Attachment 2a - Life Cycle Assessment - Data and Data Sources for Kodak i2800, i2600, i2400 Scanners

(base weight is for i2800 and i2600 which have the same components. For most components the i2400 has the same weight as i2800 except where noted)

Raw Materials/Subcomponents

Data Use	Data Name	Data Description	Data Source	Weight of Raw Material (grams)
Composite Subcomponents				
Wiring and cables	Cable, connector for computer, without plugs, at plant/GLO U	Production of typical computer electrical cable	Ecoinvent	703
External power supply/adapter (adjusted proportionally by weight)	Power adapter, for laptop, at Plant/GLO U	Production of labtop power adapter	Ecoinvent	228
Printed wiring boards	Printed wiring board, power supply unit desktop PC, Pb free, at plant/GLO U	Component input and production efforts (incl. PWB waste) for the production of a PWB used in the power supply unit of a desktop PC, using Pb-free solder material.	Ecoinvent	139
Metal Components				
Steel component material	Steel, low-alloyed, at plant/RER U	Mix of steels with hot rolling	Ecoinvent	2111
Steel component manufacturing	Steel product manufacturing,	Conversion of steel to	Ecoinvent	2111

	average metal working/RER U	manufactured product		
Copper component material	Copper, primary, at refinery/RAS U	Conversion of ore to cathode copper	Ecoinvent	28.5
Copper component manufacturing	Copper product manufacturing, average metal working/RER U	Conversion of copper to manufactured product	Ecoinvent	28.5
Neodymium component material	Silver, at regional storage/RER U	Mix of silver production from scrap and mines	Ecoinvent	2.42
Imaging Components				
Mirror Glass	Flat glass, coated, at plant/RER U	Production of mirror type glass	Ecoinvent	107
LED	Light emitting diode, LED, at plant/GLO U	Hole through mounting LED production	Ecoinvent	4 – i2800, 0- i2400
Protective glass	Flat glass, uncoated, at plant/RER U	Flat glass production	Ecoinvent	87
Camera lens (surrogate)	LCD glass, at plant/GLO U	LCD flat glass production	Ecoinvent	17 -i2800, 13 – i2400
LCD module	LCD module, at plant/GLO U	Production of LCD module with 15 inch screen	Ecoinvent	12.1
Plastic Components				
Conversion of plastic material into plastic components	Injection moulding/RER U	Conversion of plastic material into injection molded parts	Ecoinvent	2870
Acrylonitrile-butadiene-styrene copolymer component material	Acrylonitrile-butadiene-styrene copolymer, ABS, at plant/RER U	ABS production to delivery to plant	Ecoinvent	2088
Polycarbonate component material	Polycarbonate, at plant/RER U	Polycarbonate production to delivery to plant	Ecoinvent	549
Polymethyl	Polymethyl	Polymethyl	Ecoinvent	6 – i2800,

methacrylate component material	methacrylate, beads, at plant/RER U	methacrylate production to delivery to plant		0 – i2400
Polyurethane component material	Polyurethane, flexible foam, at plant/RER U	Polyurethane production to delivery to plant	Ecoinvent	2
Polystyrene component material	Polystyrene, high impact, HIPS, at plant/RER U	Polystyrene production to delivery to plant	Ecoinvent	1.5
Glass fibre plastic filler component material	Glass fibre, at plant/RER U	Glass fibre production to delivery to plant	Ecoinvent	138
Carbon fiber plastic filler component material	Carbon and graphite products 4.9 kg/$	Carbon fiber production to delivery to plant	US Input Output data	72
Polyethylene component material	Polyethylene low density granulate (PE-LD), production mix, at plant RER	Polyethylene production to delivery to plant	Ecoinvent	0.3
Nylon component material	Nylon 6, at plant/RER U	Production of Nylon 6	Ecoinvent	18 –i2800 20- i2400
Packaging				
Corrugated packaging	Corrugated board, mixed fibre, single wall, at plant/CH U	Production of corrugated sheets and board	Ecoinvent	1300
Polyethylene packaging	LDPE resin E	LDPE production	Industry Data 2.0	44
Polystyrene packaging	Polystyrene, expandable, at plant/RER U	Polystyrene production	Ecoinvent	266
Shipping Pallets	Dry rough lumber, at kiln, US SE/US	Conversion of green wood into dry lumber including kiln drying	US Life Cycle Inventory	460
Information sheets, Labels	Paper, wood-containing, LWC, at regional storage, /RER U	Impact of paper production and transport to regional distribution	Ecoinvent	301- i2800, 291 – i2400

Rollers				
Synthetic rubber component material,	Synthetic rubber, at plant/RER U	Synthetic rubber production to delivery to plant	Ecoinvent	23
Polypropylene component material,	Polypropylene, granulate, at plant/RER U	Polypropylene production to delivery to plant	Ecoinvent	4
Conversion of plastic material into plastic components	Injection moulding/RER U	Conversion of plastic material into injection molded parts	Ecoinvent	27
Roller Packaging				
Corrugated packaging	Corrugated board, mixed fibre, single wall, at plant/CH U	Production of corrugated sheets and board	Ecoinvent	63.6
Polyethylene packaging	LDPE resin E	LDPE production	Industry Data 2.0	14
Labels	Paper, wood-containing, LWC, at regional storage, /RER U	Impact of paper production and transport to regional distribution	Ecoinvent	0.6
Miscellaneous small components				
Silicon component	Silicon, multi Si, casted, at plant/RER U	Gate to gate impact of off-grade Si	Ecoinvent	7.6
Cloth component	Textile, woven cotten at plant, GLO U	Textile production, weaving impact	Ecoinvent	3.2

Manufacturing/Assembly

Data Use	Data Name	Data Description	Data Source	Data Value
Electricity consumed during assembly	Electrical consumption	KWH	Kodak Assembly Plant	4.1
*Electricity Impact	Electricity. Low voltage at grid/ CN U	Includes production mix and line losses (KWH)	Ecoinvent	4.1
Water used during assembly	Water consumption	kg	Kodak Assembly Plant	23
Water Impact	Tap water at user/CH U	Water treatment and transport to user (kg)	Ecoinvent	23
Material in Product	Bill of Materials	Component weights and material composition	Kodak Engineering	See Raw Materials/Subcomponents
Material in Waste	Waste Fraction	Waste Data as fraction of Product produced	Kodak Assembly Plant	1 % of materials/subcomponents was added and included in raw materials

*See electricity sheet in Attachment 2b for production mix. See below for detailed description of data sources

Transportation – Data Values vary with Scenario and are shown in Attachment 2b

Data Use	Data Name	Data Description	Data Source
Transport weight	Bill of Materials	Total Shipping weight including packaging and shipping pallets	Kodak Engineering
Scanner Transport Distance	Average shipping distance	Calculated based on 2010 regional sales figures of similar model and representative location in each region	Kodak marketing
Raw material and subcomponent	Estimated averaging shipping distance	500 miles	Estimated by Kodak Logistics based on

Transport distance			component and manufacturing location
Scanner air transport	Transport, aircraft, freight, intercontinental/RER U	Includes full life cycle for ship operation, maintenance and construction including port contribution	Ecoinvent
Scanner ocean transport	Transport, transoceanic freight ship/OCE U	Includes full life cycle for plane operation, maintenance and construction including airport contribution	Ecoinvent
Scanner land transport	Transport, lorry >28t, fleet average/CH U	Includes full life cycle for truck operation, maintenance and construction including road contribution	Ecoinvent

Use - Data Values vary with Scenario and are shown in Attachment 2b

Data Use	Data Name	Data Description	Data Source
Electricity consumed during use	Electrical consumption	KWH based on average consumer scan, sleep and off times and measured consumption in each state	Kodak Digital Imaging Division
*Electricity Impact for the Americas customers	Electricity, low voltage, at grid/US U	Includes production mix and line losses	Ecoinvent
*Electricity Impact for Aisan customers	Electricity. Low voltage at grid/ CN U	Includes production mix and line losses	Ecoinvent
*Electricity Impact for the European, Middle East, and African customers	Electricity, low voltage, at grid/DE U	Includes production mix and line losses	Ecoinvent

*See electricity sheet in Attachment 2b for production mix. See below for detailed description of data sources

EOL

Data Use	Data Name	Data Description	Data Source	Data Values
End of Life Disposition of Scanner and packaging	Durable goods waste scenario /US U	Mix of dispositions based on average US durable goods (See Life Cycle Inventory Data #16 in report body for detail on EOL fates)	EPA, Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006. www.epa.gov/osw/nonhaz/municipal/pubs/msw06.pdf.	Raw materials/subcomponent weights
End of Life Disposition of Rollers when replaced	Non-Durable goods waste scenario /US U	Mix of dispositions based on average US non-durable goods (See Life Cycle Inventory Data #17 in report body for detail on EOL fates)	EPA, Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2006. www.epa.gov/osw/nonhaz/municipal/pubs/msw06.pdf.	Roller and packaging weight – see Attachment 2b for number of roller replacements

Simapro Abbreviations and Explanations

- Ecoinvent is a large database that collects life cycle data and is independent of Simapro, but is the largest database available in Simapro.
- U – unit level process that provides the full supply chain data (not S, which provides aggregated data that does not break out the supply chain)
- CN - China
- GLO - Global
- LWC – Lightweight coated paper
- RER - Europe
- CH – Switzerland
- RAS – Asia and the Pacific
- LDPE – Low-density polyethylene
- DE- Germany

Electricity Impact Data From Ecoinvent

US - From Simapro Description

Translated name: Strom, Niederspannung, ab Netz
Included processes: This dataset describes the transmission of low voltage electricity. Included are electricity losses and direct SF6 emissions to air as well as the grid infrastructure.
Remark: Total electricity losses of 7%, 13%, and 80% at high, medium, and low voltage level, respectively, are approximately assumed along with Swiss data. US data are used for quantification of SF6 emissions; Swiss data are used for electricity grid infrastructure requirement.; Geography: Total losses are based on data from the US, whereas the brakdown of losses to the three voltage levels is based on Swiss data and own assumptions. Attribution to the three voltage levels of electricity uses in different economy sectors is done along the shares used for Switzerland. SF6-emission factors are based on official US publications.
Technology: Average technology used to transmit and distribute electricity. Includes underground and overhead lines.
Version: 2.2
Energy values: Undefined
Local category: Elektrizität
Local subcategory: Versorgungsmix
Source file: 06683.XML

China - From Simapro Description

Translated name: Strom, Niederspannung, ab Netz
Included processes: Low voltage supply mix is identical to production mix at low voltage grid (no import/export assumed). Dataset modelled on the basis of equivalent European datasets.
Remark: Supply mix is identical to production mix at low voltage grid. Dataset modelled on the basis of equivalent European datasets, where calculation of losses follows the same scheme. Chinese total (no voltage level) losses percent from 2004 IEA statistics.; Geography: Approximate country-specific estimation of losses based on ecoinvent approach. Rest is from estimation for Europe.
Technology: Unspecified.
Version: 2.2
Energy values: Net values
Local category: Elektrizität
Local subcategory: Versorgungsmix
Source file: 06680.XML
Translated name: Strommix, Produktion CN
Included processes: Production mix at busbar is identical to supply mix, i.e.e no import/export assumed. Dataset includes contributions from individual sources. Factors are from CN statistics 2005.

Remark: Production mix at busbar is identical to supply mix, i.e.e no import/export assumed. Of contributions from individual sources, only hard coal and nuclear have been described with CN-specific energy chains whereas the others are modelled with European datasets. Uncertainty factors somewhat consider also these approximations, besides the uncertainly on the percent contribution to total mix itself.; Geography: Country-specific factors.
Technology: Unspecified.
Version: 2.2
Energy values: Net values
Local category: Elektrizität
Local subcategory: Erzeugungsmix
Source file: 06689.XML

Germany - From Simapro Description

Translated name: Strom, Niederspannung, ab Netz
Included processes: Included are the electricity production in Germany and from imports, the transmission network as well as direct SF6-emissions to air. Electricity losses during low-voltage transmission and transformation from medium-voltage are accounted for.
Remark: This dataset describes the transformation from medium to low voltage as well as the distribution of electricity at low voltage.; Geography: Data apply to public and self producers. Geographical classification according to IEA. Assumptions for transmission network, losses and emissions are based on Swiss data.
Technology: Average technology used to distribute electricity. Includes underground and overhead lines, as well as air- and SF6-insulated medium-to-low voltage switching stations. Electricity production according to related datasets
Time period: Time of publications.
Version: 2.2
Energy values: Undefined
Percent representativeness: 100.0
Production volume: 319 TWh
Local category: Elektrizität
Local subcategory: Versorgungsmix
Source file: 00761.XML