

HEALTH, CLIMATE, RESILIENCE:

# LET'S DECARBONIZE THE MEDICAL DEVICES INDUSTRY

Summary - June 2025

AS PART OF OUR  
**ACTION PROGRAM FOR 2027**



# For the Decarbonization of the Medical Device Industries



After having carried out major work on the decarbonization of the French healthcare system in 2021, and then on the decarbonization of the long-term care sector in 2024, The Shift Project now presents a synthesis of its collaborative research on the decarbonization of the medical device industries. This work, conducted in partnership with the **Caisse Nationale d'Assurance Maladie (CNAM)**, the **Haut Conseil pour l'Avenir de l'Assurance Maladie (HCAAM)**, the **RESPECT Chair (EHESP)**, and with the support of **MGEN**, has also focused on medicines, which are the subject of a separate synthesis.

## Context

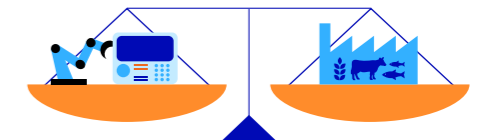
Climate change and increasing strains on fossil fuel supply will profoundly affect the medical device industries. **Their value chain, which is highly globalized, will become increasingly vulnerable to physical climate-related risks.** Moreover, pressure on these industries will intensify, as ecosystem degradation and the multiplication of climate crises will have increasingly severe health consequences. On the one hand, we will need to meet **growing health demand** in a more unstable environment. On the other hand, it will be necessary to reduce greenhouse gas (GHG) emissions and **move away from oil and gas**: this is the focus of this report.

## Goal of the study

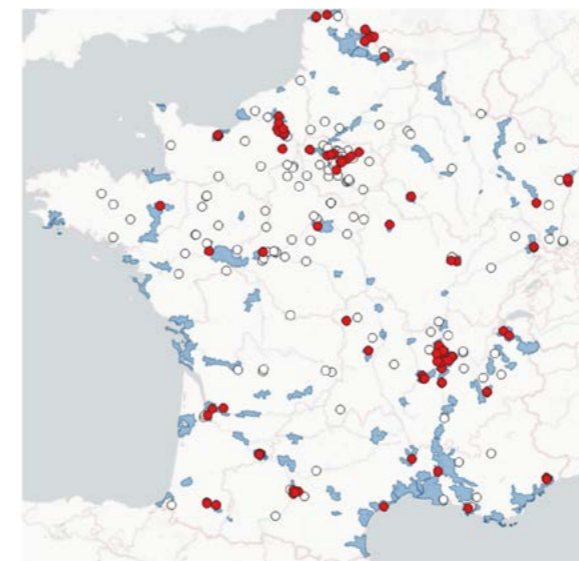
To understand where greenhouse gas (GHG) emissions from the medical device industry originate across its globalized value chain, **and to identify the levers for decarbonization and resilience to energy shocks.** This is the first report to assess emissions and mitigation levers on the basis of physical and energy flows.

### Current Situation

Emissions from medical devices consumed in France amount to around **7.4 MtCO<sub>2</sub>e per year**, a level comparable to the emissions produced **by the entire agri-food industry in France.**



### Health industries and climate risks



French pharmaceutical production sites (red dots) that are exposed to floods.  
**Sources:** The Shift Project 2025 with data from Géorisque.gouv

## Levers for action

This new report offers European and global medical device industry stakeholders a set of quantified decarbonization levers and actions. In particular, we have identified several categories of medical devices and specific action levers tailored to the diversity of devices consumed in France.

## Decarbonization potential

This report provides an estimate of the decarbonization potential: we found that the sector could reduce its emissions by 72% by 2050. To achieve this, the sector must mobilize levers across all aspects of the value chain: **none are optional, all are necessary.**

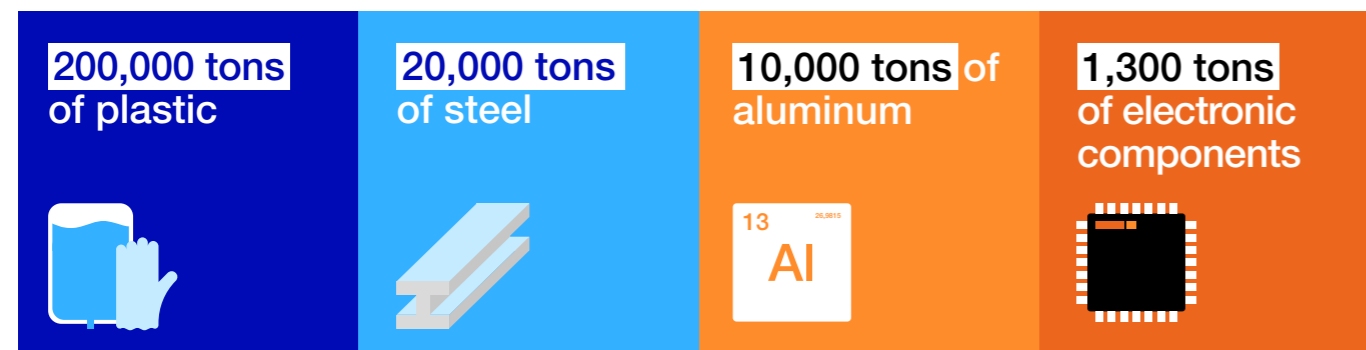
# Medical devices consumed in France

Our study focuses on the emissions generated by medical devices consumed annually in France.

Understanding the link between energy-climate and medical devices industries requires assessing their greenhouse gases emissions, which implies to quantifying first the volumes implied. Our study evaluates the quantities of material used for medical devices consumed in France (excluding exports produced in France) and translates these flows into carbon emissions.

### Definition

A medical device is an object or equipment used in the healthcare system to diagnose, treat, monitor, or prevent a health condition.

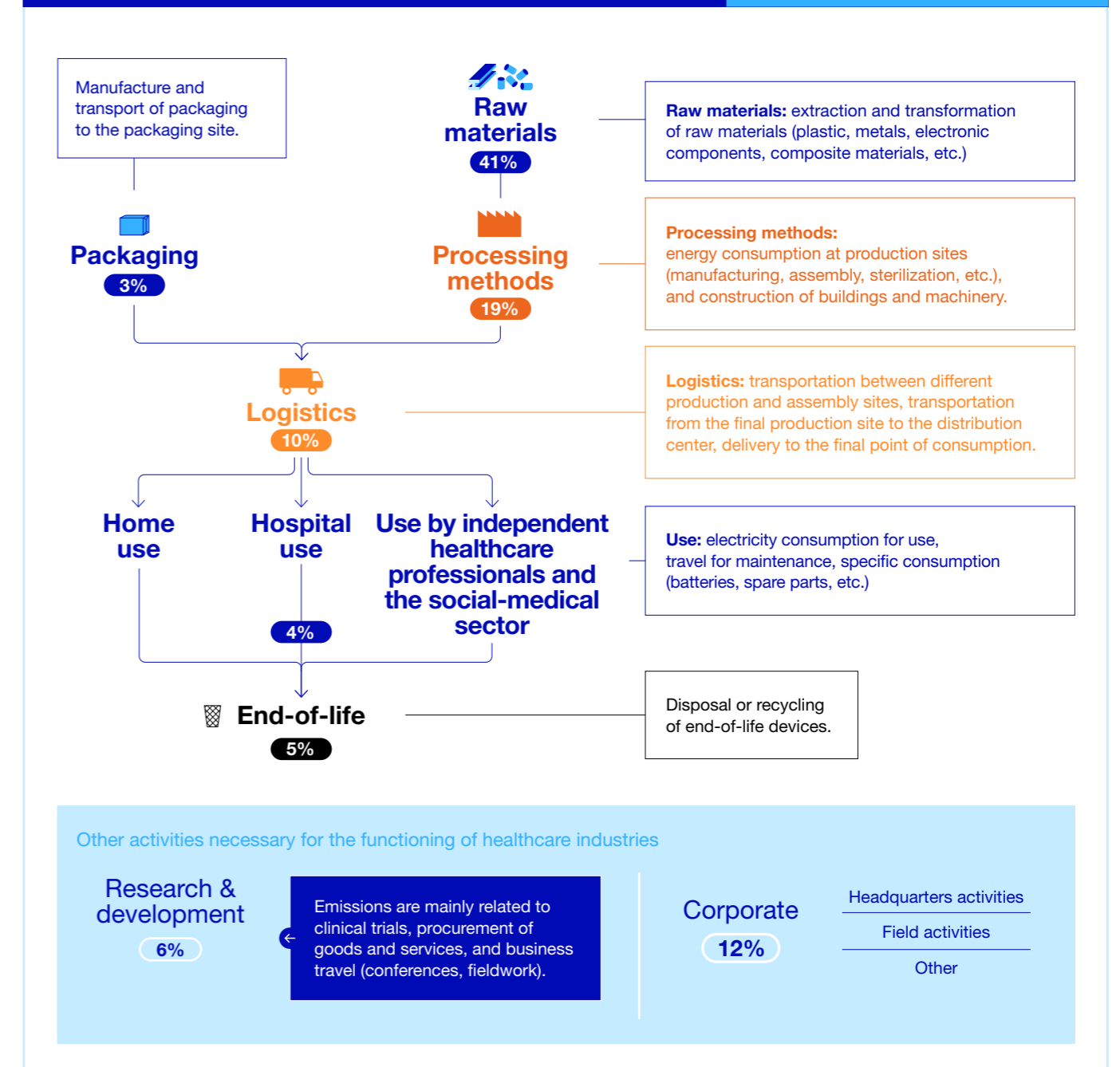


# What are the greenhouse gas emissions of the medical device industry?

We estimate that the greenhouse gas emissions induced by the medical devices consumed in France in 2023 amount to

**7,4 MtCO<sub>2</sub>e**




This estimate covers the entire scope described below.



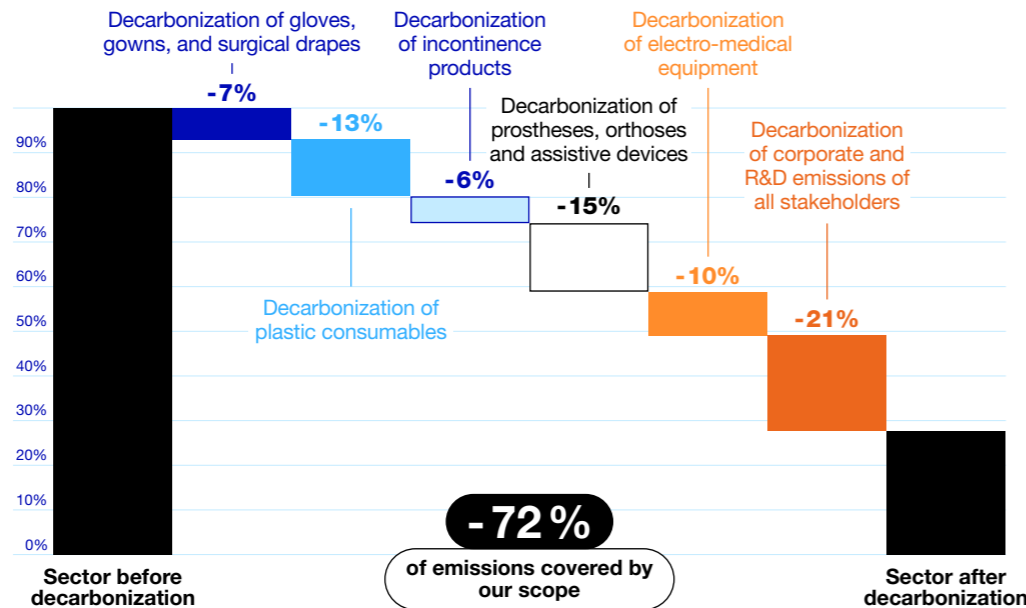
# How to decarbonize the medical devices industry?



If nothing is done, annual emissions from the medical device industry could increase due to higher consumption, mainly because of:

|   |   |  |
|---|---|--|
| <p><b>The aging of the population</b></p>  | <p><b>The rise of chronic illnesses, notably related to pollution and climate degradation</b></p>  | <p><b>Changes in medical devices used (increase in certain screening tests, use of digital technology)</b></p>  |
|---|---|--|

In this report, we do not take into account these developments between now and 2050, as they may be highly unpredictable.



We estimate that by 2050, emissions generated by the consumption of medical devices covered by our scope could **potentially decrease by 72%** compared to 2023.

Decarbonization of medical devices **is possible**. It must be fast and proactive in order to limit cumulative emissions between 2023 and 2050.

**All industries** involved in the medical devices value chain must act quickly and decisively by mobilizing all available levers: **none are optional, all are necessary**.

The medical devices value chain has a significant impact on the climate and is heavily dependent on fossil fuels: decarbonizing is also **a matter of resilience and energy sovereignty** for industries and the healthcare system.

## Cross-sectoral levers

**1 No one-size-fits-all solution:** due the wide variety of medical devices, each category requires its own decarbonization levers. Our work has identified **specific solutions** for each product family.

**2** Decarbonization of the sector relies above all on the **mobilization of suppliers:** plastics, metallurgy, textiles, electronics, logistics, sterilization, and mechanics. This involves either **avouing low-carbon players** (e.g. a French plastic producer) or **supporting** them in developing strategies to reduce their emissions.

**3** To be fully effective, **decarbonization must cover the entire value chain**, from raw material production to logistics, including energy consumption and end-of-life management. Supporting the decarbonization of French consumption helps to decarbonize all global value chains.

**4** We propose **a set of criteria for relocation:** priority should be given to strategic devices for healthy sovereignty (e.g., gloves, masks, or gowns) and to high value-added products that depend on air freight (e.g., glasses or pacemakers). Relocating part of the production of these devices in Europe, and particularly to France, plays a key role in the decarbonization of industry while strengthening the autonomy of the healthcare system.

**5** **Standardized carbon criteria:** two conditions are essential for effective decarbonization: a standardized **method for calculating** the carbon footprint that is adapted to the diversity of medical devices, and an environmental criterion representing **at least 10% of the overall score in evaluations**. Additionally, this method must **focus on the criteria that have the greatest impact on the carbon footprint** of products.

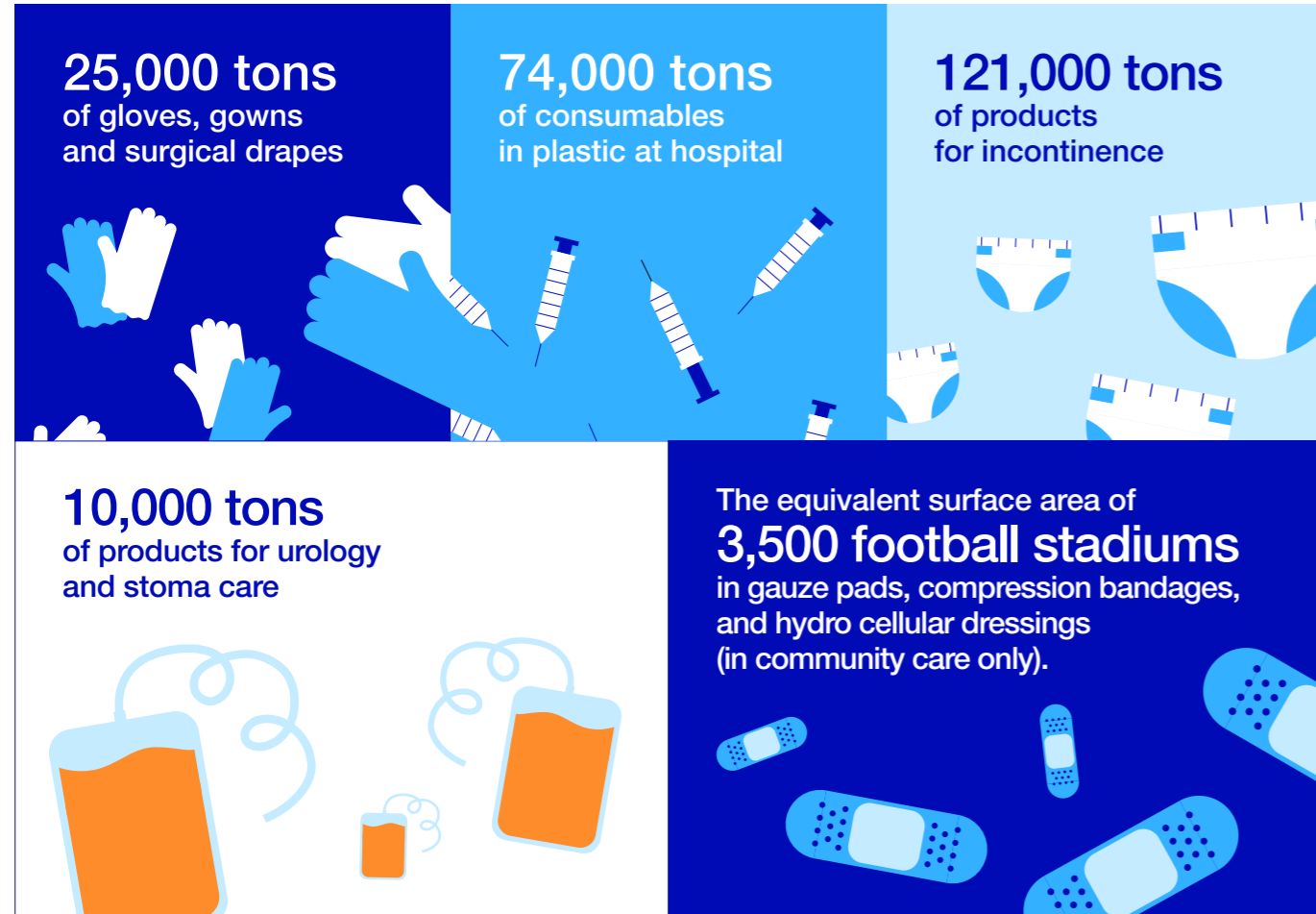
**6** **Academic research needs to be consolidated:** certain segments remain understudied, and industrial specificities are sometimes omitted. For example, academic research tends to underestimate the difference in carbon footprint between single-use and reusable devices.

# Decarbonizing consumables

**Single-use consumables** refer to all medical devices that are used only once before being discarded, whether sterile or non-sterile.



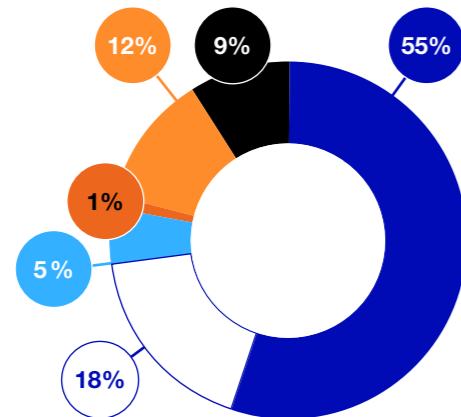
## Annual consumption



## Where do emissions from consumables come from?

We estimate that imaging single-use consumables in France generates emissions of **1,500 ktCO<sub>2</sub>e per year**.

- End-of-life**
- Sterilization**
- Packaging**
- Transportation**  
For certain products, a large proportion of consumption is imported from Asia: this is the case for more than half of the volume of bandages imported into France, and approximately 97% of surgical gowns.



**Raw materials**  
The manufacture of consumables relies in particular on the production of nearly **200,000 tons of plastic pellets** (mainly polyethylene, polypropylene, and PVC) and more than **75,000 tons of viscose**.

**Use**  
The production of consumables requires specific processes (injection, extrusion, etc.) in order to transform raw materials. These processes may take place in clean rooms, which are highly energy-intensive.

## Decarbonization levers: how to get there?

### 3 key levers

- Engage raw materials suppliers:**  
→ By turning to suppliers committed to an active decarbonization strategy (SBTi, Ecovadis, etc.), or by helping them to develop decarbonization strategies;  
→ By favouring more sustainable or French suppliers.
- Decarbonize energy consumption:**  
Through energy efficiency measures (electric plastic molding, optimization of clean rooms with airflows, etc.) and improvements in carbon intensity (electrification, renewable energy production, etc.).
- Relocate certain strategic medical devices:**  
By targeting devices that represent a major challenge for healthcare sovereignty and require particularly high-emission production processes: gloves, gowns, surgical drapes, compresses, etc.

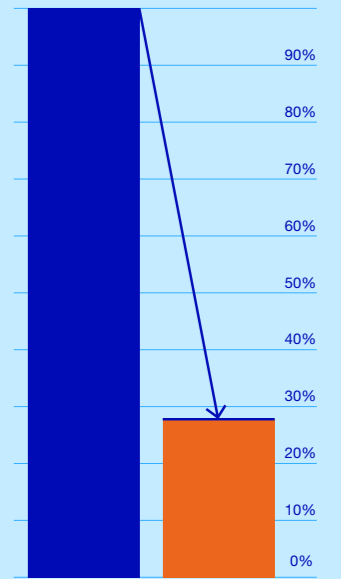


**BUT ALSO...**  
→ **Eco-design of products** (reducing product weight, seeking alternative materials);  
→ **Decarbonization of transportation** (gradual electrification of road freight);  
→ **Adapting the packaging of care kits**.

### In parallel:

- Taking the environment impact into account in procurement:**  
→ Develop a standardized method for calculating carbon footprints that is adapted to the diversity of medical devices;  
→ Establish environmental criteria focusing on the most significant factors in the carbon footprint of products. This score must represent at least 10% of the overall score in evaluations.
- Developing research:**  
→ Conduct life cycle analysis on products not covered in this report (consumables for wound care and healing, diabetes self-monitoring and self-treatment devices, multi-material consumables);  
→ Identify appropriate decarbonization levers for these products.

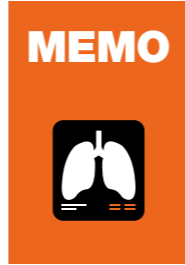
### Identified reduction potential



**-72%**  
of emissions by 2050

# Decarbonizing imaging equipment

This fact sheet concerns equipment used for imaging examinations, including MRI, CT scans, radiology equipment (including dental equipment), ultrasound scanners, and gamma cameras.



## Where do emissions from imaging equipment come from?

We estimate that imaging equipment in France generates emissions of **230 ktCO<sub>2</sub>e per year**.

### End-of-life

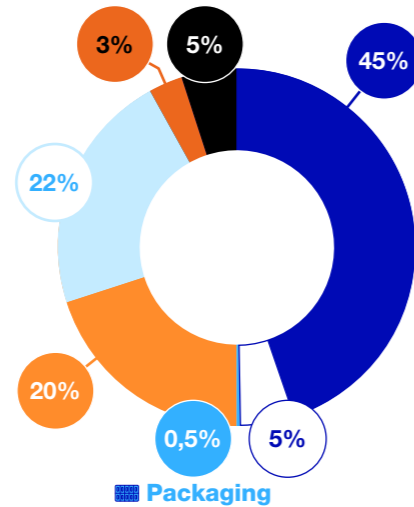
### Déplacements pour la maintenance

### Transportation

The majority of imaging equipment imported from outside Europe is now transported by air. Air transport accounts for 95% of emissions related to transportation.

### Use

The imaging equipment used in France consumes 580 GWh each year, which is equivalent to the average electricity consumption of **260,000 French citizens**.



### Raw materials and production

The imaging equipment purchased each year represents **5,800 tons of equipment**. More than 80% of emissions related to production come from the manufacture of electronic component.

# Decarbonizing electro-medical equipment

The term “electromedical equipment” refers to any medical device that consumes electricity. This sheet concerns electromedical equipment other than imaging equipment: equipment for respiratory disorders (CPAP, oxygen therapy, etc.), hemodialysis generators, syringe pumps, autoclaves, etc.



## Where do emissions electro-medical equipment come from?

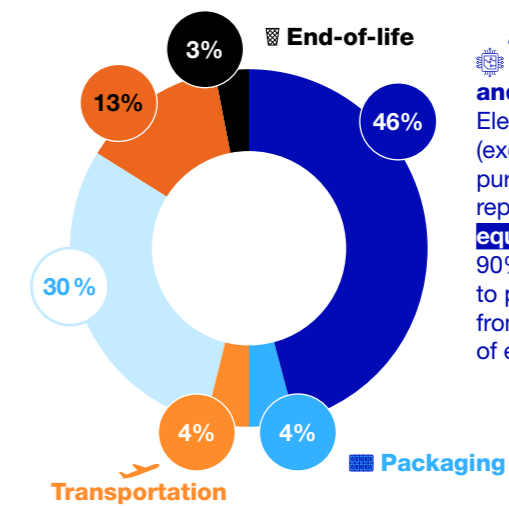
We estimate that electro-medical equipment in France (excluding imaging equipment) generates emissions of **310 ktCO<sub>2</sub>e per year**.

### Travel for maintenance

Travel is necessary to carry out maintenance operations. This is particularly the case of the 500,000 CPAP machines in France, or for the sleep apnea equipment used by 1.8 million French people.

### Use

Some medical devices consume significant amount of electricity. A fixed oxygen concentrator consumes as much electricity as the average French person in a year. An autoclave consumes as much as 13 French people, and a radiotherapy machine as much as 177 French people.



### Raw materials and production

Electro-medical equipment (excluding imaging) purchased each year represents **4,000 tons of equipment**. 90% of emissions related to production come from the manufacture of electronic component.

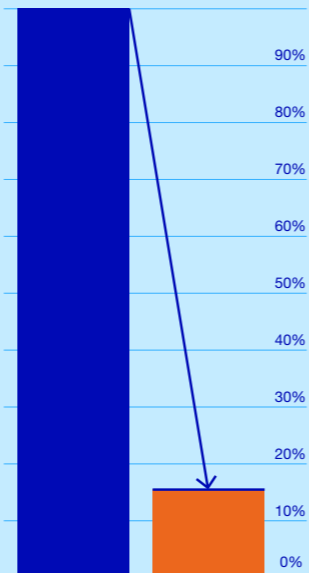
## Decarbonization levers: how to get there?

### 4 key levers

- Extending the lifespan of equipment**  
Notably through changes to the terms and conditions for reimbursement of the **technical fee**.
- Promoting a shift from air freight to sea freight**  
By promoting the use of sea transport in purchasing.
- Developing offers for reconditioned equipment**  
In particular by structuring reconditioning channels and integrating certain criteria into purchasing practices.
- Optimizing the energy consumption of equipment**  
In particular by systematically using standby modes for equipment.

- BUT ALSO...**
- Use of aluminum and low-carbon steel
  - Internalization of maintenance operations

### Identified reduction potential



**- 84%**  
of emissions by 2050

## Decarbonization levers: how to get there?

### 4 key levers

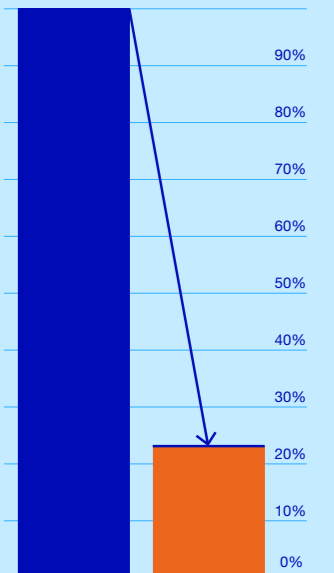
- Extending the lifespan of equipment**  
In particular through standardization of lifespan concepts, enhanced reparability, guaranteed availability of spare parts, and greater backward compatibility.
- Developing offers for reconditioned devices**  
Notably by structuring reconditioning channels and integrating certain criteria into purchasing practices.
- Optimizing equipment energy consumption**  
By optimizing usage and favoring devices with lower consumption.
- Decarbonizing maintenance operations**  
Through a gradual transition to electric vehicle fleets.

### BUT ALSO...

- A reduction in air transport, particularly for robots, radiotherapy equipment, and equipment for respiratory diseases.
- Promoting the purchase of virtuous raw materials, in particular by engaging suppliers in a coherent, long-term decarbonization strategy.

- Decarbonization of production sites, particularly through improved energy efficiency and by favoring low-carbon energy sources (e.g., French electricity).

### Identified reduction potential



**- 77%**  
of emissions by 2050

# Decarbonizing assistive technologies

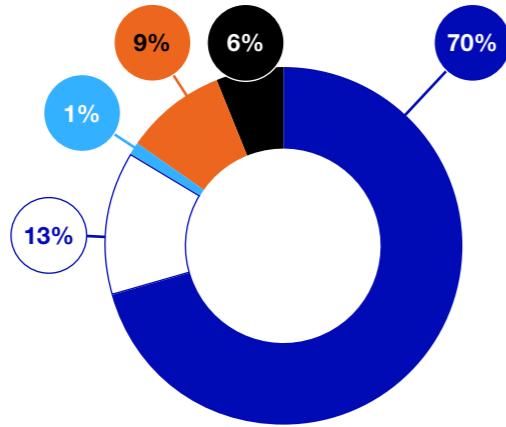


This fact sheet concerns assistive technologies, i.e., equipment that enables people with disabilities or older adults to compensate for everyday difficulties: medical beds, anti-bedsore mattresses, wheelchairs or other vehicles, canes, crutches, walkers, standing frames, etc.

## Where do emissions from assistive devices come from ?

We estimate that assistive technology consumed in France generate emissions of around **530 ktCO<sub>2</sub>e per year**.

- End-of-life**  
About one third of assistive technologies are no longer used one year after purchase.
- Transportation, delivery and maintenance**
- Packaging**
- Production**  
The production processes for technical aids (cutting, welding) require significant energy consumption.



**Raw materials**  
Assistive technologies purchased each year represent **44,000 tons of raw materials**, of which approximately 40% of steel, 40% of plastic and 20% of aluminum.

# Decarbonizing orthoses

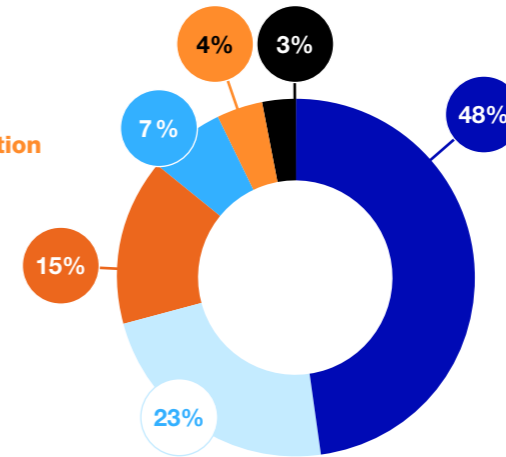


This fact sheet concerns so-called standard orthotics, i.e., those produced industrially according to standard sizes: compressions orthotics, splints, insoles, orthopedic shoes, cervical collars and lumbar belts.

## Where do emissions from orthoses come from?

We estimate that standard orthoses consumed in France generate emissions of around **60 ktCO<sub>2</sub>e per year**.

- End-of-life**
- Transportation and distribution**
- Packaging**
- Dyeing**  
Dyeing operations require the consumption of steam and gas.
- Production (assembly, weaving)**



**Raw materials and production**  
The production of textiles (polyamide, elastane, cotton) manufactured in France has a carbon footprint 25% to 50% lower than that of products manufactured in China.

N.B: results below focus on contention orthoses. Other orthoses have relatively similar emission profiles.

## Decarbonization levers: how to get there?

### 3 key levers

#### Developing a circular economy

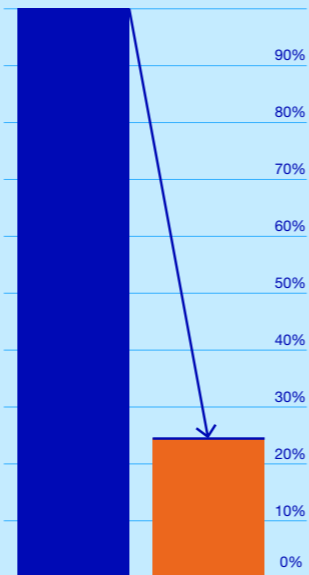
based on reconditioning, restoring items to good working condition, and extending their lifespan, notably through:

- An inventory of the fleet;
- Pooling collections;
- Clarifying legal responsibilities;
- Guaranteeing the availability of spare parts;
- Developing technical guides for reconditioning with certification;
- Training with specialized technicians.

#### Engaging raw materials suppliers

- By choosing suppliers committed to an active decarbonization strategy (SBTi, Ecovadis, etc.), or by helping them develop decarbonization strategies;
- By prioritizing low-carbon or French suppliers.

### Identified reduction potential



**-76%**  
of emissions by 2050

#### BUT ALSO...

- Decarbonizing production sites (cutting, welding, assembling).
- Differentiating between reimbursements and coverage limits under the LPP for low-carbon products.

## Decarbonization levers: how to get there?

### 4 key levers



**Developing a circular economy** based on reconditioning, and restoring items to good working condition.



**Engaging raw materials suppliers**  
By choosing suppliers committed to an active decarbonization strategy or by supporting them in shaping these strategies, and by favouring low-carbon or French suppliers.

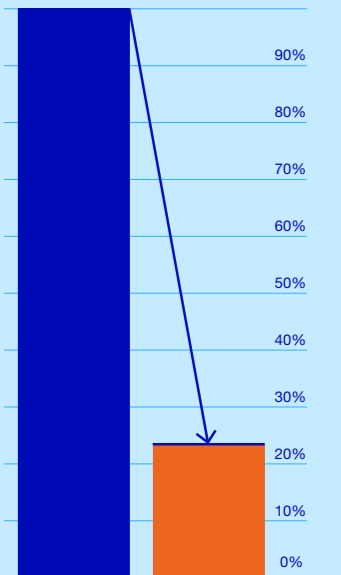


**Encouraging a rental model**  
By developing rental packaging for orthoses included in the LPP nomenclatures.



**Decarbonizing production sites**  
In particular, by working on sites energy efficiency through electrifying production processes.

### Identified reduction potential



**-77%**  
of emissions by 2050

#### BUT ALSO...

- Reducing the weight of orthoses and their packaging;
- Decarbonizing road transport and reducing delivery frequencies.

# Decarbonizing optical devices

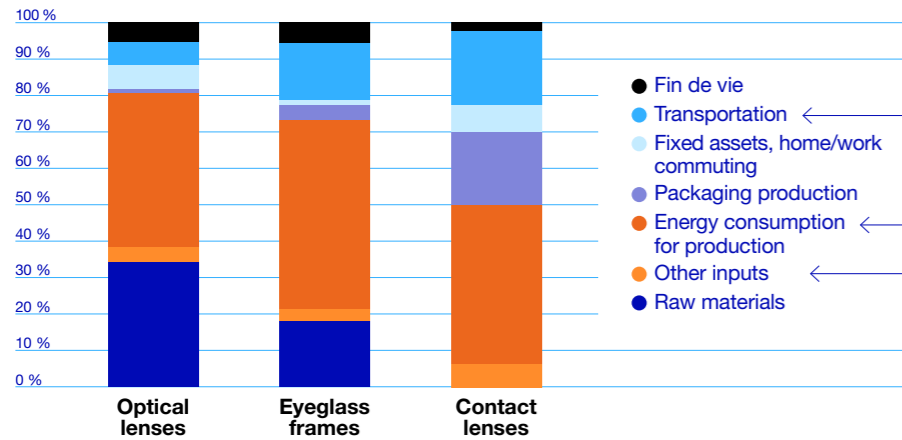
This fact sheet concerns optical devices, more specifically optical lenses, eyeglass frames, and contact lenses.



## Where do emissions from optical devices come from?

We estimate that optical devices consumed in France generate emissions of around **220 ktCO<sub>2</sub>e per year**.

### Breakdown of greenhouse gas emissions of different optical devices



**Air transport** is often preferred for importing optical devices.

**Production**  
The production of optical devices requires large amounts of energy, which is particularly carbon-intensive due to part of the production being located in Asia.

**Presentation glasses, chemical inputs, single-use molds.**

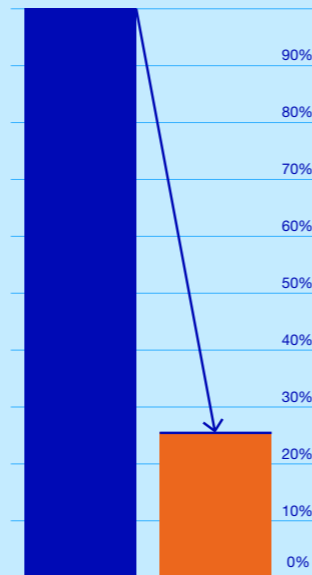
## Decarbonization levers: how to get there?

### 4 key levers

- Relocating part of the production in Europe**  
By prioritizing the production of Class B frames, the production of semi-finished products, and the surfacing of prescription lenses.
- Encouraging industries to effectively decarbonize**  
By involving mutual insurance companies, healthcare networks, and opticians to promote the most environmentally friendly products.
- Decarbonizing raw materials production**  
In particular, by mobilizing polymer suppliers and favouring low-carbon materials for frames.
- Reducing the use of air transport**  
In particular for Class A frames and second pairs, semi-finished lenses, and frame accessories.

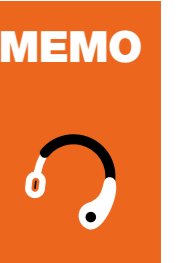
- BUT ALSO...**
- Decarbonizing energy consumption of production sites;
  - Developing circular economy for frames;
  - Electrifying and reducing the frequency of deliveries from retailers;
  - Considering the relevance of offering second pairs, for examples when frames are replaced without a change in prescription.

### Identified reduction potential



**-74%**  
of emissions by 2050

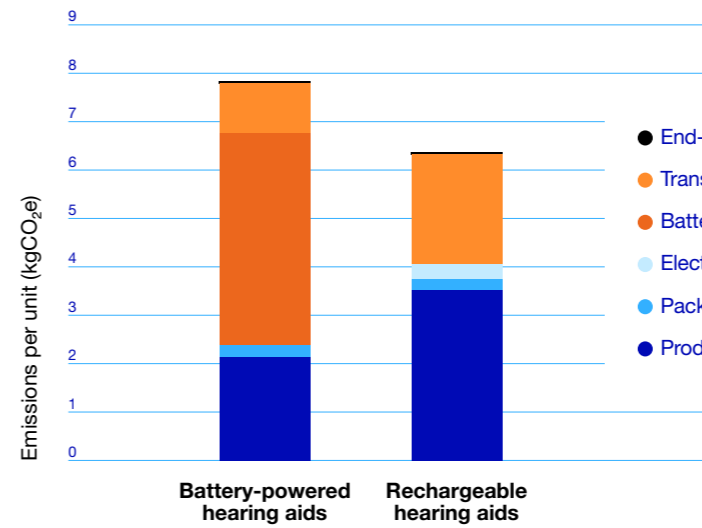
# Decarbonizing hearing aids



## Where do emissions from hearing aids come from?

We estimate that hearing aids consumed in France generate emissions of around **11 ktCO<sub>2</sub>e per year**.

### Emissions of hearing aids in France per unit sold



the majority of hearing aids are imported from Asia, of which 90% are shipped by **air freight**.

**more than 32 million batteries for hearing aids are produced annually for French consumption.**

**Electronic components (microphones, speakers) and charging cases for rechargeable hearing aids are responsible for the majority of emissions related to production.**

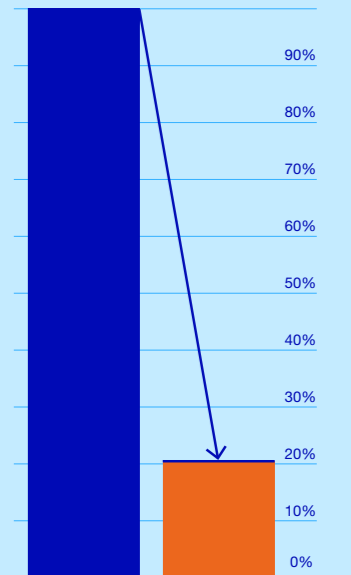
## Decarbonization levers: how to get there?

### 4 key levers

- Increase the lifespan of hearing aids**  
By promoting repairs, ensuring the availability of spare parts, and developing reparability index.
- Initiating a transition away from battery-powered devices**  
In particular, by including rechargeable hearing aids in the 100% healthcare offer.
- Encouraging industries to effectively decarbonize**  
By involving mutual insurance companies, healthcare networks, and hearing aid retailers to promote low-carbon products.
- Reducing the use of air transport**  
By promoting the use of maritime transport.

- BUT ALSO...**
- Standardizing charging boxes by introducing a universal charger common to all manufacturers;
  - Developing circular economy for end-of-life devices;
  - Decarbonizing and reducing the frequency of deliveries by retailers.

### Identified reduction potential



**-79%**  
of emissions by 2050

# Decarbonizing instruments



## Decarbonization levers: how to get there?

Medical instrumentation includes all the tools used by healthcare professionals to examine, diagnose, treat, or operate on their patients.

### Prioritize reusable items



In **75%** of studies comparing the carbon footprint on single-use and reusable instruments, **emissions from reusable instruments are lower.**



Studies showing the opposite greatly **underestimate the carbon footprint of single-use products by omitting steps in the value-chain.** In addition, reusable products have a lower carbon footprint in France because the electricity mix used for sterilization is low-carbon.



Therefore, based on environmental considerations, **we recommend the use of reusable instruments by default.**

### How to prioritize reusable items?

### 4 key levers



#### Consolidating research and knowledge

By conducting academic studies that take into account the specificities of industrial production, and by fostering a critical eye among purchasers.



#### Fostering a culture of reuse

By strengthening human and material resources dedicated to sterilization, by adopting a global economic vision of reuse, and by actively involving healthcare professionals.



#### A need for recommendations from professional societies

To guide the decisions of users and purchasers.



#### Considering reprocessing single-use devices

By promptly launching a reprocessing trial.

### Other levers for decarbonizing instruments



#### BUT ALSO...

- **Reducing the use of air freight:** when air transport is used, it is responsible for around 20% of the carbon footprint of instruments.
- **Decarbonizing sterilization:** by optimizing autoclave load factors and initiating a review of sterilization times.

# Decarbonize implantable devices



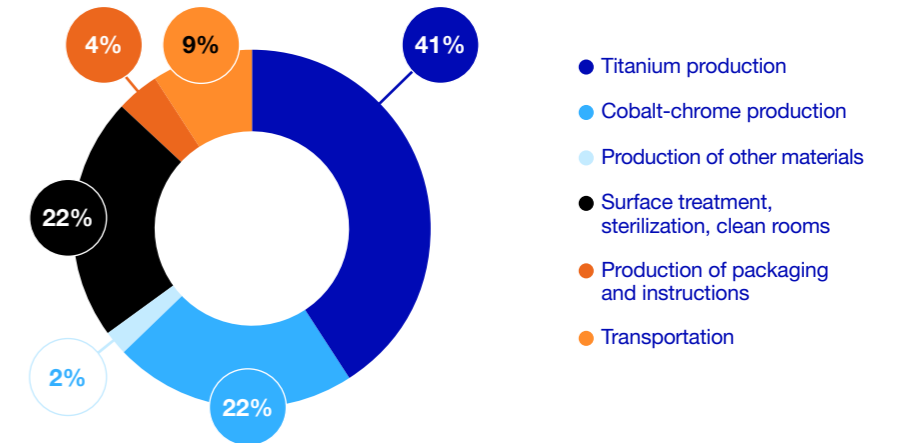
This fact sheet concerns implantable devices: orthopaedic implants (hip, knee, spine), cardiac and vascular implants, cochlear implant systems, brainstem implants, etc.

## Where do emissions from implantable devices come from?

To date, no life cycle analysis taking into account specific industrial processes has been conducted for implantable devices.

The results presented here constitute an exploratory basis, which will be further developed and extended to other segments: defibrillators and cardiac probes, endoprostheses, etc.

We estimate that hip and knee implants used in France generate emissions of around **16 ktCO<sub>2</sub>e per year.**



## Decarbonization levers: how to get there?

### 4 key levers



#### Developing research

By conducting rigorous life cycle analyses that specific industrial processes into account.



#### Engaging raw materials suppliers

By choosing suppliers that are committed to decarbonization strategies or by supporting them in this process.



#### Considering relocating the production of certain implants

Notably those representing significant consumption volumes: cardiac probes and defibrillators, etc.



#### Reducing the use of air freight

For example, for imports of cardiac implants, certain intermediate components, or for the transport of orthopaedic implants to overseas departments and regions.



#### BUT ALSO...

- **Recycling production waste from orthopaedic implants:** notably chrome-cobalt and titanium.
- **Limiting implant waste:** in particular by implementing "reverse logistics" systems enabling their recovery, reuse, or repurposing.
- **Decarbonizing production sites:** by improving the energy efficiency and carbon intensity of the energy used.

# Decarbonizing in-vitro diagnostic devices

This fact sheet concerns in-vitro diagnostic devices: reagents, analytical instruments and automated systems, and consumables used in diagnostic processes.



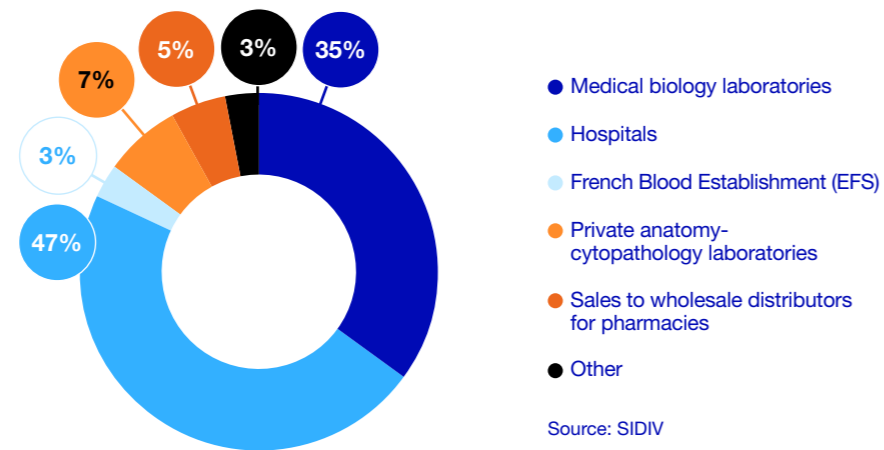
## Where do emissions from in-vitro diagnostic devices come from?

To date, we have not conducted an analysis of the distribution of emissions along the value chain of in vitro diagnostic devices.

We are therefore using, as a first order of magnitude, monetary emission factors.

We estimate that in vitro diagnostic devices consumed in France generate emissions of around **800 ktCO<sub>2</sub>e per year**.

Breakdown of French consumption of in-vitro diagnostic devices



## Decarbonization levers: how to get there?

### 4 key levers

|   |  |
|---|--|
| <p><b>Reducing the use of air freight</b><br/>By using sea freight expect in strictly necessary cases, such as diagnostic reagents with a shelf life of less than one year.</p>   | <p><b>Engaging raw materials suppliers</b><br/>By turning to suppliers committed to an active decarbonation strategy, or by helping them to develop decarbonation strategies, while giving preference to those demonstrating stronger environmental performance in the selection criteria.</p> |
| <p><b>Developing research</b><br/>By conducting rigorous life cycle analyses that take into account specific industrial processes, and by separately analysing the main reagents: biochemistry, molecular biology, immunology, microbiology, etc.</p> | <p><b>Systematizing eco-design of products</b><br/>By taking into account the entire life cycle of instruments and reagents, as well as their packaging and associated logistics.</p>  |

The Caisse Nationale de l'Assurance Maladie (CNAM), with its 200 employees, is the operational spearhead of the compulsory health insurance system in France. It oversees, coordinates, advises, and supports the actions of the local bodies that make up its network (CPAM, DRSM, Ugecam, CGSS, etc.). CNAM conducts negotiations with healthcare professionals within the framework of the Union Nationale des Caisses d'Assurance Maladie (Uncam). Through its risk management activities and the healthcare services it provides, CNAM contributes to the efficiency of the healthcare system and compliance with the national health insurance expenditure target (Ondam). It also takes part in implementing public policies on prevention and informs its beneficiaries each year to help them become active participants in their own health.

[www.ameli.fr](http://www.ameli.fr)



Founded in 1946, MGEN is today the leading mutual insurance organization for public sector employees. Its unique positioning enables it to manage health insurance, supplementary health coverage, and provident schemes for more than 4.6 million people. MGEN provides comprehensive support to its members, ranging from the prevention of risks to their physical and mental health to healthcare services delivered in medical facilities. It makes available to all 1,800 mutualist healthcare and support structures that it co-manages and co-finances throughout France. MGEN also works with employers on workplace well-being, contributing to the performance and attractiveness of the public sector. Since 2017, MGEN has also been a founding member of the VYV Group, the leading mutualist actor in health and social protection in France.

[www.mgen.fr](http://www.mgen.fr)



The Haut Conseil pour l'Avenir de l'Assurance Maladie (HCAAM – High Council for the Future of Health Insurance) is a body for reflection and proposals which, since 2003, has contributed to a better understanding of the challenges, functioning, and possible developments of health insurance policies.

Created in 2003, the HCAAM is composed of 66 members, representing at a high level the main organizations, institutions, trade unions, federations, and associations active in the field of health insurance and, more broadly, in the healthcare system.

[www.securite-sociale.fr/hcaam](http://www.securite-sociale.fr/hcaam)



*The Shift Project* is a think tank working toward a carbon-free economy. As a non-profit association under the French 1901 law and recognized as serving the public interest, and guided by scientific rigor, our mission is to inform and influence the debate on the energy transition in Europe. Our members are major companies that have chosen to make the energy transition their priority.

[www.theshiftproject.org](http://www.theshiftproject.org)

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