NATIONAL RESEARCH, DEVELOPMENT AND INNOVATION OFFICE
HUNGARY

A publication edited and released by the National Research, Development and Innovation Office (NRDIO).

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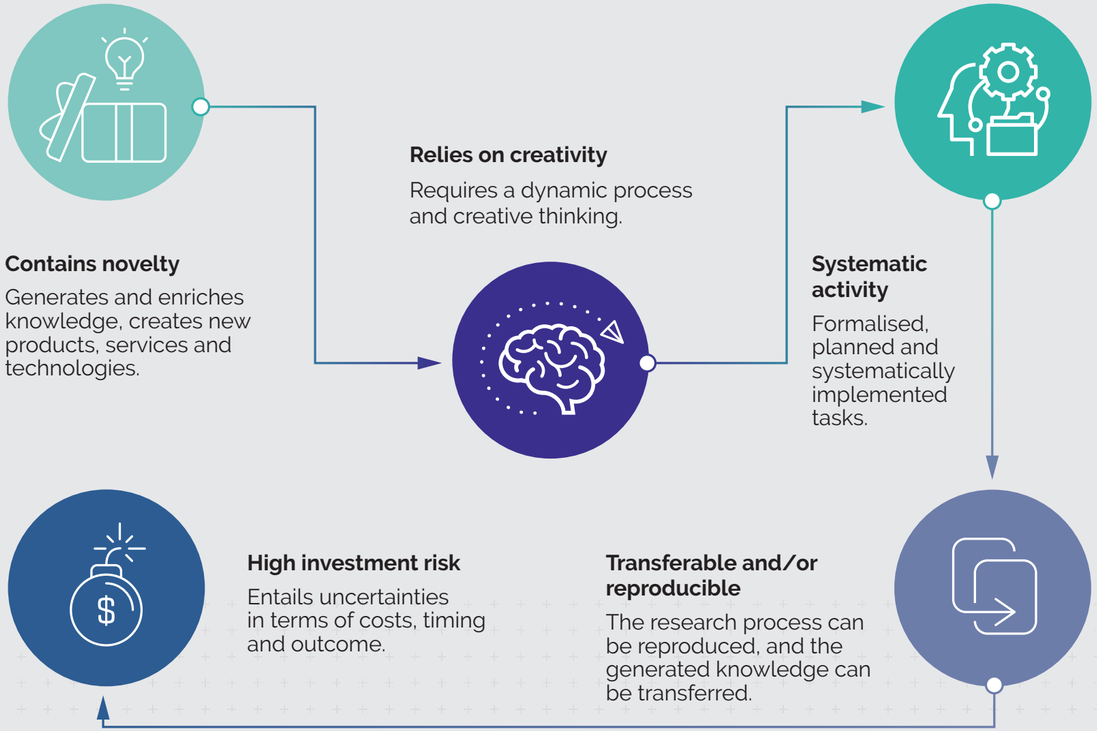
KEY FEATURES OF RESEARCH AND DEVELOPMENT



SECTORS OF RESEARCH AND DEVELOPMENT

In Hungary, 57% of the research units are operated by businesses.

The aim is to strengthen the knowledge utilisation of the public **research network**, to build **university-focused** innovation ecosystems, and to boost the competitiveness of businesses by strengthening RDI.

A UNIVERSITY-FOCUSED INNOVATION ECOSYSTEM

The new initiative of the **Territorial Innovation Platforms (TIP)** aims to enable cooperation between the stakeholders of local ecosystems and create new collaborations.

The number of research units (pc)
2018

Research institutes:

127

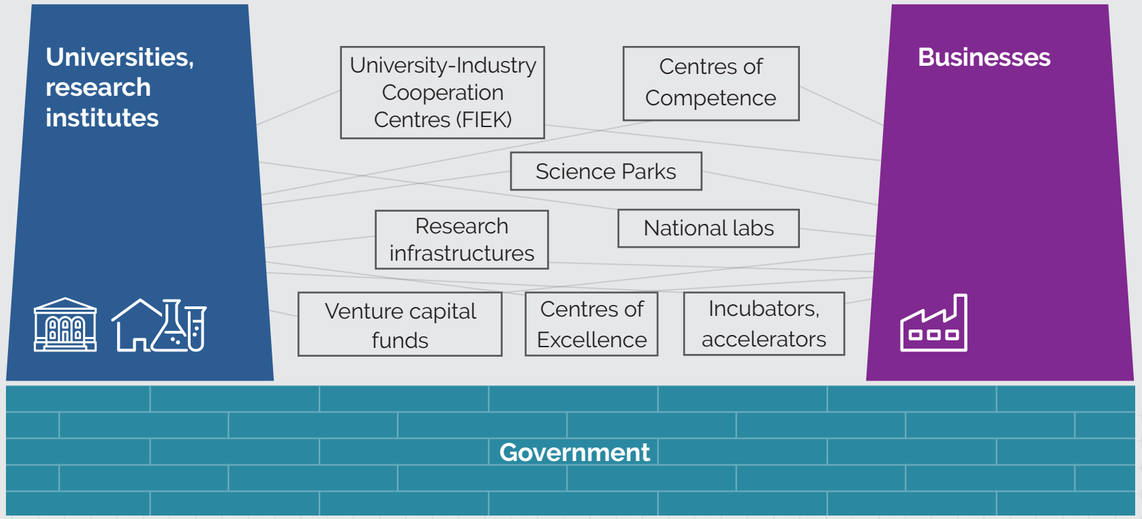
Higher education institutions:

1333

Businesses:

1966

Source: Hungarian Central Statistical Office (HCSO)



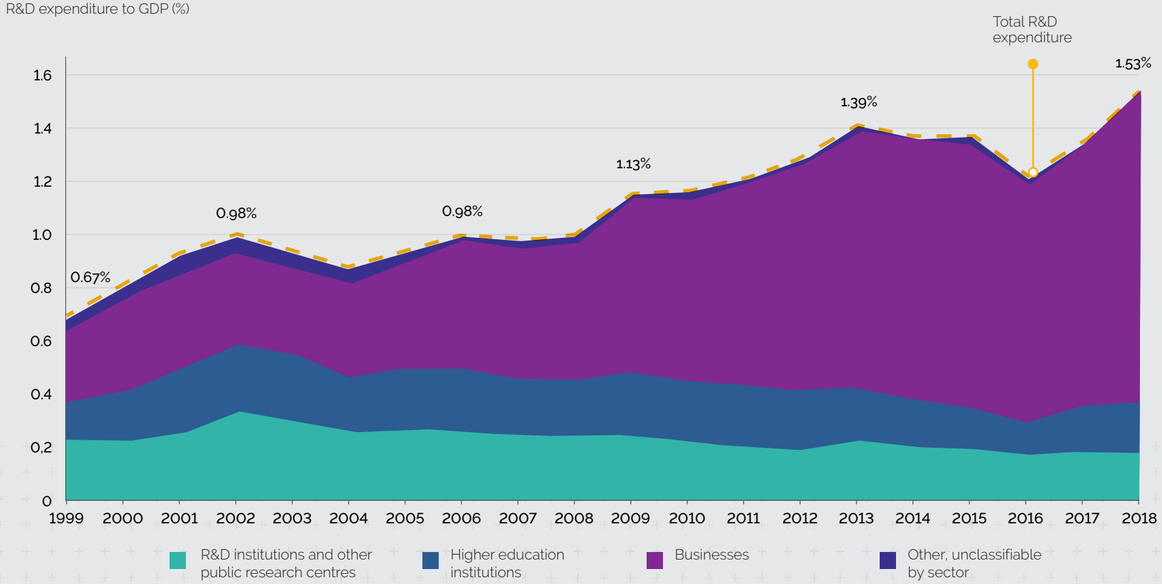
Source: NRDIO

R&D EXPENDITURE IN HUNGARY

The importance of R&D within the national economy has more than doubled since the turn of the millennium.

The aim is to create and operate an **inspiring and sustainable funding system.**

R&D expenditure to GDP (%)

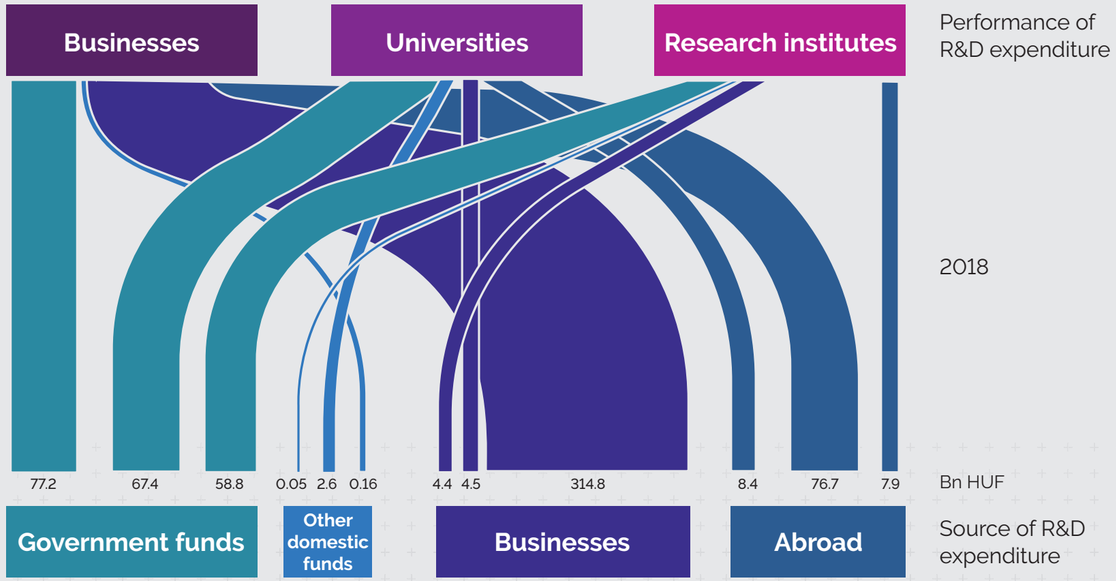


Source: Eurostat

R&D EXPENDITURES BY SOURCES OF FUNDS AND SECTORS OF PERFORMANCE

R&D funds from business sources performed by universities and research institutes are very limited.

The **knowledge-creating cooperation** between organisations needs to be strengthened in order to make the Hungarian research and innovation culture capable of addressing global challenges.



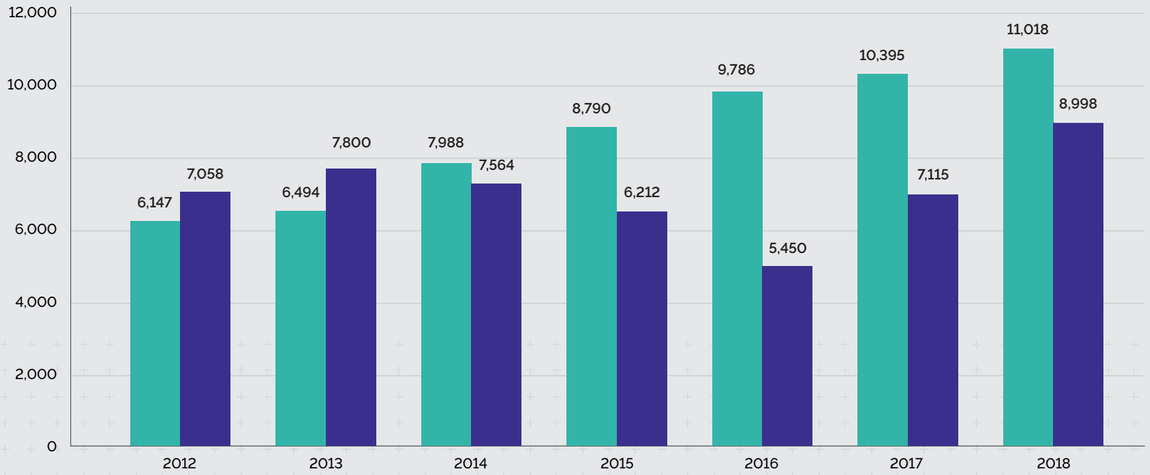
Source: HCSO

R&D ACTIVITY OF BUSINESSES BY SIZE CLASS

The last few years witnessed significant increase in the number of researchers working in SMEs, getting closer to the headcount at large companies.

Policy measures and planning need to **distinguish between large companies, SMEs and start-ups.**

Number of researchers (FTE) — Large companies — Micro, small and medium sized enterprises — 2018



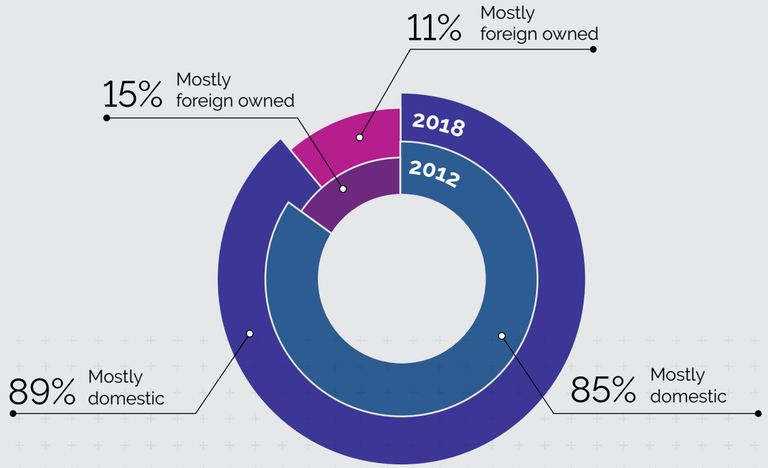
Source: HCSO

R&D ACTIVITY OF BUSINESSES BY OWNERSHIP

Domestic businesses are increasingly getting engaged in R&D activities in Hungary.

The aim of developing university-focused innovation ecosystems is to improve the **global competitiveness of domestic-owned businesses** through enhanced R&D activities.

Shares of research units



Source: HCSO

Average number of researchers (FTE) 2018

At mostly domestic owned businesses:

5 persons

At mostly foreign owned businesses:

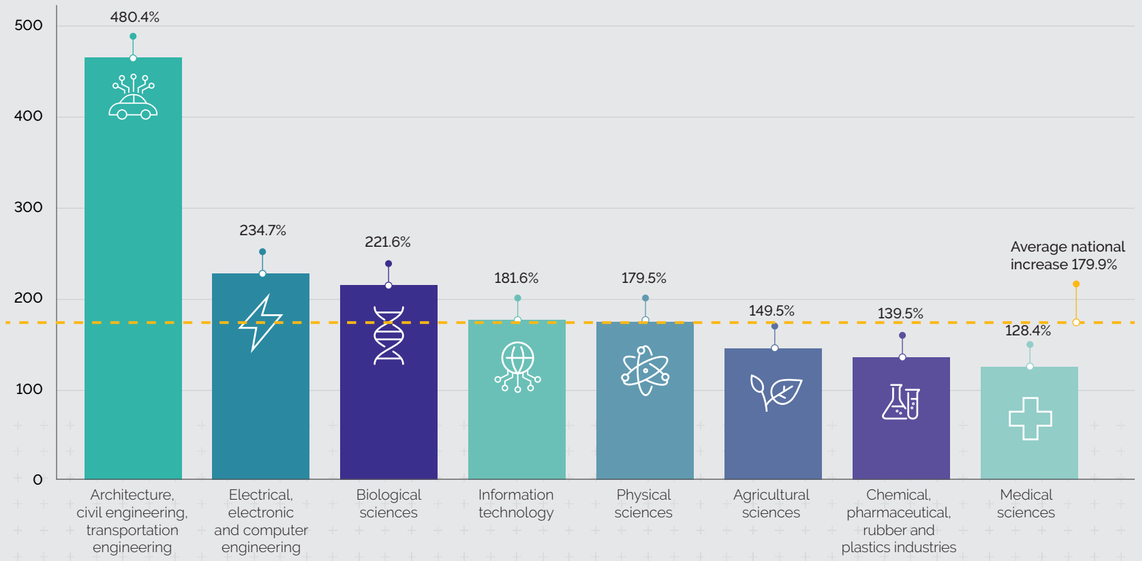
52 persons

CHANGES IN R&D EXPENDITURE BY FIELDS OF SCIENCE

Technological fields had the most significant increase in R&D expenditure in the last few years.

Excellence-based research and interoperability of disciplines need to be encouraged **with an eye on global challenges.**

Change between 2012-2018
(%, 2012=100%)



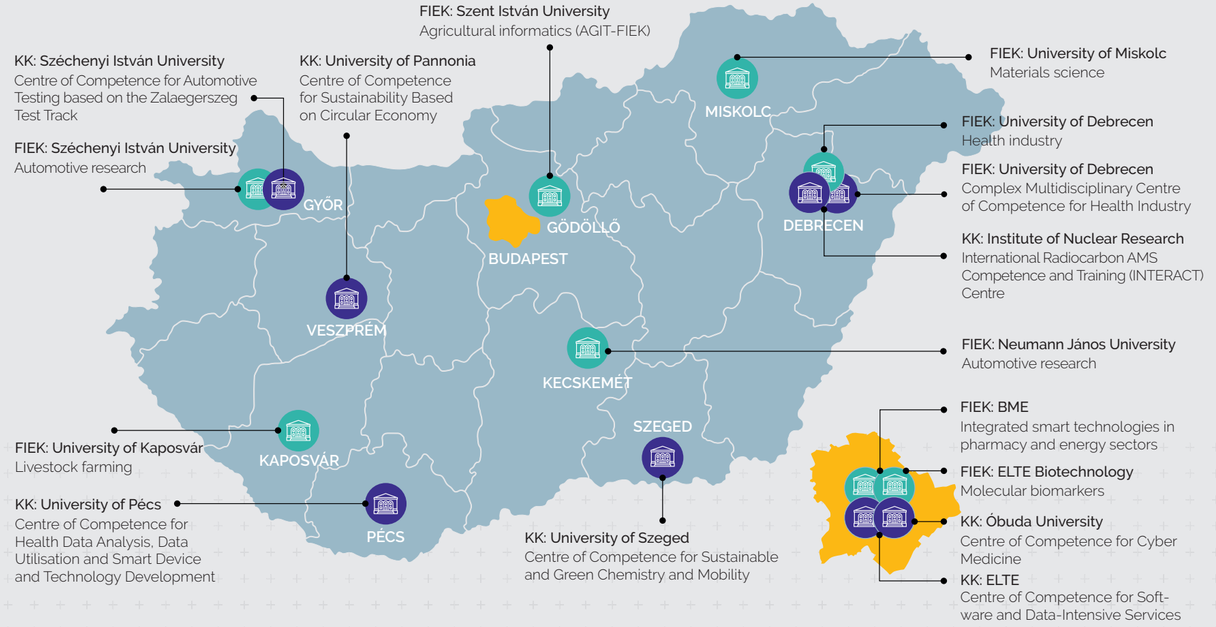
Source: HCSO

RESEARCH AREAS OF KNOWLEDGE TRANSFER PROJECTS

The aim is to support **long-term and sustainable** strategic collaborations between industry, higher education and research centres, with the potential to increase Hungarian competitiveness.

University–industry research collaborations:

University–Industry Cooperation Centres (FIEK) | Centres of Competence (KK)

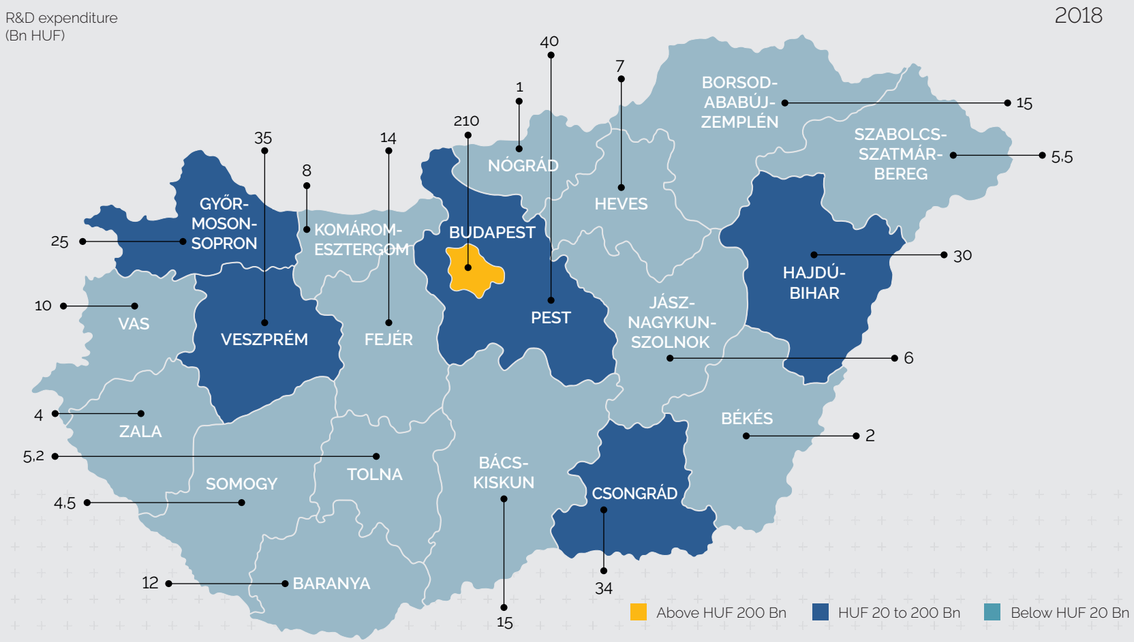


Source: NRDIO

REGIONAL DIFFERENCES IN R&D EXPENDITURE

Out of total R&D expenditure, 60% goes to Budapest-based research units.

Local knowledge capacities must be exploited effectively to ensure a **balanced development** of research and innovation processes.

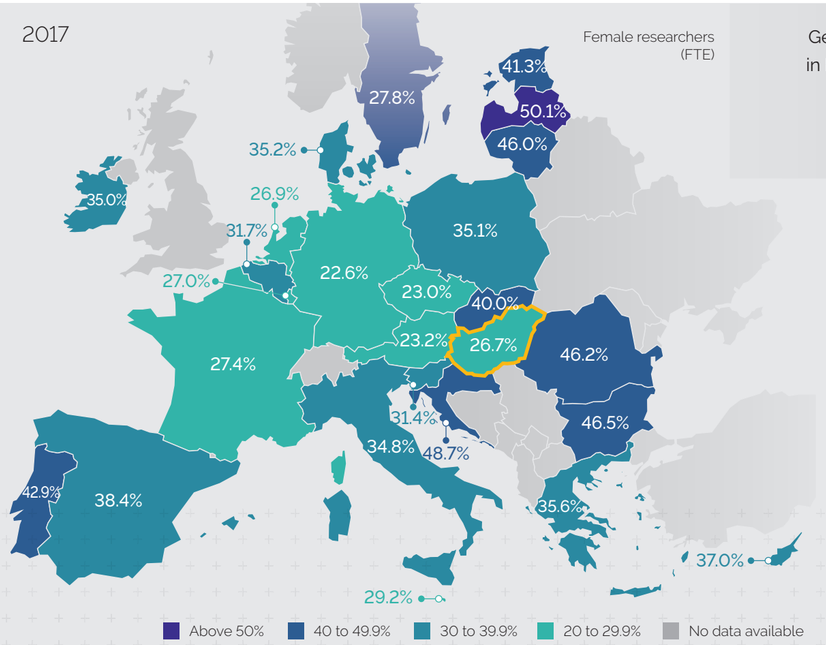


Source: HCSO

WOMEN IN SCIENCE

In Hungary, the share of female researchers is lower than in most of the EU Member States. The higher the rank in the academic hierarchy, the less likely it is filled by a woman.

It must be encouraged that **men and women receive equal recognition** for their knowledge and have equal access to opportunities in the research and innovation process.



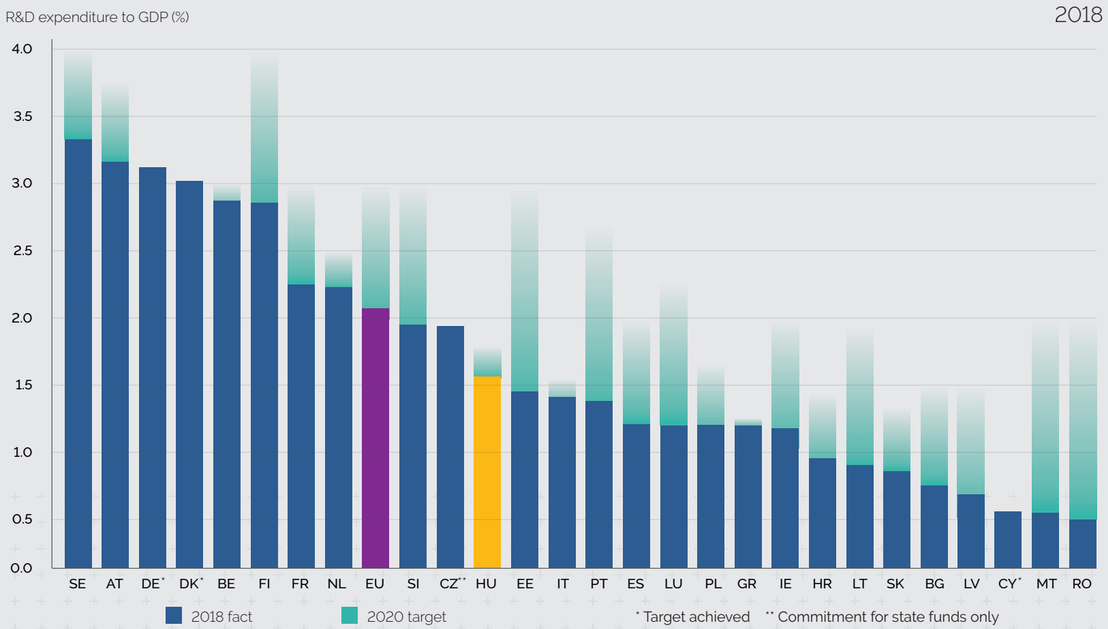
Source: HCSO, Eurostat

Gender ratio in Hungarian academic hierarchy 2015

HUNGARY'S R&D EXPENDITURE IN THE EUROPEAN LANDSCAPE

In 2018, Hungary's R&D expenditure reached 1.53% of the GDP, getting close to the 2020 target of 1.8%.

Increasing R&D expenditure remains a high priority also for the period after 2020.

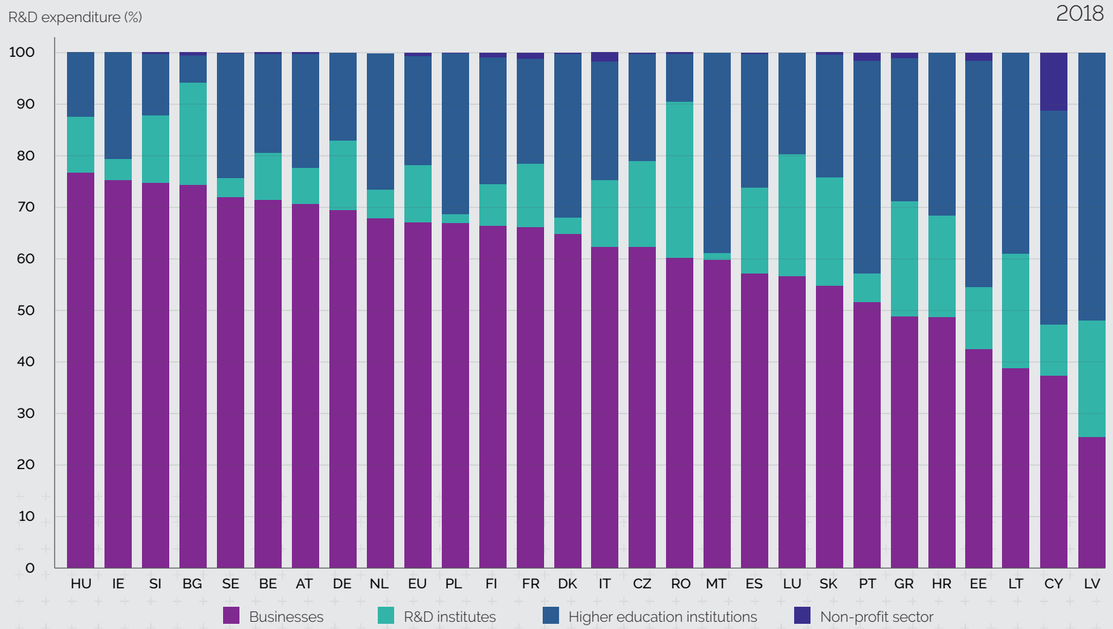


Source: Eurostat, The European Semester

R&D EXPENDITURE BY SECTORS IN THE EU MEMBER STATES

Among the EU Member States, Hungary's business sector shows the highest share in R&D expenditures.

Commercialisation of research results should be a main focus when providing funding to businesses. The aim is to further integrate Hungarian SMEs in global value chains.

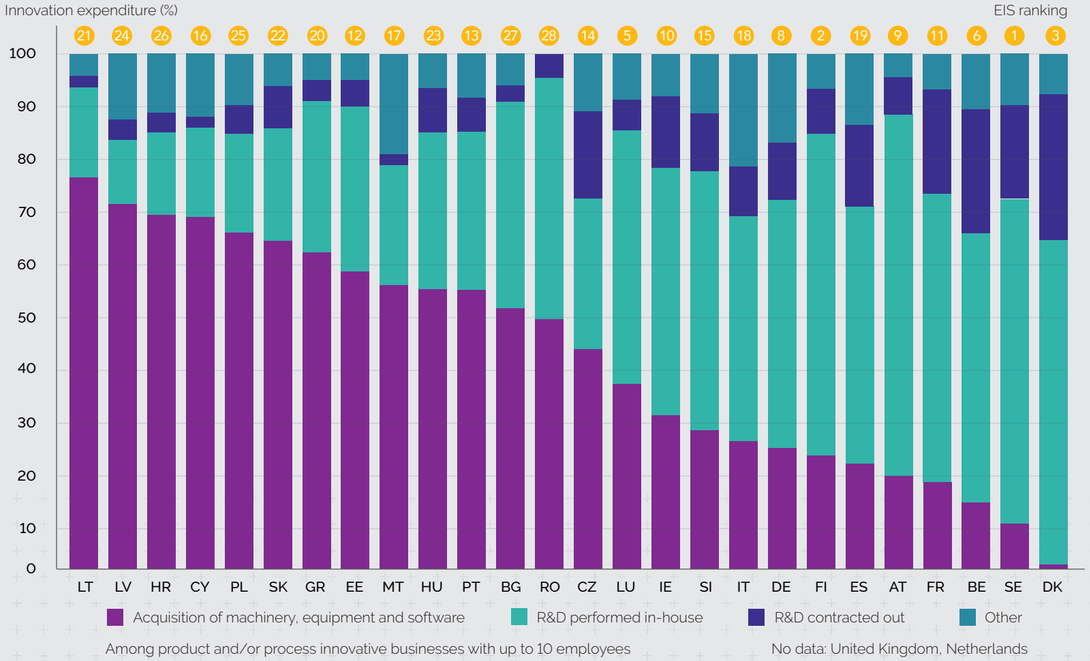


Source: Eurostat

TYPES OF INNOVATION EXPENDITURE

In the countries with lower innovation performance, innovative businesses tend to expend more on buying technology rather than in-house R&D activities.

To improve Hungary's innovation performance, **openness, creative thinking, and ambition to create value is needed** from actors of the society and the economy.



Among product and/or process innovative businesses with up to 10 employees

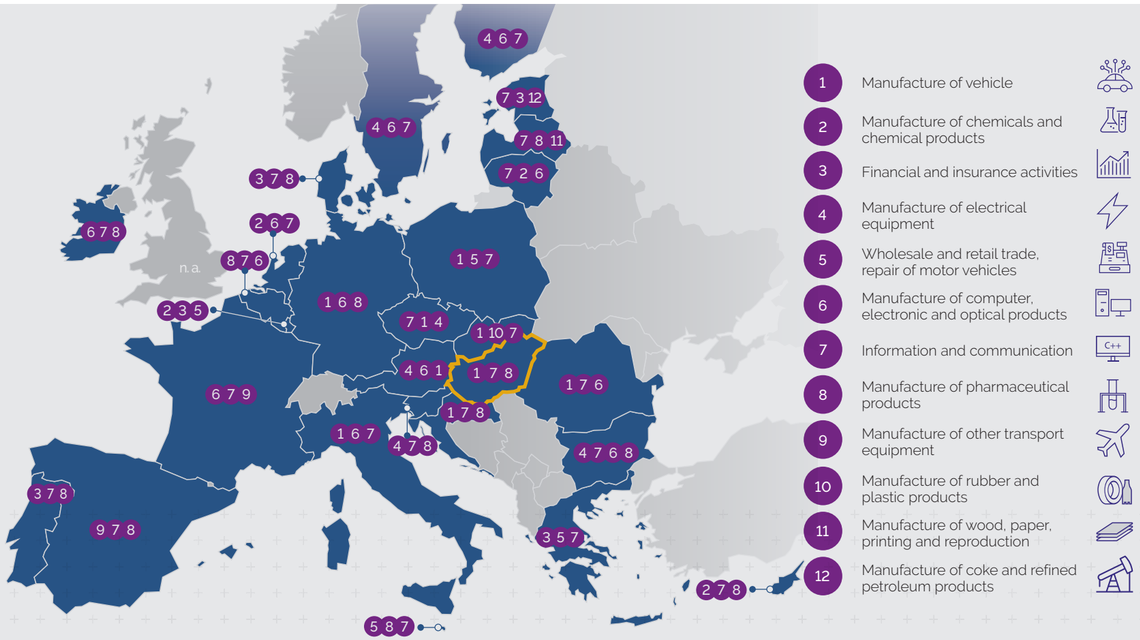
No data: United Kingdom, Netherlands

Source: Eurostat - Community Innovation Survey (CIS) 2016

TOP PERFORMING SECTORS IN R&D IN THE EU MEMBER STATES

In Hungary the pharmaceutical industry, manufacture of motor vehicles and ICT are the sectors that invest most in R&D.

The EU as a whole, including Hungary, gives particular importance to **fostering challenge-driven and demand-driven research and innovation.**



Source: Eurostat; NRDIO calculation based on business R&D expenditure by NACE Rev. 2, 2013-2017

KEY FEATURES OF INNOVATION

The main difference between innovation and an invention or a prototype is that innovation is already **available on the market or applied in practice.**

Charasteristics of innovation:

Business innovation

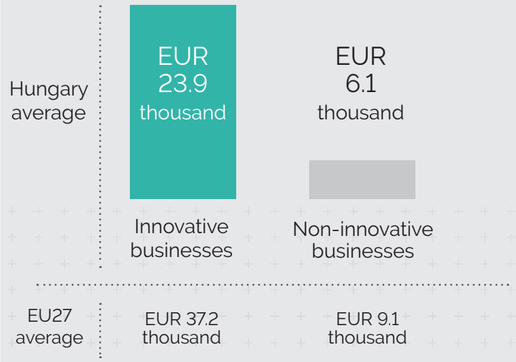
new or significantly modified product or business process (or a combination of the two)

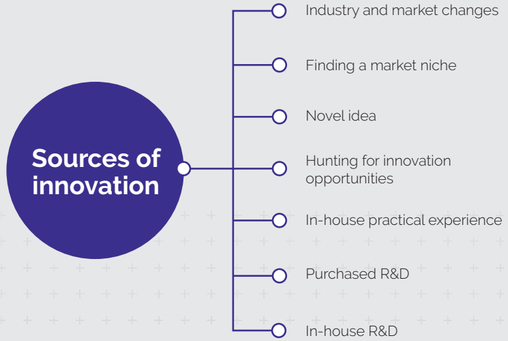
considerably differs from the **organisation's pervious** product or process

has been **introduced to the market** or put into operation.

Impact of innovation:

Average turnover of businesses, 2016



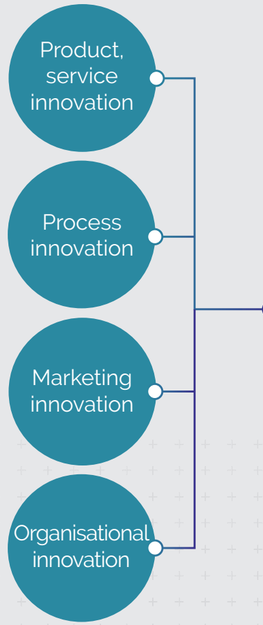


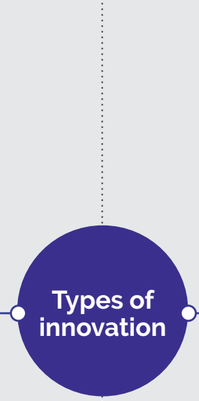
Source: Eurostat - Community Innovatin Survey (CIS), among businesses with 10+ employees

TYPES OF INNOVATION

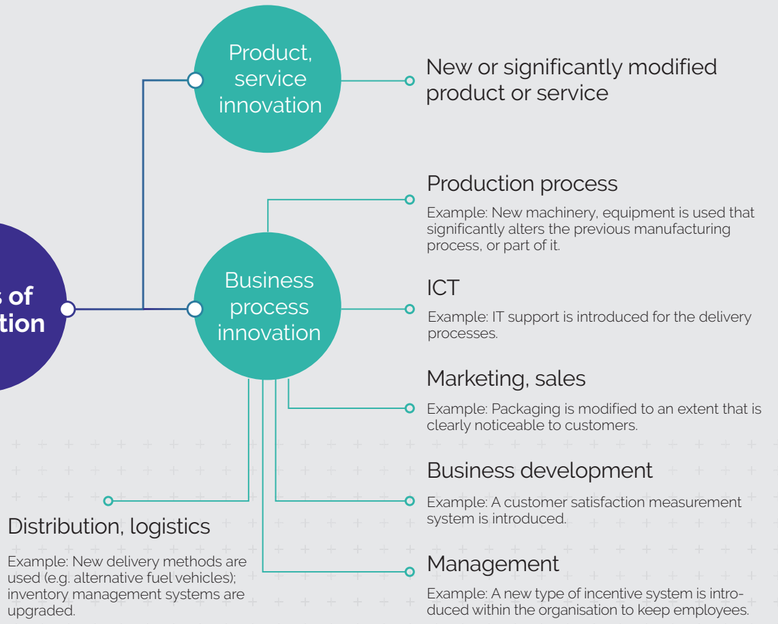
Most businesses, SMEs in particular, should primarily focus on **incremental, continuous innovation** to realise technological development and capture markets.

Definition before 2018





2018: Updated international definition, renewed typology



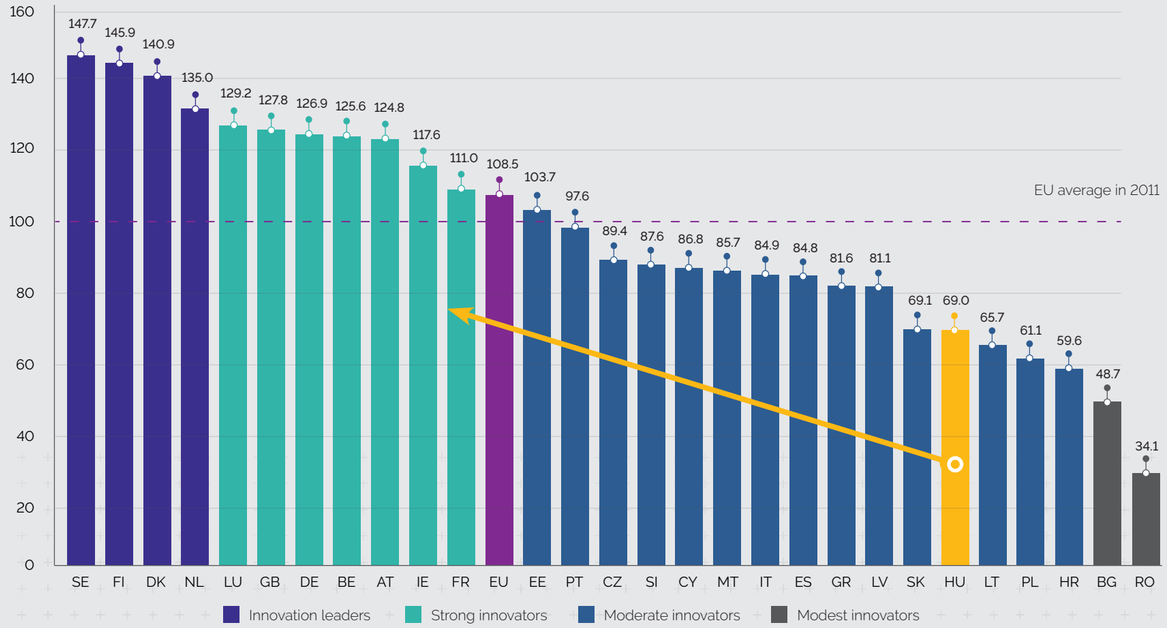
Source: OECD - Oslo Manual 2018

HUNGARY'S INNOVATION PERFORMANCE

Hungary ranks 23rd among the EU Member States, according to the European Innovation Scoreboard published in 2019.

To make Hungary become a strong innovator by 2030, there must be a **sharp increase in SMEs' innovation capacity and readiness to cooperate.**

Cumulated Innovation Index 2018
(%, 2011=100%)



Source: European Innovation Scoreboard, EIS 2019

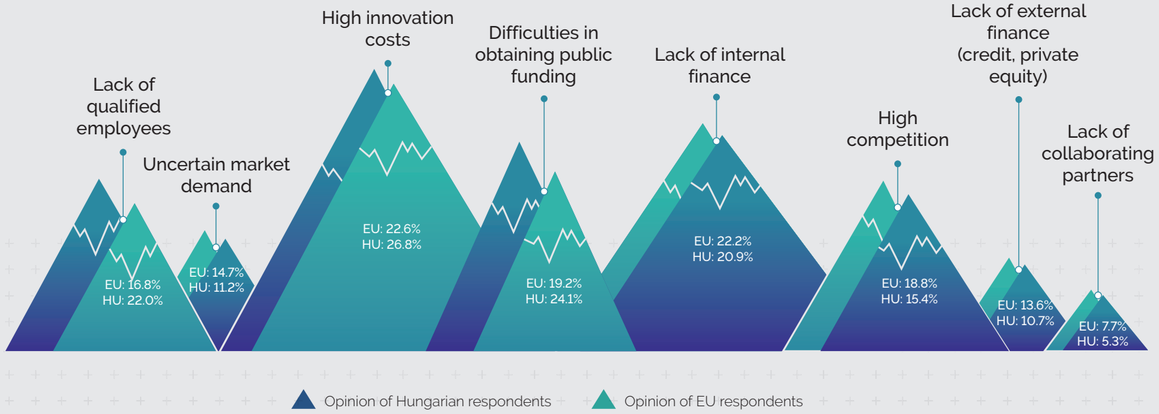
HAMPERING FACTORS FOR INNOVATION IN THE EU

According to a survey conducted among innovative businesses, high costs are seen as the main barrier to innovation in both Hungary and the European Union.

It is vital to create an advanced **regulatory and business environment that supports research and innovation.**

External market factors (partners, market demand, competition, loan) are seen more differently by Hungarian entrepreneurs than the EU average.

The share of survey respondents citing the given factor as a barrier (%)

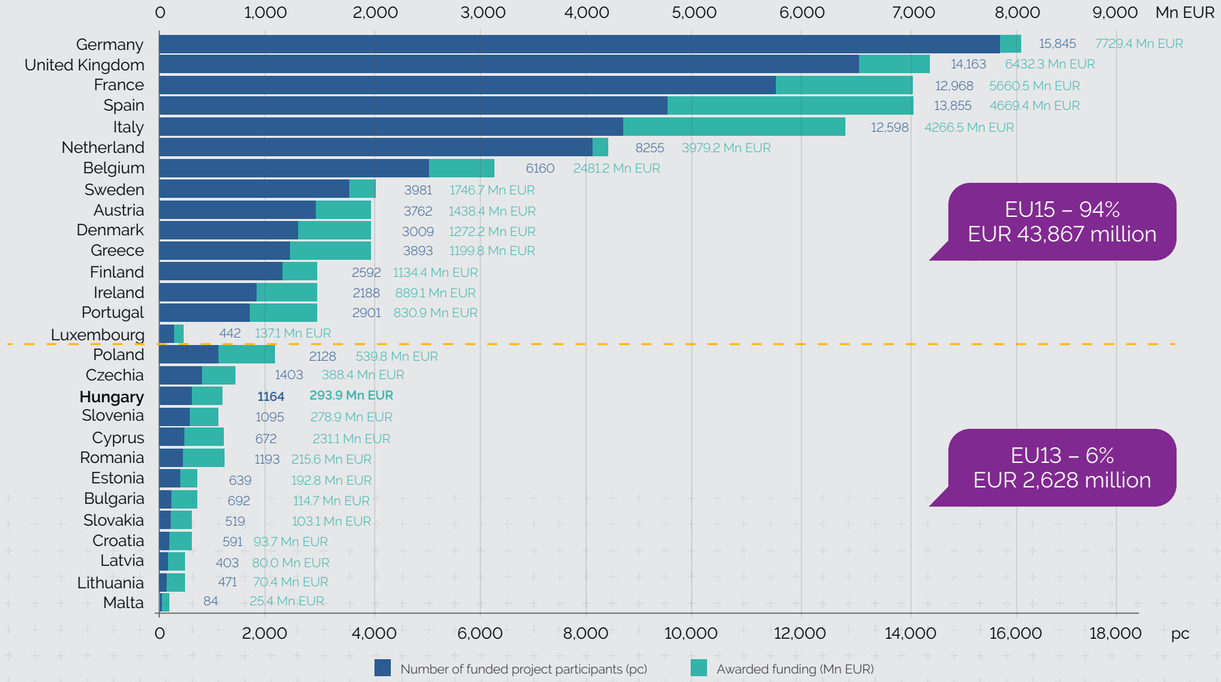


Source: NRDIO calculation based on Eurostat - Community Innovatin Survey (CIS) 2016

HORIZON 2020 RESULTS IN THE EU MEMBER STATES

Strengthening international participation is a core element of a dynamized knowledge flow.

Hungarian participants account for only 1% of winners within the EU28. Among the EU13 countries, Hungary boasts the third highest support rate from H2020 sources.

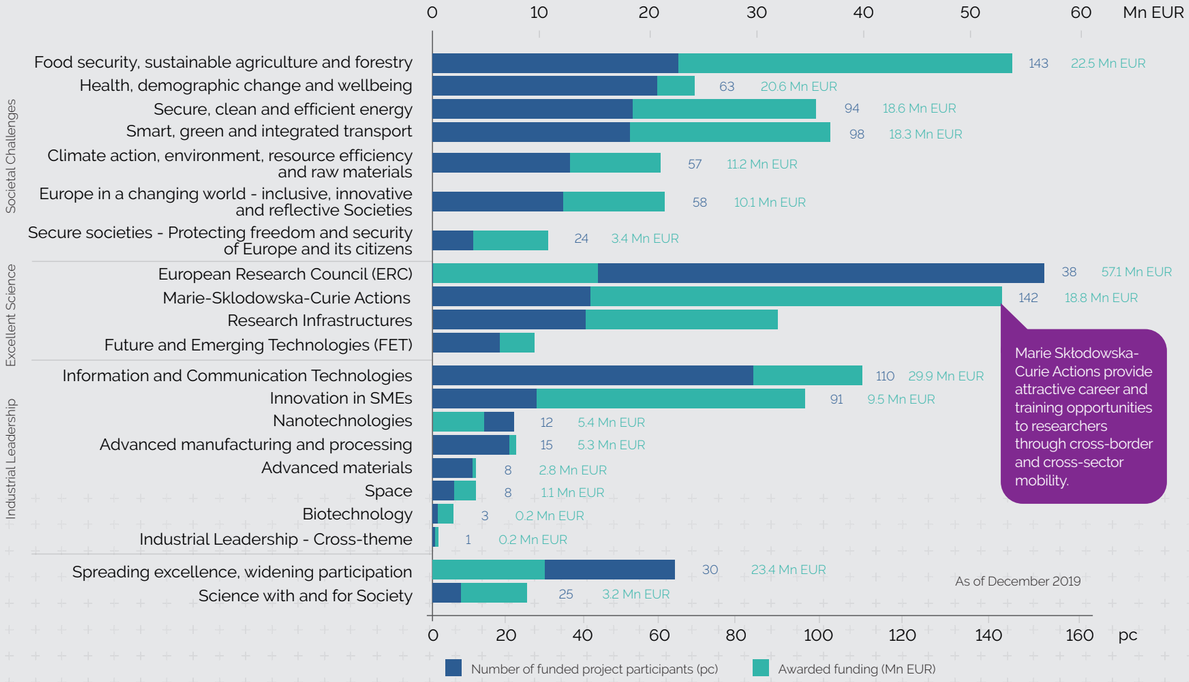


Source: NRDIO, based on Cordis database 2015-2019

HUNGARIAN PARTICIPATION IN THE HORIZON 2020 CALLS

Key to international research cooperations: strategic partnerships **with leading European research networks.**

Most of the supported Hungarian participants are involved in Marie Skłodowska-Curie Actions and programmes aimed at improving food security and sustainable agriculture.



Source: NRDIO, based on Cordis database 2015-2019

ELI: HUNGARY'S LARGEST RESEARCH INFRASTRUCTURE DEVELOPMENT

High energy photonics

Provides developer testbed environment for the development of high-energy, short-pulse laser systems in the laboratory scale to industrial partners.

Research in the field of energy

Several applications can be offered from solar panels to artificial photosynthesis.

Applications in the field of biological imaging

High resolution nanometre imaging of biological material is a key technology to understand structure-function relationship in biological soft matter.

Applications in the field of medicine

Medical applications of ultra luminous x-ray sources include the fields of diagnostics and therapy.

Attosecond instruments

Attosecond pulses enable the performance of time-resolved intranuclear or intramolecular electron dynamic experiments that provide an insight into major molecular excitations and chemical reactions over time.

ELI-HU Non-profit Ltd.

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H-6728 Szeged
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H-1027 Budapest
Phone: +36 1 336 0542

Web: eli-alps.hu

Information technology, materials science and nanoscience

Materials science application of high-luminosity, tuneable short wavelength irradiation is of special importance in chemical/elemental surface analysis.

ELI is the first infrastructure in the world capable of investigating the interactions between light and matter **with a highest ever intensity.**

THz technologies and applications

THz technology is already widely used for imaging purposes in the semiconductor industry, security technology, cultural heritage protection and many other fields.

ZALAZONE: ONE OF HUNGARY'S MOST ADVANCED APPLIED RESEARCH AND EXPERIMENTAL DEVELOPMENT INFRASTRUCTURE INVESTMENTS

Dynamic platform

A test site for high speed (up to 200 km/h) stability, brake and platooning tests.

Bad road

Eight defined test surfaces for maximum 50 km/h design speed.

Handling course

Serves for steering, ESP and other vehicle dynamics test elements.

Noise measurement track

Enables noise measurement tests which are necessary for European homologation processes.

Water basins

Allow water resistance tests for vehicles.

Rural road, highway, motorway

Multi-section inner roads provide motorway, highway and rural road test environment that allows to execute medium and high speed tests in real circumstances.

Braking platform

Designed to carry out ABS, ESP and ATC test with special surfaces and built-in watering system.

High-speed oval track

Enables the safe performance of high speed tests at about 200 km/h.

The Zalaegerszeg test track is unique, as it offers not only conventionaldynamics tests but also allows validation tests for **autonomous and electric vehicles.**

Extreme side-shifted road

A 130 m long 10% side shift road which can be used in both direction for two-way testing.

Smart City Zone, streets

Designed for autonomous and connected vehicles, providing urban traffic circumstances.

Slopes

Different slopes allow testing on surfaces with high and low friction coefficients or any combinations.

Automotive Proving Ground Ltd.

Honvéd u. 13-15.,
H-1055 Budapest

Project office:

Fészek u. 4.,
H-8900 Zalaegerszeg

Phone: +36 92 900 117
Email: zone@apz.hu

Web: zalazone.hu

OUR MEMBERSHIPS IN LARGE INTERNATIONAL RESEARCH INFRASTRUCTURES

Participation in the most significant international research infrastructures support Hungarian experts to pursue competitive research and build partnerships.

ESFRI Roadmap 2021
A new aspiration is to cross the existing boundaries of knowledge and find sustainable solutions to global challenges.

Physical sciences and engineering

E-infrastructure

Further information on Hungarian RI memberships:

Social sciences and cultural innovation

Health and food sciences

Further information on Hungary's National Research Infrastructure Roadmap:

THREE PILLARS OF THE NEW NATIONAL RDI STRATEGY

Hungary's National RDI Strategy fosters, in a well-balanced manner, basic research, applied research aimed at solving societal-economic challenges and innovation activities alike.

Learn more on the funding schemes and current calls supporting the three pillars.

Support for individual research excellence in basic research

The professional excellence of individual researchers and research groups should be supported to improve the international visibility and recognition of Hungarian science.

Support for applied research and industry-academia collaborations addressing global challenges

Market-based, long-term and sustainable cooperation between the business sector and the higher education should be reinforced, technology transfer should be encouraged.

Support for the innovation ecosystem, businesses and startups

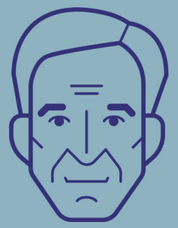
The competitiveness of businesses should be improved by fostering research and innovation, and expanding the scope of joint RDI activities.

"Innovation has nothing to do with how much money you have. It's about the people you have, how you're led, and how much you get it."

Steve Jobs - co-founder, Apple Inc.

"If I had asked people what they wanted, they would have said faster horses."

Henry Ford - founder, Ford Motor Company



"One thing about creative work is that it's never done."

Mihály Csíkszentmihályi - Hungarian-American psychologist

"Innovation happens between people. The more they are involved in various topics, the more open the different tiers are to each other, the more often the spark will come and the better the innovation will become. All you have to do is to open the doors and give space to people."

Chris Anderson - CEO, 3D Robotics

"If you always do what you always did, you will always get what you always got."

Albert Einstein - theoretical physicist

"It's not an experiment if you know it's going to work."

Jeff Bezos - founder, Amazon

"Science and technology ... they do not solve all problems. But without science and technology no problem can be solved."

Ede Teller - theoretical physicist

"If you're not failing every now and again, it's a sign you're not doing anything very innovative."

Woody Allen - director, writer, actor

"I have not failed. I've just found ten thousand ways that won't work."

Thomas Edison - businessman, inventor

National Research, Development and Innovation Office
Hungary

For further useful information visit the NRDIO website:
nkfih.gov.hu