processes is not covered by this product benchmark			
Dolime	Dolime or calcined dolomite as mixture of calcium and magnesium oxides produced by the decarbonation of dolomite ($CaCO_3.MgCO_3$) with a residual CO_2 exceeding 0,25 %, a free MgO content between 25 % and 40 % and a bulk density of the commercial product below 3,05 g/cm^3. Dolime shall be expressed as 'standard pure dolime' quality with a free CaO content of 57,4 % and a free MgO content of 38,0 %	All processes directly or indirectly linked to the production of dolime are included	yes	1,072
Sintered dolime	Mixture of calcium and magnesium oxides used solely for the production of refractory bricks and other refractory products with a minimum bulk density of 3,05 g/cm^3	All processes directly or indirectly linked to the production of sintered dolime are included	yes	1,449
Float glass	Float/ground/polish glass (as tons of glass exiting the lehr)	All processes directly or indirectly linked to the production steps melter, refiner, working end, bath and lehr are included	yes	0,453
Bottles and jars of colourless glass	Bottles of colourless glass of a nominal capacity < 2,5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather; infant's feeding bottles) except extra-white flint products with an iron oxide content expressed as percent Fe_2O_3 by weight lower than 0,03 % and colour coordinates of L in the range 100 to 87, of a in the range 0 to – 5 and of b in the range 0 to 3	All processes directly or indirectly linked to the production steps materials handling, melting, forming, downstream processing, packaging and ancillary processes are included	yes	0,382

	(using the CIELAB advocated by the Commission internationale d'éclairage) expressed as tons of packed product			
Bottles and jars of coloured glass	Bottles of coloured glass of a nominal capacity < 2,5 litres, for beverages and foodstuffs (excluding bottles covered with leather or composition leather; infant's feeding bottles) expressed as tons of packed product	All processes directly or indirectly linked to the production steps materials handling, melting, forming, downstream processing, packaging and ancillary processes are included	yes	0,306
Continuous filament glass fibre products	Melted glass for the production of continuous filament glass fibre products namely chopped strands, rovings, yarns and staple glass fibre and mats (expressed as tons of melted glass exiting the foreheath). Mineral wool products for thermal, acoustic and fire insulation are not included	All processes directly or indirectly linked to the production processes glass melting in the furnaces and glass refining in the foreheaths are included. Downstream processes to convert the fibres into sellable products are not included in this product benchmark	yes	0,406
Facing bricks	Facing bricks with a density > 1 000 kg/m^3 used for masonry based on EN 771-1, excluding pavers, clinker bricks and blue braised facing bricks	All processes directly or indirectly linked to the production processes raw material preparation, component mixing, forming and shaping of ware, drying of ware, firing of ware, product finishing and flue gas cleaning are included	no	0,139
Pavers	Clay bricks used for flooring according to EN 1344	All processes directly or indirectly linked to the production processes raw material preparation, component mixing, forming and shaping of ware, drying of ware, firing of ware, product finishing and flue gas cleaning are included	no	0,192
Roof tiles	Clay roofing tiles as defined in EN 1304:2005 excluding blue braised roof tiles and accessories	All processes directly or indirectly linked to the production processes raw material preparation, component mixing, forming and shaping of ware, drying of ware, firing of ware, product	no	0,144

		finishing and flue gas cleaning are included		
Spray-dried powder	Spray-dried powder for the production of dry-pressed wall and floor tiles in tonnes of powder produced	All processes directly or indirectly linked to the production of spray-dried powder are included	yes	0,076
Plaster	Plasters consisting of calcined gypsum or calcium sulphate (including for use in building, for use in dressing woven fabrics or surfacing paper, for use in dentistry, for use in land remediation), in tonnes of stucco. Alpha plaster is not covered by this product benchmark	All processes directly or indirectly linked to the production steps milling, drying and calcining are included	no	0,048
Dried secondary gypsum	Dried secondary gypsum (synthetic gypsum produced as a recycled by-product of the power industry or recycled material from construction waste and demolition) expressed as tons of product	All processes directly or indirectly linked to the drying of secondary gypsum are included	no	0,017
Short fibre kraft pulp	Short fibre kraft pulp is a wood pulp produced by the sulphate chemical process using cooking liquor, characterised by fibre lengths of 1-1,5 mm, which is mainly used for products which require specific smoothness and bulk, as tissue and printing paper, expressed as net saleable production in Adt (Air Dried Tonnes)	All processes which are part of the pulp production process (in particular the pulp mill, recovery boiler, pulp drying section and lime kiln and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,12
Long fibre kraft pulp	Long fibre kraft pulp is a wood pulp produced by the sulphate	All processes which are part of the pulp production process (in particular	yes	0,06

	chemical process using cooking liquor, characterised by fibre lengths of 3-3,5 mm, which is mainly used for products for which strength is important, as packaging paper, expressed as net saleable production in Adt (Air Dried Tonnes)	the pulp mill, recovery boiler, pulp drying section and lime kiln and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included		
Sulphite pulp, thermo-mechanical and mechanical pulp	Sulphite pulp produced by a specific pulp making process, e.g. pulp produced by cooking wood chips in a pressure vessel in the presence of bisulphite liquor expressed as net saleable production in Adt. Sulphite pulp can be either bleached or unbleached. Mechanical pulp grades: TMP (thermomechanical pulp) and groundwood as net saleable production in Adt. Mechanical pulp can be either bleached or unbleached. Not covered by this group are the smaller subgroups of semichemical pulp CTMP — chemi-thermomechanical pulp and dissolving pulp	All processes which are part of the pulp production process (in particular the pulp mill, recovery boiler, pulp drying section and lime kiln and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,02
Recovered paper pulp	Pulps of fibres derived from recovered (waste and scrap) paper or paperboard or of other fibrous cellulosic material expressed as net saleable production in Adt	All processes which are part of the production of pulp from recovered paper and connected energy conversion units (boiler/CHP)) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for	yes	0,039

		sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included		
Newsprint	Specific paper grade (in rolls or sheets) expressed as net saleable production in Adt used for printing newspapers produced from groundwood and/or mechanical pulp or recycled fibres or any percentage of combinations of these two. Weights usually range from 40 to 52 g/m^2 but can be as high as 65 g/m^2. Newsprint is machine-finished or slightly calendered, white or slightly coloured and is used in reels for letterpress, offset or flexo-printing	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,298
Uncoated fine paper	Uncoated fine paper, covering both uncoated mechanical and uncoated woodfree expressed as net saleable production in Adt: 1. Uncoated woodfree papers suitable for printing or other graphic purposes made from a variety of mainly virgin fibre furnishes, with variable levels of mineral filler and a range of finishing processes. This grade includes most office papers, such as business forms, copier, computer, stationery and book papers. 2. Uncoated mechanical papers cover the specific paper grades made from	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,318

	mechanical pulp, used for packaging or graphic purposes/magazines			
Coated fine paper	Coated fine paper covering both coated mechanical and coated woodfree papers expressed as net saleable production in Adt: 1. Coated woodfree papers made of fibres produced mainly by a chemical pulping process which are coated in process for different applications and are also known as coated freesheet. This group focuses mainly on publication papers. 2. Coated mechanical papers made from mechanical pulp, used for graphic purposes/magazines. The group is also known as coated groundwood	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,318
Tissue	Tissue papers expressed as net saleable production of parent reel cover a wide range of tissue and other hygienic papers for use in households or commercial and industrial premises such as toilet paper and facial tissues, kitchen towels, hand towels and industrial wipes, the manufacture of baby nappies, sanitary towels, etc. TAD — Through Air Dried Tissue is not part of this group	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included. The conversion of parent reel weight to finished products is not part of this product benchmark	yes	0,334

Testliner and fluting	Testliner and fluting expressed as net saleable production in Adt: 1. Testliner covers types of paperboard that meet specific tests adopted by the packaging industry to qualify for use as the outer facing layer for corrugated board, from which shipping containers are made. Testliner is made primarily from fibres obtained from recycled fibres. 2. Fluting refers to the centre segment of corrugated shipping containers, being faced with linerboard (testliner/kraftliner) on both sides. Fluting covers mainly papers made from recycled fibre but this group also holds paperboard that is made from chemical and semi-chemical pulp	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,248
Uncoated carton board	This benchmark covers a wide range of uncoated products (expressed as net saleable production in Adt) which may be single or multiply. Uncoated carton board is mainly used for packaging applications which the main needed characteristic is strength and stiffness, and for which the commercial aspects as information carrier are of a second order of importance. Carton board is made from virgin and/or recovered fibres, has good folding properties, stiffness and scoring ability. It is mainly used in cartons for consumer products such as frozen food, cosmetics and for	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,237

	liquid containers; also known as solid board, folding box board, boxboard or carrier board or core board			
Coated carton board	This benchmark covers a wide range of coated products (expressed as net saleable production in Adt) which may be single or multiply. Coated carton board is mainly used for commercial applications that need to bring commercial information printed on the packaging to the shelf in the store in applications such as food, pharma, cosmetics, and other. Carton board is made from virgin and/or recovered fibres, and has good folding properties, stiffness and scoring ability. It is mainly used in cartons for consumer products such as frozen food, cosmetics and for liquid containers; also known as solid board, folding box board, boxboard or carrier board or core board	All processes which are part of the paper production process (in particular paper or board machine and connected energy conversion units (boiler/CHP) and direct process fuel use) are included. Other activities on site that are not part of this process such as sawmilling activities, woodworking activities, production of chemicals for sale, waste treatment (treating waste onsite instead of offsite (drying, pelletising, incinerating, landfilling), PCC (precipitated calcium carbonate) production, treatment of odorous gases, and district heating are not included	yes	0,273
Nitric acid	Nitric acid (HNO_3), to be recorded in tons HNO_3 (100 %)	All processes directly or indirectly linked to the production of the benchmarked product as well as the N_2O destruction process are included except the production of ammonia	yes	0,302
Adipic acid	Adipic acid to be recorded in tons of dry purified adipic acid stored in silos or packed in (big)bags	All processes directly or indirectly linked to the production of the benchmarked product as well as the N_2O destruction process are included	yes	2,79
Vinyl chloride monomer (VCM)	Vinyl chloride (chloroethylene)	All processes directly or indirectly linked to the production steps direct chlorination, oxychlorination and EDC cracking to VCM are included	yes	0,204

Phenol/acetone	Sum of phenol, acetone and the by-product alpha-methyl styrene as total production	All processes directly or indirectly linked to the production of phenol and acetone are included, in particular air compression, hydroperoxidation, cumene recovery from spent air, concentration and cleavage, production fractionation and purification, tar cracking, acetophenone recovery and purification, AMS recovery for export, AMS hydrogenation for ISB recycle, initial waste water purification (first waste water stripper), cooling water generation (e.g. cooling towers), cooling water utilisation (circulation pumps), flare and incinerators (even if physically located OSB) as well as any support fuel consumption	yes	0,266
S-PVC	Polyvinyl chloride; not mixed with any other substances consisting of PVC particles with a mean size between 50 and 200 µm	All processes directly or indirectly linked to the production of S-PVC are included except the production of VCM	yes	0,085
E-PVC	Polyvinyl chloride; not mixed with any other substances consisting of PVC particles with a mean size between 0,1 and 3 µm	All processes directly or indirectly linked to the production of E-PVC are included except the production of VCM	yes	0,238
Soda ash	Disodium carbonate as total gross production except dense soda ash obtained as by-product in a caprolactam production network	All processes directly or indirectly linked to the process units brine purification, limestone calcination and milk of lime production, absorption of ammonia, precipitation of $NaHCO_3$, filtration or Separation of $NaHCO_3$ crystals from mother liquor, decomposition of $NaHCO_3$ to Na_2CO_3, recovery of ammonia and densification or production of dense soda ash are included	yes	0,843