

INNOVATION

ENERGY

DIGITALISATION

TRANSPORT

HEALTH

>>>
IN ACTION

CIRCULAR BIO-BASED ECONOMY

GREEN TECHNOLOGIES



>>>

JOINT UNDERTAKINGS
FOR CUTTING-EDGE
RESEARCH
IN EUROPE





Luxembourg: Publications Office
of the European Union, 2020

© European Union, 2020

Reproduction is authorised
provided the source is acknowledged.

PRINT	ISBN 978-92-95221-01-7	doi:10.2885/693676	HS-02-20-603-EN-C
PDF	ISBN 978-92-95221-00-0	doi:10.2885/766310	HS-02-20-603-EN-N



INNOVATION

>>>

IN ACTION

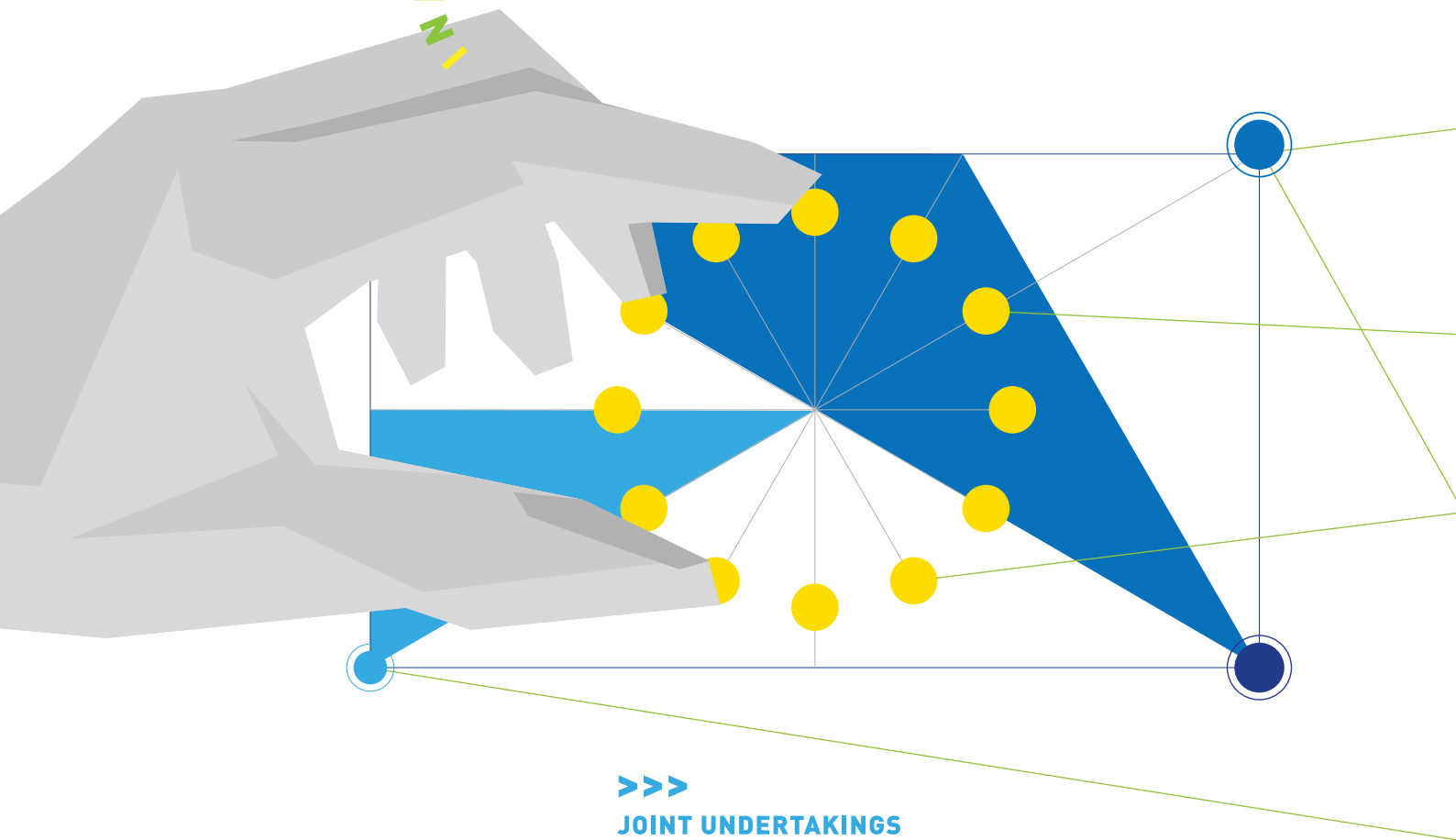
>>>

JOINT UNDERTAKINGS
FOR CUTTING-EDGE
RESEARCH
IN EUROPE



INNOVATION

>>>
IN ACTION



>>>

**JOINT UNDERTAKINGS
FOR CUTTING-EDGE
RESEARCH
IN EUROPE**



WHY DOES EUROPE NEED JOINT UNDERTAKINGS?

CUTTING-EDGE RESEARCH & INNOVATION

We are agile, efficient and truly inclusive public-private partnerships, capable of leveraging knowledge, skills and expertise. We keep ahead of the curve by delivering scientific excellence and innovation across key industrial sectors - smarter and greener mobility, innovative healthcare, improved circular economy, cleaner energy and better electronics.

GREEN RECOVERY

We are scaling up investments needed in strategic sectors in order to support the transition towards a green economy, meeting the goals of the European Green Deal and Digital Europe.

ENHANCING EU COMPETITIVENESS

Through a close cooperation of research and industry, and an alignment with other European and national policies, we effectively contribute to strengthening EU leadership on a global stage.

MISSION-ORIENTED

By embedding the partnerships within the EU's policy and regulatory framework, we ensure that research is oriented towards the right priorities, bringing real added value to Europe's economy and society and maximising the resources available at regional, European and global level.

ACHIEVING GREAT THINGS TOGETHER

We cooperate closely with the European Commission, Parliament and Council, as well as with relevant regulatory bodies and national authorities in the participating countries, contributing to overall European strategy and policies. From industry to digital, energy and health, we bring research to the market, and we produce competitive results, by creating jobs and growth.

JOINT UNDERTAKINGS IN NUMBERS



HORIZON 2020 EU CONTRIBUTION

€5.26 bn



10.05 % of HORIZON 2020



PARTICIPANTS

11 761

PARTICIPATIONS



8.67 % of HORIZON 2020

4 343

UNIQUE PARTICIPANTS



12.38 % of HORIZON 2020



SMEs

2 463

PARTICIPATIONS



20.94 % of HORIZON 2020



RESEARCH ORGANISATIONS

4 809

PARTICIPATIONS



3.28 % of HORIZON 2020

These statistics do not include figures from F4E,
as it benefits from €6.8 bn from Euratom.



50 COUNTRIES PARTICIPATING IN JU PROJECTS

Austria
Belgium
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Ireland
Italy
Latvia
Lithuania
Luxembourg
Malta
Netherlands
Poland
Portugal
Romania
Slovakia
Slovenia
Spain
Sweden

Australia
Brazil
Canada
China
Gabon
Iceland
Israel
Marshall Islands
Norway
Republic of Korea
Russian Federation
Senegal
Serbia
Sierra Leone
South Africa
Switzerland
Taiwan
Tanzania
Tunisia
Turkey
Ukraine
United Kingdom
United States

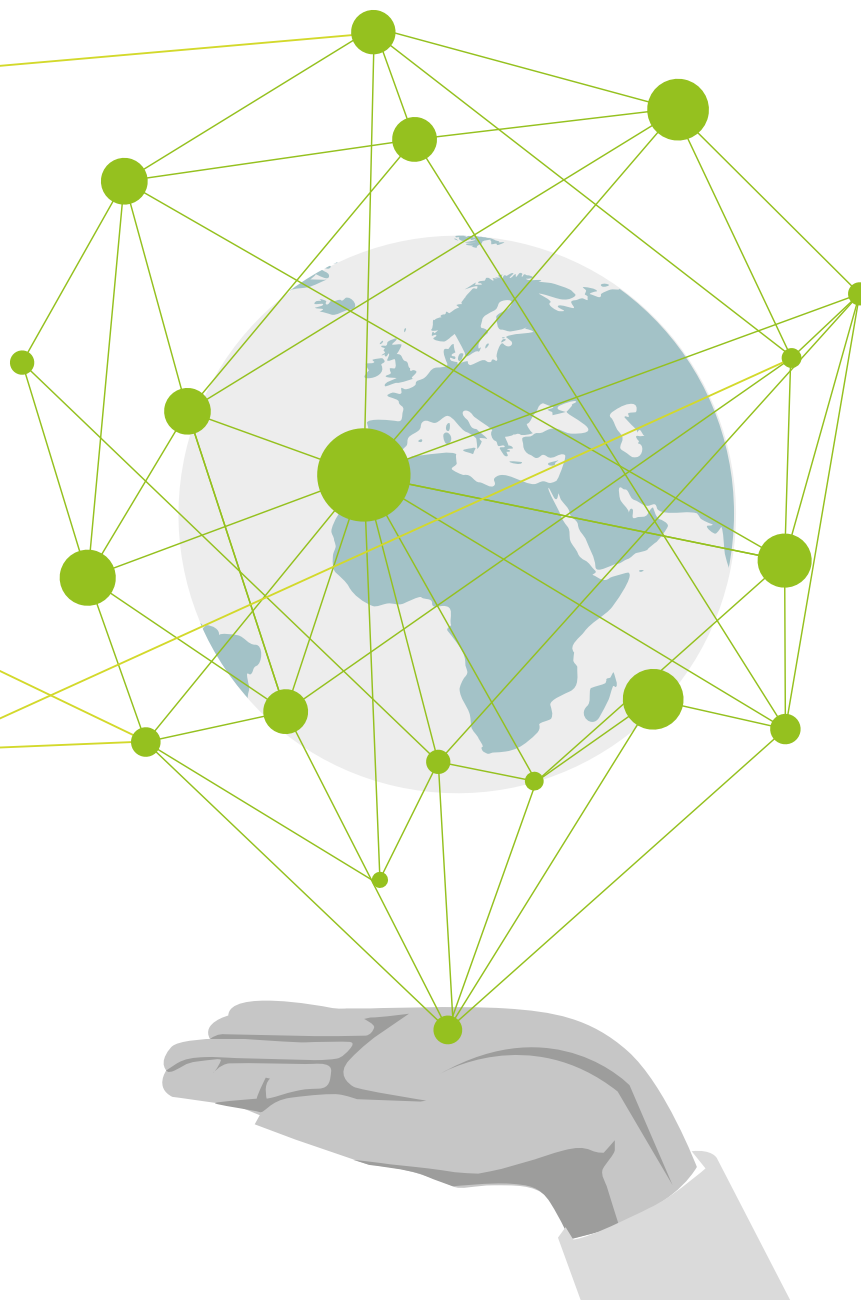


TABLE OF CONTENTS



Bio-based Industries Joint Undertaking is the most ambitious research and innovation initiative in the European bioeconomy. It is investing €3.7 bn in developing a sustainable and competitive bio-based industry and preparing the post-petroleum era, thus contributing to several objectives of the European Green Deal and Sustainable Development Goals.

8



Clean Sky 2, a public-private partnership between the European Commission and the European aeronautics industry, develops innovative technologies for greener aviation, aiming to reduce CO₂ emissions and noise levels. Bringing together more than 900 participants from industry, SMEs, research centres and academia for the best innovative results, Clean Sky 2 is strengthening European aeronautics collaboration, global leadership and competitiveness.

10

18



The Innovative Medicines Initiative is a partnership between the EU and Europe's pharmaceutical industry. We are globally recognised as a pioneer of open innovation and an attractive model for successful PPPs in research. We have over 150 projects delivering results that address some of the biggest unmet needs in medical research and drug development, including antimicrobial resistance, pandemic preparedness, dementia, diabetes and cancer.

16



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

A unique PPP between the European Commission and Hydrogen Industry (Hydrogen Europe), the FCH JU contributes to the development of sustainable and competitive fuel cells and hydrogen technologies in Europe. FCH JU supports innovative hydrogen solutions for sustainable energy and transport applications and for sectorial integration to help the EU reach its decarbonisation targets and strengthen its industrial competitiveness.

12



ECSEL Joint Undertaking

Electronic Components and Systems for European Leadership

A tripartite (EU/Industry Associations/Participating States) funding programme supporting world class Electronic Components and Systems. Shaping digital innovation by enabling smart and sustainable solutions in key sectors such as mobility, health, environment, energy, digital society, and boosting the overall competitive manufacturing capability of the EU.

14



Fusion for Energy (F4E) is the Joint Undertaking managing Europe's contribution to ITER—the biggest scientific experiment on the path to fusion, the energy of the sun and the stars.

20



The Single European Sky ATM Research (SESAR) Joint Undertaking is leveraging the latest digital technologies to transform Europe's aviation infrastructure, making it safer, smarter and more sustainable, thereby matching the ambitions of the 'European Green Deal' and the 'Europe fit for the digital age' initiative.

22



Shift2Rail's vision is to deliver the most sustainable, cost-efficient, high-performing, time driven, digital and competitive customer-centred transport mode for Europe. We do this through research and innovation, which develops cutting-edge innovative solutions to create railway systems of the future for passengers and freight. Our goal is to develop an interoperable, high capacity rail system, allowing it to become the backbone of future climate-neutral mobility and transport in Europe. The technological demonstrators, at the heart of Shift2Rail's R&I programme, are the building blocks of a systemic railway transformation, strategically driven by the European Green Deal objectives and Digital Strategy.



A high-impact initiative for green recovery of Europe

Launching the circular bio-based economy

The Bio-based Industries Joint Undertaking is a €3.7 bn public-private partnership between the EU and the Bio-based Industries Consortium. It aims to de-risk investments for the construction and deployment of biorefineries across Europe to contribute to a more sustainable low-carbon economy.

Since its inception in 2014, BBI JU has funded over 120 projects, in particular nine flagship biorefineries that are first-of-their-kind in Europe and are expected to reduce about 600 000 tons of CO₂ emissions in total per year. They are deploying very different business models representing €1.3 bn of private investments leveraged by €215 m of BBI JU grants. These biorefineries will create more than 3 000 direct and 10 000 indirect jobs, most of them in rural and coastal areas.

Furthermore, BBI JU is enabling a fully circular use of resources. The vast majority of projects transform previously underutilised sidestreams from agriculture, forestry and fisheries into valuable bio-based materials and products. Also, all feedstock used in the projects must be sustainably sourced in Europe and not compete with food production.

The bio-based industries sector is growing and very promising, yet fragmented across actors and regions. By helping the sector reach its potential and coherently structuring the value chains, the BBI JU initiative is a crucial enabler of the EU's Bioeconomy Strategy.

The mobilising effect is also essential for specific groups of research and technology stakeholders - more than 35 % of the funding goes to SMEs and 30 % to research centres and universities, ensuring long-term stability and predictability for the sector.



PROJECT EXAMPLES

>>>

EMBRACED

Creating sustainable materials from used nappies

Disposable nappies have a sizeable environmental impact. 8.5 thousand tons of such waste are incinerated or landfilled in Europe every year. The EMBRACED project has developed collection and recycling systems that turn used nappies into profitable new materials, such as organic fertilisers or packaging films.

>>>

FIRST2RUN

Greening marginal lands to make bioproducts

FIRST2RUN proved the effectiveness of a sustainable biorefinery that respects the environment and biodiversity while creating jobs in agriculture and industry. The project extracted oil from the seeds of cardoon grown on marginal land near the biorefinery in Sardinia to make products such as compostable plastics, lubricants, and cosmetics.



FACTS AND FIGURES


35 % of funding goes to SMEs

84 % of projects will deliver bio-based products that will lower greenhouse gas emissions by replacing fossil-based alternatives

75 % of projects contribute to waste reduction, reuse, and recycling

82 % of projects result in the creation of new skilled jobs, most of them in rural areas

CONTACT US

 www.bbi-europe.eu

 [@BBI2020](https://twitter.com/BBI2020)

 [Bio-based Industries
Joint Undertaking \(BBI JU\)](#)

 [Bio-Based Industries
Joint Undertaking](#)



Innovation Takes Off!

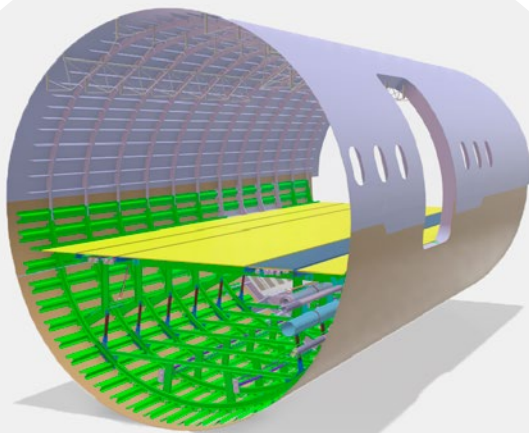
En route to climate-neutral aviation

Clean Sky 2, part of the EU's Horizon 2020 programme, is a Joint Undertaking of the European Commission and the European aeronautics industry. It actively contributes to the environmental objectives of Flightpath 2050's 'European Vision for Aviation' report to reduce CO₂, gas emissions and noise levels produced by aircraft.

Clean Sky 2 is developing innovative, cutting-edge technologies for more aerodynamic wings, lighter and more efficient engines, smarter systems, brand-new aircraft configurations, and a more sustainable aircraft lifecycle, for large, regional, and small planes, and helicopters.

Bringing together the aeronautics industry, SMEs, research centres and academia for the best innovative results, Clean Sky 2 is also contributing to strengthening European aeronautics collaboration, global leadership and competitiveness.

Running from 2014 to 2024, Clean Sky 2 has a total budget of €4 bn, and counts over 900 participants in 30 countries.



PROJECT EXAMPLES

>>>

Next Generation MultiFunctional Fuselage Demonstrator

Leveraging thermoplastics for cleaner skies

The Next Generation MultiFunctional Fuselage Demonstrator (MFFD) project is examining the full potential of thermoplastic composites to help future European airliner production to become faster, greener, and more competitive. A fuselage barrel made of thermoplastic composites weighs less because fasteners are no longer needed, and the materials are more recyclable.

>>>

TechTP Demonstrator

From sketches on paper to reality

Clean Sky's TechTP engine demonstrator project paves the way for a 100% European-built sustainable, quiet and efficient engine for use with general and small commuter-sized aircraft (up to 19 passengers), and is on track for the next phases of its development and testing regimes. It is the first delivered key demonstrator of Clean Sky 2!



FACTS AND FIGURES

Clean Sky participants include:

> 335 SMEs = 37% of all participants

> 300 industry members

> 150 universities


> 112 research organisations

> 5000 scientists and engineers involved

18 Memoranda of Understanding signed with EU Member States and Regions

CONTACT US

 www.cleansky.eu

 [@cleansky_ju](https://twitter.com/cleansky_ju)

 [Clean Sky Joint Undertaking](https://www.linkedin.com/company/clean-sky-joint-undertaking)

 [Clean Sky](https://www.youtube.com/c/cleansky)



Powering the digital transformation in Europe

The fine art of shaping digital innovation together

The ECSEL Joint Undertaking, the public-private partnership on Electronic Components and Systems (ECS), funds Research, Development, and Innovation projects for world-class solutions in key sectors such as mobility, health, environment, energy etc. ECS applications are present in all aspects of our daily life, and more than ever such key enabling technologies are essential in the era of the digital transformation.

Through ECSEL JU, European industry, SMEs, and Research and Technology Organisations (represented by 3 Associations, AENEAS, ARTEMIS-IA and EPoSS) work closely together, supported and partly co-financed by 30 ECSEL Participating States and the European Union. Such a “tripartite” model has been able to create a very strong leverage effect: each euro paid by the EU has resulted in more than €4 for research and innovation activity in Europe.

In addition to funded projects, ECSEL JU’s Lighthouse Initiatives focus the community on all aspects of their specific domains, which are of key importance to European citizens.

Living in a world evolving at the highest speed, the ECSEL JU - with its unique modus operandi - implements an effective “co-funding/risk sharing” facility (~€5 bn) in an extremely complex and interconnected sector like ECS. The ECSEL JU contributes to establishing strategic European alliances, to maintain EU strengths (including manufacturing capabilities) and secure fast access to reliable solutions “Made in Europe”, for the socio-economic recovery and stability of the EU.

Recognising that ECS technologies are an engine to ensuring Europe’s digital competitiveness and its autonomy, the ECSEL JU program substantially contributes in building the EU’s resilience.



PROJECT EXAMPLES

>>>

ENABLE-S3

Safe automated transport through cost-efficient validation and verification of on-board electronics

Safety is everything, especially in highly automated transport vehicles (cars, trucks, trains, ...), making verification and validation (V&V) of the electronics systems a major concern. Real-world tests are unrealistically expensive and potentially dangerous, and pure simulation by computers cannot cover all the detailed physics involved. ENABLES3 develops solutions that optimally combine real-world and simulated V&V to ensure safety, as well as economical commercialisation of automated electronics systems.

>>>

OCEAN12

Keeping electronics systems on a tight energy budget is more fun for the user and better for the environment

The electrical power consumed by electronics systems is an important concern, impacting battery life in portable devices, heat management in larger systems, and the environmental impact of wasted electrical energy more generally. OCEAN12 will use the innovative Fully Depleted Silicon On Insulator (FD-SOI) technology to develop new sensors, microprocessors and application designs that offer the lowest possible power consumption components, mainly for automotive and aeronautic applications.

FACTS AND FIGURES

14 Calls

78 Projects

More than 2700 participations

€4.04 bn RDI costs

€1.93 bn
EU and National
funding

€2.11 bn industries own financing

3 Lighthouse Initiatives:

Industry4.E
Mobility.E
Health.E

CONTACT US

 www.ecsel.eu

 @ECSEL_JU



 ECSEL JU





FUSION
FOR
ENERGY

Bringing the power of the Sun to Earth: abundant, safe and sustainable energy for the future

Fusion for Energy is a Joint Undertaking under the EURATOM Treaty with the mission to make fusion energy a reality

Energy holds the key to our economic prosperity and social well-being. A sustainable energy mix is needed to fight climate change and Europe is at the forefront of developing one of the most promising long-term options: fusion, the energy that powers the sun and the stars. Harnessing it on Earth, as an energy source, is a major scientific and technological challenge whose potential rewards are far-reaching, as it can provide virtually abundant, safe and sustainable energy.

ITER is the next major milestone on the path to fusion energy. Europe is the host to the project, currently under construction in the south of France. ITER is a global scientific partnership bringing together half of the world's population: China, Europe, Japan, India, the Republic of Korea, the Russian Federation and the United States. ITER is on track to start first operations (so-called "first plasma") in December 2025.

F4E's main task is to provide Europe's contribution to ITER; it also supports the development of fusion through the Broader Approach Agreement with Japan; in the longer term, F4E will use the knowledge and expertise gained from its work to prepare for the construction of industrial fusion power plants.

Europe is responsible for nearly half of ITER, which in itself means many business opportunities. F4E is working together with industry and research organisations to manufacture thousands of components, and build the infrastructure of the biggest fusion machine in history.



PROJECT EXAMPLES

>>>

Fusion can be part of a sustainable energy mix

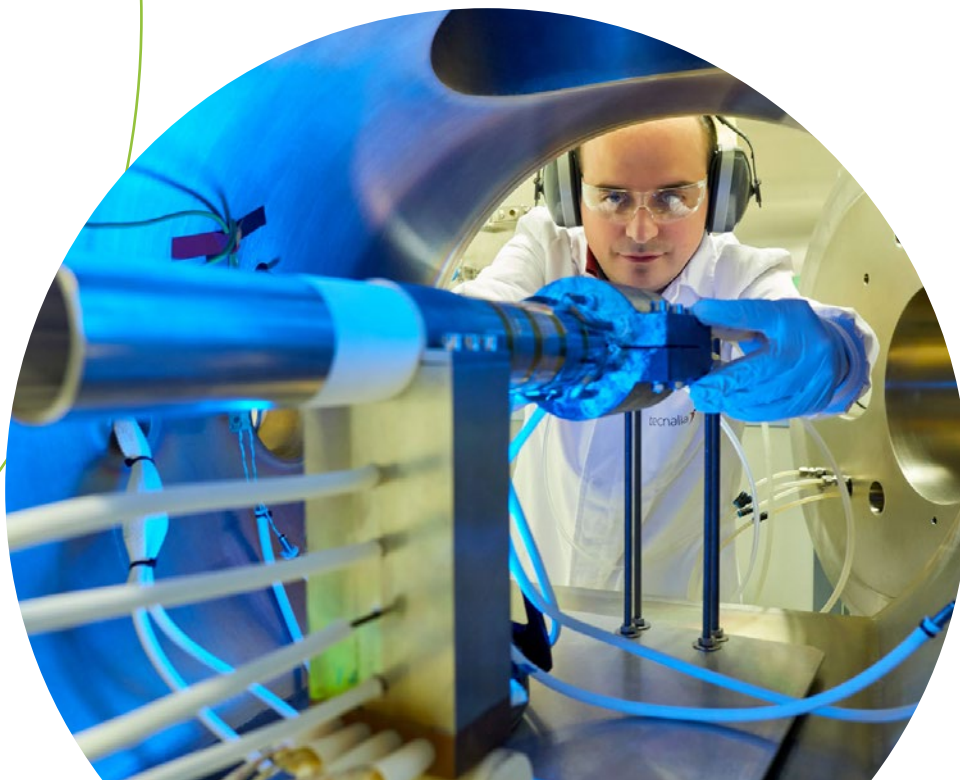
More than half of the energy we consume comes from abroad at a cost of €1 bn per day. Fusion can provide abundant, safe and sustainable energy complementing renewables.

50 grams of lithium, found in 280 litres of Earth crust and 12 grams of deuterium (hydrogen) found in 400 litres of water, can produce the total of the energy consumed by an EU citizen during its lifetime.

>>>

Investing in fusion boosts European industry and stimulates growth

The ITER “first-of-a-kind” technology systems and high quality standards generate knowledge and pave the way for future spin-offs, helping Europe to maintain its leadership in fusion research and be a champion of green growth. European industry benefits from this transfer of knowhow, expands into new markets and becomes more competitive, offering more smart jobs and generating economic growth.



FACTS AND FIGURES

EU contribution (2008-2019): €6.8 bn (2008 prices)

Contracts signed: 833

Unique participants: 600 companies, 70 research organisations, 1670 subcontractors

Country participation: 28 EU countries and Switzerland

**Approximately 40 000
job-years created between
2008 and 2017 (83,000 more
by 2030)**

Investment in fusion brings a net economic benefit of 5-6%

**400+ new technologies,
tools and processes,
20+ spin-offs, start-ups,
joint-ventures**


Spin-offs in Metrology, Robotics (Remote Handling Systems), waste processing, Extracting helium from gas, vacuum systems

CONTACT US

 www.f4e.europa.eu

 @fusionforenergy

 Fusion for Energy



 fusion4energy



Clean Hydrogen for Europe

The success story of European Commission working in partnership with the industry on Research and Innovation

FCH JU achievements during both FP7 and Horizon 2020 have been creating low-carbon and sustainable solutions, enabling market entry for new products, as it strives to make hydrogen and fuel cell products an everyday reality in Europe.

Transport is a challenging sector to decarbonise. FCH JU has funded a series of flagship bus, car and refuelling infrastructure projects: over 2000 cars and vans and more than 300 buses are currently under deployment; 101 HRS¹ are currently being demonstrated. Because research has significantly enhanced the performance of hydrogen fuel cells, the FCH JU oversees their application to heavy-duty, trains, maritime and aviation sectors.

In the building sector, FCH JU has been instrumental in the development and commercialisation of 2000 fuel cell μ CHP² units that allow householders and businesses to produce much of their own electricity, heat and hot water in an efficient, clean and silent manner.

The deployment of renewables leads to an increasing demand for energy storage. FCH³ technology is the only option available today to store renewable energy on a large scale and use it for all energy needs – from transport to building heat and power to industry, thus enabling sectorial integration. Moving from 100 kW to 20 MW single electrolyser projects, the FCH JU allocated considerable resources to the refinement of the clean hydrogen production, with the result that Europe is now a world leader in this technology.

FCH JU is playing a fundamental role in removing the commercialisation barriers by providing support to develop a suitable regulatory framework for the new hydrogen market. Further initiatives concerning education and training of the European workforce have been undertaken to further support the uptake of hydrogen in the market and to capitalise on its full socio-economic benefits.

All FCH JU achievements contributed to the recent publication of the first ever European Strategy for Hydrogen, as part of the Green Deal package.



¹ Hydrogen refueling station

² micro Combined Heat and Power

³ Fuel cells and hydrogen

PROJECT EXAMPLES

>>>

Hydrogen Valleys,
Regions and Islands

Green hydrogen production sites are setting up all over Europe, from Scotland's remote Orkney Islands to the industrial heartlands of Austria supplying green hydrogen to all type of applications. Showcasing the role of H2 in sectorial integration, the FCH JU is supporting a flagship "Hydrogen Valley" project. And to foster replication the FCH JU is providing Project Development Assistance support to regions across Europe.

>>>

Decarbonising
transport

Building from research activities for performant and affordable fuel cells in combination with novel hydrogen on-board storage solutions, the FCH allowed bringing quiet and non-polluting hydrogen vehicles to the market. Fuel cells buses are now a competitive alternative for zero-emission public transport, hydrogen cars are deployed for commercial taxis operation and ships, trains, trucks and airplanes are now about to shift to hydrogen.



FACTS AND FIGURES

262 supported R&I Projects
€978 m EU funding,
complemented by €1 bn
from private sources,
leveraging additional
private investments of
about €900 m

269 SMEs have received
funding

2 Hydrogen Valleys
– Orkney Islands and
Northern Netherlands

11 European regions
benefiting from Project
Development Assistance

20 MW electrolyser for
chemical industry in
Groningen, the Netherlands;

141 HRS in live availability
system

120 kWe system for waste
water treatment plant in
Turin, Italy

CONTACT US

 www.fch.europa.eu

 [@fch_ju](https://twitter.com/fch_ju)

 [FCH JU](https://www.linkedin.com/company/fch_ju)

 [FCHJU](https://www.youtube.com/channel/UCFCHJU)

INNOVATION

>>>
IN ACTION

IMI

INNOVATIVE MEDICINES INITIATIVE



Europe's partnership for health

Delivering results that address major medical challenges like antimicrobial resistance, cancer and dementia.

IMI is a €5 bn partnership between the EU and the European pharmaceutical industry (represented by EFPIA, the European Federation of Pharmaceutical Industries and Associations).

We were launched in 2008 with the goal of improving the medicines development process and making it more efficient, and to ensure that patients will have faster access to better and safer medicines.

Today, we are globally recognised as a pioneer of open innovation and an attractive model for successful PPPs in research. A true partnering machine, we forge collaborations that bring together all relevant stakeholders including universities, large pharmaceutical companies, SMEs, patient groups, and medicines regulators, as well as companies in other health-related sectors, such as diagnostics, imaging, and IT.

Together, our 150 projects are delivering results that address some of the biggest unmet needs in medical research and drug development, including antimicrobial resistance, pandemic preparedness dementia, diabetes and cancer.

Highlights include:

- an approved Ebola vaccine and other tools useful for pandemic preparedness;
- pan-European hospital and laboratory networks that are making it easier to run clinical trials of new antibiotics;
- novel antibodies that neutralise the MERS coronavirus and could help to tackle SARS-CoV-2, which causes COVID-19;
- a new classification of diabetes sub-types that is paving the way for more personalised treatments;
- new insights into the roles of different genes in Alzheimer's disease, knowledge that is essential for developing treatments;
- 'big data' tools that are allowing scientists to gain new insights from existing health data, while protecting patient privacy.



PROJECT EXAMPLES

>>>

Ebola+

IMI-funded Ebola vaccine gets green light from regulators

Recent Ebola outbreaks in Africa have left thousands dead. Now, an Ebola vaccine regimen co-funded by IMI has obtained regulatory approval. IMI supported the development of the Janssen vaccine regimen through clinical trials, community engagement, capacity building, and manufacture methods. So far, 100 000 people have started the vaccine regimen and up to 1.5 million vaccine regimens are stockpiled.

>>>

CANCER-ID

Hunting for cancer clues in blood samples

Cancerous tumours shed cells and fragments of DNA into the bloodstream. The CANCER-ID project developed methods to extract these cells and fragments of genetic material from blood samples and then analyse them. Ultimately, these 'liquid biopsies' could allow patients' condition to be assessed more regularly, without the need for invasive, risky surgical biopsies.

FACTS AND FIGURES

64 % of IMI2 projects involve patients, either as full project partners or as representatives on advisory boards, for example

As of the end of 2019, IMI1 and IMI2 projects had produced 5 837 papers published in scientific journals

25 % of these papers are 'highly cited', meaning they are in the 10 % of papers by journal category and year of publication

36 organisations have become IMI2 Associated Partners and invest in our projects

28 outputs from IMI1 and IMI2 projects have gained regulatory approval

62 % of projects have made resources / outputs available to the wider scientific community

CONTACT US

 www.imi.europa.eu

 [@IMI_JU](https://twitter.com/IMI_JU)

 [imi-channel](https://www.linkedin.com/company/imi-channel)

 [Innovative Medicines Initiative \(IMI\)](https://www.youtube.com/InnovativeMedicinesInitiative)





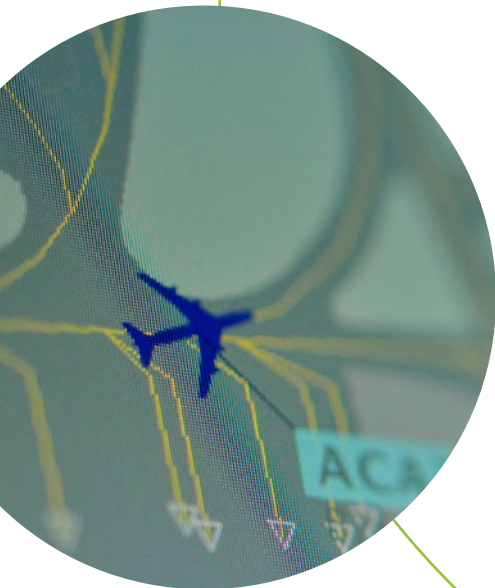
Digital transformation of Europe's aviation infrastructure

Delivering smart and sustainable air transport for all

Air transport is a key driver for European integration and economic prosperity, and key to connecting Europe's citizens, businesses, communities and cultures. However, Europe's aviation and air traffic management (ATM) infrastructure is outdated, unable to respond effectively and sustainably to changes in traffic demand and diversity of air vehicles that are taking to the skies.

While an energy transition is the only way in the long term to ensure carbon neutral air transport, the aviation infrastructure can be modernised at a more rapid pace, making air transport smarter, more sustainable, connected and accessible to all. The Single European Sky ATM Research (SESAR) Joint Undertaking is developing the technological solutions to make this transformation a reality. It works with all actors in the aviation value chain to define a common modernisation roadmap and has delivered a comprehensive set of solutions to make ATM more scalable, economically sustainable, environmentally efficient, predictable and resilient in the long run (see examples).

This partnership approach has given Europe greater influence in the global aviation arena, particularly in setting international standards and shaping the Global Air Navigation Plan of the International Civil Aviation Organization (ICAO).



PROJECT EXAMPLES

>>>

Scalable and resilient air traffic management

Virtual centres make use of cloud computing and data sharing technologies to decouple air traffic service provision from the geographical location where services are delivered. This opens up the possibility for air traffic control operations to be delegated to other control centres, for example in case of a system failure. With virtualisation, air traffic controllers are no longer bound to a physical control room. They can potentially work from any location, serving any airspace.

>>>

Safe and secure integration of drones into the airspace

The SESAR JU is conducting research activities on the safe and secure integration of drones into the airspace in support of U-space, the European Commission's initiative to boost Europe's drone market. The research focuses on services and technologies needed to manage a broad range of drone operations and their interaction with manned aviation. These range from parcel deliveries in urban locations, medical emergencies and police interventions, as well as air taxi landings at airports.

FACTS AND FIGURES

€1.6 billion (incl. €585 million EU contribution)

1 300 experts

31 research institutes

70 universities

83 small and medium enterprises

39 cooperative arrangements

99 solutions (SESAR 1 & SESAR 2020) delivered, out of which 56 are part of implementation plans

A further 87 solutions in the pipeline, delivering:

environmental improvements

greater predictability of air traffic

enhanced aviation safety

CONTACT US

 www.sesarju.eu

 [@SESAR_JU](https://twitter.com/SESAR_JU)

 [SESAR](https://www.youtube.com/SESAR)





Making Rail the Backbone of Future Climate-neutral Mobility and Transport in Europe

Moving European Railway Forward to Meet Passengers' and Shippers' Needs

The Shift2Rail Joint Undertaking (S2R) is a €0.9 bn public-private partnership under the Horizon 2020 Framework Programme established to manage and coordinate mission-oriented Research and Innovation (R&I) activities for a major transformation of rail systems in Europe. Shift2Rail contributes to smart and sustainable growth by developing cutting-edge innovative solutions to create railway systems of the future for passengers and freight. Its R&I activities address the evolving needs of EU citizens, target life-cycle cost and efficiency of rail systems, and develop the necessary technologies to complete the Single European Railway Area, contributing towards a climate-neutral European society. The S2R R&I Programme focuses on demonstration activities and dissemination of relevant results for market uptake, promoting the competitiveness of the European rail industry while creating a multiplier effect of EU funds.

Rail is a complex system of systems. It is an enabler, capable of delivering huge value both to its users and wider society, with the ability to carry large volumes of passengers and freight safely, speedily, and sustainably. Shift2Rail R&I activities are working to make rail more user-centred and designed to deliver the highest levels of dependability, resilience, and service quality. This way rail can realise its potential at the core of a competitive and resource-efficient multi-modal European transport network, facilitating a shift from dependence on less sustainable modes. The European Green Deal has underlined the urgency of action on decarbonisation: rail is generally vastly more environmentally friendly and energy-efficient than other modes, yet still capable of being even more so.

Shift2Rail's work aims to develop a better understanding of the interactions between the components of the whole system and its connections with other modes, underpinned by a systemic, smart, and sustainable concept of operations, based on a sector-wide vision.



PROJECT EXAMPLES

>>>

RUN2RAIL

Innovative running gear solutions for rail vehicles

In order to make trains a more attractive option for passengers, RUN2RAIL worked on developing a new generation of more comfortable, environmentally friendly and reliable trains, with reduced life-cycle costs. Several technological concepts for the next generation of running gear were developed, from a tool to predict and ultimately help lower the interior noise coming from wheels, to 3D metal printing to manufacture components which can withstand service loads and hard-wearing working conditions.

>>>

ASTRail

Train tracking technologies that improve European train control system

This project studied the potential use of satellite positioning technology and automated train operations in the railway sector. These solutions will contribute to capacity increase (by providing an absolute positioning system for trains thus enabling a new signalling block system) and deliver more energy efficient and punctual operations. The possibility of having more trains per track means that more European passengers and businesses could make use of rail transport.

FACTS AND FIGURES

Creation of additional EU GDP up to €49 bn

Creation of extra 140 000 Jobs

Additional export worth up to €20 bn

Up to €9 bn indirect leverage on industry R&I (by developing H2020-funded innovations)

€1 bn life-cycle cost savings in first 10 years, then via continued implementation: €150 m per year

The benefits above are in reference to the period 2015-2030. Source: Impact assessment: Proposal for a Council Regulation establishing the Shift2Rail Joint Undertaking SWD (2013) 535.



CONTACT US

 www.shift2rail.org

 [@Shift2Rail_JU](https://twitter.com/Shift2Rail_JU)

 [Shift2Rail Joint Undertaking](https://www.linkedin.com/company/shift2rail-joint-undertaking)

 [SHIFT2RAIL](https://www.youtube.com/Shift2Rail)

 [Shift2Rail Joint Undertaking](https://www.facebook.com/Shift2RailJointUndertaking)

THE JOINT UNDERTAKINGS

The Joint Undertakings, as European public-private partnerships (PPPs), were set up to drive innovation in key industrial sectors and tackle urgent societal challenges with a quick and close-to-market approach.

JUs have been demonstrating their ability to deliver results that are both scientifically excellent and have practical applications in areas that are vital to Europe's competitiveness.

Currently, EU funding for the JUs comes from the EU's Research and Innovation Programme, Horizon 2020, for the period from 2014 to 2020. Industrial partners and, where relevant, national authorities must match at least the EU funding. In practice, this means that ~€7 bn of EU funding leverages more than €17 bn in R&I activities.

INNOVATION

>>>
IN ACTION

>>>
JOINT UNDERTAKINGS
FOR CUTTING-EDGE
RESEARCH
IN EUROPE

PHOTO CREDITS

Cover, page 2 and page 7: istock.com/erhui1979; 8: divedog; 9: Baan Taksin Studio; 10: Airbus Operations; 11: Safran/Remy Bertrand; 12: OCEAN12; 13 (from left to right): Philips, Adobe Stock, Adobe Stock; 14, 15: Fusion for Energy; 16: Voestalpine; 17: E-trucks; 18: Pixabay; 19: Alexandra Donaldson/LSHTM; 20: Eurocontrol; 21: NATS; 22: Shift2Rail Joint Undertaking; 23: Adobe Stock.



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING



INNOVATION

>>>
IN ACTION

>>>
**JOINT UNDERTAKINGS
FOR CUTTING-EDGE
RESEARCH
IN EUROPE**



Publications Office
of the European Union