FUJITSU

Product Life Cycle Assessment 2021

Fujitsu ESPRIMO P9010 Desktop PC

Climate change is one of the most important global challenges that society of the 21st century faces. According to the Intergovernmental Panel on Climate Change (IPCC), it is necessary to limit the average temperature to two degrees towards the pre-industrial level in order to minimize the risks of global warming. This means that Greenhouse gas emissions, which are the main reason for climate change, have to be reduced by at least 80% by 2050 as compared to 1990. The rapidly developing ICT industry, whose products now dominate almost all aspects of daily life, can help to reach this target.

Fujitsu's Environmental Philosophy and Mission

Since its foundation in 1935, Fujitsu has made environmental conservation one of the company's top management priorities, based on the principle of "operating in harmony with nature." Recognizing our mission as a global ICT company, we promote environmental management with the commitment of top management under the "Sustainability Management Committee" chaired by the president. We are also building an environmental management system (EMS) based on the ISO 14001 international standard in order to implement environmental activities throughout the Fujitsu Group.

The Fujitsu Group has established the “FUJITSU Climate and Energy Vision,” a medium- to long-term environmental vision with the goal of bringing the Fujitsu Group’s CO2 emissions to zero by 2050, as well as contributing to the achievement of a decarbonized society and the adaptation to climate change. We also support and participate in international initiatives on de-carbonization and climate change, setting medium- and long-term targets for GHG emissions and the use of renewable energy.

We aim to contribute to achieving the 1.5°C climate change goal of the Paris Agreement and also to resolving environmental challenges, through such measures as developing innovative solutions that make effective use of resources.

In August 2017, the reduction targets of greenhouse gas (GHG) emissions from its business facilities and a part of value chain, set by Fujitsu Group, was approved by Science Based Targets (SBT) initiative as being at science based level. The SBT initiative was established in 2015 jointly by a number of organizations, including the World Resources Institute (WRI) and UN Global Compact. It encourages companies to set GHG emission reduction targets consistent with science-based evidence to the level required by the Paris Agreement, validating targets that comply with criteria including indirect emissions not only within the company but also in the supply chain.
Targets :
- To reduce GHG emissions from our business facilities by 71.4% by FY 2030 and 80% by FY 2050 in comparison to FY 2013.

- To reduce GHG emissions from our business value chain (purchased goods and services, and the use of sold products) by 30% by FY 2030 in comparison to FY 2013.

In July 2018, Fujitsu joined RE100, which strives to significantly expand the adoption of renewable energy at a global scale, as Japan's first Gold Member. RE100 is an international initiative led by The Climate Group in partnership with CDP and consists of companies committed to source 100% of the electricity they use from renewable sources.

The Fujitsu Group will consider the appropriate steps for each region and expand its procurement of electricity from renewable sources at locations in Japan and around the world, starting with data centers outside Japan. The Group will concurrently continue its work on R&D and technology trials for energy management and storage, and contribute to the spread of renewable energy in society as a whole.

Renewable Energy Electricity Usage Goals at Fujitsu Group Locations

- Goal : 100% by 2050
- Intermediate Goal : 40% by 2030

The Fujitsu Group introduced the Green Product Evaluation System in 1998 to enhance the development of environmentally friendly designs. Since then, we have been implementing LCA when developing new products and utilizing it to further improve the environmental design of our products. For some of our products, we are also working toward obtaining environmental labels such as EcoLeaf and the Electronic Product Environmental Assessment Tool (EPEAT) by making use of our internal product LCA initiatives.

As products become increasingly service-oriented and more and more cloud-based businesses using the IoT appear, society's needs with regard to sharing have grown, and there is increased pressure to consider the Circular Economy (CE) from a policy perspective. In particular, by developing sharing services and other such services, we can contribute to the Circular Economy by promoting the reuse, refurbishing, and remanufacturing of parts, as this enables maintenance during use and collection after use to be performed more efficiently. For these reasons, in the 2019 fiscal year, we began examining the effects of servicizing green products with environmentally friendly designs, regarding them as products that support services.

To understand whether providing services reduces environmental impact and where the trade-offs lie in a society where sharing is becoming more widespread, the Fujitsu Group is working together with related servicizing departments to conduct LCA for services as functional units. For example, in the 2019 fiscal year, we estimated the effectiveness of cloud services for servers by comparing them to on-premises software. When servers were consolidated in a cloud data center, server operation and data processing were found to be more efficient than when using on-premises software. Furthermore, resource consumption and waste were estimated to be reduced due to highly efficient resource recovery achieved by reusing (refurbished) parts for maintenance and recycling after use. We learned that not only do these initiatives reduce CO_2 emissions, but also helps reduce resource-related environmental impacts. We will continue to practice LCA for various servicizing efforts and use it to identify LCA issues in servicizing, to consider circular product design with a focus on the point of use in order to transition services to low-carbon and circular systems, and to form business models. We anticipate that the shift towards sharing and cloud computing will continue to accelerate, and we aim to contribute to Goal 12 of the SDGs by helping to build a sustainable society by providing services (functions) that conserve energy and resources and achieve sustainable business.

We use ICT systems for the preparation and registration of Product Environmental Green Assessments and LCAs. We use these systems to centrally manage information on aspects of environmentally conscious design related to legal and regulatory compliance; materials and chemical content of purchased components; efforts to make products smaller, lighter, or more energy efficient; ease of recycling and dismantling.

Already in 2010 Fujitsu has done a LCA for the FUJITSU DESKTOP ESPRIMO E9900 and in 2018 for FUJITSU DESKTOP ESPRIMO P9010 together with the bifa environmental institute (www.bifa.de) based on the international standards ISO 14040 and ISO 14044. The LCA underwent a critical review by the Fraunhofer Institute for Reliability and Microintegration (www.izm.fraunhofer.de). Same partners are assigned for a new LCA and critical review in 2021.

Impact categories of LCA

The following impact categories have been selected in order to assess the environmental performance.

Impact Category	Impact assessment model	Unit
Climate change (GWP 100)	IPPC [IPPC 2013]	kg CO_2 equivalents
Acidification (AP)	CML 20016 [Guinée 2002], [CML 2016]	kg SO_2 equivalents
Particular Matter	RiskPoll Model [Rabl 2004]	kg PM 2,5 equivalents
Eutrophication (EP)	CML 2016	kg PO_4 equivalents
Photochemical oxidation (POCP)	CML 2016	kg C_2H_4 equivalents
Ozone layer depletion (OPD)	CML 2016	kg R11 equivalents
Primary Energy Demand	Primary energy demand from renewable and non-renewable resources (net cal. Value)	kJ
Resource Depletion – mineral, fossil (ADP)	CML 2016	kg Sb equivalents
Resource Depletion – Water	Swiss Ecoscarcity [Frischknecht 2008]	m^3 H_2O equivalents

Table 1: selected impact categories for LCA

Selected System for LCA

The selected system Fujitsu ESPRIMO P9010 is a reliable, power saving Microtower, which is available in different power supply versions and certified for EPEAT, TCO and Energy Star.

Figure 1: Microtower ESPRIMO P9010

Product specification of ESPRIMO P9010

- Microtower housing with Platinum Power Supply Unit (PSU)
- Motherboard with Intel® Core™ processor incl. heat sink
- 2 x 4 GB DDR4 RAM modules
- 1 TB Hard Disk Drive (HDD)
- 512 GB Solid State Drive (SSD) M.2 Module
- Super multi Optical Disk Drive (ODD)
- Graphic card incl. heat sink
- Microsoft® Windows® 10 Professional operating system

Sections of LCA

The life cycle of the examined ESPRIMO P9010, including mouse, keyboard, manuals and packing, covers the following sections:

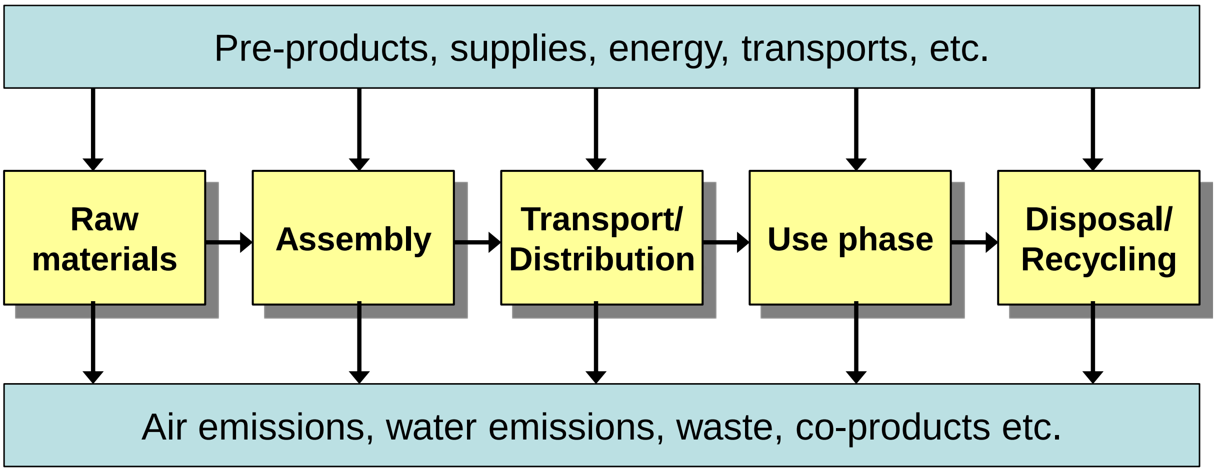


Figure 2: Section of the LCA

Raw Materials:
Include extractions, treatment, supply of raw materials, manufacturing of subassemblies and the energy consumption of all these processes.

The following components have been taken into account:

- Chassis, power supply
- Mainboard components and printed circuit board including assembly in Augsburg
- Processor (CPU), processor cooler, memory, graphic card incl. heat sink
- Hard disk drive (HDD), optical disk drive (ODD), Solid State disk (SSD, M.2 module)
- Cable, mouse, keyboard
- Manuals, packaging

Desktop assembly:

Desktop assembly in Brno at Czech Republic plant includes:

- Energy supply
- Scrap and waste management
- Plug-in components
- Complete accessories
- Installation software
- System test

Transport/Distribution:

Almost all routes have been considered including the transport of:

- Subassemblies from manufacturing in China to assembly in Brno at Czech Republic by ship and airplane respectively.
- Desktops from assembly plant in Czech to the distribution center in Germany by large truck and after that to the customer by van and car respectively
- Desktops from the customer to the place of collection by car and following to nearest dismantling facility by mid-sized truck

Use phase:

The following definition of the use phase is determined by:

- An average lifetime of 5 years
- Typical annual energy consumption
  - 101.69 kWh/year for maximum configuration calculated for Energy Star 8.0 certification (based on worst-case power supply Gold).
  - 33.0 kWh/year for standard configuration based on Energy Star 8.0 calculation in terms of sensitive analyses.
- Use phase of the desktop in Germany and for comparison in France, Poland and Norway in terms of sensitivity analyses (country specific energy mix).
- Spare parts: processor, memory, mainboard, optical disk drive, hard disk drive, power supply, keyboard (in relation to total failure rates).

Recycling:

The following conditions are assumed:

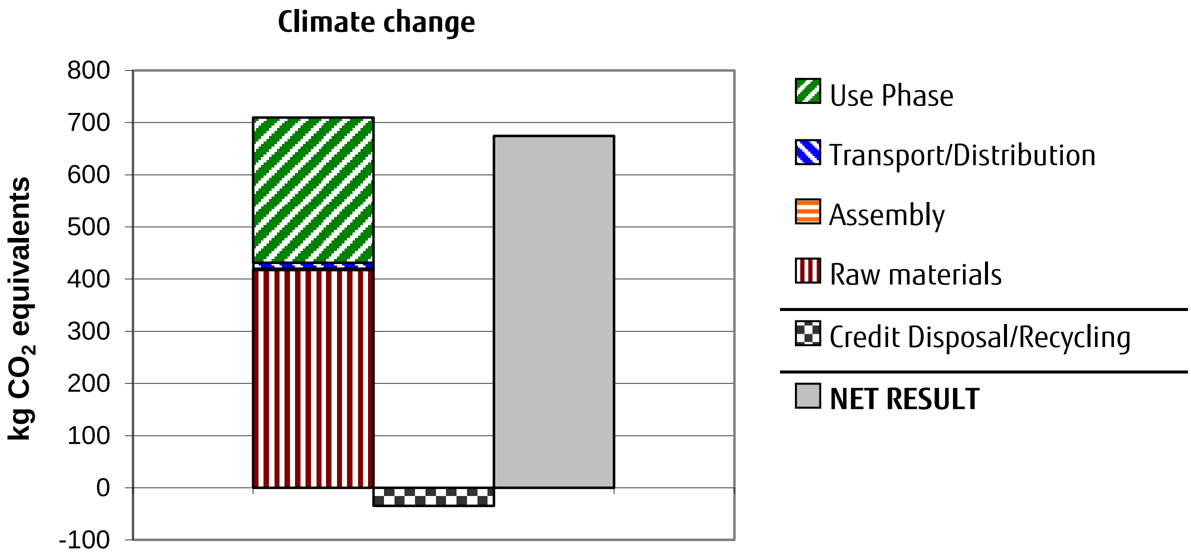
- Recycling rate including thermal recovery: >98% by weight
- The desktop is recycled after the anticipated lifetime of 5 years
- No components are reused or resold (assumption only!)
- Dismantling process in recycling center almost exclusively by hand
- Main material and components: iron, aluminum, copper, plastics, power supply, printed circuit boards, cable
- Additional recycling of keyboard, mouse, packaging and manuals is considered

Results of LCA

1. Climate change (greenhouse effect) - Product Carbon Footprint of the ESPRIMO P9010

The greenhouse gas (GHG) emissions have been identified as the most relevant indicator for environmental performance. The results of the calculation were used to assign the product carbon footprint over its entire life cycle. The product carbon footprint includes the contribution of GHG emissions to global warming in kg of CO_2 equivalents (CO_2eq).
In a sensitivity analysis of the use phase, the footprint of the system was also assessed for several countries (France, Poland and Norway) because of the different energy mixes, which have a big impact on the carbon footprint of the product. The total amount of carbon emissions comprises mainly the use phase and the raw materials. The greenhouse gas emissions resulting from the use phase are caused exclusively by energy consumption during the use of the product. The replacement of spare parts has almost no influence on the results.

At Figure 3 the net result in the amount of total **675 kg CO_2 equivalents** is determined by the use phase and the raw materials. Emissions of transport/distribution play a minor role and emissions of assembly contribute less than 1 % to the net result. The effect of disposal/recycling credits is small with a reduction of about 5 %.



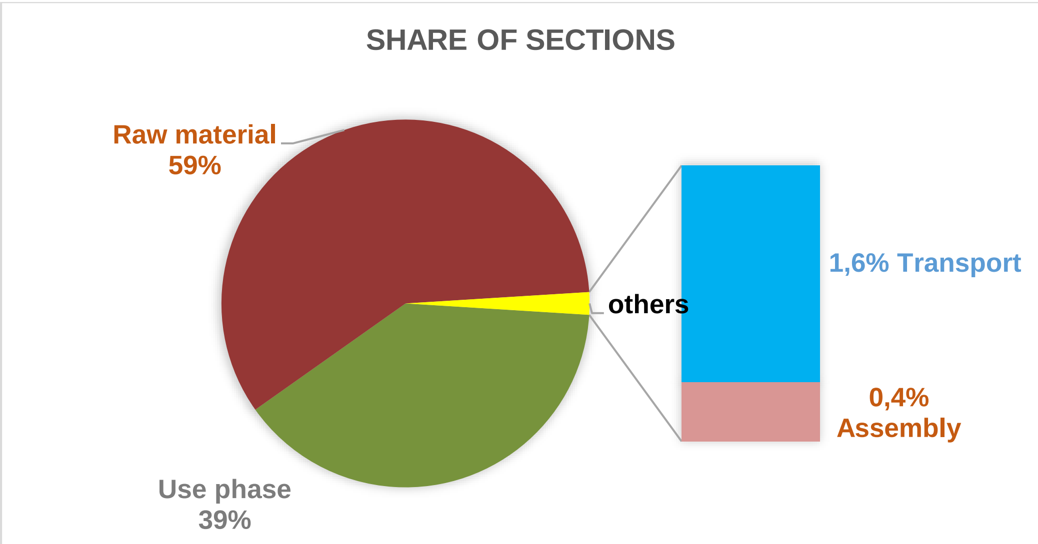


Figure 3a and 3b: Global warming potential for one unit of ESPRIMO P9010 and share of sections (share without offsetting the "avoided" emission of recycling)

The amounts are:

- Use phase : 278 kg CO_2 equivalents
- Raw materials : 417 kg CO_2 equivalents
- Transport/Distribution : 11 kg CO_2 equivalents
- Assembly : 3 kg CO_2 equivalents
- Credit Disposal/Recycling : -35 kg CO_2 equivalents

The emissions, mainly carbon dioxide, resulting from raw materials primarily originate from the production of SSD and graphic card as well as from the production of mainboard components. The largest quantities occur from the production of wafer for integrated circuits, the production processes for electronic components and wiring board material as well as from power generation for all production processes

The figure 4 shows the share of raw material with the main impact of 512GB SSD M.2 module.

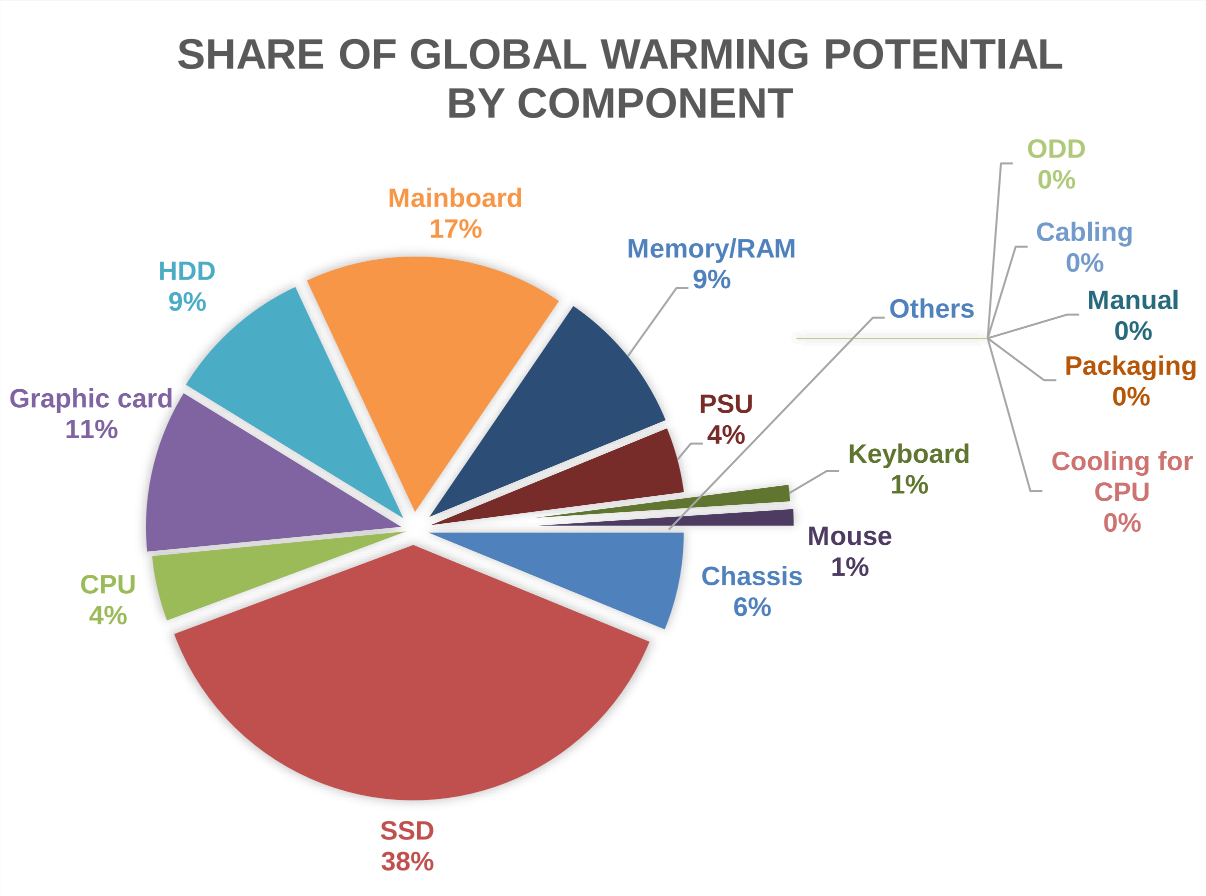


Figure 4: Share of global warming potential by component (raw material); elements displayed 0% are less than 1%

The emissions resulting from the use phase are caused by the energy supply. Replacement of spare parts has almost no influence on the use phase result.
The emissions, mainly carbon dioxide, resulting from raw materials primarily originate from the production of SSD and graphic card as well as from the production of mainboard components.
The largest quantities occur from the production of wafer for integrated circuits, the production processes for electronic components and wiring board material as well as from power generation for all production processes.

The first part of the transport model contains the transport from suppliers to assembly in Brno. Almost all pre-products are produced in Asia, particularly in China. High value components such as CPU or HDD are delivered by plane. Components of high volume such as chassis or PSU are transported by ship. The second part of the transport model contains the delivery of assembled desktops to customers.

The third part of the transport model contains the transport of desktops to recycling at the end of life. At first, the desktop is transported to a place of collection usually located in the immediate vicinity. When a sufficient amount is collected the desktops are transported to the nearest dismantling facility.

Through the reuse of resources in recycling center in Paderborn, the environmental impact of products can be reduced. This includes electricity and heat from incineration and secondary raw materials from recycling. These "avoided" impacts are balanced out and credited to the environmental impacts of the respective product.

<u>Results of sensitivity analysis: Use phase with different energy mix</u>

For the base scenario, use of desktop in Germany is applied. For a sensitivity analysis, results are derived if using the desktop in France, Poland and Norway. This means that the German electricity mix for energy supply in use phase has been replaced by 3 different electricity mix. All differences between the electricity mixes are shown in Table 2.

Fuel	German electricity mix (time period 2017)	French electricity mix (time period 2017)	Polish electricity mix (time period 2017)	Norwegian electricity mix (time period 2017)
Lignite	22.8%	-	30.6 %	-
Hard coal	14.2 %	2.3 %	46.4 %	< 0.1 %
Nuclear power	11.7 %	71.0 %	-	-
Natural gas	13.4 %	7.2 %	5.9 %	1.7 %
Wind power	16.2 %	4.4 %	8.8 %	2 %
Photovoltaic	5.1 %	1.7 %	< 0.1 %	-
Biogas	5.3 %	< 0.5 %	0.6 %	< 0.1 %
Hydropower	4.0 %	9.9 %	1.8 %	95.9 %
Waste	2.0 %	0.8 %	0.2 %	0.3 %
Biomass	1.6 %	0.6 %	3.1 %	< 0.1 %
Coal gas	1.8 %	< 0.5 %	1.3 %	< 0.1 %
Heavy fuel oil	0.9 %	1.3 %	1.2 %	< 0.1 %
Peat	< 0.5 %	-	-	-
Geothermal power	< 0.5 %	-	-	-
Solar thermal power	< 0.5 %	-	-	-

Table 2: Used energy mix for sensitive analyses (sphera 2021)

If the ESPRIMO P9010 is used in Germany with its electricity mix split between 5 main sources causes approximately a total amount of 675 kg CO_2eq over its lifetime of 5 years. For the sensitivity analysis, results are derived if using the desktop in other countries.

Sensitive Analyses France
German electricity mix for energy supply in use phase has been replaced by French electricity mix with predominantly nuclear power. This result in a total amount of 445kg CO_2eq for France electricity mix. Changes in the composition of electricity mix (in this case mostly nuclear power) as well as country-specific differences in supply of fuels, power plant technology and exhaust air treatment result in a reduced environmental burden, except in the cases of depletion of abiotic resources and ozone layer depletion. Sb and R11 equivalents remain unchanged whereas the results of all other impact categories are reduced between 2 % and 57 %. All changes are a result of use phase only.

Sensitive Analyses Poland
The German electricity mix for energy supply in use phase has been replaced by Polish electricity mix with predominantly coal power plants. The electricity mix of Poland with a higher share of lignite and coal results in approximately 893 kg CO_2eq.

Sensitive Analyses Norway
the German electricity mix for energy supply in use phase has been replaced by Norwegian electricity mix with predominantly hydropower.
With approximately 411 kg CO_2eq, the usage of the desktop in Norway also has a lower footprint because of its considerable proportion of renewable energy.

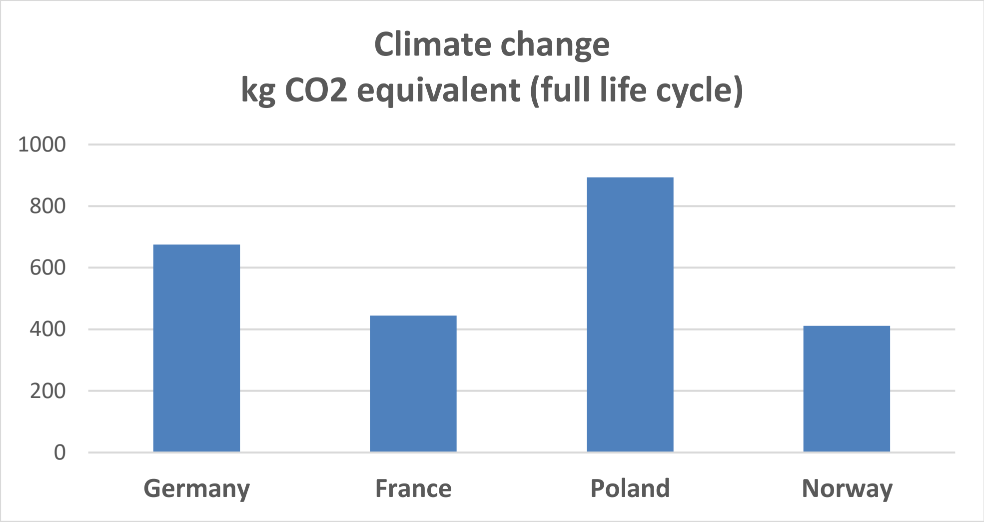


Figure 5: Total Global warming potential of one ESPRIMO P9010 for usage in different countries with specific energy mix (sensitive analyses)

These results show that the use phase and, therefore, the total amount of the carbon footprint depend highly on the energy supply/energy mix of the power generation in the respective country.

Results of sensitivity analysis: Standard configuration without graphic card

Fujitsu offers with the ESPRIMO P9010 a selection of different components. The power consumption measurement for Energy Star certification has to be measured with maximum possible configuration with maximum power consumption. These values are used for the LCA analyses to show the maximum impact.

These Energy Star configuration results in highest power consumptions which normally not be used on customer side. Therefor Fujitsu offers more realistic power consumption in addition with their "White paper power consumption".
Link: https://sp.ts.fujitsu.com/dmsp/Publications/public/wp-ENERGY-STAR-8-ESPRIMO-P9010.pdf

For the ESPRIMO P9010 with a standard configuration (Platinum PSU, Intel Core i7, 2x4GB, M.2 SSD, ODD, Windows 10) the power consumption is 33.0kWh/year only.
The reduced power consumption during the use phase results in a reduced environmental burden. The climate change impact decreases from 675 to 444 kg CO_2-eq which is a reduction of 231 kg CO2 equivalents (- 26 %). All changes are mainly result of use phase and partly of raw materials. The reductions of transport/ distribution and end of life are marginal.

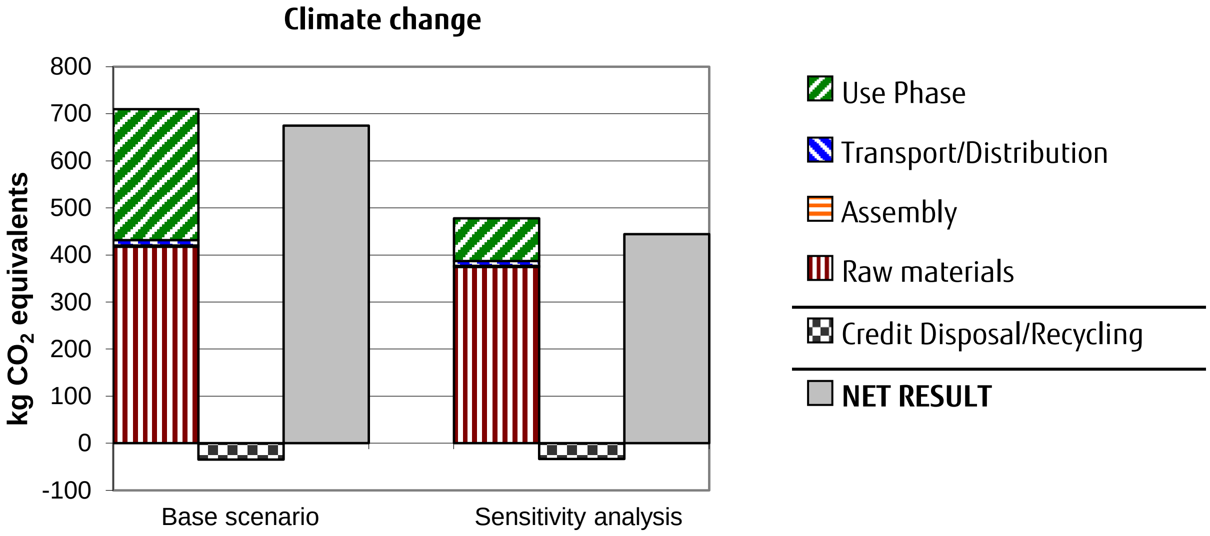


Figure 6: Global warming potential for one ESPRIMO P9010 of base scenario and sensitivity analysis (desktop PC without separate graphic card and adapted power consumption in use phase)

2. Other impact categories of LCA

The Greenhouse effect is the most intensely discussed environmental impact category. Nevertheless, Fujitsu is also aware of other environmental effects. The contributions of life cycle phases to emissions of all investigated impact categories are summarised in figure 7.

Impact Category	**Raw Materials**	**Assembly**	**Transport/ Distribution**	**Use Phase**
Greenhouse effect	**59 %**	< 1 %	2 %	**39 %**
Acidification	**86 %**	< 1 %	2 %	**12 %**
Particulate matter	**96 %**	< 1 %	1 %	3 %
Eutrophication	**97 %**	< 1 %	< 1 %	3 %
Photochemical oxidants formation	**87 %**	< 1 %	2 %	**11 %**
Ozone layer depletion	**97 %**	< 1 %	3 %	< 1 %
Cumulative energy demand	**55 %**	< 1 %	1 %	**44 %**
Depletion of abiotic resources	**99 %**	< 1 %	< 1 %	< 1 %
Water consumption	**20 %**	< 1 %	< 1 %	**80 %**

Figure 7: Contributions of life cycle phases to investigated impact categories (environmental burden without credit disposal/recycling)

The net results are determined by the use phase and the raw materials. Furthermore, for eutrophication and for depletion of abiotic resources the environmental burdens are significantly reduced by about 18 % and 27 % as a result of credits from recycling processes. The effect of disposal/recycling credits of the other impact categories is up to 10 %.

2.1 Cumulative primary energy demand in detail

Primary energy demand is often difficult to determine due to the various types of energy source. Primary energy demand is the quantity of energy directly withdrawn from the hydrosphere, atmosphere or geosphere or energy source without any anthropogenic change. For fossil fuels and uranium, this would be the amount of resource withdrawn expressed in its energy equivalent (i.e. the energy content of the raw material). It is important that the end energy (e.g. 1 kWh of electricity) and the primary energy used are not

miscalculated with each other; otherwise, the efficiency for production or supply of the end energy will not be accounted for.
The total Primary energy consumption renewable and non-renewable resources are given in GJ.

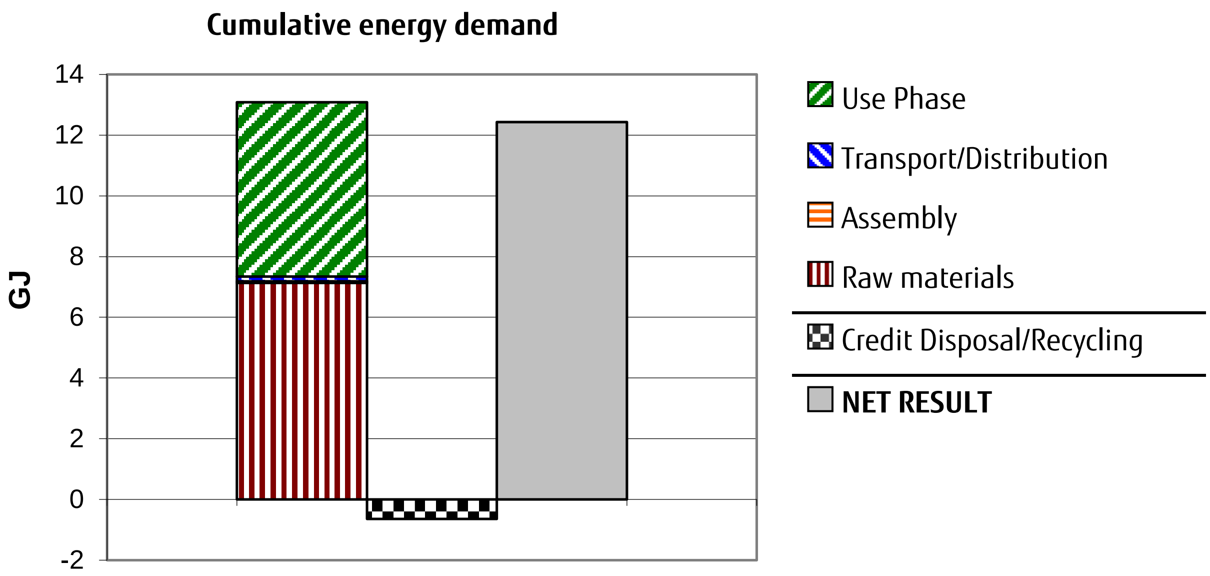


Figure 8: Cumulative energy demand for one desktop

The net result in the amount of total **12.4 GJ CED** is mainly determined by the use phase and the raw materials. Emissions of transport/distribution play a minor role and emissions of assembly contribute approximately 1 % to the net result. The effect of disposal/recycling credits is small with a reduction of about 5 %. The amounts are:

The amounts are:

- Use phase : 5.7 GJ
- Raw materials : 7.1 GJ
- Transport/Distribution : 0.2 GJ
- Assembly : < 0.1 GJ
- Credit Disposal/Recycling : - 0.6 GJ

The energy demand resulting from the use phase is caused by the energy supply. Replace-ment of spare parts has almost no influence on the use phase result.

The energy demand resulting from raw materials primarily originates from the production of SSD and graphic card as well as from the production of mainboard components. Responsible are mainly the use of non-renewable energy resources for electricity consumption and during the production of wafer for integrated circuits.

2.2 Water consumption in detail

In comparison to resource depletion of abiotic resources, water is treated as a separate issue, as it has many unique properties that make the problem of water availability very different (e.g. quality, regional factors). Water resource use weighting is based on the water pressure index published by OECD.

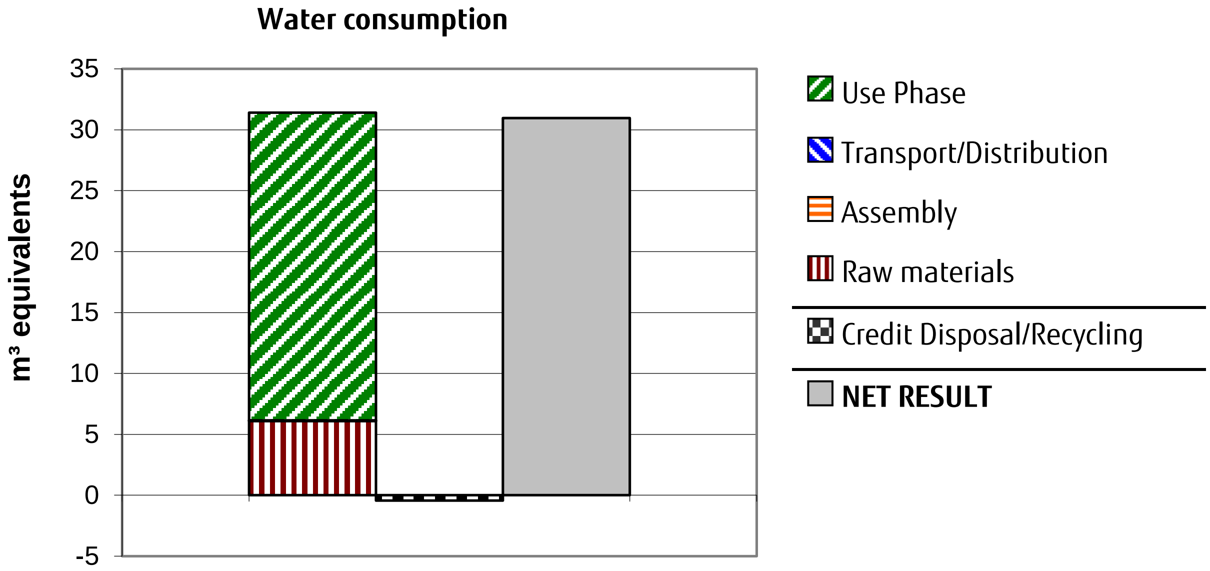


Figure 9: Water consumption for one ESPRIMO P9010

The net result in the amount of total 31.0 m³ equivalents is mainly determined by the use phase and the raw materials. Resources for transport/distribution and assembly together contribute less than 1 % to the net result. The effect of disposal/recycling credits is also small with a reduction potential of well 1 %.
The amounts are:

- Use phase : 25.3 m³ equivalents
- Raw materials : 6.1 m³ equivalents
- Assembly : 0.03 m³ equivalents
- Transport/Distribution : 0.02 m³ equivalents
- Credit Disposal/Recycling : - 0.44 m³ equivalents

The water consumption resulting from the use phase is caused by the energy supply. Re-placement of spare parts has almost no influence on the use phase result.

The water consumption resulting from raw materials primarily originates from the production of SSD and graphic card as well as from the production of mainboard components. Responsible are mainly unspecified water used for energy consumption and the production of wafer.

3. Measures of Fujitsu

Raw material
Emissions resulting from raw materials primarily originate from the production of SSD (wafer), mainboard (components and printed circuit board), graphic card, RAM module (memory), and power supply unit. Responsible is mainly the energy supply in upstream processes of these components. Although the influence of Fujitsu is limited, the high environmental impact especially of wafer production will continuously be addressed to the suppliers by quarterly supplier meetings and improvements are checked by supplier questionnaires.

Assembly/ manufacturing
Fujitsu will force the supplier to increase the usage of renewable energy to reduce the environmental impact. There is a significant influence of a higher share of transport by airplane on the greenhouse effect. Better forecast accuracy will help to reduce the transport by airplane.

Transport/ distribution
In order to reduce the environmental impact associated with transport, Fujitsu is working to reduce its CO_2eq emissions through modal shifts, promoting the effective utilization of railroad and sea transportation and reducing the proportion of air transport.
Additionally, we are promoting reduce, reuse and recycle efforts for packing products and parts in order to reduce the environmental burden of the distribution process.

Use phase
Main area to reduce the Product Carbon Footprint is the use phase; in this section, the biggest savings of emissions are possible. In order to reduce the energy consumption of the products, we focus on developing and producing energy efficient products like small desktops, Mini PCs and thin clients. Offering systems with high efficient power supplies more than required by Energy Star certification will help to reduce the power consumption in general. In addition, we give our customers recommendations on how to reduce the footprint of their product and thereby take an active part in climate protection.

Recycling
Disposal and recycling are of high importance for the reduction of Eutrophication and of depletion of abiotic resources.
Furthermore, high quality recycling enables the use of secondary materials already in production and thus the closing of material cycles. The use of secondary material will substitutes primary material and consequently leads to reduced environmental bur-dens in the sector raw material in all impact categories.
The more Fujitsu desktops are brought into high quality recycling processes, the higher is the environmental effect.
The increase of postconsumer recycling material share will help to improve this situation.
In accordance with the concept of Extended Producer Responsibility (EPR), the Fujitsu Group carries out recycling programs that comply with the waste disposal and recycling laws and regulations of the various countries in which it operates. We also try to carry out as much collection, reuse and recycling as we can in countries where recycling is not obligatory keeping in line with the concept of Individual Producer Responsibility (IPR). http://ts.fujitsu.com/recycling

4. Lessons learned

The calculation of absolute and comparable values for all the impact categories of a life cycle analyses and especially for product carbon footprint during the entire life cycle of a product is not possible especially for the intention of a product-to-product comparison.
Following items beside fast changes of portfolio in ICT have influence

- high effort for data collection and analyses of complete supply chain
- different geographies, configurations, services and customers
- multiple database with different content and consistency

Nevertheless, Fujitsu has attained a good transparency concerning CO_2eq -emissions along the entire value chain of the product in order to identify potential for additional reduction of emissions.

Differences compare to LCA 2018 of ESPRIMO P957

Using the successor of the former system gives a chance to try to compare former and new LCA. Although the values are not 100% comparable, the calculation is showing a trend to be decreasing, mainly by lower power consumption and changed electricity mix.
Changed/ updated values in the used database has influence on the calculated criteria. In some cases, the result shows higher values in other cases lower, for example CO_2 equivalents.

CO_2 equivalents	ESPRIMO P957 (2018)	ESPRIMO P9010 (2021)
Use phase	503 kg CO_2 eq	278 kg CO_2 eq
Raw material	449 kg CO_2 eq	417 kg CO_2 eq
Transport/Distribution	22 kg CO_2 eq	11 kg CO_2 eq
Assembly	2 kg CO_2 eq	3 kg CO_2 eq
Credit Disposal/Recycling	-15 kg CO_2 eq	-35 kg CO_2 eq

The database for calculation has changed for example the changes of electricity mix in Germany.

Fuel	German electricity mix (time period 2014)	German electricity mix (time period 2017)
Lignite	25%	22.8%
Hard coal	19%	14.2%
Nuclear power	16%	11.7%
Natural Gas	10%	13.4%
Wind power	9%	16.2%

The power consumption of the system is reduced but at same time the measurement/ calculation of Energy Star has changed (Energy Star Version 6.1 versus version 8.0)
ESPRIMO P957 in 2018 159.2 kWh/year for maximum configuration
ESPRIMO P9010 in 2021 101,69 kWh/year for maximum configuration

The assembly location has changed too and the used energy mix and power consumption is different.
In case of credit disposal/ recycling, there was an update of database especially for Gold, which has influence on resource depletion and the primary energy values.

Further insights:

- Continue activities for further improvement of the energy efficiency of the desktop PC.

- Intensify information for users regarding their possibilities to reduce the energy consumption in use phase.

- Avoid sole focus on energy efficiency of desktop PC although use phase is a key factor in the greenhouse effect as raw materials are a key factor for several other impact categories.

- Continue communication with suppliers about their possibilities to reduce environmental loads. New technologies with high-integrated components like memory and SDD have big influence on climatic impact.

- Continue and spread intensive recycling activities because recycling provides important positive effects in aquatic eutrophication and toxic and eco-toxic parameters.

- Due to the significant influence of a high proportion of transport by airplane, we keep in mind that it is advantageous for the environment to perform assembly close to the end user.

- Politics in Germany and Europe as other regions too, focus on enhancing the share of renewable energy in energy mixes. With higher share of renewable energy, the influence of the use phase on net results of impact categories will decrease. Therefore, in a mid- to long-term perspective the importance of non-use life cycle phases will rise. The sensitivity analysis with a use phase in Norway may be taken as a view into this future. Here, the raw material contribute over 90 % to the total greenhouse effect. For use in Norway, the influence of transport/distribution is also much higher than for a use phase in Germany.