The role of the ICT sector toward decarbonization

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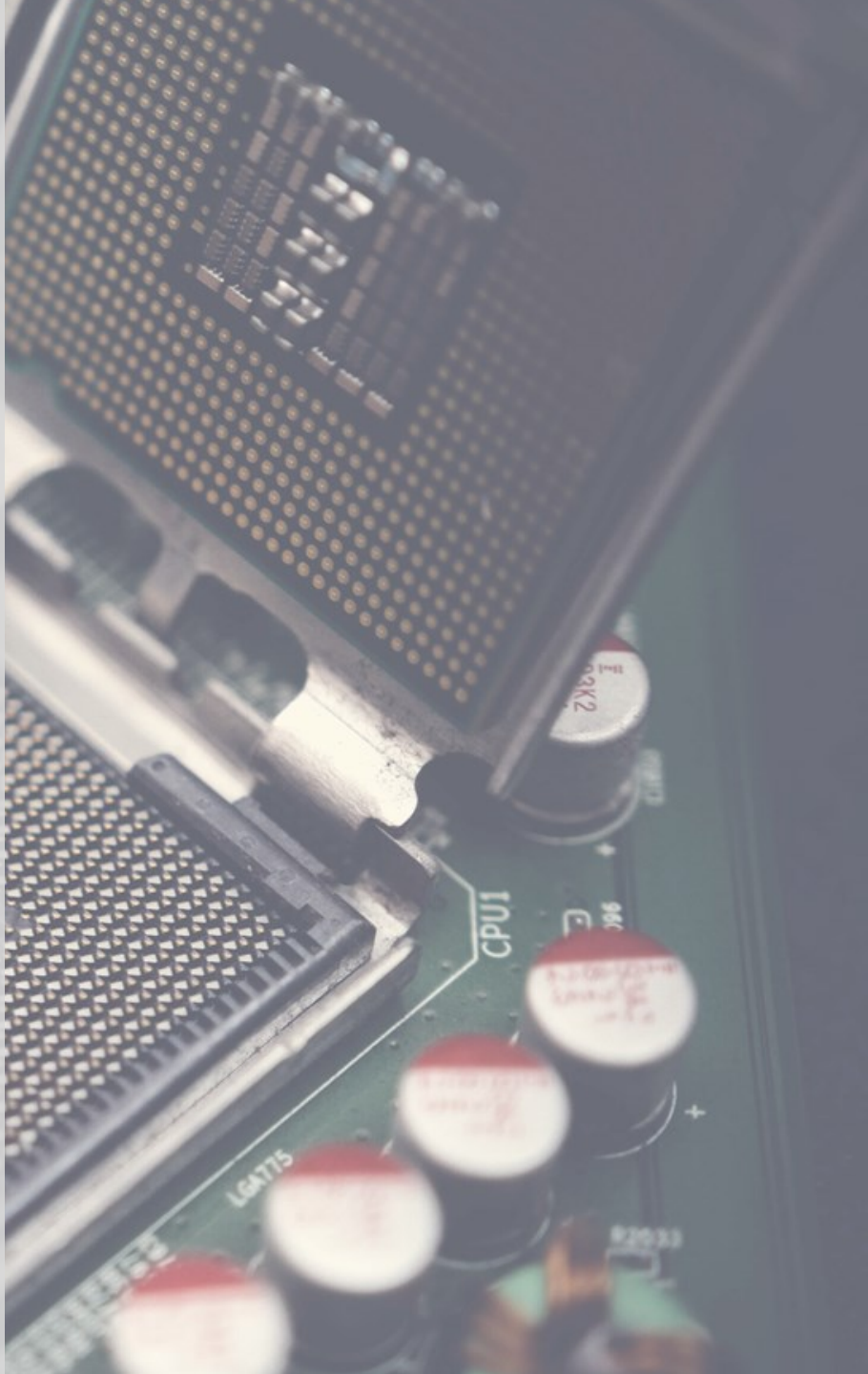

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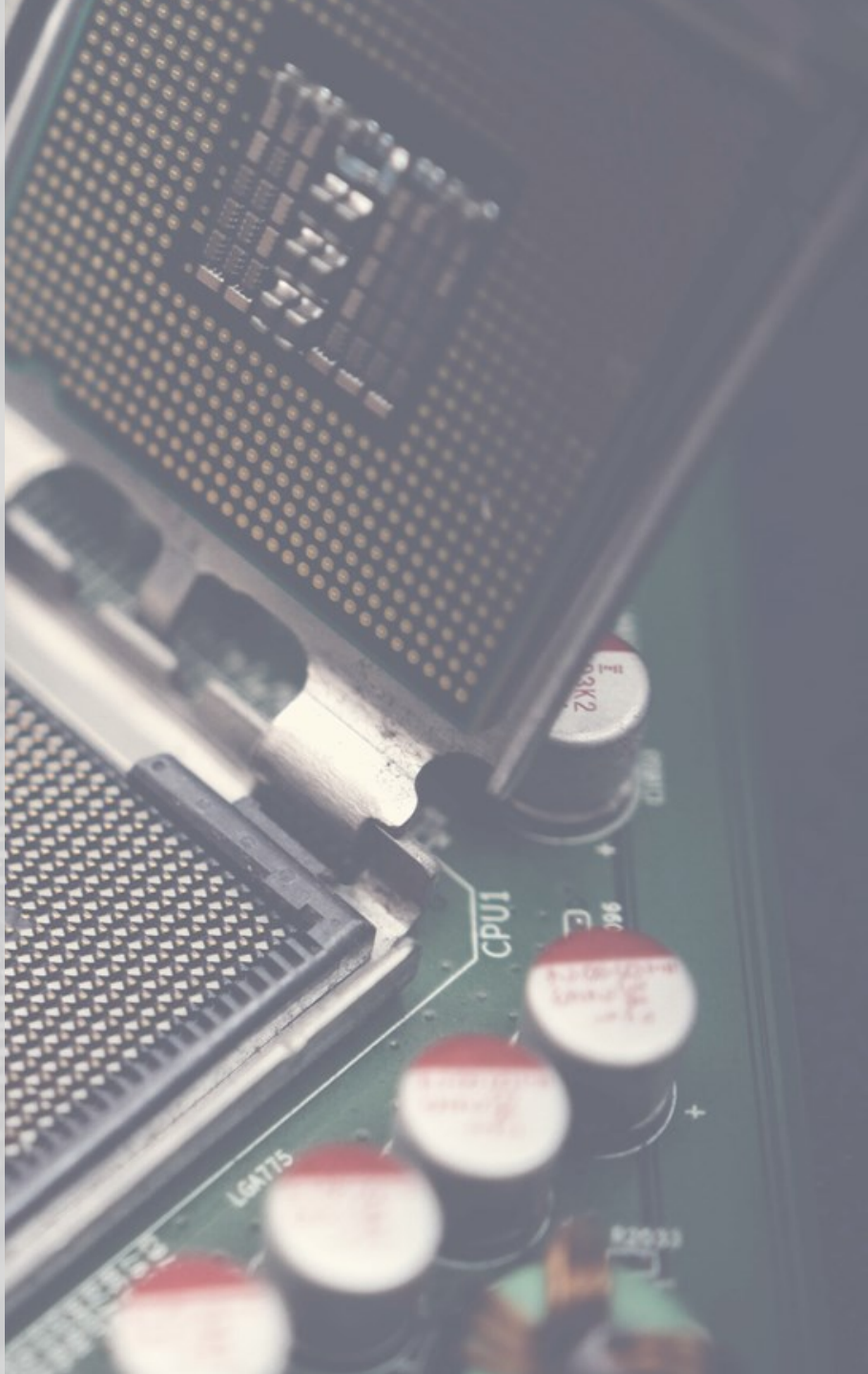


The business cycle of **ICT products and the related GHG emissions** can be divided into **three different categories**:

01

Embodied

Emissions released from the extraction of raw materials and during the **manufacturing process**

Operational

Use or operational emissions (from energy use and maintenance of ICT Systems)

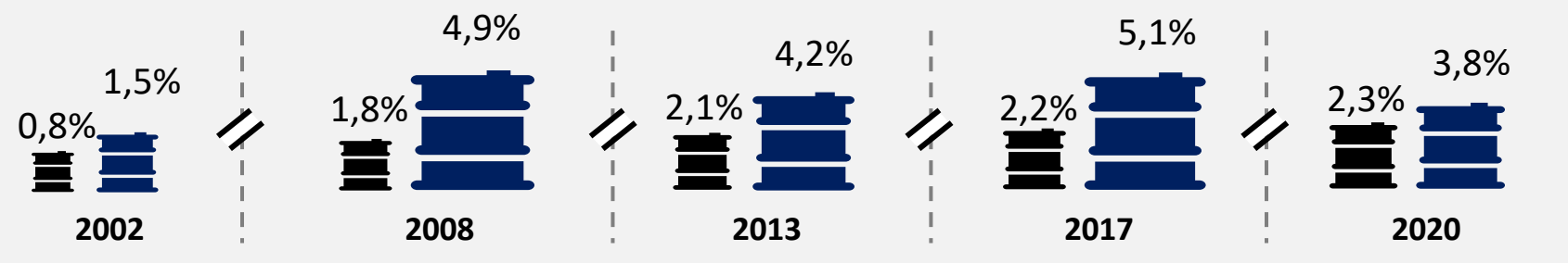
02

03

Disposal

Emission bound to the disposal of the devices

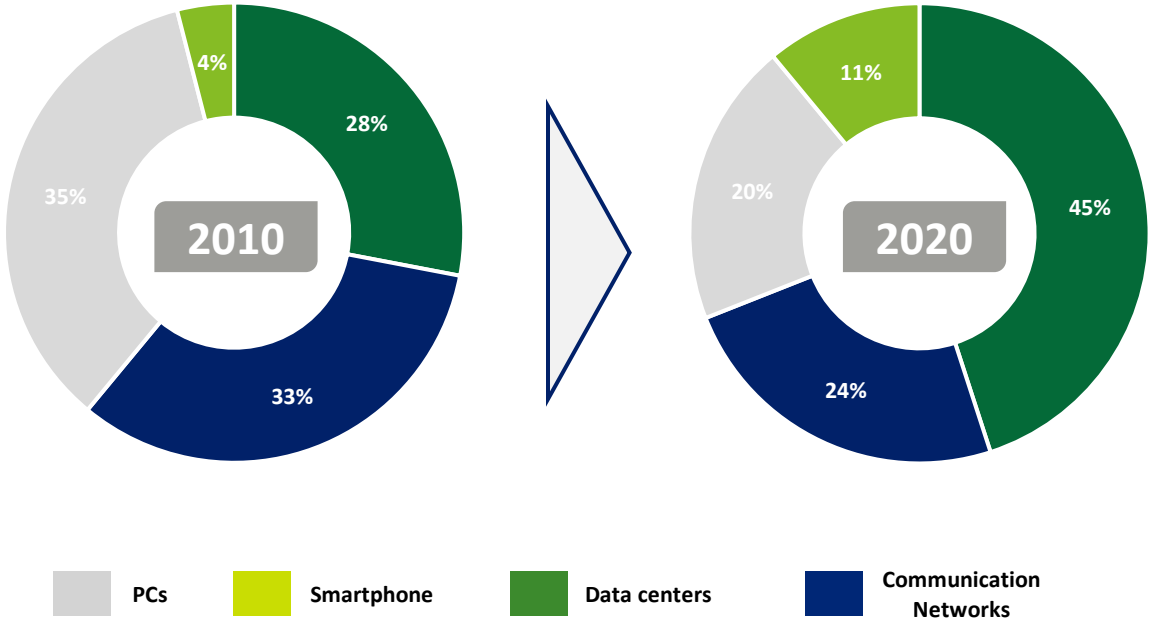
The **ICT sector** has seen a massive and **substantial growth** in the last **70 years**. **ICT** is now so significant that there is an increasing awareness regarding its **environmental impact**.



It is inferred a growing trend of ICT sector's emissions compared to Total GHG emissions.

Increases YoY in GHG emissions % (Total GHG emissions vs ICT sector)

Relative Contribution of ICT categories by GHG emissions (2010 vs 2020)



***The leftmost pie chart represents** the **ICT sector GHG's emissions in 2010 while the rightmost one is related to 2020**.*

*In this decade, it's noticeable a huge increase of the **data centers** and **smartphones** in the contribution of **ICT overall emissions**.*

Source: UNEP DTU partnership, UN environment programme, DTU – "Greenhouse gas emissions in the ICT sector – Trend and methodologies"

No mitigating actions scenario

If there would not be implemented any **restraining action**, considering as a reference the emissions of 2023, the **ICT sector will double** its emission by **2030.** This assuming that:

Efficiency

Slowdown in Moore's law* and consequent plateau in energy consumption.

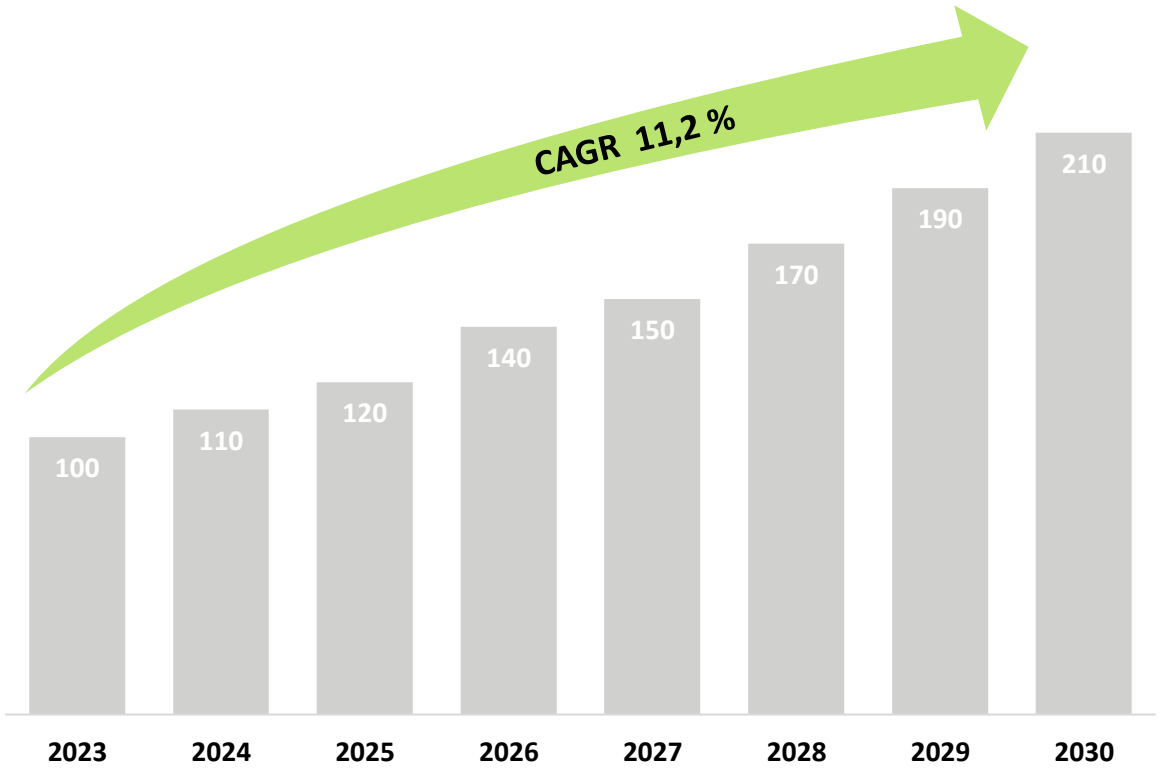
Policy

The lack of sectorwide policies, such as incentives and compliance mechanisms could delay the decarbonization process.

Behaviors

Users' habits conflicting with replacement devices capable of being more efficient.

ICT Greenhouse Gas Emissions



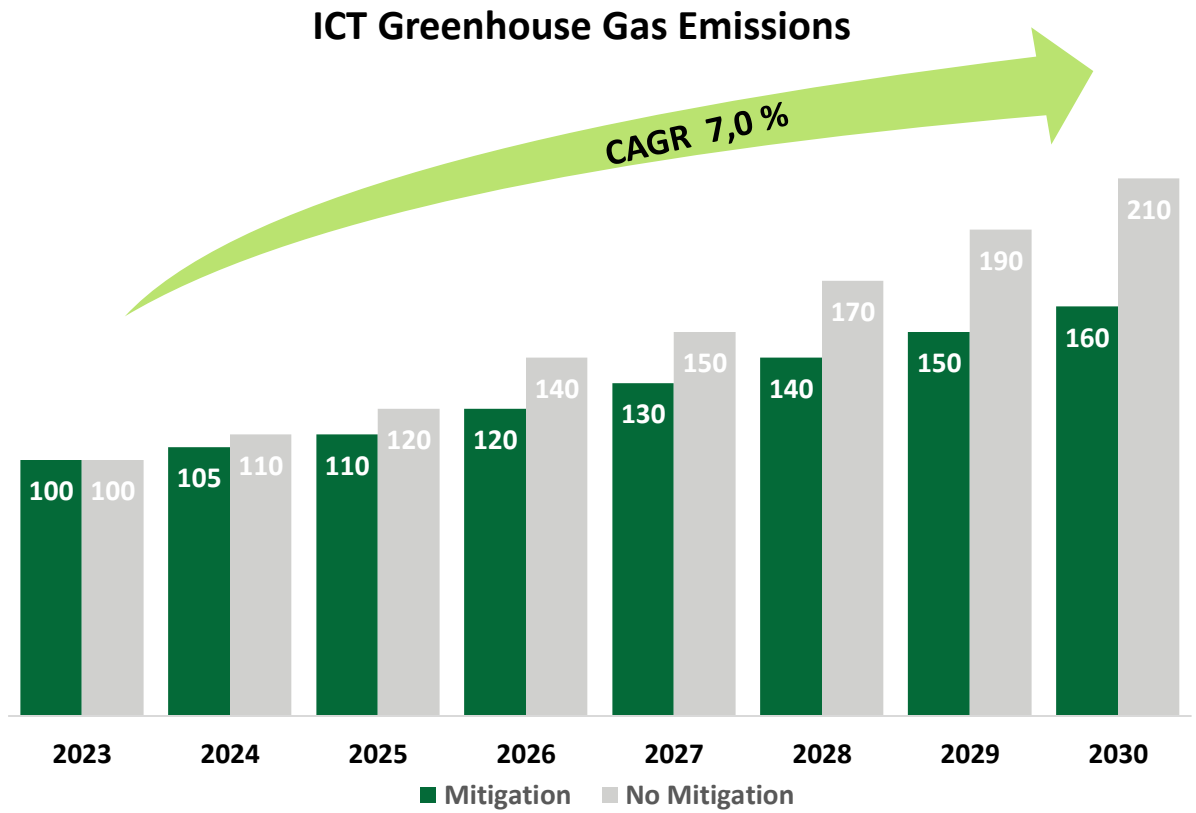
Source: Deloitte elaboration on L. Belkhir, A. Elmeligi, "Assessing ICT global emissions footprint: Trends to 2040 & recommendations", 2018.

(*) *Moore's electronic circuit efficiency law according to which: Every 18 months there is a doubling of the number of transistors, resistances and capacitors in integrated circuits (including microprocessors) and this allows a decrease in terms of consumption and an increase in efficiency.*

Mitigating actions scenario

The estimates presented here reflect the impact of **mitigating actions** that can have an **outcome** on the **production of CO_2** related to the ICT sector, including:

Efficiency	Policy	Behaviors
Moore's law continues to resonate. Lower power consumption and higher performance.	**Fulfilment of targets related to the main climate agreements (Paris 2030, COP26).**	**Resorting of the repair market. Reduction of multi-device behaviour.**



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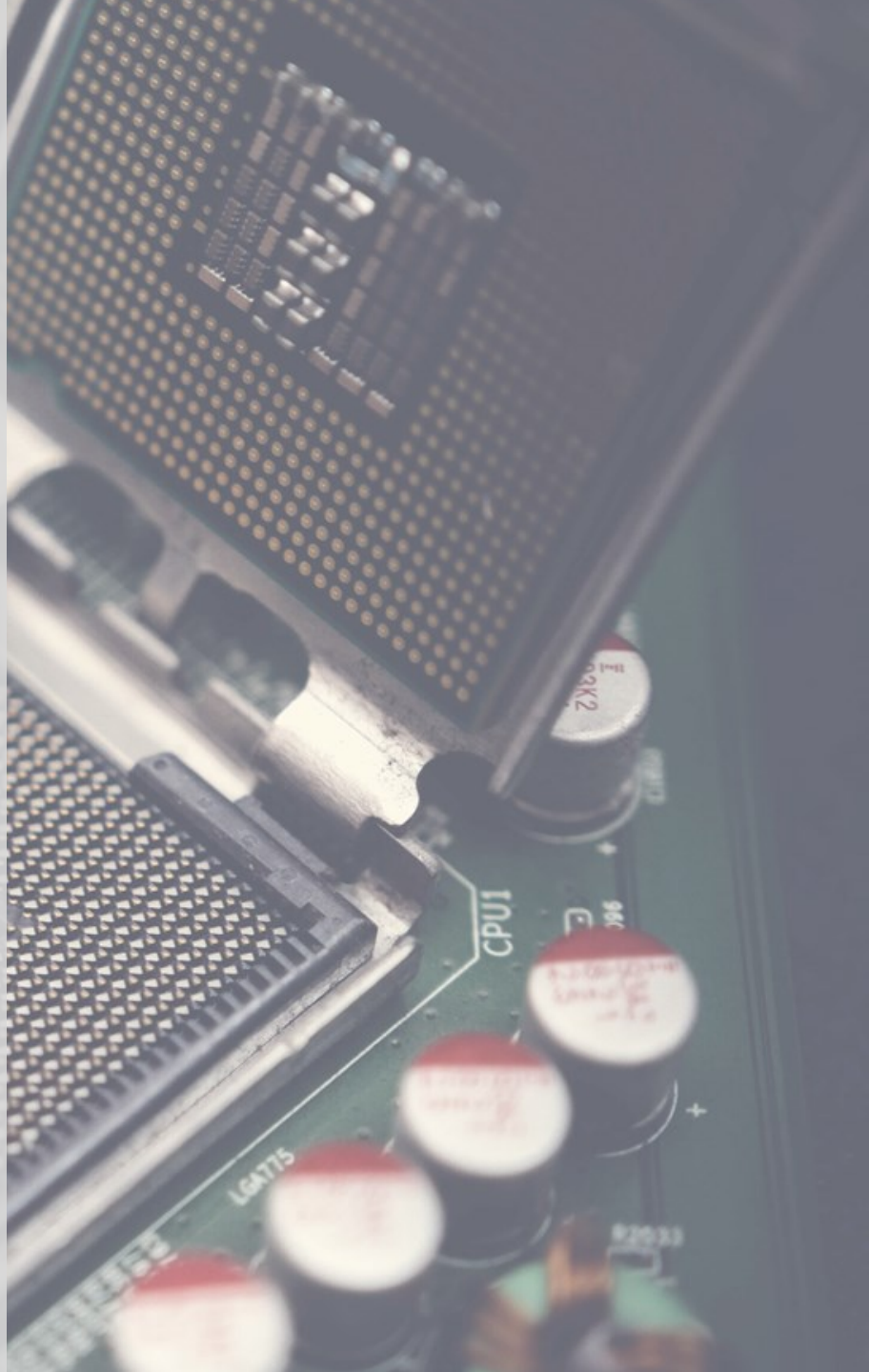
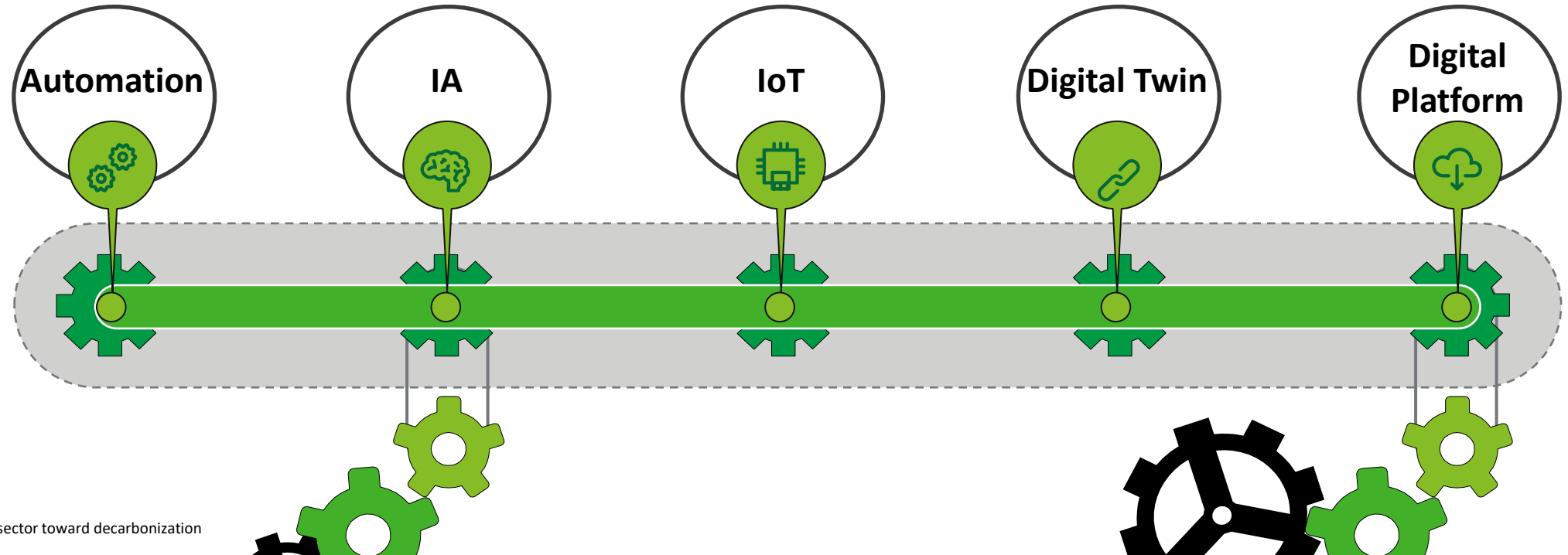


ICT impact on other sectors

*"**ICT permeates the world economy** from **retail** (ecommerce) to **transportation** (automated vehicles), **education** (Massive Open Online Courses), **health** (electronic records and personalised medicine), **social interactions** and personal relationships (social networks)."*

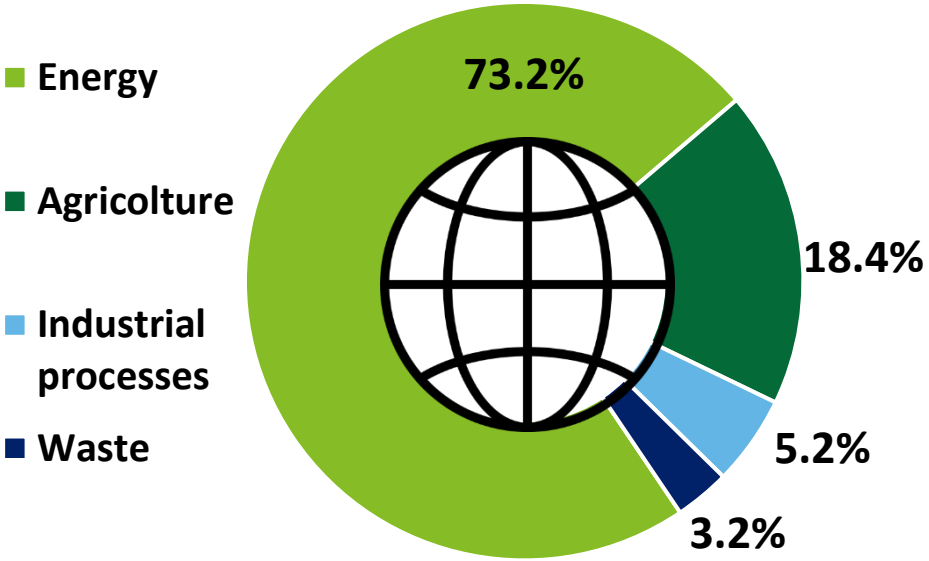
- EFEB NETWORK, SMEs and the Digital Economy, "Digital knowledge base and ICT market"

It is possible to estimate the **positive impact of the ICT sector** on **decarbonisation** by understanding what **kind of applications ICT can unleash for other sectors** in terms of GHG emission reductions**.**

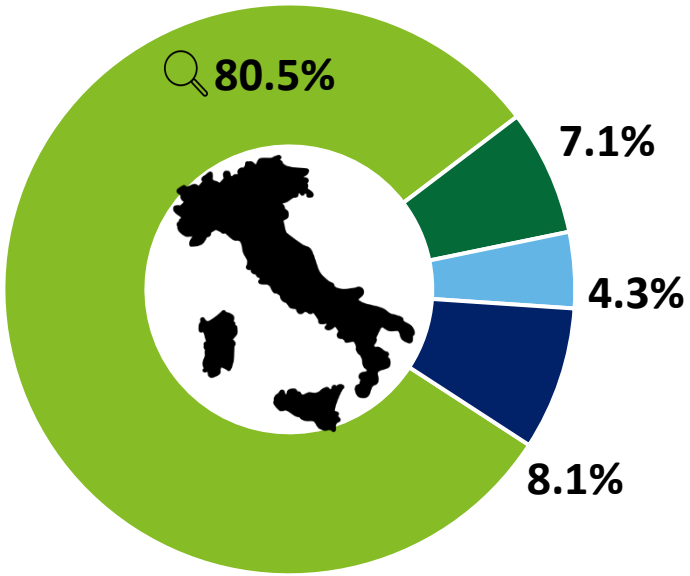


Globally, the **largest sectors** in terms of **GHG emissions** are mainly: *i)* **fossil-based energy;** and *ii)* **agriculture**. As well for the **Italian market** the sectors that contribute the most in terms of GHG emissions is the **Energy** one with 80,5%, which can be divided into **sub-components reflecting sub-sectors.**

World GHG Emission by sector*



Italy GHG Emission by sector*



Digital transformation *is the key enabler for higher* ***productivity levels, savings and an enabler of the green revolution****, as it can dematerialize, measure and improve processes (****energy****,* ***industrial*** *and* ***family consumption****)**.

Italian energy emissions by:*

Production	Transport	Manufacturing	Services	Family	Others
16,1%	23,4%	7,4%	6,2%	11,5%	16,1%

(*)The European House – Ambrosetti, "Verso una net zero society", 2021

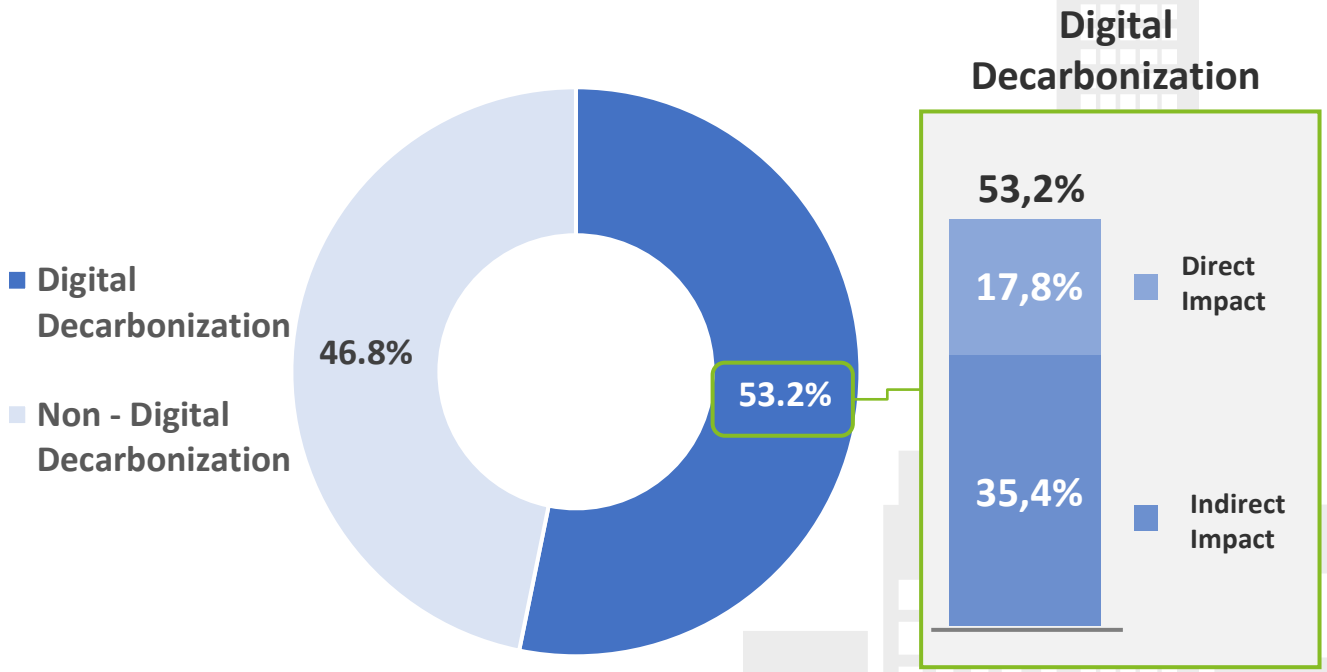
For each sector, ICT systems may reduce GHG emissions.

Sector	Transport	Industrial Processes	Manufacturing	Family
Possible Applications	1 Smart cities 2 Mobility as a service 3 **Driving assistance**	1 **Reduction in fugitive emissions**	1 **Process optimisation**	1 **Household energy consumption management**
Application example	Use of data for **monitoring and improving driving styles** with **less** impact on **fuel consumption**.	**Reduction** of **emissions** thanks to the ability to monitor and maintain plants through **data analysis**.	**Reduction of energy consumption** through the adoption of **monitoring data** to **improve production processes**.	Increased **domestic energy efficiency** through the adoption of **smart metering** and **remote control**.

For each sector, ICT systems may reduce GHG emissions.

Sector	Production	Services	Agriculture	Waste
Possible Applications	1 **Smart grid** 2 Optimisation 3 Monitoring dispatchability	1 **Cloud and IT Infrastructure**	1 Precision agriculture 2 **Industry 4.0**	1 **Circular economy platform**
Application example	**Contribution of digital** to **modulation** of consumption **loads and consequent reduction of energy peaks;**	Improved **energy consumption** by moving from **on-premise** to **cloud infrastructure**;	**Soil** and **air analysis** and monitoring for **efficient water use**;	**Increased material lifecycle** and reusability **through digital platforms**;

Below it is reported the contribution of **Digital Technology** to the climate **decarbonization process in Italy** by **2050***:



Digital technology with its direct and indirect contribution (i.e. impulses towards other **technologies, processes and infrastructures)** will be responsible for **53,2% of total emissions reduction, with** a **greater importance** to the **decarbonization** than **non-digital** (**46,8%).**

Digital technology will be one of the main weapons in the fight against climate change.

(*)The European House – Ambrosetti, "Verso una net zero society", 2021
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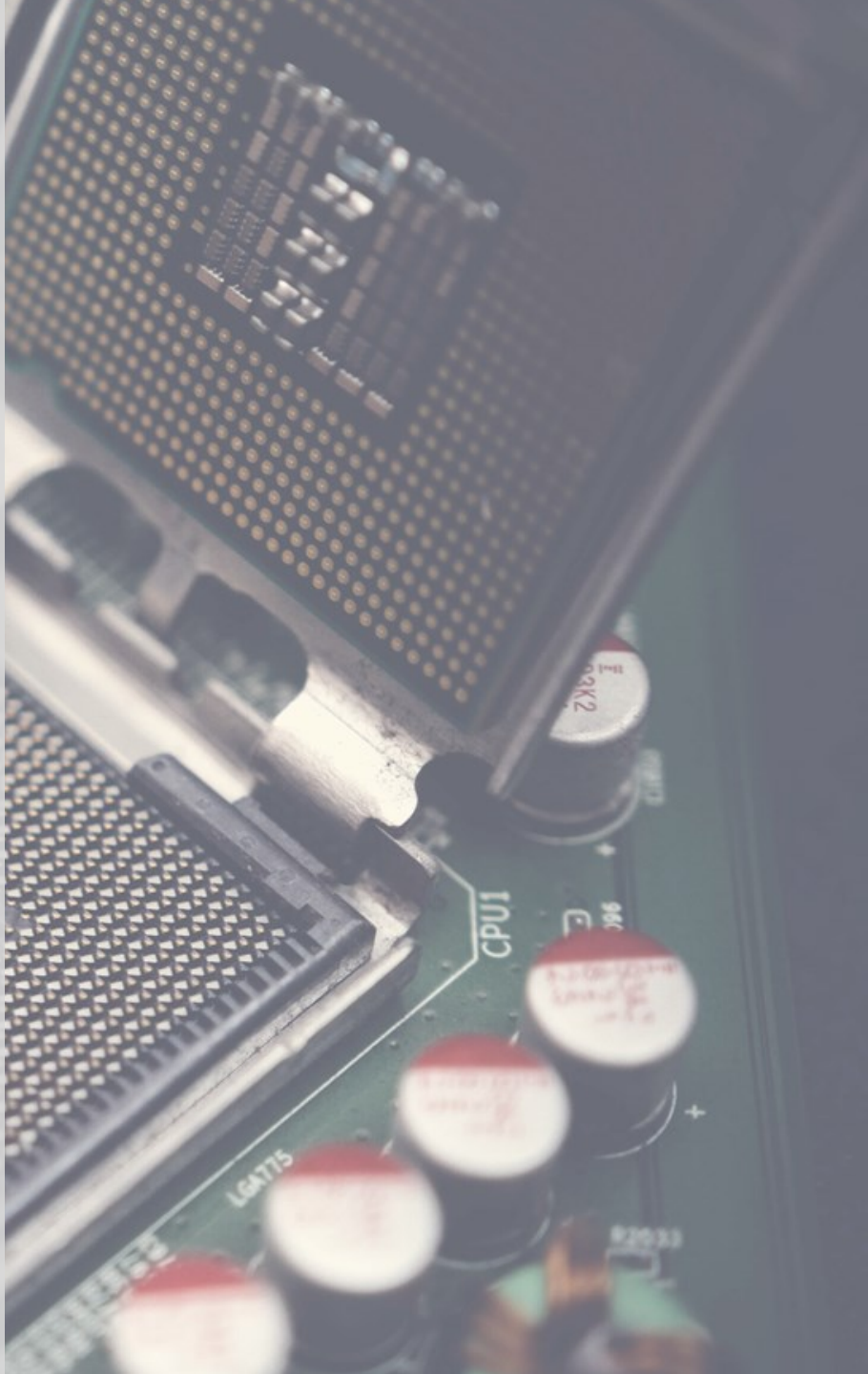


Ecosia is a **search engine**, operated by the Berlin-based GmbH namesake.

The company states to be non-profit, dedicating **100 % of profits** from online advertising to **climate action.**

Business Model

Provider

Ecosia furnishes search results thanks to own algorithm and Microsoft Bing technology.

ADS Revenues

User's click on advertisements displayed **in search results generate on average 0,5 euro.**

Users

Ecosia attract users through web channels and climate **sensibilization campaigns** (e.g., social media).

Climate

Ecosia allocates revenues toward climate protection initiatives.

Climate Action

Source: Ecosia, Web Site, 2022

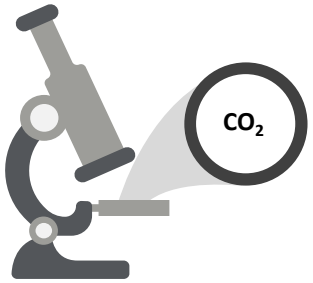
Ecosia neutralizes **CO_2** emissions related to the searches in two steps.

REDUCTION OF DIRECT EMISSIONS

Ecosia's business operations (office heating and electricity, as well as business trips);
Power consumption of the servers and user's devices.

REDUCTION OF INDIRECT EMISSIONS

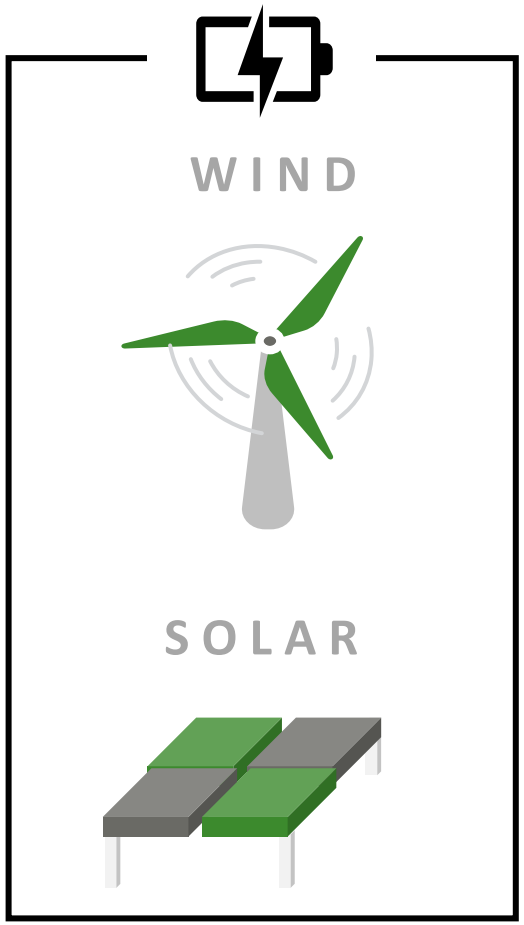
Power consumption of search partners' servers
Power consumption of the IT infrastructure through which search data travels.



Estimation

	Annual Emissions (tonnes CO_2e)	Emissions per search (grams CO2e)
Google	+ 6.086.962 (gross) + 3.294.905 (net)	+ 2,64 (gross) + 1,43 (net)
Microsoft	+ 2.908.411 (gross) 0 (net)	+ 6,30 (gross) 0 (net)
Ecosia	No Emissions	- 1.042 (gross) - 1.111 (net)

Ecosia invested 20 EUR/mln in 2022 into renewables to counter fossil fuel dependence: searches on Ecosia are powered by **100% renewable energy.**



Neutralization

Direct

Ecosia is a renewable energy producer and user. **The solar plants and wind turbines** not only generate **enough electricity** to power all **Ecosia** searches with renewable energy but they also produce **twice as much**.

2x

The electricity to power all Ecosia searches

Indirect

Extra energy produced by the plants is sold for an average € 0,05 per kWh. Moreover, thanks to its reforestation campaign **ECOSIA is able to regenerate the environment** by making up for others' pollution.

Regeneration of the environment

Source: Ecosia Web Site, 2022
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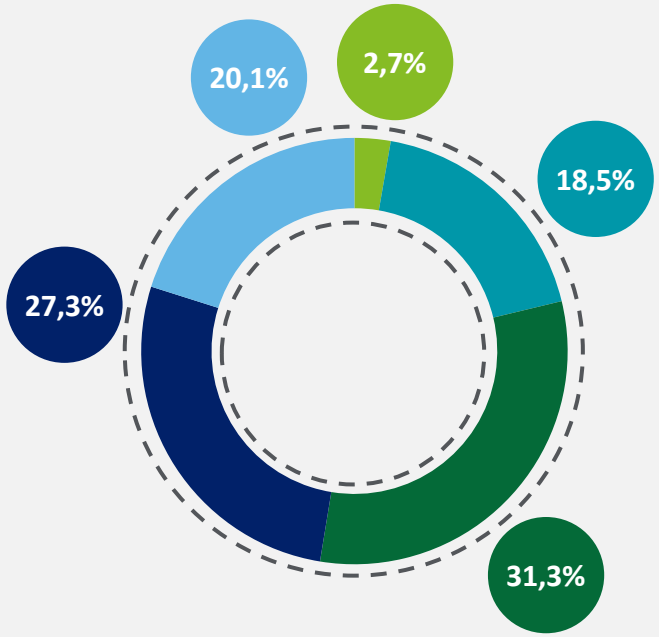
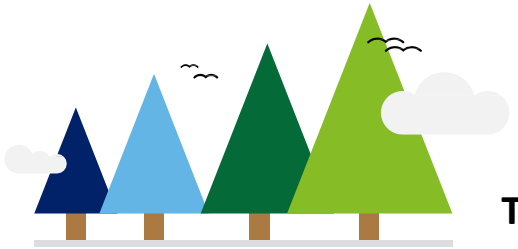
As no-profit organization, Ecosia uses the generated revenues **to cover operational** costs and to **invest in green project**.

Total revenues allocation



- **Money invested spreading the word about ECOSIA**
- **Money invested planting trees**
- **Money invested for environmental projects**
- **Taxes paid to contribute the social community**
- **Operational costs**



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Trees financed in July 2022

If Ecosia were as big as Google, it could absorb **15% of all global CO_2 emissions.**

Because of the commitment on decarbonization, **Deloitte uses Ecosia** as search engine.

 Source: Ecosia, Web Site, 2022

Deloitte.

Thank you for your kind attention!

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