

An aerial photograph showing a winding wooden boardwalk or path that curves through a dense, lush green forest. The path is made of light-colored wood and has a dark railing. Several people can be seen walking along the path. The forest is composed of many tall, thin trees with green foliage.

CLEANTECH IN FLANDERS 2020



Cleantech
Flanders

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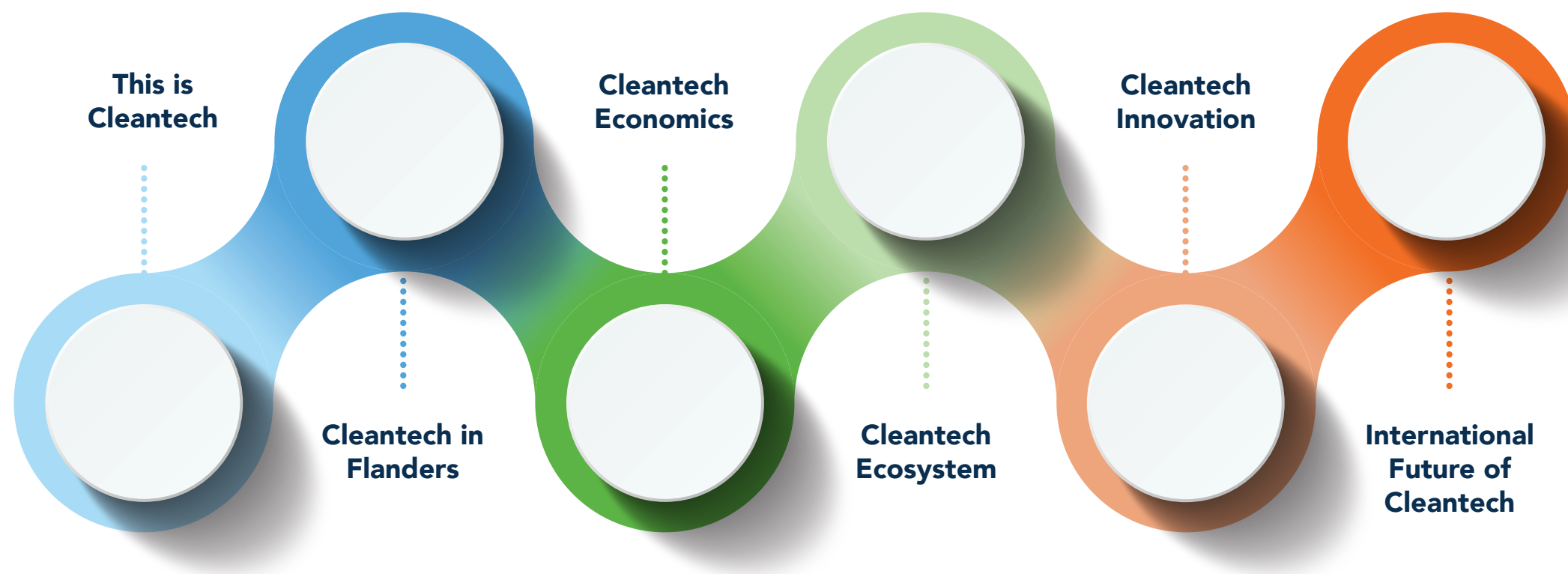
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About the author

More and more companies and organisations are endorsing the demand for sustainability. In order to (further) develop their circular and sustainable initiatives, they can turn to Cleantech Flanders for information, inspiration and opportunities.

Cleantech Flanders promotes and stimulates the implementation of clean technologies which accelerate the transition to a sustainable world.

Cleantech Flanders is a catalyst for innovation and implementation of clean technologies in society and operate across sectors on multiple cleantech domains.



THIS IS CLEANTECH

Cleantech, short for clean technology, is defined as the collection of all technologies that contribute to a cleaner environment and energy savings, accelerating the transition to a sustainable society.

In the form of technology, cleantech makes sustainability tangible.

Cleantech is not a classic sector, it is cross sectoral and plays a role in various (industrial) domains covering energy, sustainable circular economy, mobility, air, water, and soil.

Clean technology produces cleantech products, processes and services that improve both operational and environmental performance.



Enhancing productivity and efficiency



Reduction of costs, energy consumption or waste



Optimising usage of resources and energy



Sustainable Materials



Energy Efficiency



Renewable Energy



Water & Wastewater



Recycling & Solid waste



Sustainable Buildings



Sustainable Agriculture



Sustainable Mobility & Transport



Processing & Manufacturing

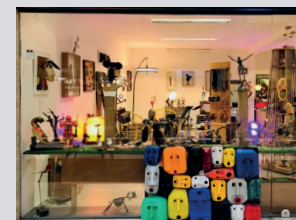
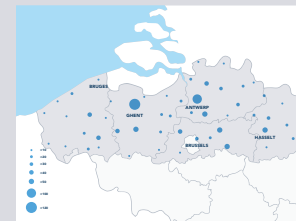
CLEANTECH IN FLANDERS

Cleantech is everywhere

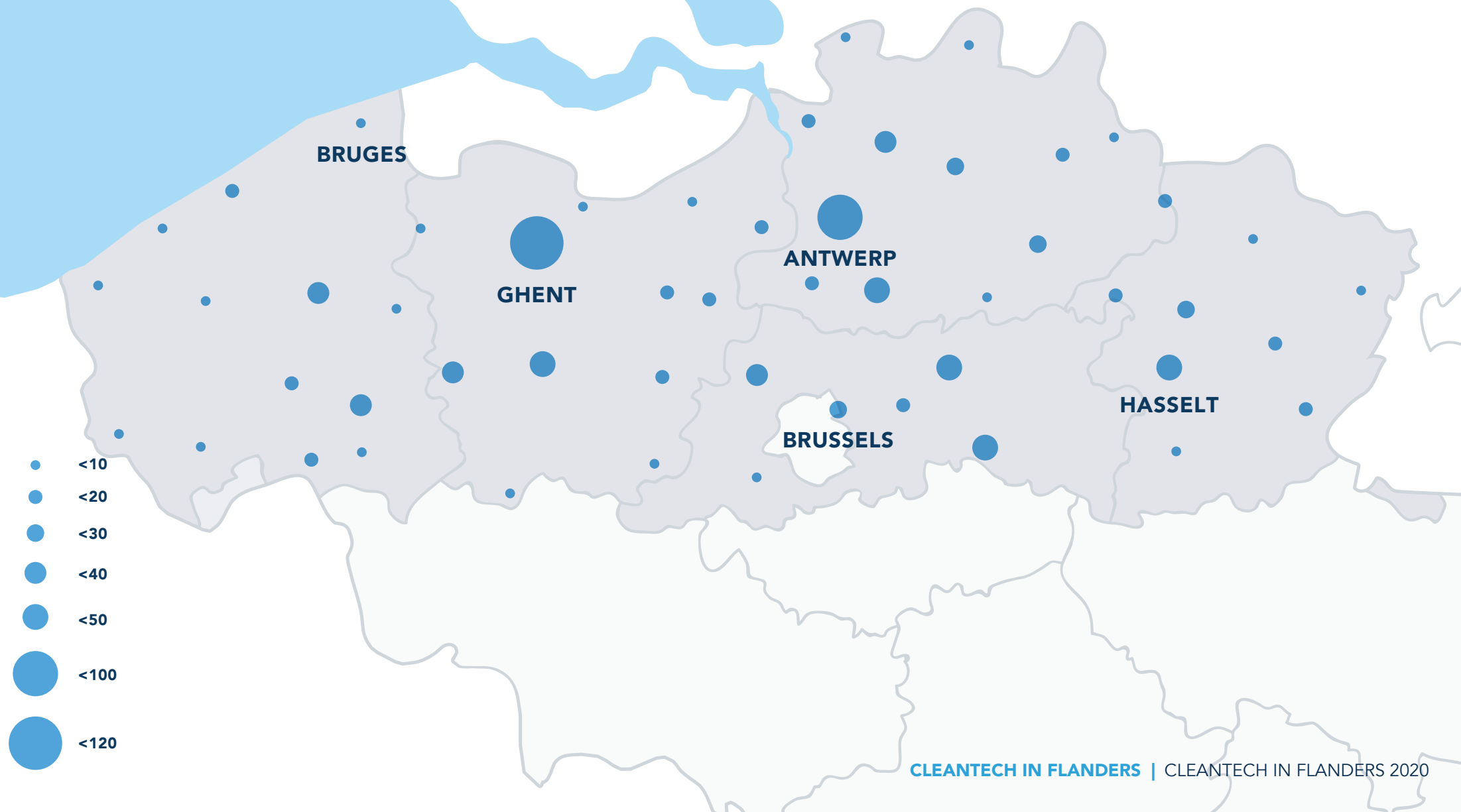
In our day to day life, we use energy, drink clean water, go to work in our electric car and minimise waste. But where can you find the businesses responsible for these clean technologies?

Flanders' thriving cleantech sector is anchored in the population centers of the region. The strong representation of cleantech in these areas coincide with the presence of institutions of higher learning: Ghent, Leuven and Antwerp.

The activity in Flanders' cleantech landscape is yielding some interesting results in terms of our competitiveness, results and cutting edge projects. A selection is provided per illustration.



Distribution of cleantech in Flanders



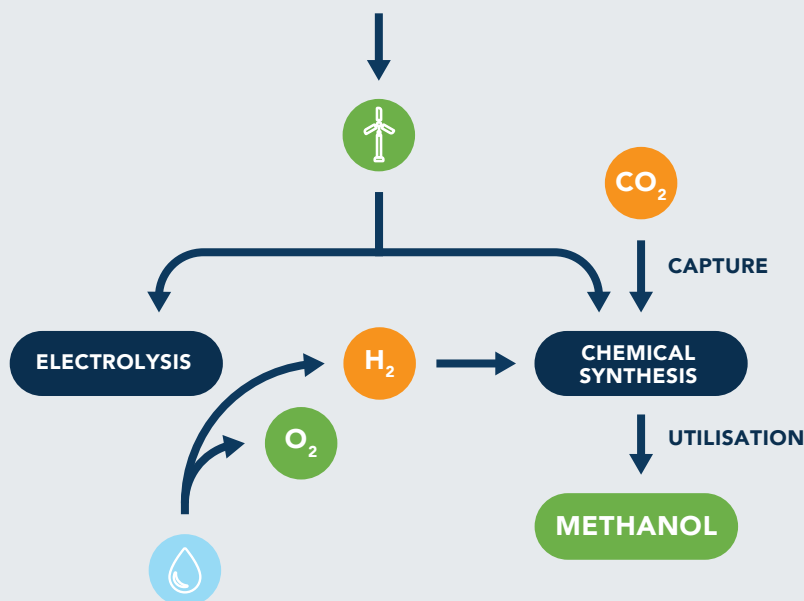


Carbon Capture Utilisation Hub in North Sea Port

The coast line of Flanders offers opportunities for harvesting from the sea. Nine windmill farms and a modular off-shore grid produce abundant renewable energy. This energy can be used to produce methanol and heat.

The project Carbon Capture & Utilisation Hub uses renewable energy and water to create hydrogen. By adding CO₂ from the industry in Ghent, heat and methanol can be produced. The demo project will go in operation in 2023.

Source: www.co2value.eu





Belgium ranks 3rd for cleantech Initial Public Offering

Belgium ranks 3rd for cleantech IPO's (Initial Public Offering): the public offering of shares to raise capital from public investors. Singapore and the USA are placed first and second.

Belgium holds a strong Cleantech R&D budget (weight by GDP), larger than its direct neighbours the Netherlands, Germany and France.

Source: CTG Global Cleantech Innovation Index 2017

The world's first circular concept store in Leuven

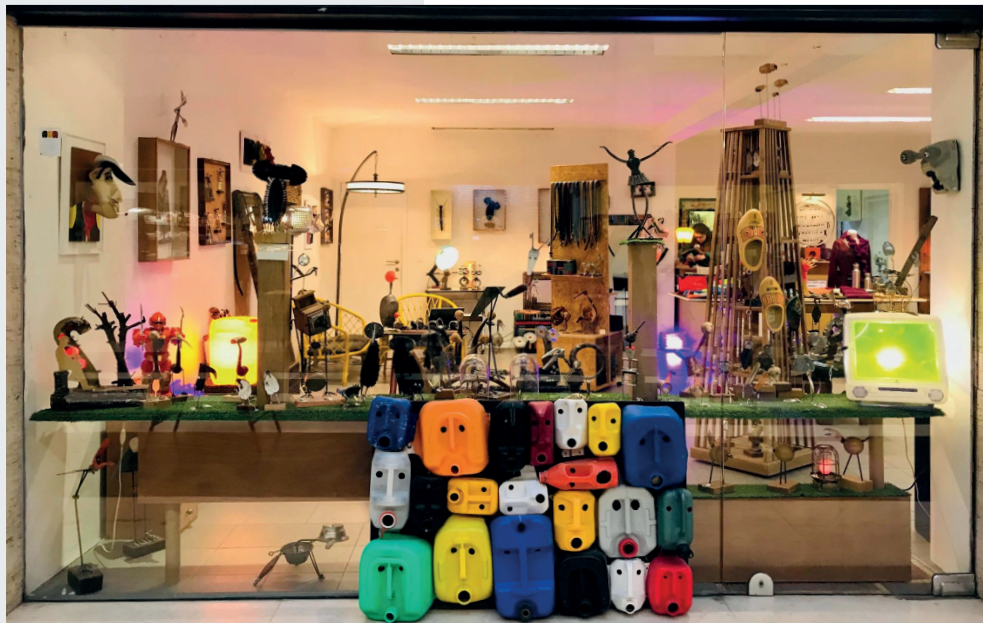
Belgium has a relative high materials reuse rate of 17%, it ranks 4th after the Netherlands, UK and Italy. Although Belgium has robust recycling systems in place, it produces high levels of waste. Flanders is tackling this issue also on community level.

Founded in March 2019, Leuven is home to the world's first circular concept store, combining elements from makerspaces, fablabs and retail stores. The concept store's goal is to introduce circular entrepreneurship to all stakeholders in a visual and tangible way, thus propagating further awareness of the circular economy model.

Further examples of circular economy initiatives can be found on vlaanderen-circulair.be, who routinely launch open calls for new projects.

www.maakbaarleuven.be

Source: POLITICO's circular economy index, 2018, based on Eurostat and EU data



CLEANTECH ECONOMICS

Actors & memberships

Flanders is home to 1000+ actors in cleantech. The sector has a value of almost 4 billion euro (EBITDA) and employs about 25,000 Full Time Employees (FTE).

Actors & domains

Approximately 40% generate and produce technologies (Tech Providers & Enablers), a strong majority of experts facilitate the implementation (55,4%) to Pioneers (6,8%) leading the cleantech revolution.

Employment in cleantech

The sector grows on average by 18 companies a year and has seen an evolution in which domains the sector grows. Recent development shows a strong mainstay of actors in the energy sectors, where there is still room for growth, and a resurgence within the waste and recycling domain, which already shows a level of maturity.

Total actors: 1000+

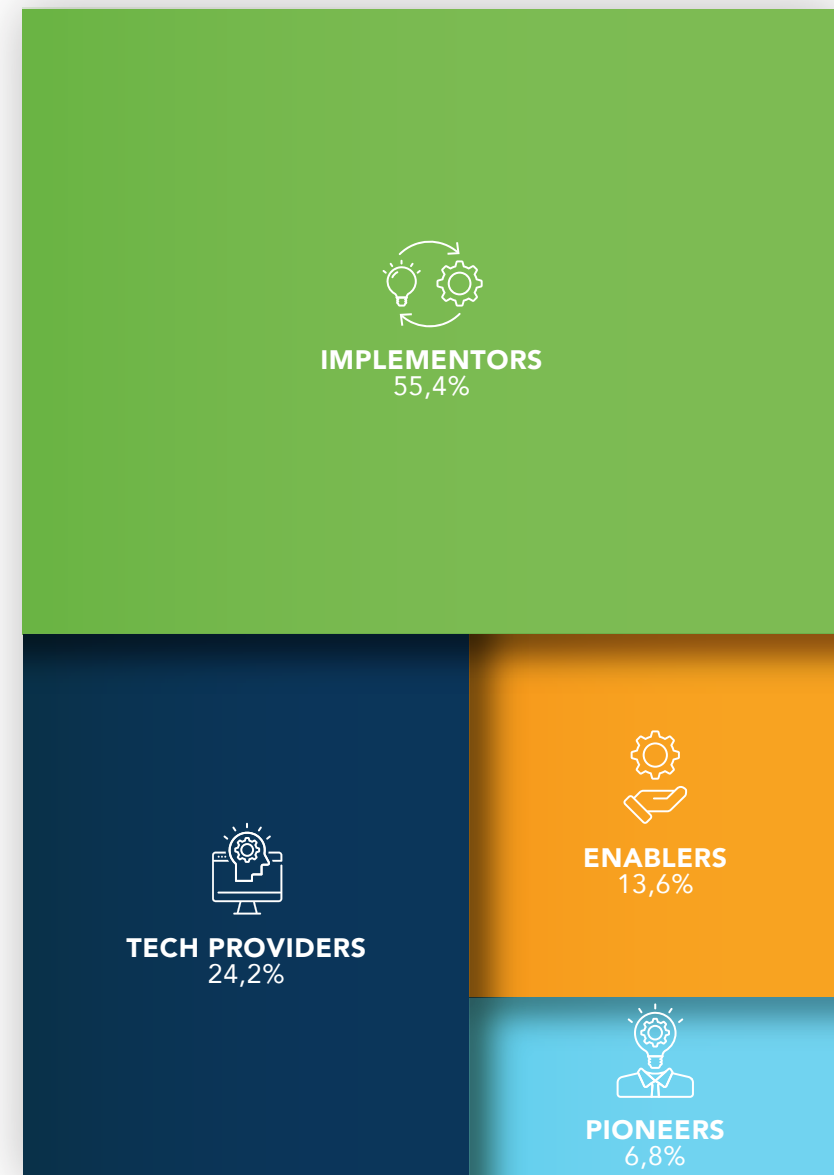
We classify individual actors into four relationship categories to cleantech:

Tech providers manufacture and sell cleantech, enabling customers to contribute to environmental goals.

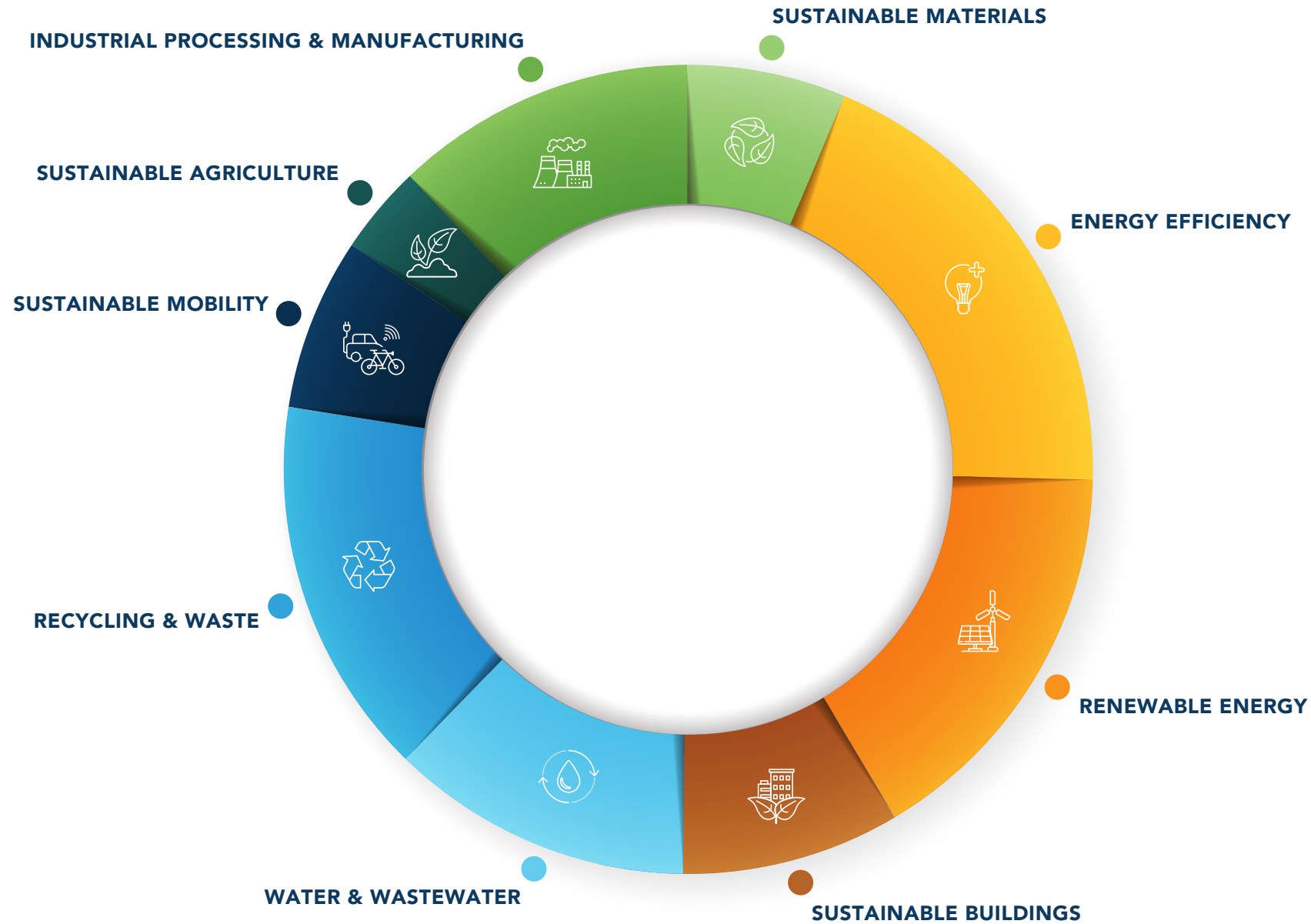
Pioneers are game changers, applying cleantech within their production process.

Implementors help other companies to adopt cleantech.

Enablers facilitate the cleantech ecosystem.



Distribution of actors in cleantech domains

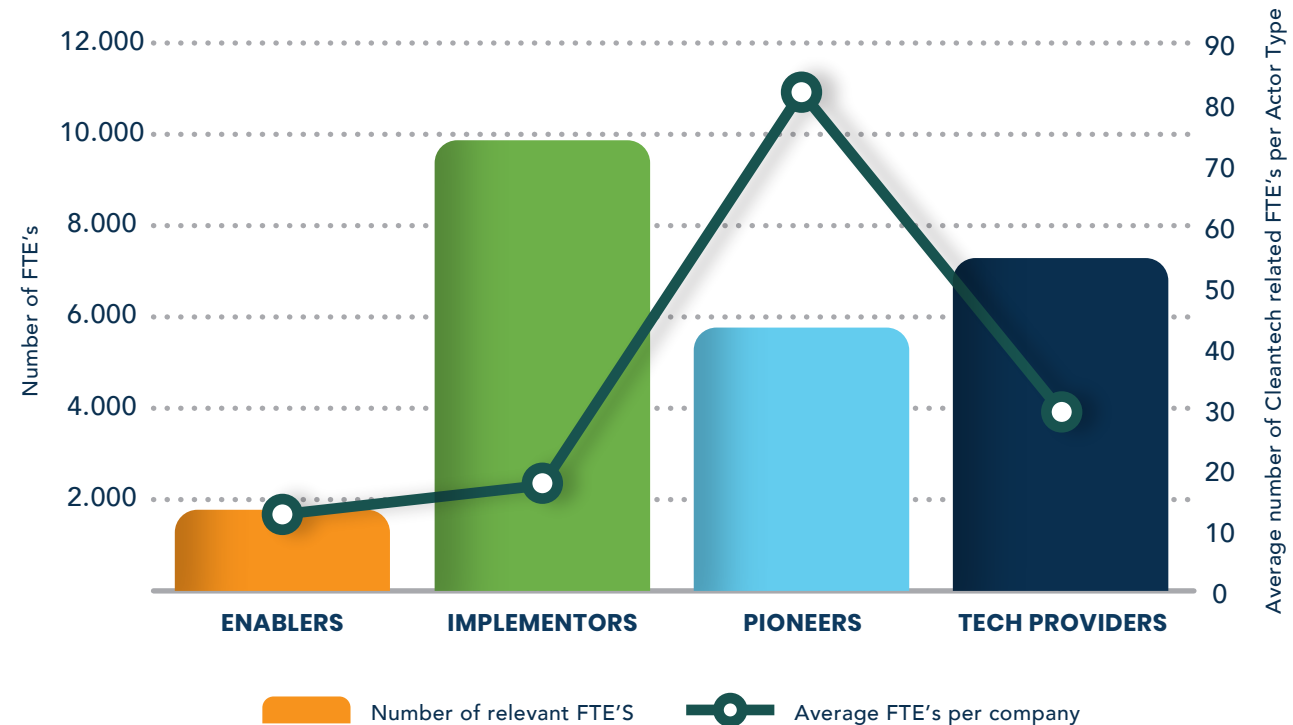


Number of FTE'S employed in cleantech in Flanders

The cleantech sector employs about 25,000 Full Time Employees (FTE).

The majority of the actors are SMEs with a low staff-count (1-10), with the Implementors category accounting for approximately 40%.

The Pioneers on average employ 82 FTE's per company, implying that it's the medium and larger companies investing and implementing clean and sustainable technologies.



CLEANTECH ECOSYSTEM



SPEARHEAD CLUSTERS

INDUSTRY

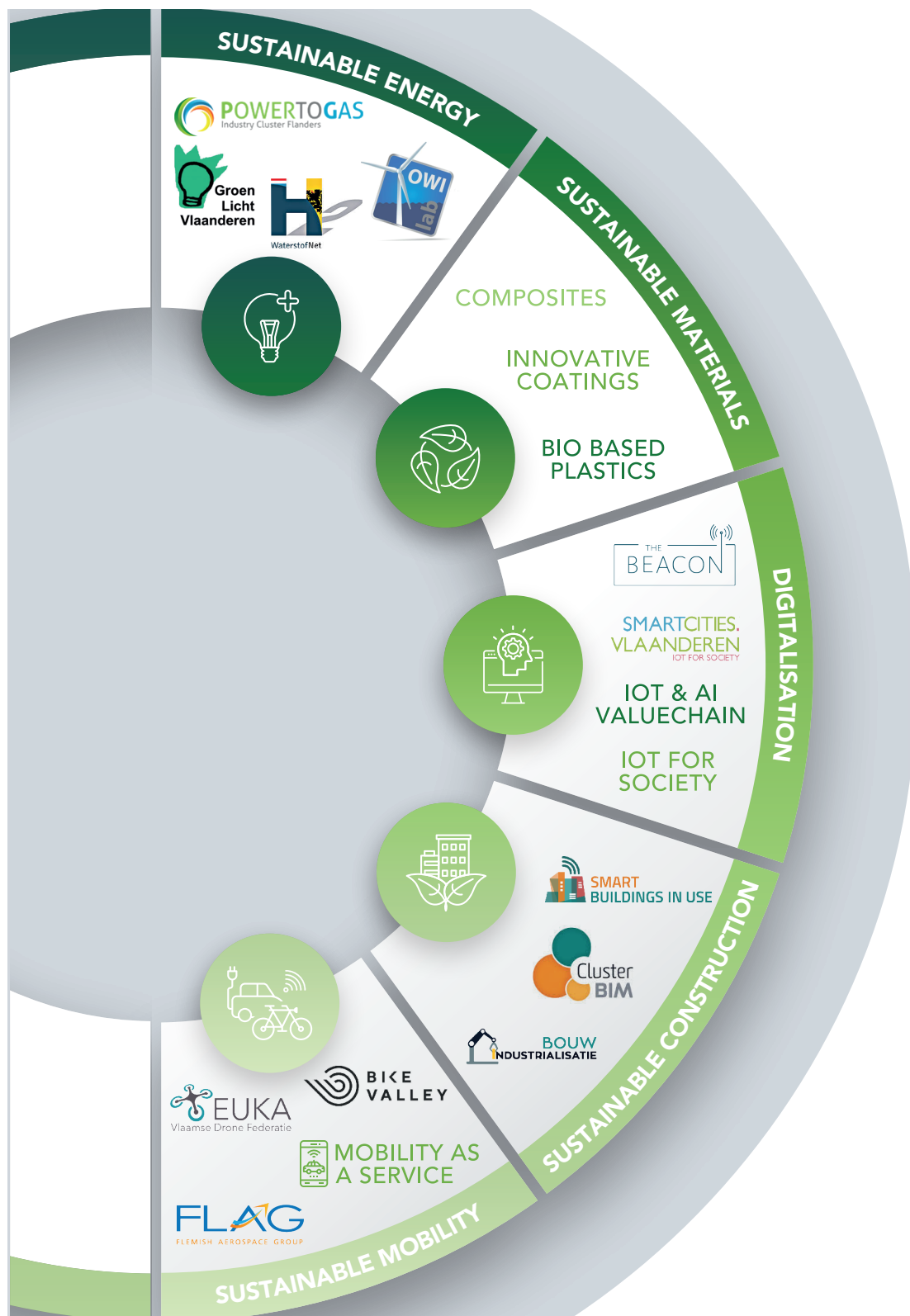
The cluster policy targets innovative Flemish companies that are open to collaboration with colleagues and R&D institutions and share the ambition to grow internationally.

The Flemish cluster policy distinguishes two types of clusters:

Spearhead Clusters connect important strategical domains.

Innovative Business Networks (IBNs) are usually smaller, bottom-up initiatives to organise a collaboration dynamic in a specific domain.





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SAMEN MAKEN WE
MORGEN MOOIER

OVAM



PUBLIC AUTHORITIES



FLANDERS
INVESTMENT
& TRADE

STRUCTURAL PARTNER



AGENTSCHAP
INNOVEREN &
ONDERNEMEN

PUBLIC AUTHORITIES

Multiple Flemish government agencies support companies, allowing them to accelerate their business.

Furthermore, the Flemish region has interesting corporate tax rates and awards generous tax exemptions for research based employment.





COMMUNITY

COMMUNITY

Citizens are informed about cleantech innovations through several events.

E.g. CleanTechPunt introduces the concept of cleantech to a wider public by informing citizens, providing educational info in and for schools, and regularly train Cleantech Ambassadors.



RESEARCH INSTITUTES

ACADEMIA

Research and academic education constitute an important basis for the innovation chain.

Innovation-oriented research and its valorisation potential are enabled by the research policy.

The Flemish universities successfully participate in inter-university and international networks.





KU LEUVEN



UNIVERSITIES

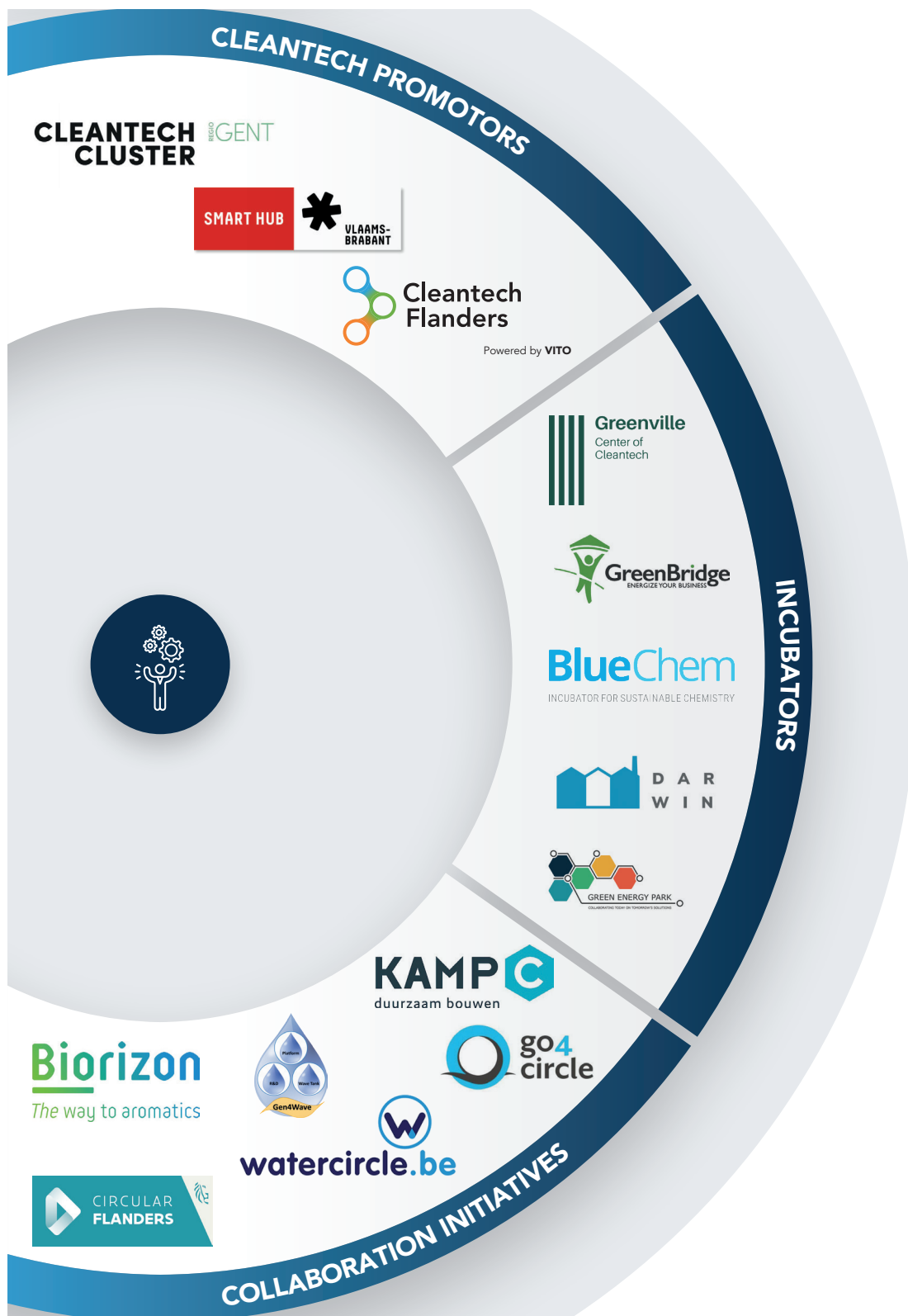
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FACILITATORS

Provide connection between industry, academia, government and community to improve cleantech adoption, implementation and accelerate innovation. Facilitation can happen in the form of networking, financing, and/or promotion.

CLEANTECH INNOVATION

**Patents per
domain**

Since the 1970's, Flanders has been aware of the importance of an environmental policy.

New materials and technologies have been quickly embraced and innovative solutions are proven crucial.

**Patents over the
years**

Innovation shows a stable rate of 85 published cleantech patents per year with 'energy' being the leading domain.

**Most patent
publishing actors**

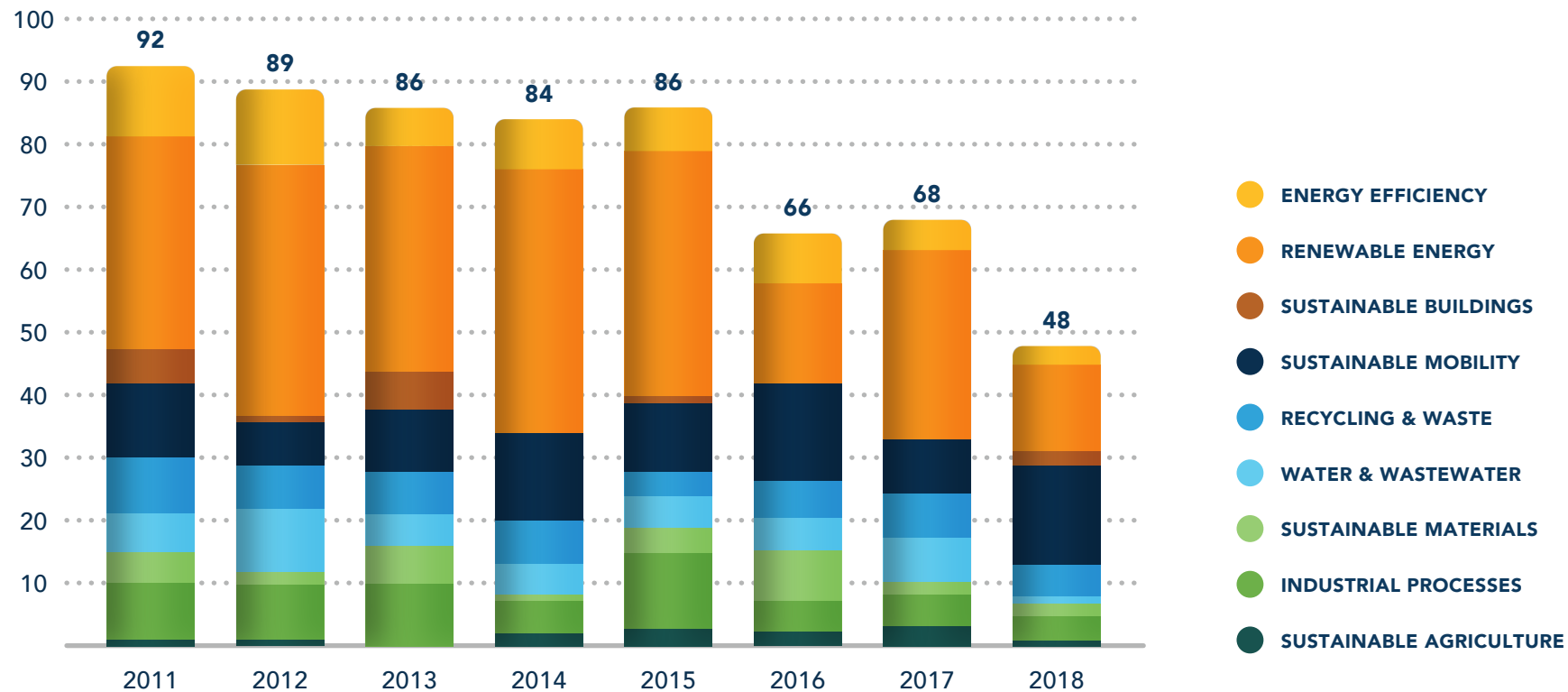
Research institutions and large commercial entities are the key drivers in the landscape, filing far more than the average number of patents.

Patents per cleantech domain in Flanders



Patents over the years

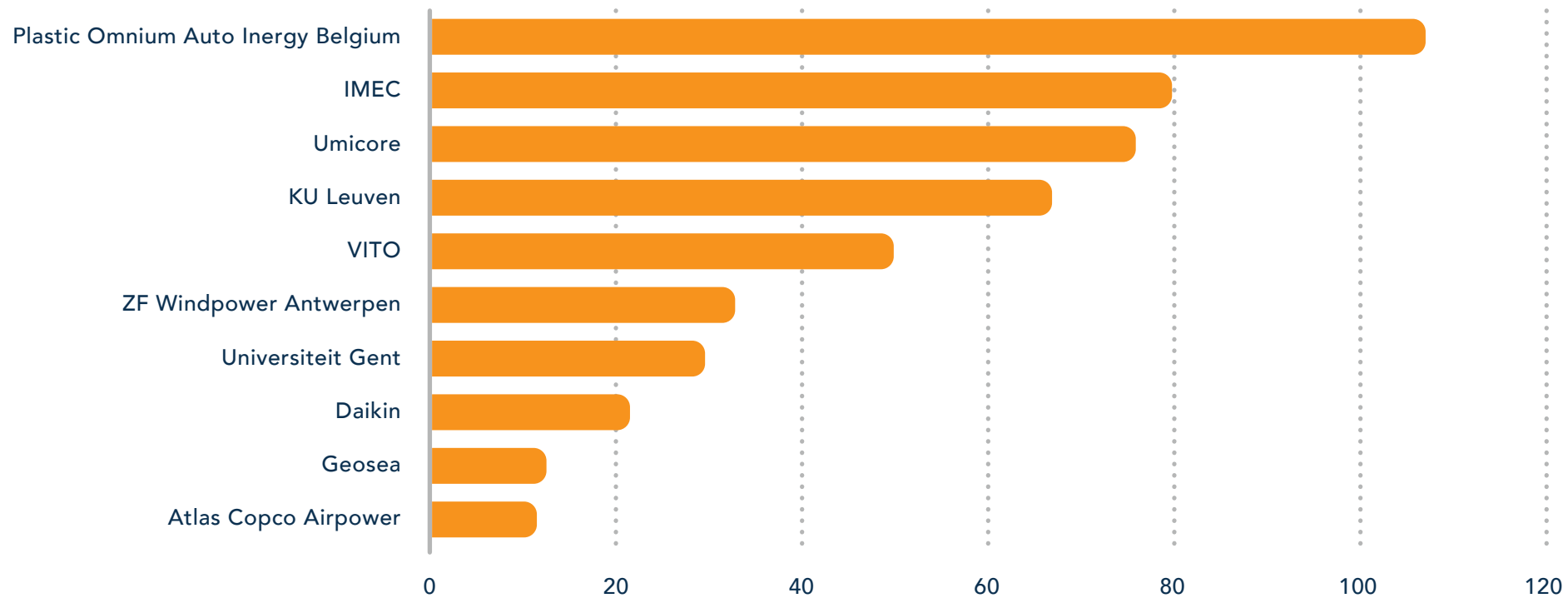
in Flanders



Innovation is shown to be stable. The duration of the patent reviewing process before publishing causes a drop of published patents filled in 2016.

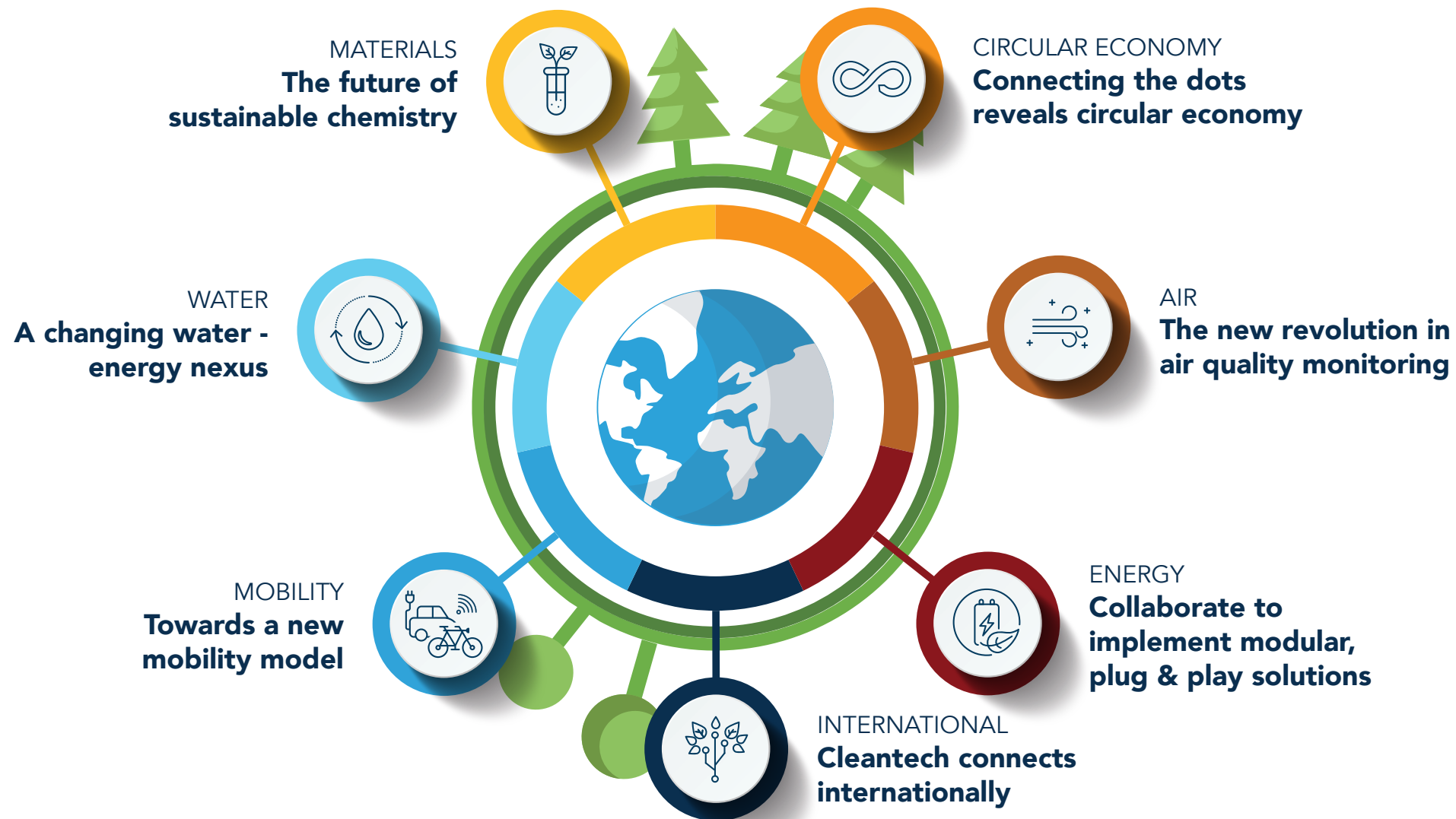
Number of cleantech patents

top actors, published since 2010



The top 10 innovators in the cleantech landscape is made up for dedicated research institutions and larger commercial companies with dedicated research divisions.

INTERNATIONAL FUTURE OF CLEANTECH





METIN BULUT

Business & Relationship
Development at VITO



MATERIALS

The future of sustainable chemistry

Since fossil feedstocks will remain the main carbon source for the chemical industry, circular economy offers short to mid-term sustainable solutions for end-of-life CO₂ emissions and pollution for plastics products. The introduction of bio-based resources offers perspective for obtaining new molecules with interesting functionalities. CO₂ itself can replace fossil feedstocks, but has to fit in adequate strategies for renewable energy storage (Power-to-X) and/or local value chains. This will require the continued development of intensified CO₂ capture and utilisation technologies.

Heat is currently applied as primary energy source, mostly in the form of steam, and is obtained by the combustion of fossil feedstocks. This results in an important CO₂ footprint which can be reduced by electrification and the gradual transition of the energy sector towards renewable low carbon energy production. This strategy is applicable for utility production like Power-to-Heat.





KARL VRANCKEN
Research Manager at VITO



CIRCULAR ECONOMY

Connecting the dots reveals circular economy

Circular economy is a complex network of connected material cycles, requiring extension of the lifecycle and maintaining a high standard of quality for materials and products alike. Thus the circular economy faces the challenge of connectivity between people, companies and products. Digital technology is increasingly being applied to provide a platform for this connectivity.

Connectivity between people is provided by apps which enable exchanges and sales of goods and services.

Connectivity between companies is prevalent in sharing and exchange of materials and infrastructure. Technology enabling the tracking of materials is crucial in order to guarantee the quality of (secondary) materials, or the usage patterns of leased goods and infrastructure.

Connectivity between products is the backbone for optimal use, increase of energy efficiency and preventive maintenance.





STIJN JANSSEN
Program Manager at VITO



AIR

The new revolution in air quality monitoring

Air pollution is still a major environmental concern for policy makers and the general public. Although air pollution concentration levels have been significantly reduced over the last decades, limit values put forward by the European Commission and the World Health Organisation are still exceeded for some harmful pollutants. In contrast to the decreasing trend in pollution levels, an increased public awareness could be observed over the last years, giving rise to large citizen initiatives such as CurieuzeNeuzen.

With the availability of low-cost sensor devices, the possibility for setting up dense sensor networks in a so-called Internet of Air is the revolution to come in air quality monitoring. This revolution is taking place in a Smart City context and comprises data, such as traffic flow/composition, residential & industrial emissions. The deployment of such an Internet of Air would allow to address the challenge of cleaner air for everybody.





GUY VEKEMANS
Strategy Coordinator
Sustainable Energy at VITO



ENERGY

Collaborate to implement modular, plug & play solutions

In order to reach energy and climate goals, no efforts should be spared in the innovation and deployment of new energy solutions. Increasing the degree of renovation is crucial in order to ensure that by 2050 all buildings are as energy efficient as new built homes in 2020.

Companies from different sectors (i.e. IT, construction, energy, ...) will need to collaborate to implement modular, plug & play solutions, to improve the comfort of users and implement pre-fab construction technologies and energy systems in the most optimal manner. The increased interaction between buildings and between communities must take center stage, especially in means of local energy production, exchange and storage.

New and sustainable processes will lead to alternative, sustainable fuels and products. Cross-sectoral collaborations, also crossing country borders, will bring industrial nodes together and enable further upscaling. Coupling to the infrastructure challenge will be the necessary technology developments for storage of both energy and molecules.





CLAIRE TILLEKAERTS

CEO at Flanders Investment
& Trade



INTERNATIONAL

Cleantech connects internationally

We are already witnessing the impact of environment and climate challenges on a daily basis, and global growth will undoubtedly further exponentially expand the task at hand. The challenges that we witness, seem to be infinite and vast: the energy crisis, the ever growing waste streams, access to clean water, resource scarcity, etc. While we have identified and are tackling a good number of these challenges locally, we also have an obligation and see opportunities in exporting these solutions and technologies internationally. It is clear that the expertise, which our academics, research institutes, clusters and individual companies have developed, is indeed unique, applicable, and scalable in an international context.

Hence our decision to make it an integral part of our strategic plan 'Flanders Accelerates'. Our objective, as Flanders Investment & Trade, is to help export that knowledge to you – to be part of the solution. Collaborating on an international scale gives ample opportunities to increase innovation in cleantech.





PIERRE FACHÉ
Smart Hub Manager
Cleantech at Smart Hub
Vlaams-Brabant



MOBILITY

Towards a new mobility model

The current mobility model is faced with numerous challenges, such as traffic jams and infrastructure improvements. The most prominent challenge still remains the use of fossil fuels. To optimise the mobility model and decrease emissions, a drastic shift is needed towards multi-modal transport systems for passengers and goods, car sharing and performant public transport systems.

Alternative energy sources such as electric and hydrogen offer sustainable, zero-emission alternatives. Evidently, renewable energy and green hydrogen are implied. With further developments, the batteries in these vehicles are improved, resulting in extended range, longer life cycle and lower demand for rare metals.

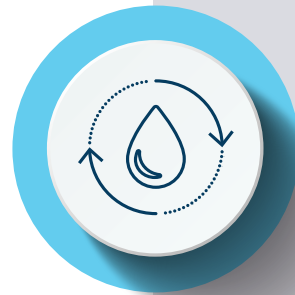
Autonomous driving will optimise the use of the road-system, fuel consumption, and on-demand public transport system integration.





ALAIN DUCHEYNE

Project Manager Cleantech at
Cleantech Flanders, VITO



WATER

A changing water - energy nexus

Water is an integral part of economic activity, with innovative cleantech solutions being at the forefront of enabling better treatment and management. Worldwide, 70% of fresh water is consumed by the agricultural sector (predominantly for irrigation purposes) and 19% by industry (mainly for thermoelectric cooling). The interest in hydroponic farming systems is a clear sign of the agricultural sector making an effort to address both land and water scarcity.

The energy sector has always been acutely aware of the crucial role water plays. Even so, a shift in mindset is observed with the propagation of the “water-energy nexus” concept, which highlights the duality of water requirements for energy production, and energy requirements for water production. A shift in the nexus is anticipated in the near future as energy is transitioning to renewable sources, which are less water intensive. Yet at the same time, water production is increasingly relying on energy intensive sources (e.g. desalination), to guarantee supply as precipitation patterns are affected by climate change. Opportunity arises as innovative cleantech solutions are considered an integral part of solving these and many more water management related problems.



EDITORIALS



FRANS SNIJKERS

Director at Cleantech
Flanders, VITO

The future of cleantech looks bright

Flanders in the Antwerp-Rotterdam-Rhein-Rhur-area, hosts the second largest chemical cluster in the world and Europe's largest biorefinery. The proximity of industry and the population has made that the region has overcome many environmental and ecological challenges.

As such, Flanders finds itself in pole position for developing innovative clean technological solutions. Innovation in cleantech by start-ups, scale-ups, as well as large enterprises, is supported by a dynamic innovation landscape.

Cleantech Flanders plays a crucial role in connecting cleantech actors. We spread and advocate cleantech, facilitate cleantech innovations and its implementation in society.

The future of cleantech looks bright. Cleantech enabling technologies like artificial intelligence, machine learning, sensors, light-weight materials, 3D-printing, blockchain, big data, drones, boost innovation in tradition cleantech domains like renewable energy, energy efficiency, circular and bio-economy air, water and soil.

EDITORIALS



BRUNO REYNTJENS

Commercial Director at VITO

We promote Flemish cleantech in Flanders and abroad

The first climate agreement dates back to 1992, the Flemish sustainable development goals were launched 5 years ago, the awareness to act continues to increase.

The systemic transition required for mitigating climate change requires intensive collaboration between companies, policy makers, knowledge institutes and citizens.

VITO's goal as Flemish knowledge institute focused on sustainable development is to facilitate this collaboration and develop clean technologies, solutions and insights. That is why VITO empowers Cleantech Flanders to independently promote Flemish cleantech in Flanders and abroad.

Cleantech is the term used for the collection of technologies and technological solutions that we need to develop, implement and use in order to realize the transition. The region of Flanders comprises a dynamic cleantech community stretching across several of the typical industrial sectors.

In this Cleantech report we present an overview of Flemish cleantech, the ecosystem, its impact and the future challenges.

ABOUT THIS REPORT



ABOUT THIS REPORT

This report presents the current state of Flemish cleantech and stretches the evolutions and challenges of cleantech. Cleantech Flanders strives for a yearly edition of a cleantech report.

We hope to ...

- Provide accurate data, information and analysis results highlighting the strengths of the Flemish cleantech ecosystem.
- Promote awareness of the fact that cleantech, like sustainability, can be a driver for market share increase, marketing, and expanding to new (international) markets.

Methodology



Become a partner of Cleantech Flanders

Cleantech Flanders shows which companies are active in cleantech both in Flanders and in other areas.

Do you have a cleantech product or service? Have you implemented a clean technology? If so, we are happy to put your company or organisation in the spotlight. Joining the Cleantech Flanders community has many advantages.



Get to know: We keep you up to date on the latest cleantech trends and developments



Get connected: We match cleantech opportunities to like-minded large companies, SMEs and scale-ups.



Go global: We help you upscale your cleantech business abroad.



Join Cleantech Flanders for free.