PHD ENG.

WOJCIECH KAMIENIECKI

DIRECTOR OF THE NATIONAL CENTRE
FOR RESEARCH AND DEVELOPMENT

DEAR READERS,

Another year of the operation of the National Centre for Research and Development haspassed. It was a time of dynamic changes. Our relationships with applicants and beneficiaries were transforming.
The challenging process of internal restructuring of the Centre began.
We simultaneously carried out our core activities and modified NCBR's proposal so as to better respond to market needs.
2019 was the year of strengthening cooperation with applicants and beneficiaries. The previous ecosystem for supporting our partners was extended. Applicants and beneficiaries can now use such tools and solutions as the Innovation Assistant, the Budget Assistant and the Information Point, and participate in open meetings with our experts. The key to define this model of contacts is partnership.

If your challenges do not scare you, it means they are not big enough.

RICHARD BRANSON

New challenges and market needs necessitated changes in the Centre itself. The process is still under way.
New, larger organisational units appeared in the management structure to enable better use of resources.

We have begun a difficult and necessary process of changes in the NCBR IT system so as to meet the needs of the Centre and its partners. Considerable changes occurred in our international activities. We launched an office in Brussels, and are continuing the integration process of the National Contact Point for EU Research Programmes with the Centre. The purpose of all this is to effectively acquire funds and solutions beneficial for the innovation market in Poland in the current and, most importantly, the following financial perspective. The operation of these structures and the previously created International Cooperation Department is coordinated by the newly established International Cooperation Office. All these activities will make us well prepared for the new EU programme Horizon Europe. This is also the time when we managed to finished work on launching the NCBR Investment Fund (NIF), another tool supporting the innovation market.

The greatest asset of the Centre have been, and still are, the people, their competence and experience. Today we can speak of the NCBR Group which, in addition to the Centre, consists of the company NCBR+ sp. z o.o. established in 2018 and the mentioned NIF S.A.

We use the knowledge and experience of those who began their work at the moment when NCBR was created and those who have recently contributed their new skills and experience, also in the business area. The latter factor is of particular importance, as today the Centre, while remaining the executive agency of the Minister of Science and Higher Education, a public institution, must focus its activities on best market practices and experiences of businesspeople while retaining high standards of public funds acquisition – and these are not easy tasks.

In the publication handed over to you we are summarising the previous year 2019. We are discussing our achievements, but primarily presenting the innovations market in Poland from the Centre's perspective. For the first time in the document summarising NCBR's activities we are referring to the extensive body of expert knowledge and research carried out by the Centre. Numbers, indices and opinions will show the development of the R&D sector in Poland. The publication also touches upon new trends we have observed in the field.

NCBR today is not only an institution providing financial support to the innovation market in Poland, but also a centre of knowledge and competence. We would like to respond to market needs swiftly and efficiently, and at the same time create new opportunities for innovators.

It is difficult to mention all our programmes and initiatives worth looking at. However, it should be emphasised that in addition to the "Fast Track" programme, which is enjoying the greatest popularity, we have launched a number of thematic competitions on plastics, space technologies and innovative fertilisers; we are continuing the GameINN programme supporting the extraordinarily innovative gaming market in Poland, as well as international programmes, a competition for creating innovative devices generating and storing energy "The Grand Challenge: Energy" implemented as part of the Grand Challenge formula, and many others.
We develop programmes and competitions with beneficiaries in mind. The report presents some of them, as innovations are specific solutions created by particular people. In the report we are using the term "partner" to refer both to applicants and beneficiaries. This way we would like to emphasise activities initiated in 2019 aimed at changing NCBR's philosophy, according to which our partners will be at the centre of our interest and constitute the main theme of our initiatives.
It is hard not to mention funds, as they reflect the scale of our activities.

2019 was a record-breaking year when it comes to funds which the Centre spent on support for Polish businesspeople and innovators. They amounted to PLN 4.2 bn. Thanks to the money, a hundred novel and fascinating projects could be launched. The most popular programme implemented by the Centre was undoubtedly "Fast Track" under the Smart Growth Operational Programme (SGOP), but we also conducted competitions as part of the Knowledge Education Development Operational Programme (KEDOP), the Digital Poland Operational Programme (DPOP) and national and strategic programmes funded with the targeted grant of the Minister of Science and Higher Education. It is also important to mention international competitions and those involving defence and state security.
We are summarising the year 2019, but writing this text in 2020, it is hard to escape the challenging reality. The year 2020 has set a big challenge for us. The coronavirus pandemic has drastically and unexpectedly thwarted many plans, impacted the global economy and made us realise a number of deficiencies and needs. Once again it has turned out that innovations and new technologies can assist us, especially in extraordinary situations.
AI, IoT and 5G are boldly entering our lives. Communication, education and remote working platforms have become essential solutions. Work in the field of pharmacy and support for uniform hospitals has gained special importance, and efficient logistics solutions have turned out not only an element of competitive advantage but also a way of saving human lives.
The crisis has also shown the great significance of building social competences, capabilities for cooperation and fast decision-making. In terms of funding, Horizon 2020 is coming to an end, and we are approaching the launch of Horizon Europe. Today it is difficult to predict how 2020 will end. We are seeing new challenges to the economy. We would like the projects implemented with the Centre's support to bring an efficient response to these challenges. We will choose the best solutions, support applicants and beneficiaries and play an active role in the reconstruction of the Polish economy.
We would like for NCBR to welcome 2021 as an innovative executive agency keeping pace with leaders of technological and social changes and quickly responding to the dynamically changing world.

WOJCIECH KAMIENIECKI, PHD ENG.
DIRECTOR OF THE NATIONAL CENTRE
FOR RESEARCH AND DEVELOPMENT

PROFESSOR

ANNA ROGUT

PRESIDENT OF THE COUNCIL OF THE NATIONAL CENTRE FOR RESEARCH AND DEVELOPMENT

DEAR READERS,

Another year of NCBR's activities was a year of continuation of the ongoing programmes and of continuous extension and adjustment of the Centre's proposal to new challenges and changing conditions. It was also a period of further streamlining and improvement of work organisation. The Council of the Centre took an active part in all these activities, within its capabilities and assigned tasks, aiming at increasing the accuracy, efficiency, role and significance of NCBR in the Polish innovation support ecosystem. In the previous year the Council of the Centre also assigned great significance to the successive assessment and evaluation of already implemented projects and programmes, and the Report we are presenting is a summary of these efforts. The results of the analysis show that the Centre's support feasibly contributes to the development of the Polish economy and science. Smart investments in innovations are an opportunity for technological and social development and an improved level and quality of our lives.

PROFESSOR ANNA ROGUT
PRESIDENT OF THE BOARD
OF THE NATIONAL CENTRE FOR RESEARCH AND DEVELOPMENT

NCBR

MISSION, VISION AND ENVIRONMENT

If you can dream it, you can do it.

WALT DISNEY

NCBR is an executive agency of the Minister of Science and Higher Education.

MISSION

The mission of NCBR is to support business and science in creating and using innovative solutions based on scientific research, carrying out development and business undertakings based on modern solutions. We are helping create the world of Polish innovation. We are building modern reality and future.

VISION

NCBR is a centre for supporting and developing innovative technological and social solutions, which creates the ecosystem of knowledge and information related to these solutions. It stimulates and implements projects contributing to the civilisational development of the country.
NCBR is strengthening its role as a key institution for innovation development in Poland. It remains the most effective agency acting for the financial support of science and businesses in research and development initiatives at the national and international level.

NCBR'S VALUES:

- Cooperation
- Trust
- Closer relationships with beneficiaries
- Development
- Commitment

In its activities NCBR focuses on the implementation of the sustainable development strategy, the Green Deal policy, and on overcoming any discrimination barriers.

These values are professed by the Centre in building relationships with partners and the environment in which it functions. In the Annual Report NCBR is pointing to the diversity of partners and ranges of their activities as well as to the fact that stakeholder groups are cooperating with each other and through these interactions and outcomes of completed projects they create the unique **innovation landscape in Poland**.

APPLICANTS
BENEFICIARIES
BUSINESS
SCIENCE
START-UPS
MINISTRY OF SCIENCE AND HIGHER EDUCATION
MINISTRY OF DEVELOPMENT FUNDS AND REGIONAL POLICY
EXPERTS
NCBR GROUP
EMPLOYEES

Support offered by NCBR is addressed mainly to Polish businesspeople and the scientific community. Instruments proposed by the Centre make it possible to minimise the risk associated with developing innovative solutions in many areas of Polish economy. Support provided by NCBR motivates entrepreneurs to invest their own funds in research and development initiatives in Polish companies operating in various industries.
In addition to programmes addressed to businesspeople, an important role in the Centre's proposal is played by programmes aimed to support cooperation between scientists and businesspeople and assist scientific establishments in introducing modern technologies, products and services to the market.

With the help of NCBR, scientific establishments can obtain funding, i.a. for creating concepts of the commercial use of research work results, acquiring partners interested in implementing project results and securing intellectual property rights. Cooperation of scientific establishments with businesspeople on R&D projects focusing on solving specific practical problems creates a unique opportunity to overcome barriers resulting from varying needs and specificity of these environments.

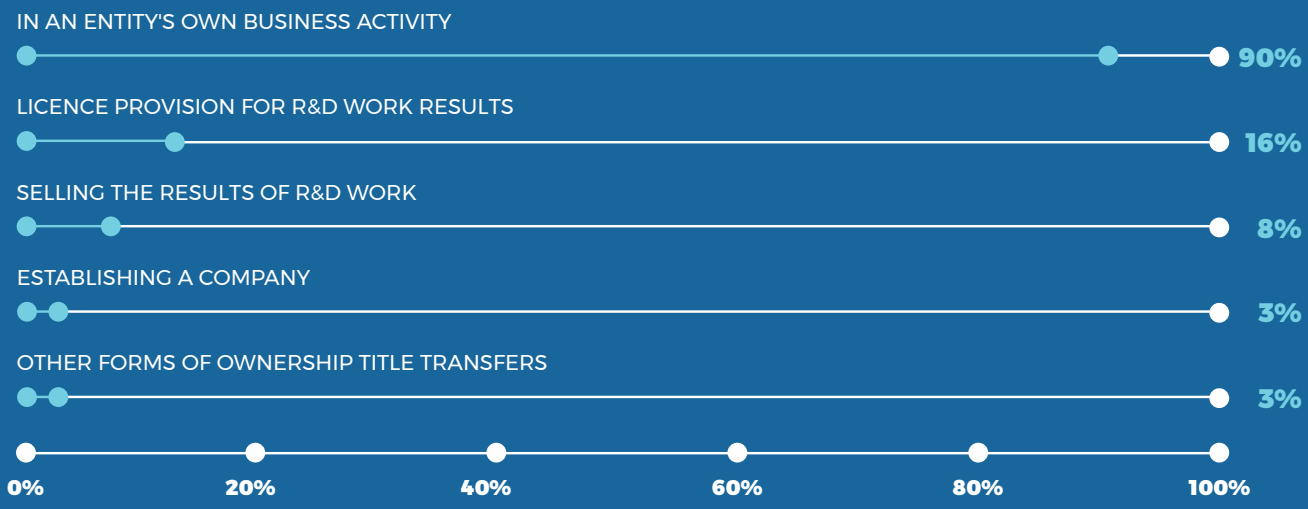
KEY RESULTS FOR 2019[1]

- **9% MORE FUNDING AGREEMENTS** concluded than in 2018
- **17% MORE PERIODIC REPORTS ASSESSED** than in 2018
- **25% PAYMENT REQUESTS MORE (OVER 14,000)** than in 2018
- **46% MORE PROJECTS MONITORED DURING THEIR DURABILITY PERIOD** than in 2018
- **18 MORE CALLS WERE ANNOUNCED** as compared to the Business Plan for 2019
- **VALUE OF SGOP CERTIFICATIONS GREW BY 28%** as compared to 2018
- **VALUE OF KEDOP CERTIFICATIONS GREW BY 70%** as compared to 2018
- **OVER PLN 4.2 BN WERE PAID** to R&D project implementers

KEY RESULTS FOR 2019

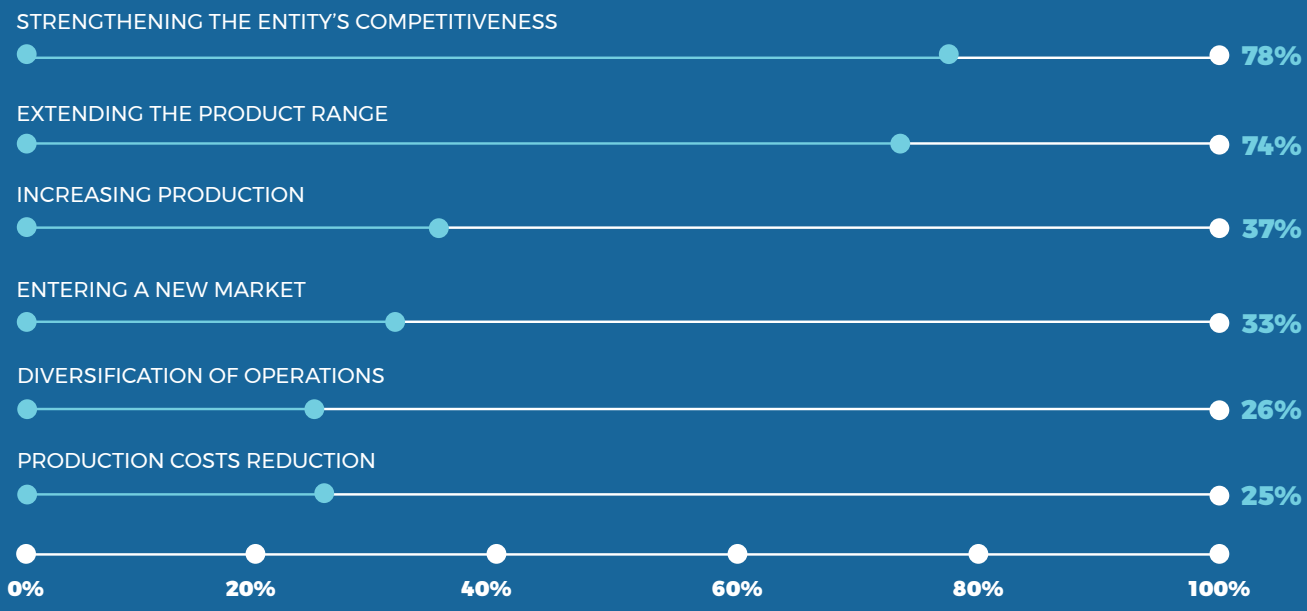
- **70% BENEFICIARIES OF SGOP AXIS I POINT TO THE KEY ROLE OF SCIENTIFIC ESTABLISHMENTS** in the implemented research projects
- **EACH GRANTEE OF THE LIDER PROGRAMME OBTAINS AT LEAST ONE PATENT OR PATENT APPLICATION**
- **RESULTS OF 76% PROJECTS ARE IMPLEMENTED IN PRACTICE**

FREQUENCY OF OCCURRENCE OF THE RESPECTIVE FORMS OF IMPLEMENTATION OF THE RESULTS OF PROJECTS FUNDED BY NCBR



1. Source: NCBR data

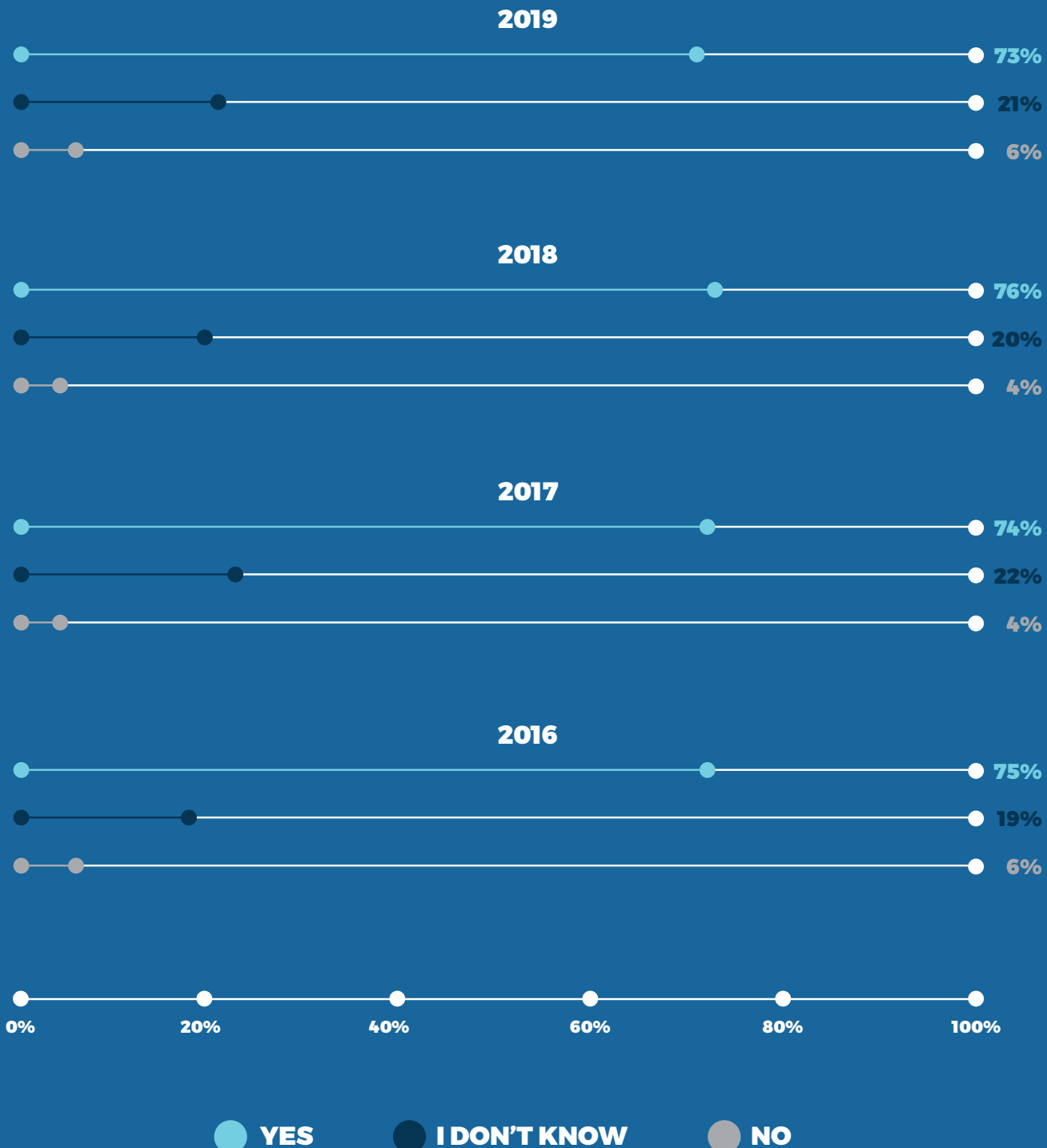
FREQUENCY OF OCCURRENCE OF THE RESPECTIVE OUTCOMES OF PROJECTS FUNDED BY NCBR



KEY RESULTS FOR 2019

- **R&D OUTLAYS INCREASE ON AVERAGE BY 58%** as a result of the implementation of projects funded by NCBR
- **AN INCREASE IN EMPLOYMENT ON AVERAGE OF 23% FOR R&D SPECIALISTS** as a result of NCBR funding
- **AN INCREASE IN EMPLOYMENT ON AVERAGE OF 7% FOR R&D SPECIALISTS** as a result of NCBR funding
- **REVENUE OF PLN 1.4 BN AND PROFIT OF PLN 164 M WERE GENERATED** in the analysed sample of projects with assessed implementation reports (2018–2019)
- **APPROX. 73% APPLICANTS ARE WILLING TO REAPPLY** for NCBR funds

NCBR APPLICANT SATISFACTION MONITORING – DISTRIBUTION OF REPLIES *Are you willing to apply for NCBR funds again?*



NCBR has been active since 2007. From its foundation, the Centre's goal is to support Polish enterprises and research institutes in creating and implementing innovative solutions based on the results of research carried out by scientists and innovators. So far **PLN 59 bn** were awarded for this purpose. Projects pending and completed by beneficiaries have made a real impact on the Polish economy and changed the lives of the country's residents, which is further discussed in the subsequent part of this Report.

The year 2019 marked another stage in the history of the institution. Economic changes in Poland, the quickly progressing technological revolution, challenges associated with creating Industry 4.0, ecology, restructuring of the power sector, AI development and cyber security has made NCBR face new challenges. These challenges refer both to the programme aspect, the formulation of the Centre's proposal, setting directions adequate to changing market needs and building an ecosystem for contacts and cooperation with applicants and beneficiaries. These are also challenges associated with changing the internal operation of the organisation.

This means creating new processes and courses of action, implementing modern IT solutions, digitalisation facilitating contact both within the Centre and with applicants and beneficiaries. The necessary change does not mean a departure from verified practices and action methods, and takes place in a way not disrupting the ongoing work of the Centre and the implementation of the previously taken up activities. In 2019 the Centre managed to simultaneously continue ongoing operational processes and launch an extensive plan of necessary transformations.

THE MAJOR EVENTS AND PROCESSES IN 2019

Everything should be made as simple as possible, but no simpler.

ALBERT EINSTEIN

The basis of the Centre's activities, compliant with its mission, is support for innovative research and development projects. Last year NCBR continued the fulfilment of its range of programmes, announced new initiatives, at the same time analysing on an ongoing basis and working on designing and improving its portfolio. In addition to these activities a number of essential projects were carried out, forming an integral part of the strategic plan adopted by the Centre for organisational and programme changes.

MAJOR EVENTS IN 2019

APPOINTING A NEW DIRECTOR OF NCBR

Wojciech Kamieniecki, PhD Eng., has taken the position of the Director of the National Centre for Research and Development.

EXTENDING THE RANGE OF CALLS FOR PROPOSALS OFFERED BY THE CENTRE

59 calls were announced, i.e. 18 more than assumed in the Business Plan for 2019, including 14 new calls. They included: 4 thematic competitions, 2 competitions related to joint undertakings with regions, 7 international competitions and a competition entitled "Track for Mazovia" These competitions are a direct response to specific needs in the area of R&D.

NCBR'S CALLS FOR PROPOSALS - SELECTED EXAMPLES

"THE GRAND CHALLENGE: ENERGY".

For the first time NCBR has announced a call for proposals within an innovative formula of a research challenge referring to the Grand Challenge initiated in 2004 by the American Defense Advanced Research Projects Agency (DARPA). This is a novel solution in NCBR's portfolio which provides inventors with opportunities to participate in the Centre's activities. The winner will be selected in the finals and receive a prize of **PLN 1 m**.

GAMEINN

GameINN is designed for the dynamically developing computer games sector. 27 projects were selected for funding as part of the call for proposals for the total amount of almost **PLN 105 m**. Funds for projects were awarded to, i.a. 7 companies listed on the Warsaw Stock Exchange.

SPACE TECHNOLOGIES

The call for proposals for "Fast Track – space technologies" was carried out from September to November 2019. During this time NCBR received 33 applications, 15 of which received funding in the amount of over **PLN 143 m**.

"TRACK FOR MAZOVIA"

The initiative is a response to numerous applications pointing to the urgent need to support the implementation of R&D projects carried out in the Mazowieckie Province. The call's budget is **PLN 600 m.**

INTERNATIONAL COOPERATION DEVELOPMENT

In another edition of Norwegian Funds and the EEA Financial Mechanism as part of the "Applied research" Programme calls were announced with a total allocation of nearly **PLN 250 m.** Also, the first conference was organised to summarise NCBR's achievements in the field of international cooperation – from its origin to 2019 – with the participation of speakers from the whole world and 150 attendees.

NCBR'S ACTIVITIES ABROAD

Since 2019, in cooperation with Business Science Poland, the Office has operated in Brussels to represent the interests of Polish scientific community associated with the Ministry of Science and Higher Education and the SME sector. The Office's operator is NCBR.

RECORD-BREAKING VALUE OF CERTIFICATIONS

Record-breaking funds certification results were achieved: in the SGOP a rise of over 28% was recorded in comparison to 2018, and in KEDOP – of nearly 70% as compared to 2018.

NEW INITIATIVES FOR DEFENCE AND SECURITY

3 calls for proposals were announced and 2 were concluded as part of projects for the state defence and security, with a total allocation of **PLN 750 m**.

MAJOR PROCESSES IN 2019

BUILDING THE NCBR GROUP

Launching operating activities of all entities comprising the NCBR Group, i.e. the NCBR+ Company and NCBR Investment Fund (NIF).

CREATING A NEW OPERATIONAL STRUCTURE OF NCBR

Redevelopment of NCBR's organisational structure, opening offices, changes in the Centre's management, and arrangement and optimisation of processes.

BUILDING THE INFORMATION AND COMMUNICATION SYSTEM

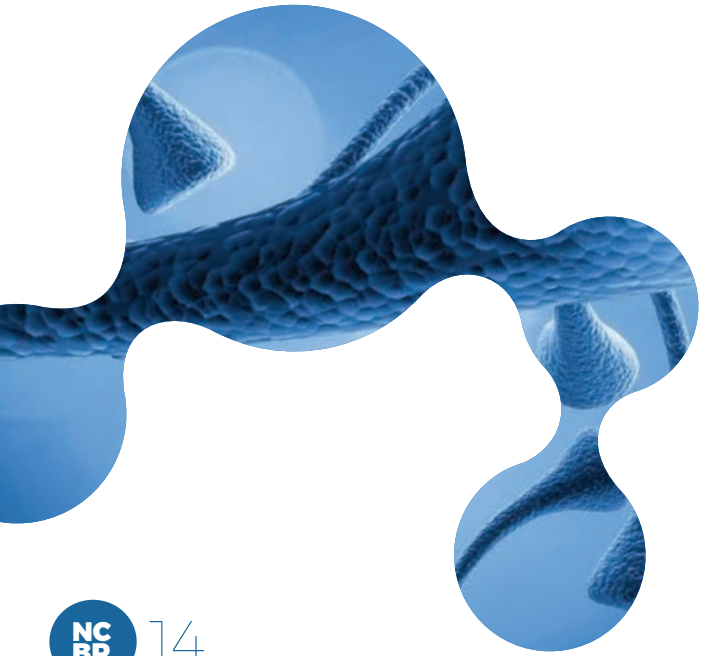
The implementation of the first stage of the project for building a system for information and communication with applicants and beneficiaries. Preparation and launch of applications: Innovation Assistant and Budget Assistant providing potential applicants with simple and intuitive tools enabling preliminary verification of the project idea and budget.

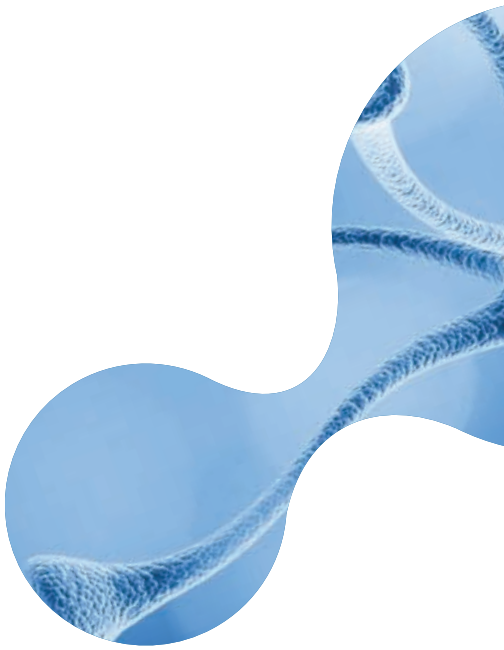
IMPLEMENTING THE PROJECT "CLOSER TO BENEFICIARIES"

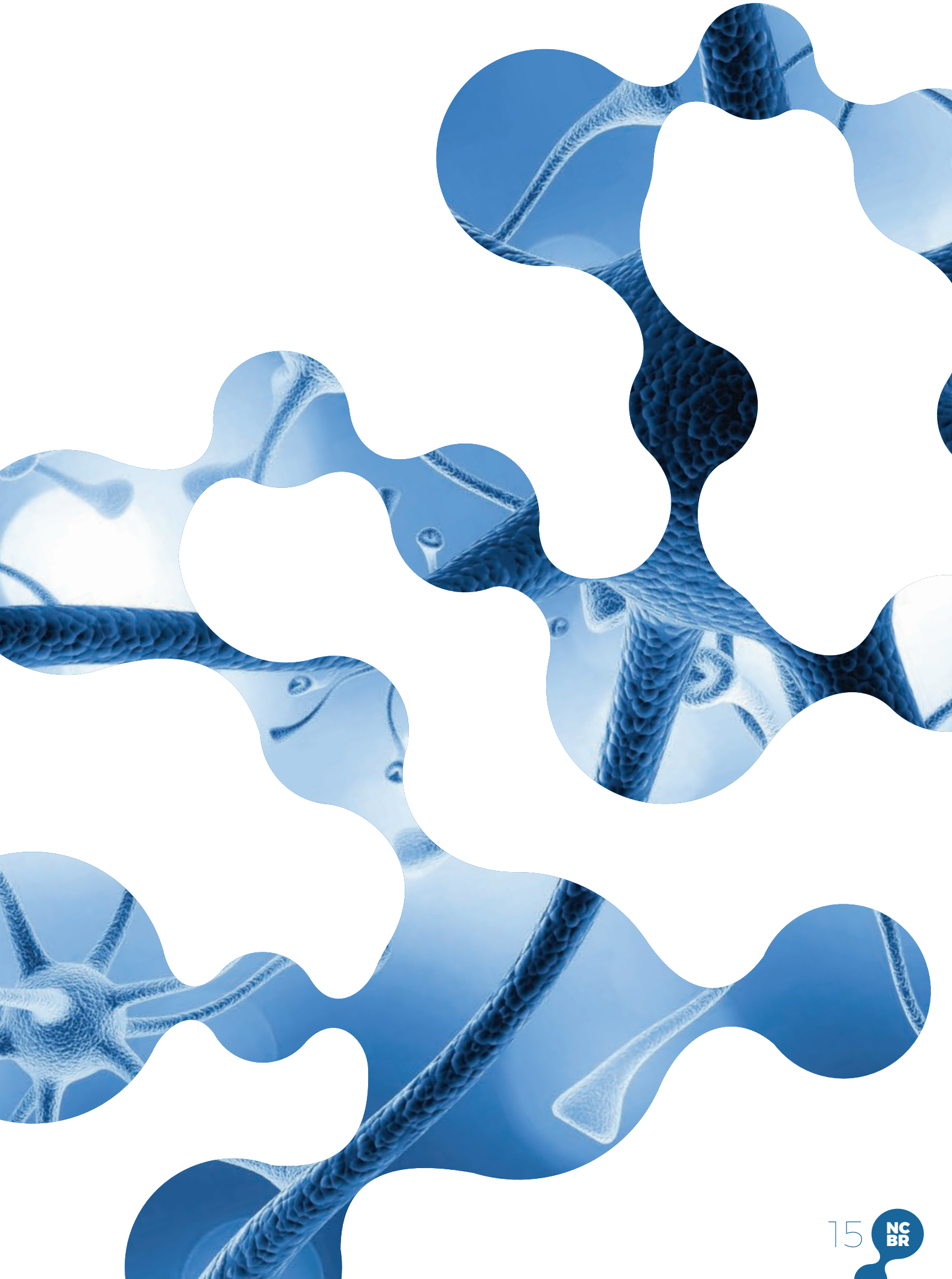
Simplification of the process of calls selection and assessment (reducing the number of required documents), shortening and improving the communication process with the applicant and the beneficiary (the "Simple Polish language" initiative). Extension of the information and communication system through the application of online tools and social media.

IMPLEMENTING AN INITIATIVE FOR EMPLOYEES "BECAUSE MY IDEAS COUNT!"

Organising a competition for employees in order to seek facilitations and improvements which will change and modernise processes and procedures at the Centre.







NCBR IN NUMBERS

MAJOR DATA FOR 2019

THE CENTRE ANNOUNCED

59 CALLS FOR PROPOSALS

FOR THE TOTAL ALLOCATION AMOUNT OF

PLN 6.9 BN

ON THE BASIS OF THE CONCLUDED AGREEMENTS

PROJECT CONTRACTORS RECEIVED

FUNDS AMOUNTING TO MORE THAN

PLN 4.2 BN

IN TOTAL IN CALLS FOR PROPOSALS ANNOUNCED

2560 APPLICATIONS[2]

WERE SUBMITTED THROUGH THE CENTRE

1488 PANEL MEETINGS

WERE ORGANISED AND CARRIED OUT

1245 AGREEMENTS WERE SIGNED

AS A RESULT OF THE CONCLUDED CALLS

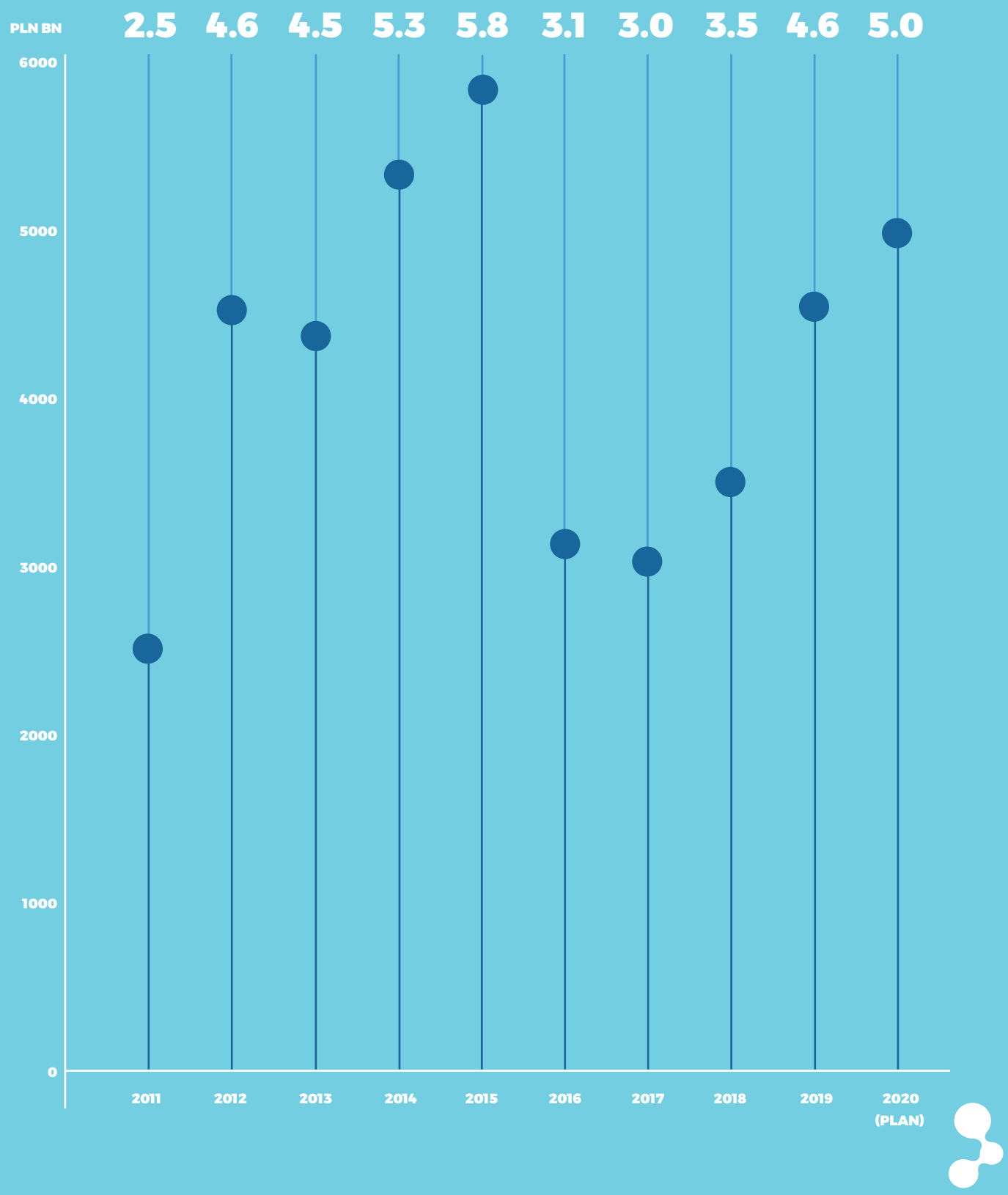
THE IMPLEMENTATION OF

4094 PROJECTS WAS MONITORED

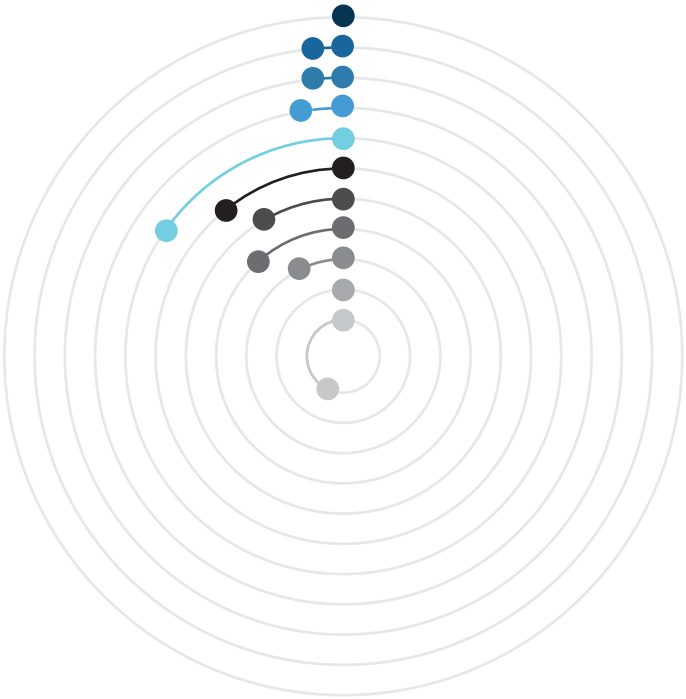
2. excluding Measure 4.2 of the SGOP implemented by National Information Processing Institute – National Research Institute

NCBR'S BUDGET

IN THE YEARS 2011–2019

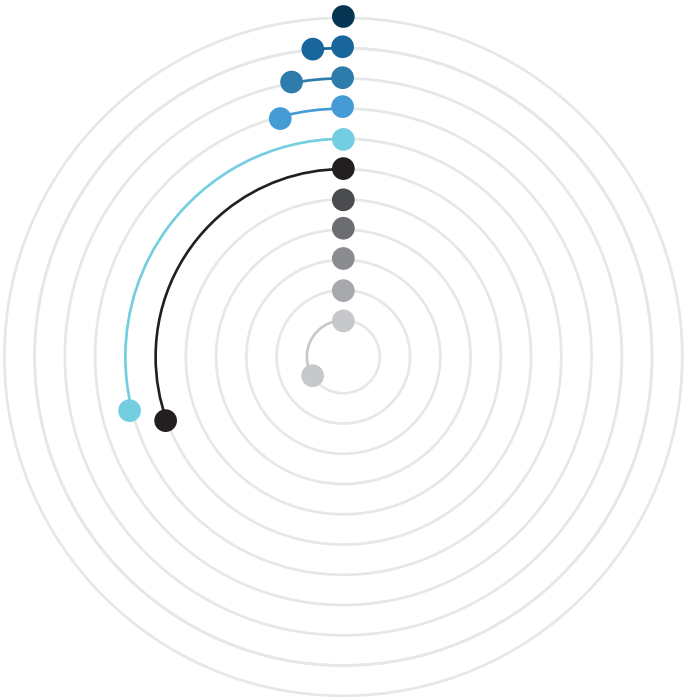


SHARE IN THE TOTAL NUMBER OF AGREEMENTS BY LEGAL FORM



2019

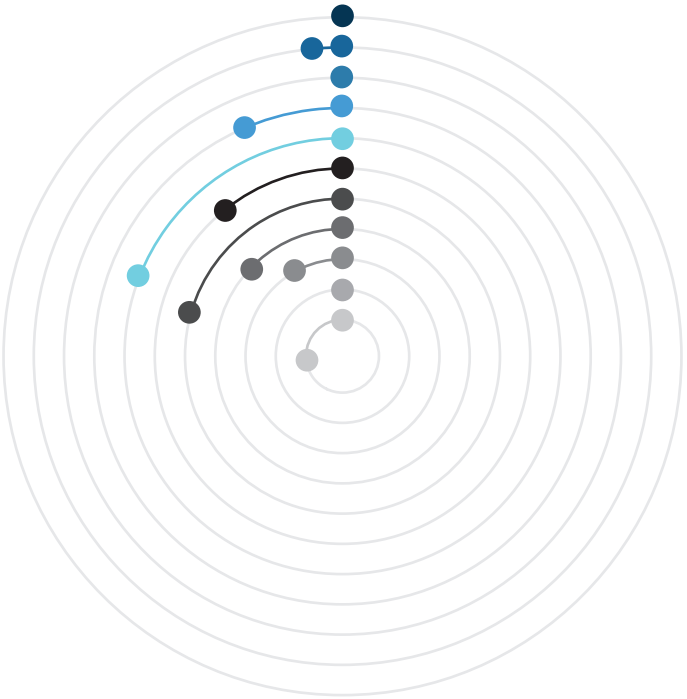
- 0% FOUNDATIONS
- 1% OTHER
- 1% RESEARCH INSTITUTE
- 2% SCIENTIFIC UNITS OF PAN
- 15% CONSORTIA
- 11% MICROENTERPRISES
- 9% LARGE ENTERPRISES
- 11% SMALL ENTERPRISES
- 5% MEDIUM-SIZED ENTERPRISES
- 0% ASSOCIATIONS
- 44% HIGHER EDUCATION INSTITUTIONS



2018

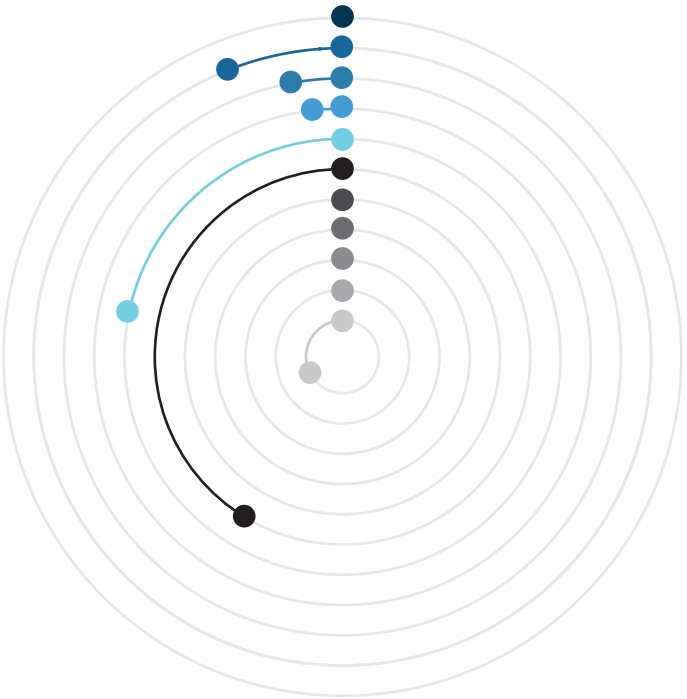
- 0% FOUNDATIONS
- 1% OTHER
- 3% RESEARCH INSTITUTE
- 4% SCIENTIFIC UNITS OF PAN
- 28% CONSORTIA
- 29% MICROENTERPRISES
- 0% LARGE ENTERPRISES
- 0% SMALL ENTERPRISES
- 0% MEDIUM-SIZED ENTERPRISES
- 0% ASSOCIATIONS
- 35% HIGHER EDUCATION INSTITUTIONS

PARTICIPATION IN THE TOTAL FUNDING AMOUNT BY LEGAL FORM



2019

- 0% FOUNDATIONS
- 1% OTHER
- 0% RESEARCH INSTITUTE
- 6% SCIENTIFIC UNITS OF PAN
- 19% CONSORTIA
- 11% MICROENTERPRISES
- 20% LARGE ENTERPRISES
- 12% SMALL ENTERPRISES
- 6% MEDIUM-SIZED ENTERPRISES
- 0% ASSOCIATIONS
- 25% HIGHER EDUCATION INSTITUTIONS



2018

- 0% FOUNDATIONS
- 7% OTHER
- 3% RESEARCH INSTITUTE
- 1% SCIENTIFIC UNITS OF PAN
- 22% CONSORTIA
- 39% MICROENTERPRISES
- 0% LARGE ENTERPRISES
- 0% SMALL ENTERPRISES
- 0% MEDIUM-SIZED ENTERPRISES
- 0% ASSOCIATIONS
- 28% HIGHER EDUCATION INSTITUTIONS

NCBR IN NUMBERS

Rule number 1: Never lose money.
Rule number 2: Never forget rule number 1.

WARREN BUFFETT

In 2019 NCBR carried out grant projects funded from European Funds: The Smart Growth Operational Programme (SGOP), the Knowledge Education Development Operational Programme (KEDOP), the Digital Poland Operational Programme (DPOP) and programmes funded with the targeted grant.

In 2019 the Centre announced **59 calls for proposals** for the total amount of **PLN 6.9 bn**, including:

- **8 CALLS FOR PROPOSALS** as part of strategic programmes (1), national programmes (4) and defence and security programmes (3)
- **29 CALLS FOR PROPOSALS** under international programmes
- **22 CALLS FOR PROPOSALS** as part of operational programmes: SGOP (18), KEDOP (3), DPOP (1)

NCBR, seeking new ways of funding research and development programmes, started the implementation of programmes under the problem-driven research formula. This was possible with the use of the best global practices in the area of managing R&D work funding process and inspirations coming from the operation method of the Defense Advanced Research Projects Agency (DARPA). Thus, the 2019 programme portfolio included a novel call for proposals for innovators and inventors "The Grand Challenge: Energy". The new formula consists in funding research projects which, through fulfilling a clearly defined goal, are to provide answers to the set challenge. The state plays the role of a smart customer creating a new market for novel products, referring, for instance, new hydrogen storage technologies, wind energy generation and storage and modern IT solutions.

The said formula is implemented by NCBR on the basis of two models, i.e. innovative partnership (IP) and pre-commercial procurement (PCP).

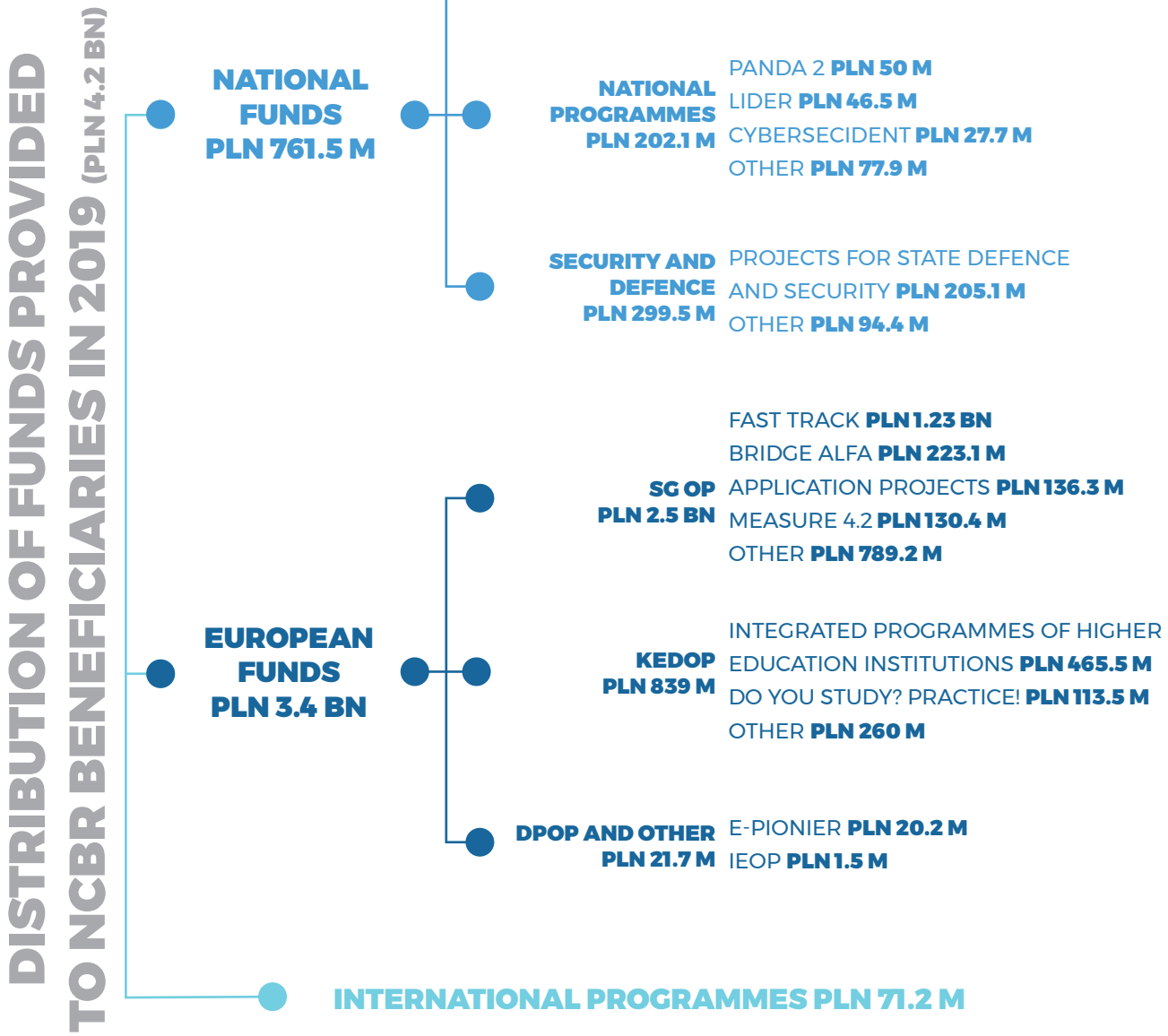
An important aspect of NCBR's activity in 2019 was also investment activity carried out through Venture Capital (VC) funds (selected as part of BRIdge Alfa i BRIdge VC) and from the PFR NCBR CVC Fund. Funding provided as part of these instruments supplied the continuously growing start-ups market in Poland, i.e. young technological companies and new business initiatives.

It is also worth mentioning the cooperation between NCBR and the National Information Processing Institute (OPI PIB) and the Foundation for Polish Science (FNP) carrying out three measures as part of the SGOP. Within Measure 4.2 OPI BIP concentrates on supporting selected projects of large strategic research infrastructure with a national or international reach and ensure efficient access to the infrastructure to businesses and other interested entities. In turn, FNP, as part of Measure 4.3, supports the implementation of International Research Agendas (IRA), with a goal to create in Poland, in cooperation with renowned research centres from other countries, specialised research establishing with a leading global position. Support under Measure 4.4 focusses on providing staff for innovative industry and research groups carrying out breakthrough R&D work and great significance for the economy or solving pressing social problems.

FUNDS PROVIDED TO NCBR BENEFICIARIES IN 2019

In 2019, on the basis of the signed agreements, beneficiaries received **funds amounting to more than PLN 4.2 bn**, of which almost **PLN 3.4 bn** for projects funded with European Funds, approx. **PLN 761.5 m** for projects funded with national funds and nearly **PLN 71.2 m** for international projects.

FUNDS PAID TO BENEFICIARIES THROUGH NCBR FOR THE IMPLEMENTATION OF PROJECTS AS PART OF THE RESPECTIVE PROGRAMMES IN 2019



FROM CALL FOR PROPOSALS TO AGREEMENT

An idea is rare.

ALBERT EINSTEIN

In calls for proposals announced by the Centre in 2019 a total of **2560 applications**[3] were submitted. Interest in the respective calls depended on their specific features; the highest number of them were submitted in horizontal calls – under Submeasure 1.1.1. of the "Fast Track" SGOP **1480 applications** were submitted.

As a result of the concluded calls **1245 agreements** were signed (9% more than in 2018), of which 487 were funded from the SGOP, 477 from the KEDOP, 148 as part of national programmes and 133 under international and strategic programmes as well as defence and security programmes.

CONTRACTING

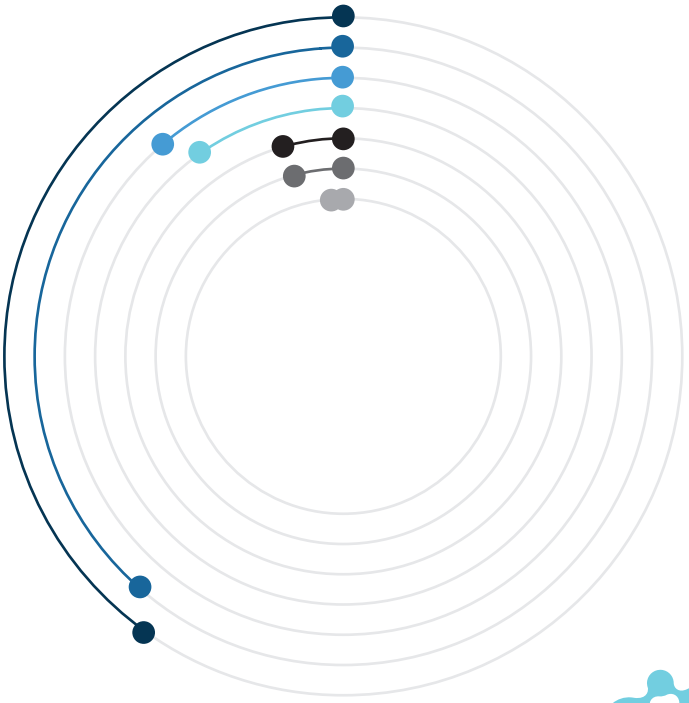
Implementing programmes financed from European Funds is associated with implementing contracting goals – the Centre, as the Intermediate Body, by concluding agreements fulfils SGOP and KEDOP contracting objectives. In 2019 the contracting plan was set at PLN 4 bn within the SGOP and over PLN 1.85 bn within the KEDOP, with performance reaching PLN 3.5 bn for the SGOP and PLN 1.4 bn for the KEDOP. From the start of the current perspective, at the end of 2019 contracting amounted to **PLN 16.6 bn for the SGOP and over PLN 4.9 bn for the KEDOP**, which corresponds, respectively, to 78% and 99% of total amounts allocated for activities implemented by NCBR.

MONITORING PROJECT IMPLEMENTATION

Signing an agreement with a beneficiary being a several-year process of funding and monitoring project implementation, with rules specified in the agreement. In 2019, funding and monitoring was provided for the implementation of **4094 projects**, with the highest number – **1688 projects** carried out as part of **the SGOP**.

3. excluding Measure 4.2 of the SGOP implemented by National Information Processing Institute – National Research Institute

DIVISION OF MONITORED PROJECTS BY PROGRAMMES AND FUNDING SOURCES



1688 SGOP

1502 KEDOP

332 NATIONAL PROGRAMMES

305 INTERNATIONAL PROGRAMMES

131 SECURITY AND DEFENCE

129 STRATEGIC PROGRAMMES

7 DPOP

MONITORING PROJECT RESULTS

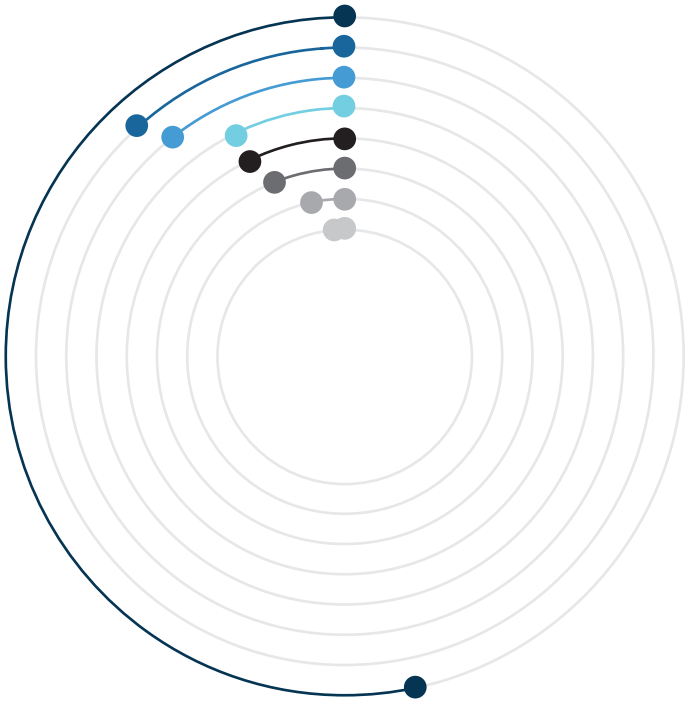
Supervision over project implementation is carried out on the basis of **periodic and final reports**, and in the case of operational programmes also on the basis of the assessment of payment requests – they were used to make the assessment of compliance of project implementation with the agreement from the substantive and financial perspective. In the monitoring process of implementing projects under strategic programmes, joint ventures and BRIdge fund initiatives, the key role is also played by steering committees and investment committees. In 2019 a total of **2138 reports** were assessed.

Provisions of agreements also include the time after the end of the funding period and project implementation – **in the project durability period**. The durability period varies from 2 to 5 years after the project completion or after sending a notification of accepting the project results and depends on the specific characteristics of the programme and funding source. In 2019 **2832** projects (46% more as compared to 2018) were covered by monitoring in the durability period, with the highest number – 1468 projects – funded from national programmes.

CERTIFICATION

In programmes financed with European Funds the verification and approval of **payment requests** is of key importance for the performance of goals set by the Managing Authority. In 2019 a total of **14773** requests for payment were approved, including: 8036 requests under the SGOP (of which 7391 were approved for PLN 1.85 bn) and 6737 requests under the KEDOP (of which 3860 were approved for PLN 818 m).

THE NUMBER OF PROJECTS IN THE DURABILITY PERIOD BY PROGRAMME ANDFUNDING SOURCE



PROGRAMME OUTCOMES

Outcomes of the performance of R&D work funded by the Centre are the subject of interest to, i.a. the Team of Experts, which evaluates whether the outcomes achieves as part of projects are implemented in business activities.
In the years 2018–2019 the Team of Experts evaluated more than 200 implementation reports, which are filed a few years after the completion of R&D work (usually 3 years after project completion)[4].

Between 2018 and 2019 experts analysed the outcomes of the following programmes: INNOTECH, the Applied Research Programme (PBS), "DEMONSTRATOR+ – supporting scientific research and development works in demonstration scale" and the so-called targeted (civil) projects. Projects as part of these programmes were implemented from 2011 to 2020 (INNOTECH: 2011–18, PBS: 2012–20, DEMONSTRATOR+: 2016–18). Taking into consideration the fact that economic operators are obligated to submit implementation reports, usually 3 years after completing the project, with full outcomes to be presented in around 5 years. Based on the work of the Team of Experts it is possible to state that the R&D work outcomes of 76% of projects funded by NCBR find economic applications[5].

4. NCBR's own analysis carried out on a group of 200 implementation reports in the years 2018-2019
5. data based on 200 implementation reports analysed by NCBR in the years 2018-2019

NCBR'S BENEFICIARIES

One can get anywhere with their own work and effort.

ADAM MICKIEWICZ

ARTIFICIAL INTELLIGENCE SYSTEM SUPPORTING PEOPLE WITH VISUAL DYSFUNCTIONS – TOUCAN EYE

THE SMART GROWTH OPERATIONAL PROGRAMME, FAST TRACK

RADOSŁAW ZDUNEK
President of Toucan Systems Sp. z o.o.

PROJECT VALUE
PLN 5,274,366.42

FUNDING AMOUNT
PLN 3,941,205.96

ARTIFICIAL INTELLIGENCE TO SERVE PEOPLE WITH VISUAL DISABILITIES: WE WOULD LIKE THE TOUCAN EYE SYSTEM TO REACH THE HIGHEST NUMBER POSSIBLE OF AROUND HALF A MILLION VISUALLY IMPAIRED PEOPLE IN POLAND, ASSISTING THEM IN THEIR EVERYDAY LIVES.

PROJECT BACKGROUND

The history of Toucan Systems is associated with expositions in museums – we have prepared a number of interactive exhibitions, including multimedia displayed on screens. We are combining arts, technology and engineering. We have often come across the issue of content presented at exhibitions or museums being unavailable to people with disabilities, including the visually impaired. The natural step for us was

to participate in NCBR's call for proposals as part of the "Fast Track" in order to create our own R&D centre making use of the technology in which we were quite well-versed in order to help people with such dysfunctions.

The origin of Toucan Eye is also quite interesting. Before we started any work, I made an appointment with the Polish Union of the Blind. I presented the concept of the system and thanks to talking to potential users we knew exactly from the very start what they need and what to focus on – this way we were able to understand their perspective. There are many problems of blind and visually impaired people that we are unable to imagine. Thanks to these consultations we modified our original assumptions. Recently we carried out field tests with visually impaired people – the results were great – Toucan Eye works in practice, and for people with visual disabilities it is an actual, crucial support.

CONCEPT

Toucan Eye is our first project – a tool that uses artificial intelligence to support people with visual disabilities in their everyday lives. The device is a camera resembling a small Bluetooth earpiece, connected wirelessly with a smartphone-sized computer carried in a pocket. The visually-impaired user no longer has to ask people, for instance at the bus stop, about the approaching bus or tram – Toucan Eye will tell them.

ABOUT NCBR

NCBR funds made it possible to create a real R&D department. During work on the first project, a team was created to develop further projects associated with artificial intelligence solving social problems – recently, for instance, we have worked on an AI system supporting the elderly and helping them remain active. NCBR's funding is always a great opportunity, and we are seizing it.

In cooperation with the National Centre for Research and Development the important aspect is specific standards in project management and implementation – settlement of purchases, remuneration, keeping documentation and preparing reports. The applicants must be aware that precision and accuracy are crucial. I cannot fail to stress that we received substantial support from NCBR's employees.

SCALE

We actually don't have any competition in Poland.
There is one similar solution in the world, developed by Orcam Technology (MyEye), but it's relatively expensive. We will try to introduce Toucan Eye to the market ourselves. The efficient operation of prototype devices fills us with optimism, so we are planning mass production. I think we will find a serious investor.

ADVICE

When it comes to advice for companies applying for NCBR support, I can say that it is worth to consider whether our competences cannot serve as a key to a whole new area of activity. We often do not see the opportunities that are close, closer than we think.

PUREAPTA, AN INNOVATIVE MODULAR SERVICE PLATFORM FOR THE SELECTION OF MODIFIED APTAMERS WITH APPLICATIONS IN DIAGNOSTICS AND THERAPY

THE SMART GROWTH OPERATIONAL PROGRAMME, FAST TRACK

PRZEMYSŁAW JUREK, PHD
Pure Biologics S.A.

NEW MEDICINES FOR RARE DISEASES, CHEAPER ADVANCED MEDICAL DIAGNOSTICS, A SERVICE PLATFORM FOR LARGE PHARMACEUTICAL COMPANIES – THESE ARE THE MAIN OBJECTIVES OF THE ”PUREAPTA” PROJECT.

PROJECT VALUE
PLN 2,327,629.00

FUNDING AMOUNT
PLN 1,807,003.00

PROJECT BACKGROUND

Initially our company provided services involving the production of recombinant proteins for large biotechnological and pharmaceutical companies. Several years ago we focussed our interest on aptamers and decided to create something ours, that is to transform from a purely service company basing its activities on unique know-how, into a producer of a product -service based on the developed intellectual property.

CONCEPT

Talking about the project, it is impossible to avoid specialist language: aptamers are molecules similar to antibodies but made of chains of compounds found in our DNA, i.e. nucleic acids. Aptamers differ from antibodies, which are proteins, but they can be used in a similar way – for instance as a tool for research, such as studies on neoplasms. The advantage of aptamers consists in its greater stability and their chemical synthesis is easier (whereas antibodies have to be produced in cell cultures), which is associated with lower research costs. In short, aptamers can be tools for research, and in perspective also therapeutic molecules, or find applications in diagnostic tests – even the most popular, such as strip tests, the most popular of which is pregnancy test. We can replace antibodies with aptamers in those tests. Pregnancy tests are popular and cheap, but there are also more complicated and expensive tests, whose prices can be largely reduced with aptamers. This naturally means a greater availability and is ultimately associated with providing health protection to a broader group of recipients.

COMPETITION

We are the only company in Poland dealing with aptamers, and there are only a few university groups conducting non-commercial research in the field. Aptamers are not commonly used on a global scale – there are several dozen companies dealing with a similar biochemical technology.

SCALE

NCBR's funding made it possible for us to scale up our operations. Biotechnological research isn't cheap. In the model that we adopted we are able to deliver very competitive tools to producers of diagnostic tests – these are aptamers which we can generate, speaking colloquially, "to order".

We have already held first meetings and talks focussing on business rather than the scientific aspect. This is a breakthrough – we are entering the commercialisation phase of the project. At the same time – based on the assumption that we can do something for others, we can also do it for ourselves – we began to use the developed technology to produce our own therapeutic solutions.
In addition, we are running two large projects based on aptamers, with a value of over a dozen million zlotys each, with a goal to create therapeutic solutions for rare diseases.
This would not be possible without the first project "PureApta" .

ABOUT NCBR

The assessment of projects made by NCBR is reliable and precise, and requires the applicants to take a realistic approach to their own projects. A considerable challenge, not only in cooperation with the Centre, is long term planning of scientific research. Not everything can be predicted five years ahead: the characteristic feature is research is that we do not know their results and are unable to predict all their results. The results of intermediate stages determine the successive decisions regarding, e.g., the purchase of equipment, the hiring of personnel, etc.

Without taking anything away from the construction sector – we are not dealing with skyscraper construction, in which most things can be planned, from foundations and the underground parking lot to the viewing platform at the very top. Fortunately, NCBR is showing flexibility and understanding, although a change of plans during the execution of the project requires considerable effort. I would recommend all applicants to be patient and ready for changes. Practising science and simultaneously being able to put the outcomes of research in practice is a really interesting challenge.
I think all members of our team, which now consists of a hundred people, share this view and the common passion.

EVIDENCE LABELLING, REGISTRATION AND TRACKING USING ADVANCED GEOINFORMATION TECHNOLOGY

SMART GROWTH OPERATIONAL PROGRAMME, APPLICATION PROJECTS

ARTUR DĘBSKI
Consortium of the Central Forensic Laboratory of the Police (CFLP) and CYBID sp. z o.o.

FORENSIC EVIDENCE AND ANALYSIS IN A CLEAR TRANSPARENT AND RELIABLE SYSTEM ARE INDISPENSABLE FOR A FAIR AND ACCURATE INVESTIGATION. EVIDENCE CAN BE EXTENSIVE AND COMPLICATED – CFLP'S AND CYBID'S SYSTEM IS DESIGNED TO KEEP IT UNDER CONTROL.

PROJECT VALUE
PLN 2,702,349.00

FUNDING AMOUNT
PLN 2,143,475.10

PROJECT BACKGROUND

CYBID has been developing forensic software for many years now, and CFLP is the obvious leader in crime scene examination and forensic evidence collection and analysis. With their shared know-how and a history of successful cooperation, it seems a matter of time before they came up with the concept of a system which uses advanced solutions to automate and facilitate forensic processes, and to ensure the high quality, objectivity and safety of forensic data.

CONCEPT

The underlying idea was to facilitate the integration of data obtained from scene analysis, and its visualisation, making sure it is clear and legible for all parties involved. This also includes monitoring physical evidence from collection on the scene to and throughout the evidentiary process, along with laboratory examination.

Appropriate technical support in reconstructing the scene of the crime plays a key role in the evidentiary proceedings that follow – every police officer knows that. Our system combines many different imaging, measurement and positioning technologies and tools: from laser measurements to UAV scene examination. The equipment can be used on an as-needed basis. What is important is that the differently obtained results can be compared and analysed to draw conclusions.

AIM

The system is positioned to improve the crime detection rate and to provide shorter investigation times. It will achieve this by providing objective and valid evidence and ensuring its safety.

COMPETITION

Clearly, there are similar solutions elsewhere in the world, although technology is naturally developing at a rapid pace, and the latest achievements must be implemented in forensic methodologies – our system ensures this through its flexibility, while also being a modular solution, i.e. one which can function in various configurations: for instance, the system can be adapted to suit the needs of police units across various levels.

PROJECT SIGNIFICANCE

The project may be of little relevance to an average citizen, but it should be kept in mind that people do not feel safe only because nothing wrong happens to them – it is also important to know that once something bad happens (theft, car accident, robbery, etc.), the matter will be investigated and dealt with rapidly and objectively. Awareness that the police as well as other actors involved (the justice system, expert witnesses, insurance companies) have modern equipment that suits their needs and a coherent system providing objective documentation on evidence can, in our opinion, serve to improve the sense of safety of each citizen.

ABOUT NCBR

Our history of cooperation with NCBR leads us to believe that once you have an idea, you need to implement it. It is worth relying on people with passion. Formal matters can be a major issue, there is no way around them, but we should consider them as minor obstacles to be overcome.

MOTTO

Once we manage to put the potential of scientists and engineers to good use, success will be within arm's reach – I consider this to be the motto of our project.

ELECTRONICS FOR THE AUTOMOTIVE INDUSTRY

KNOWLEDGE EDUCATION DEVELOPMENT OPERATIONAL PROGRAMME

DOMINIK STRZAŁKA, ENG. D.
Head of the Department of Complex Systems, Faculty of Electrical and Computer Engineering, Rzeszów University of Technology

THE PODKARPACKIE REGION IS KNOWN FOR HIGH AUTOMOTIVE TECHNOLOGY. THE POLISH COMPANIES OPERATING HERE SUPPLY COMPONENTS TO EUROPE'S LARGEST CAR MANUFACTURERS. THE RZESZÓW UNIVERSITY OF TECHNOLOGY IS RESPONDING TO THE NEEDS OF BUSINESSES LOOKING FOR HIGHLY QUALIFIED EMPLOYEES.

PROJECT VALUE

PLN 2,214,170.44

FUNDING AMOUNT

PLN 2,147,745.32

BACKGROUND AND CONCEPT

Our project is based on education and teaching. We are committed to ensuring that the Rzeszów University of Technology gives its graduates the preparation they need to start a successful career in the automotive industry, providing them with practical skills and extensive field-related knowledge.

The Podkarpackie Province has four smart specialisations, and automotive is one of them. This may be surprising to many, as south-eastern Poland is mainly associated with the "Aviation Valley" – Rzeszów, Mielec and several other cities of a former Central Industrial District. Combined, automotive companies in our region

contribute to GDP about 20% more than aviation businesses. Seeing the scale of this development, I cannot stand idly. It is an opportunity for higher education institutions to come up with new programmes and forms of education to suit the needs of local businesses.

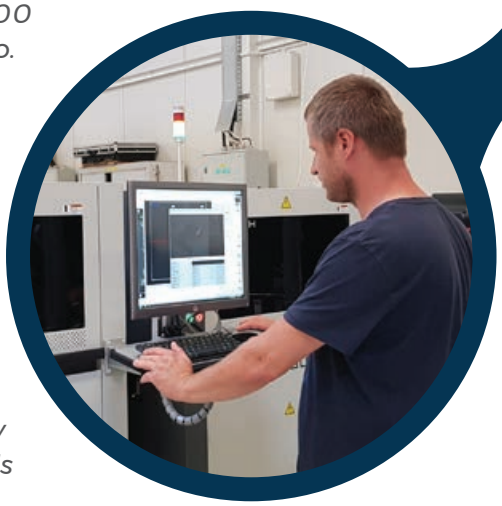
Dębica, a globally recognised brand, has been a steadfast presence for many years, and there are many other companies manufacturing components and parts. A bus manufacturing plant is located in Sanok, and Gorzyce is known for its wheel rim manufacturer, supplying products to almost all of Europe. In addition to these, there are many other automotive companies in the region. Podkarpacie proves to be a true automotive powerhouse when it comes to producing car equipment and advanced components, delivering products to major automotive companies across Europe.

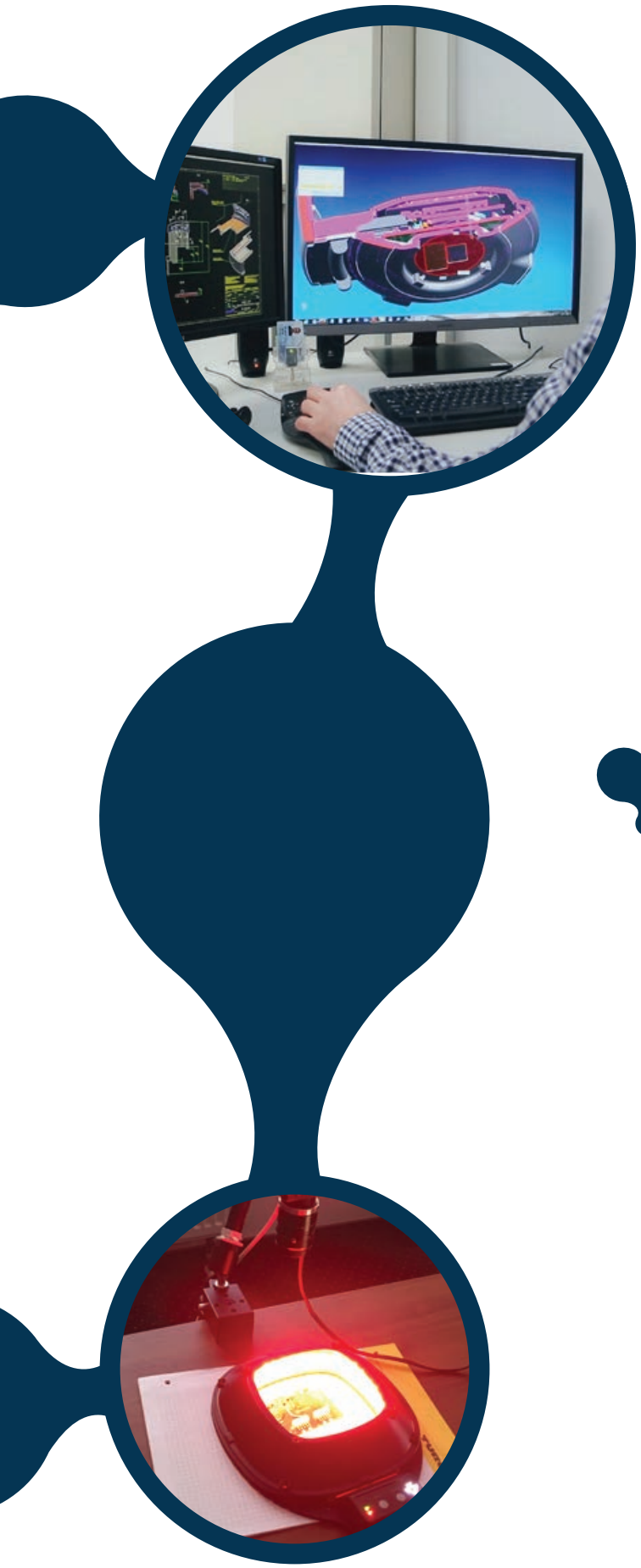
MARKET

BURY Mielec is one of the regional leaders in automotive as a supplier of electronic components. Established almost 30 years ago, the company supplies advanced electronics to the Volkswagen Group (including Bentley and Porsche), Audi, BMW and Daimler-Mercedes. It operates in the Mielec Special Economic Zone, among other locations, and employs more than 2,000 people in Poland, Germany and Mexico.

PARTNERS

BURY sp. z o.o. is the company I decided to invite to be a partner in the project to provide qualified specialists who have the required practical preparation to work in the automotive industry. As a rule, almost all graduates of the Rzeszów University of Technology specialising in such fields as electronics, automation, electrical engineering and computer science were immediately "sucked in" by the industry, and jobs were readily available. However, early on in their employment, it proved necessary to provide them with dedicated quality training and preparation to help inexperienced engineers learn the ropes. This was a very time-consuming process, stopping graduates from climbing the career ladder faster. Our educational project has shortened and facilitated this process.





As part of the programme, we prepared our students not only by placing emphasis on purely engineering skills, but also by giving them the opportunity to improve their language, communication, interpersonal and management qualifications. You can say that we have provided the automotive industry with well-prepared and more mature specialists compared to traditional graduate-employment pathways. After completing internships with BURY, directly participating in research & development work on the company's premises, and in joint university-business training courses, our young engineers have made a smooth transition to their professional careers.

The project in question offered four training pathways in four different fields, including three-month internships for forty students. So, we are talking large scale here. I consider this to be a great investment that will drive the development of our region and the automotive industry.

ABOUT NCBR

With NCBR's support, the programme could be launched successfully. It proved extremely challenging to implement the programme due to the conditions and restrictions it involved. I would advise those applying in the future to bear in mind that it takes quite a long time to complete the project. It will also take a good deal of patience and perseverance.
Project leaders must be ready to work unusual hours.

In conclusion, I want to make one practical comment. I find it debatable that reviewers reject project applications regarding proposals of training in soft skills and "field-related" competencies (by the latter I mean, for instance, teaching students waste handling procedures, and the electronics industry generates more waste than we think!). Trouble and discussion are, however, inherent to success.

CYPHERDOG

SMART GROWTH OPERATIONAL PROGRAMME, BRIDGE ALFA

SEBASTIAN KRAKOWSKI
founder and CEO of Cypherdog

CYBERSECURITY – A HOT AND TIMELY TOPIC. POLISH COMPANIES ARE WELL-POSITIONED TO TOP THE LEADERS IN THIS INDUSTRY, AND WE WANT TO BE THE BEST AMONG THEM. WE OFFER UNIQUE ENCRYPTION SOLUTIONS FOR FILE SHARING.

PROJECT VALUE

PLN 1,000,000.00
BUDGET

PLN 800,000.00
NCBR

PLN 200,000.00
FUND

PROJECT BACKGROUND

Cypherdog goes six years back, when I prepared the first project involving encrypted cloud for file sharing. The matter of cybersecurity came up naturally in this project, although the issue of the extent to which social media, especially Facebook, are spying on us, and how our data can be leaked, have not been as widely debated and publicised as they are now. And so on. These matters are highly relevant today.

I sold my first start-up to a California company, and I made the decision to stay in the business of cybersecurity – thus the concept of the Cypherdog was born.

CONCEPT

We are seeing the emergence of many start-ups which provide encryption solutions – obviously, I am not talking about developing antivirus software or similar applications – what I mean is solutions to secure files that are being shared. What is unique about our project is that file sharing does not require the presence of a "middleman". Put

most simply, if I need to send someone a file (for instance, financial statements or a report, or other confidential documents), I can open Cypherdog, I have a recipient on an anonymised contact list and I send a document that is encrypted with my own password and my own keys (private and public), and the recipient also must use their own password and key. There are no "middlemen" between me and the recipient, say an "encryption service provider."There is no one to give us the keys, no – to use a parallel – concierge to keep the private key, which is held only by the sender. Even if hackers attacked the Cypherdog servers, on which our files are stored, it would be impossible to decrypt them.

SCALE

Our project is a global innovation. Except for Australia, in which end-to-end encryption is not allowed by law (although everyone uses Facebook's WhatsApp anyway), similar projects might be of interest to any country in the world.

As of now, we have nearly 20 sales partners in Poland, we are securing partners in Europe and America, and Asia is within our reach as well. In other words, we will succeed globally by continuing to secure distributors, and they will provide the project to their partners, which support business clients. Looking at the size of the network and the financial scale of this project, the sky is the limit when it comes to its potential to grow , and in more specific terms (the investment funds involved in startups need to know the specifics), we can get to an estimated revenue of USD 20 million within 2 years. Our solution is a breakthrough which might, or even should, be of interest to anyone concerned with the safety of their digital data.

INNOVATIONS IN POLAND

The term "innovation" can be relative, with multiple, slightly varying definitions. In investment funds, which are natural partners to start-ups, there is sometimes a shortage of people able to provide a qualified assessment of this "innovation". If the solutions presented by the start-up are truly visionary, and hence inherently complex, it is difficult to expect that the novelty of the project is understood fast and in detail, even by experts. The Polish start-up market is no exception here, although many interesting initiatives are around.
What is an issue is the rate at which the decisions are made by potential investors. Still, the fact is that supported programmes such as Bridge Alfa are interesting and helpful.

ADVICE

I would advise companies applying under NCBR programmes to remain consistent, persevere and believe in success. These are the simplest and most important things.
As far as cooperation with funds is concerned (including those involved in programmes such as BRIdge Alfa), we need to develop a degree of tolerance against traditional, perhaps a bit rigid methodologies used to assess the potential of high-risk start-up projects. C'est la vie. We succeeded in doing this.

HIGH-DURABILITY HYBRID ACCUMULATOR FOR LIGHT-DUTY ELECTRIC CARS

SMART GROWTH OPERATIONAL PROGRAMME, BRIDGE ALFA

MACIEJ WIECZOREK, PHD
Breeze Energies Sp. z o.o.

DURABLE AND LIGHT BATTERIES ARE EXPENSIVE; THE CHEAPER ONES REQUIRE FREQUENT CHARGING, AND THEY HAVE A SHORT LIFETIME. WE HAVE FOUND A SOLUTION TO THIS DILEMMA, WHICH GIVE SLEEPLESS NIGHTS TO SO MANY PEOPLE!

PROJECT VALUE

PLN 1,000,000.00
BUDGET

PLN 800,000.00
NCBR

PLN 200,000.00
FUND

CONCEPT

Smaller vehicles rarely have lithium-ion batteries, mainly because of the price – these small cars must be cheap. However, the classic lithium-ion battery is four times more expensive than the lead-acid battery. This simple fact was the starting point for our project, and I was familiar with the subject itself, since as a scientists, I deal with hybrid battery systems and, more generally, accumulators.

Various solutions exist for storing electricity, some are more and some are less advanced, there are complex ones and there are simple ones. We chose the solution we believe makes most sense for a regular user: to extend the lifetime of cheaper acid batteries (which were cheaper "at the expense" of a shorter lifetime).

COMPETITION

Are we afraid of major corporations' which improve the technologies used in hybrid and electric cars? No! First of all, we are ambitious, and second, for simple reasons, we operate in niches.

SCALE

We specialise in and focus on lead-acid battery vehicles. These primarily include small devices, such as forklifts, small electric cars for driving around resorts and golf courses, hotel buses – low-powered or low-speed vehicles. A small company that has just entered the market would find it difficult to operate in the segment of passenger cars – the restrictions connected with the safety of "normal cars" are very stringent, and activities in this field would require millions in expenditures. That is why we are starting slow, but we have a plan to gradually climb the ladder until we reach the mainstream.

GOALS AND CLIENTS

The sky is the limit has been the guiding principle. One idea can give rise to several new concepts. Without doubt we have tested our technology inside-out. Batteries equipped with additional energy reservoirs we have designed, perform excellently: they charge faster and have a much longer lifetime, and they need to be replaced much less frequently, all in all providing a very cost-effective solution. These features make our product attractive on the market. Technological projects require time to achieve adequate profitability. For now, we have implemented and prepared our micro-vehicles for sale, but the coronavirus pandemic has slowed down our efforts to enter the market. Parents of teenagers have been our ever-growing customer group, as low-speed vehicles can be driven be people as young as 14, and these small electric cars are safer than scooters.

MARKET

While working on our products, we also found out that the demand for more advanced lead-acid batteries was not only on the small-vehicle market, but also in stationary energy storage solutions, such as photovoltaic systems and wind turbines – this is true essentially for all areas' in which batter lifetime and cost are a factor. Actually,

customers themselves have started asking questions about such solutions. Our experience with car batteries will thus help to deliver stationary energy storage projects. And scale-wise I am talking about at least Poland. Our market here is very receptive. Vehicles similar to ours are already present in German, Spain and Italy, but we would be the first business to market them in Poland. And as far as hybrid batteries for vehicles are concerned, we are talking about a European-wide innovation. Our market is geared towards eco-friendly, relatively cheap and convenient solutions.

We are confident that our project feeds into the changing automotive landscape.

INNOVATIONS IN POLAND

You need to have adequate research staff to promote a link between science and business. I think there need to be enough scientists to allow some of them to split time between theoretical research and research that concerns innovations with commercial potential.

ABOUT NCBR

I see NCBR's role as facilitating the practical application of research efforts and encouraging business to tap available scientific resources. We believe the existence of such a link to be one of the key prerequisites for successful funding applications. And this should be coupled with determination and patience, as well as with a serious approach to feedback from experts assessing projects – in our case most expert recommendations proved to be apt and helpful.

DEVELOPING AN ENVIRONMENT TO IMPLEMENT THE CONCEPT OF SMART BORDERS

STATE SECURITY AND DEFENCE PROGRAMME

Col. NORBERT PAŁKA, PHD ENG., Professor of the Military University of Technology
Institute of Optoelectronics, Military University of Technology

BORDERS PROVIDED WITH THE LATEST IT SYSTEMS ARE SAFE BORDERS. POLAND HAS BEEN EFFECTIVELY FULFILLING EU REQUIREMENTS TO ENSURE THAT ITS EXTERNAL BORDERS ARE SECURE AND MONITORED.

PROJECT VALUE
PLN 5,460,000.00

FUNDING AMOUNT
PLN 5,200,000.00

PROJECT BACKGROUND

The NCBR-funded project "Developing an environment to implement the concept of Smart Borders" came about in response to an EU regulatory package called Smart Borders, whose aim is to provide technical solutions to improve and expedite border control at external borders of Schengen states, and to manage borders and incoming and outgoing traffic. "Smart borders" is a clear requirement for the effective implementation of EU guidelines, designed to ensure the security of both Poland and the EU.

By 2021, all non-EU citizens crossing external Schengen borders will be subject to biometric identification.

CONCEPT

Our project is intended for the Border Guard and is expected to deliver a new database comprising documents, as well as facial photographs and fingerprints. These data will be stored and linked to data on local border traffic.

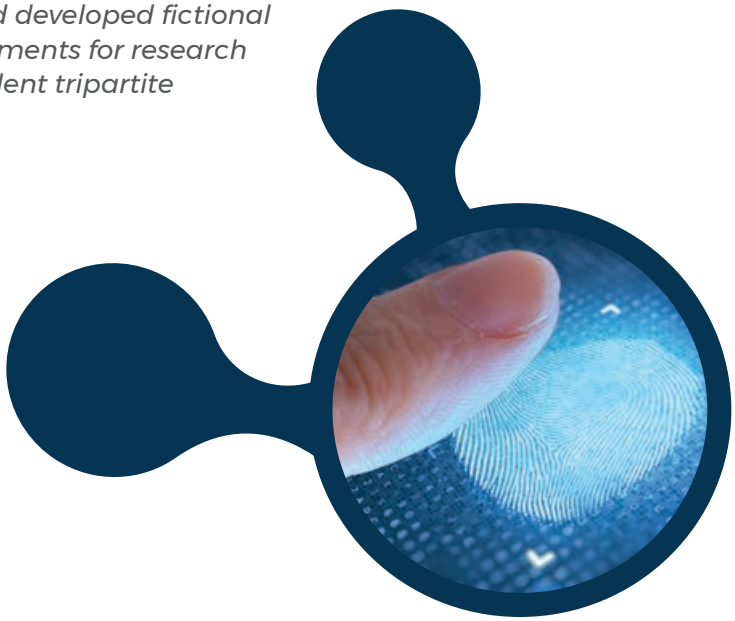
AIM

The project is clearly useful, serving to protect the economies of EU states, and helping to analyse how much time individuals spend within the European Union. This is immensely important for managing the grey economy and eliminating threats. The project was consulted with and overseen by the Border Guard, and we made efforts to answer the questions and follow Border Guard's practical recommendations.

The project was managed by Professor Mieczysław Szustakowski. The Institute of Optoelectronics, Military University of Technology (MUT) team dealt mainly with hardware, requirements and testing, and JAS Technologie, our Partner, was responsible for software and data (photograph types, fingerprints, etc. – i.e. all the database inputs). Gemalto – a global security systems producer – provided conceptual support and developed fictional biometric identify documents for research purposes. We had excellent tripartite cooperation.

ABOUT NCBR

In its research efforts the MUT is committed to finding new pathways to development. We understand defence as not only the military, but also a whole system which includes – as in this case – the Border Guard. This project, funded under an NCBR programme, allowed us to deploy and expand our security, border control and biometrics capabilities.



SPINAL CORD REPAIR USING ENDOGENOUS STEM CELL NICHES

INTERNATIONAL COMPETITION, ERA-NET NEURON

Prof. URSZULA SŁAWIŃSKA
Nencki Institute of Experimental Biology, Polish Academy of Sciences

SPINAL CORD SEVERANCE IN PEOPLE IS IRREVERSIBLE AND RESULTS IN DISABILITY. WILL IT EVER BE POSSIBLE TO REGAIN MOBILITY AFTER SUCH AN INJURY? RESEARCH ON ENDOGENOUS STEM CELLS HAS HELPED US GET CLOSER TO ANSWERING THIS QUESTION.

PROJECT VALUE

PLN 1,091,150.00

FUNDING AMOUNT

PLN 1,091,150.00

BACKGROUND

Our research on rehabilitation strategies for patients who have suffered spinal cord injuries spans more than 20 years. One of the concepts we have come up with is based on intraspinal transplantation of cells to supply neurotransmitters involved in limb movement control. These include monoamines, such as serotonin and noradrenalin.

Put most simply, the idea is to provide the spinal cord below the level of the injury (severance) with a kind of biological pump to supply this area with chemical substances (neurotransmitters) that promote

the ability to control limb movement. We have performed in vitro studies with rats, and a large body of publications on the subject has been produced. Consequently, we are now able to prove that despite the animal brain being cut off from the cord below the injury level, the spinal cord can be reactivated to restore normal limb movement.

I started exploring this subject with my team in the second half of the 1990s. We made consistent use of the rat model to investigate which cells were suitable and when to transplant them, and what was the extent to which they innervated the cellular structures of the "host", and what were the mechanisms responsible for limb movement rehabilitation.

CONCEPT

In theory, cord structures which control locomotor functions in "normal life" are governed by brain structures. When the cord is severed, not all structures below the injury level atrophy, some of them are still there. So, we need to find a way to activate them and promote this activity to "teach them" to work properly. We have demonstrated that this can be achieved by supplying serotonin to the spinal cord: supported by serotonin from the transplant, the cord network is starting to work better.

From the beginning our idée fixe, a somewhat science-fictionesque concept, was that perhaps one day it would be possible to use stem cells. And were surprised to learn that it was enough to transplant them and wait until they differentiated into suitable cells. We aimed for stem cells we could differentiate (prepare) and transplant once they had the right phenotype.

NCBR AND RATIONALE

The opportunity opened up when we got a grant and invitation to undertake research on a phenomenon identified in the organism of the zebrafish. In this fish species, often bred in aquariums, serotonin cells appear by themselves, with spinal cord and fibres regenerating spontaneously, and neurons starting to emerge (neurogenesis). Of course, what "works" in fish – the neurogenesis – does not work in mammals. Our project's primary goal is to identify the mechanisms which lead to neurogenesis, and second, to determine if the knowledge and experience gained from studying fish can help us develop methods suitable for mammals. It is a very important question we have yet to answer as we continue our work.

SIGNIFICANCE

Carried out by a consortium of five European universities from different countries, the project is innovative. I became acquainted with the experimental model in the 1990s in France, during my time at Université Descartes Paris. We are continuing research that few institutions are dealing with currently.

Our findings could be used in the future to develop a method to help restore motor functions in people suffering from spinal cord injuries. But we have a long way to go yet. Transplant rejection in people is a very common issue.
Hence scholars have been curious to find out how to take cells from the patient and differentiate and transplant them.
The answer lies in the future, but it is difficult to pinpoint when the breakthrough will take place.
Also, complex ethical issues come into play. After all, how can we experiment on people, if we know the outcomes may be disastrous.
As long as we are not a hundred percent sure, we may not encourage physicians to carry out these kinds of therapies.
Developing an effective and safe method will require much more time and a great deal of work.

INTEGRATED IRRIGATION OF ORNAMENTAL PLANT NURSERIES

NATIONAL PROGRAMMES, APPLIED RESEARCH PROGRAMME

Prof. WALDEMAR TREDER
Research Institute of Horticulture in Skierniewice

PRECISION IRRIGATION OF PLANTS IS A VERY IMPORTANT PART OF THE ENVIRONMENTAL PROTECTION POLICY.

PROJECT VALUE

PLN 2,942,250.00

FUNDING AMOUNT

PLN 2,774,500.00

PROJECT BACKGROUND

Irrigation has been of interest to our Institute from day one. Irrigation is a necessary measure in intensive horticulture for two reasons: first, some plants are grown under cover, with irrigation being the only source of water, and second, highly intensive horticulture does not allow for production to be affected by drought given the often considerable expenditures involved (related to production technology, planting material, storage, etc.).

CONCEPT

Changing weather, horticulturalists' needs and the research focus of our Institute (formerly two independent institutes – the Pomiculture Institute and the Truck Farming Institute – now merged as the Horticulture Institute and Irrigation Laboratory) have naturally combined to form an integrated objective of promoting advancement and

in container cultivation – from small pots to large nursery containers. And it is container cultivation of ornamental plants that was our initial focus.

The limited resources of water in Poland, as well as in Europe at large, can become a significant barrier to economic development. Rational water management is part of EU's policies to support environmental protection and define standards in this regard.

rationalisation in the process of supplying plants with water. Drought is a trendy subject nowadays as a matter of necessity. "Droughts of the century" have been increasingly frequent, occurring almost every year. It has been a valid concern for quite some time, although the media have taken interest in it fairly recently. This year problems have been caused primarily by the lack of snow in winter. Generally, however, climate change involves mainly increased temperatures. While rainfall levels are not significantly lower over longer periods, the average air temperature increases, naturally causing a greater demand for water.

PROJECT SIGNIFICANCE

Our project comprises two elements, or parts. The first, and most universal, one involves developing a device to control irrigation based on climate parameters. The resulting streamlined estimation cold be very important and useful for all kinds of cultivation – from agriculture to horticulture, to managing urban green spaces. The second element is about controlling irrigation

UNIQUENESS

Our project is globally unique in that it involves the development of a device to control irrigation based on an algorithm designed to estimate plants' demand for water on an hourly scale. So far, it has been common practice to estimate evapotranspiration for individual days. Based on available literature, we have developed a calculation model which, in onjunction with our prototype controller, provides accurate data on plants' demand for water for each consecutive hour. This is particularly useful for plants grown in small containers, where a single irrigation measure per day is clearly insufficient. The controller estimates water demand and adjusts irrigation frequency accordingly, depending on how plants' water needs change in the course of the day. We are very proud of this part.

HORTICULTURAL INNOVATIONS IN POLAND

As shown by our surveys, few horticulturalists in Poland use reliable criteria to estimate irrigation needs, leading to excessive use of not only water and fertilisers, but also energy. I hope this will change.

ABOUT NCBR

We had good cooperation with NCBR, and the funds helped us to carry out a really interesting and advanced project, allowing our team to spread its wings and Skierniewice to remain the capital of Polish horticulture.

DEVELOPMENT OF NEW MOLECULAR DIAGNOSTIC TESTS ALLOWING IDENTIFICATION OF KEY PATHOGENIC FUNGI OF COMMON WHEAT (TRITICUM AESTIVUM L.) FOR APPLICATION IN TARGETED PLANT PROTECTION

LIDER PROGRAMME

ADAM KUZDRALIŃSKI, PhD
University of Life Sciences in Lublin

EARLY DETECTION OF PLANT DISEASES BY APPLYING DNA ANALYSIS METHODS MAY PREVENT ENVIRONMENTAL POLLUTION WITH CHEMICAL PLANT PROTECTION PRODUCTS. THANKS TO THE METHODOLOGY WE ARE CURRENTLY WORKING ON, FARMERS WILL NO LONGER NEED TO MAKE GUESSES ON WHAT PRODUCTS THEY SHOULD USE AND IN WHAT DOSES.

PROJECT VALUE

PLN 1,110,625.00

FUNDING AMOUNT

PLN 1,110,625.00

PROJECT BACKGROUND

The beginnings of the project are quite complex. The University of Life Sciences in Lublin, Professor Solarska's team to be more precise, accepted an order for

testing plant protection products from their manufacturers. According to the guidelines, the tests were mainly based on the visual observations of plants. We evaluated the action of a given product by observation and analysis of what happens to a given plant growing on a specially prepared field. It is a widely used methodology based on international standards, yet from the beginning it seemed prone to substantial inaccuracy. Humans make mistakes, and sometimes the results of observations provided to scientists by different persons vary.

CONCEPT

The concept to apply at a wide scale molecular methods to detect crop pathogens came naturally. In fact, the method is analogous to the one applied to detect coronavirus in humans. Scientific literature presents examples of similar methods, but we applied the approach assuming more comprehensive action and significantly more accurate one. We decided to create a type of a panel of wheat diseases which are important from an economic point of view (laboratory works are normally devoted to one disease only).

Having diagnosed and marked a specific pathogen and disease, we can apply prevention and treatment procedure more precisely. Speaking metaphorically, we use a sniper's rifle, not a bomb. High-sensitivity molecular methods provide additional details about the situation at hand, and are able to detect the presence of a given pathogen in a plant before symptoms occur. Diseases which are detected at plant DNA level constitute a real opportunity to begin a new era of plant protection.

PROJECT SIGNIFICANCE

This new methodology may potentially be of major importance not only in Poland. The annual loss related to wheat pathogens is significant. At the same time the popular plant protection products are applied several times during the vegetation season, and do not act selectively. The often produce "adverse effects" in the form of chemical contamination, picrotoxins, destruction of other microorganisms, negative impact on ground waters, and negative effects on people and animals.

SCALE

Our project was developed at the University of Life Sciences in Lublin, and in Nexbio company established thanks to European Funds. Based on my experience, I can say that it is difficult to find an investor who is familiar with the specific nature of biotechnological research. Considering investments in start-ups, funds or private investors often focus only on tables with information about short-term results of a given undertaking.

ABOUT NCBR

In this context, co-financing from NCBR is of great importance, although all applicants should be aware of the fact that the launch of research and their good results are only the beginning of a potential business path, i.e. the commercialisation of the project. Fortunately, the atmosphere around start-ups and new generations of innovators seems to improve year by year.

ADVICE

When it comes to advice for persons applying for support and planning to develop a business based on research, "moving" from science to business, they should certainly have some knowledge of business and principles governing it, preferably some practical experience in the area.

ECOSYSTEM OF NCBR APPLICANTS AND BENEFICIARIES

Coming together is the beginning.
Keeping together is progress.
Working together is success.

HENRY FORD

The year 2019 at NCBR marked the period of changing the Centre's management processes, from clerical to the ones based on market principles. It is also time for shifting priorities, when the concern for applicants and beneficiaries, NCBR partners, has become one of the main aspects of the Centre's operations. The concern for NCBR partners is demonstrated at multiple levels, but can be characterised by one common practical denominator – it is aimed at yielding measurable outcomes, facilitating cooperation between the Centre and its partners. The change of the existing philosophy allowed us to create foundation for operational changes in the field of providing services to applicants and beneficiaries. By introducing a vision of a comprehensive client ecosystem, we had to face challenges related to technology and broadly understood IT issues. The existing solutions did not correspond to the internal expectations of the organisations or the expectations of market representatives, and scientific and research circles. The current needs and expectations clearly show a demand for improving the existing online solutions. However, the process requires time, financial assets and human resources.

Process automation which is currently being prepared, digitisation and computerisation will become an axis, around which we are going to rebuild the NCBR Group. Our goal is to introduce digital tools which will clearly reorganise processes, automate works and boost the Group's operational capacity.

WOJCIECH KAMIENIECKI PHD ENG.
DIRECTOR OF NCBR

In 2019, a strong trend towards a more extensive use of digital solutions emerged. It was accompanied by traditional, offline, operations. The outcomes of technological transformations, strongly accentuated all new initiatives in the organisation, will be subject to analysis in the years to come.

In this Annual Report, numerous initiatives and activities pursued by the Centre for the partners were described, and they can be defined as activities for an intentional development of client ecosystem. In order to provide a more comprehensive picture, it was indicated how these activities were received by NCBR partners.

NCBR – APPLICANTS' OPINIONS

Since 2016 applicants turning to NCBR for funds may express their views about the Centre, by filling in a questionnaire attached to the application. The aim of the survey is to show how they perceive the application procedure in force at NCBR. Within the last 5 years, nearly **2700 replies** were given. This way applicant satisfaction is continuously monitored, and the suggestions and remarks are the source of analyses and constitute one of the major arguments for changes in numerous areas of competition procedures conducted at the Centre.

APPLICANTS WHO FILLED IN THE QUESTIONNAIRE:

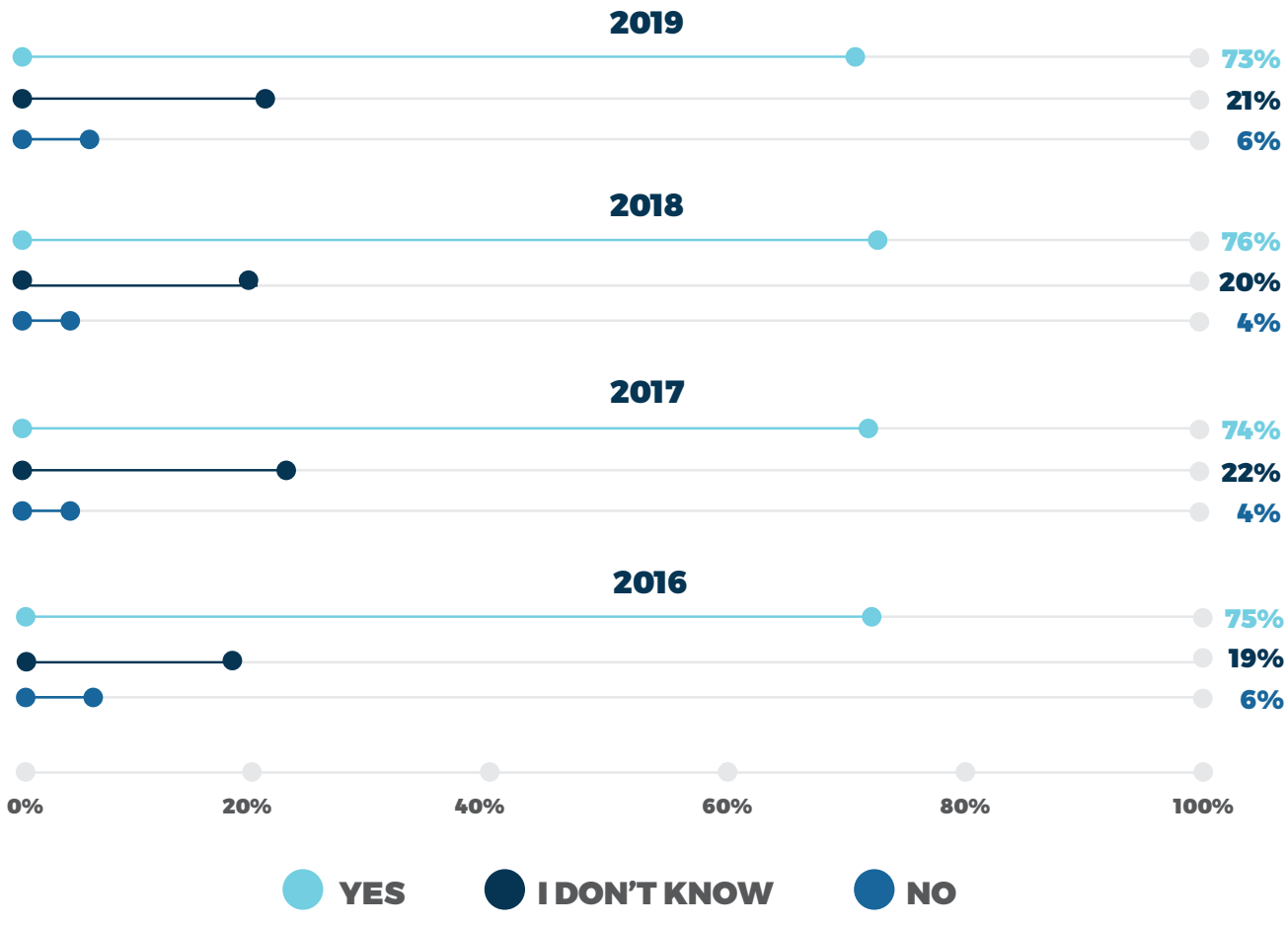
mostly had experience in implementing R&D projects;

only 23% of survey participants stated that they had not implemented R&D projects within the last 5 years, while the remaining respondents declared that if they had implemented R&D projects, they were most often financed from NCBR funds, followed by own funding;

they are persons who understand the specific nature of R&D projects, their complexity and risks related to the research process.

It should be stressed that a third of the survey participants declared that they had filed their first application with NCBR, before filling in the questionnaire. **Nearly 75% of the applicants** declared their willingness to take part in the application procedures conducted by NCBR again. The observation has not changed over the last years. One in five applicants are not sure whether they would like to file their applications to NCBR again. Of course, the undecided group should be treated as a group of potential applicants who are the focus and subject of planned operations of NCBR.

NCBR APPLICANT SATISFACTION MONITORING – DISTRIBUTION OF REPLIES TO QUESTION ***"Are you willing to take part in the funding application process at NCBR one more time, should such need arise, for example, if your funding application is not granted, would you like to receive funds for another project?"***



RESPONDING TO NEEDS

Initiatives introducing a flexible approach to competition procedures are among the most important changes in the catalogue of client-centred activities, introduced to the benefit of our applicants, including those undecided. The said initiatives mostly refer to competitions which are held as part of NCBR's flagship initiative "Fast Track". A number of changes were systematically introduced in 2019 to streamline the application and project review procedures.

THESE ARE THE MOST NOTE-WORTHY CHANGES:

A possibility **to publish interim ranking lists** was introduced as part of a given competition round before the review of all applications is complete. Thanks to this solution applicants receive information about competition results earlier than before. The execution of grant agreements as part of projects filed in a given round was also accelerated.

New application assessment criteria provide a much **broader field for amending projects** during their assessment. Applicants may correct their submissions in criteria which were previously excluded from such possibility. The criteria structure was redeveloped, and the number of criteria was reduced (from 9 to 4 scored criteria, from 12 to 9 YES/NO criteria). The most crucial project assessment elements were included in scored criteria (project essence, project delivery, results implementation), as the point scale provides greater possibility for assessment and a greater chance for a positive result than the YES/NO scale. The contents of criteria descriptions were reduced in length.

A significant change is **the introduction of a new scored criterion – "the essence of the project"**. It encompasses all the aspects related to the concept of a given project. This new criterion will help us understand the specific nature of research and development projects, and will serve as a guideline for applicants at the application preparation stage, showing them how to define the objective of their projects and identify the expected results.

The changes to the criteria were reflected in a new application form template and instructions on how to fill in applications forms. The structure is consistent with the logic and layout of the new criteria.

The entire competition documentation was substantially simplified and prepared in line with **the plain language** principle, and a new attractive graphic layout was designed for the new application form.

CLOSER TO BENEFICIARIES

"Closer to beneficiaries" is one of the organisational principles of NCBR clearly defined and consolidated in 2019. Placing greater emphasis on this value than on other values, trust, cooperation, development and engagement, clearly demonstrates the direction that the NCBR Group is planning to follow in terms of philosophy and operations.

THE ACTIVITIES PERFORMED AS PART OF FOSTERING THIS ORGANISATIONAL VALUE ARE MOSTLY AIMED AT:

- showing to entrepreneurs and scientists the possibility to develop innovative ideas,
- promoting the most interesting products developed by beneficiaries,
- promoting the NCBR brand as a government agency performing activities in the R&D sector.

Without doubt, the activities include initiatives which NCBR undertakes in the form of face-to-face meetings and consultations with potentials applicants. In 2019, a total of **62 meetings** were held in the original formula called **"NCBR for Business" (NfB)**. It is a comprehensive solution based on the use of practical experience of the Centre's specialists and external experts. During meetings in the NfB formula, potential applicants had an opportunity to learn about NCBR's programme proposal, and take part in workshops and individual consultations, gain necessary knowledge on successful application for funding from the Smart Growth Operational Programme, including in particular the "Fast Track" Competition. In 2019 over **2600 individuals** took part in **the NCBR for Businesses** project, while individual consultations were attended by nearly **400 representatives** of businesses and research units.

NCBR for Business – **www.ncbrdlafirm.pl**

NCBR employees shared their expert knowledge as part of the SME Development Support Academy. In 2019, NCBR was partner **in 6 meetings**, during which approximately **400 entrepreneurs** from all over the country had the chance to learn about the Centre's proposal, with particular attention to competitions organised as part of "Fast Track".

IN 2019, NCBR ORGANISED OR CO-CREATED NEARLY 30 INITIATIVES BASED ON NETWORKING, WITH A VIEW TO PROMOTING NCBR'S REPAYABLE INSTRUMENTS, WITH PARTICULAR EMPHASIS PLACED ON BRIDGE ALFA, INCLUDING:

- Start-upCamps – **10 meetings across Poland**,
- MIT Enterprise Forum, Start-upHub – **CEE in Tbilisi**,
- StartupBRIdge – **8 meetings in selected cities in Ukraine**,
- **3 workshops** concerning NCBR's proposal addressed to participants of the Poland Prize Programme from the CEE region.

NCBR employees, with the Centre's programme proposal and professional workshops, travelled nearly **30 thousand kilometres** in 2019, meeting with entrepreneurs and scientists across Poland. This proves how active NCBR specialists are.

This picture of engagement can be supplemented by an on-site initiative which has consolidated its position in 2019 within the Centre. It is **our Information Point**. Every day, between Monday and Friday, potential applicants can turn for assistance in successful application for funding innovation.

In addition to the standard telephone and email communication, the Information Point also holds meetings during which interested parties can talk about R&D Projects.

IN 2019, AS PART OF OPERATIONS OF THE INFORMATION POINT

we managed to provide satisfactory answers to **4627 queries from the applicants**;

we held **3653 telephone conversations**,

we organised **269 face-to-face meetings**,

a repository of answers to frequently asked questions (Q&A) was created and published on **ncbr.gov.pl**

INFORMATION POINT

ul. Nowogrodzka 47a, 00-695 Warszawa
Phone: 22 39 07 170
22 39 07 191
22 39 07 377
Email: info@ncbr.gov.pl

NCBR IS ONLINE

Performing activities for the applicants, NCBR employees are supported by online tools. **Innovation Assistant** and **Budget Assistant** are two applications developed by NCBR with applicants in mind.
They are available to the general public, developed to address most frequent problems and in response to frequently asked questions from this group.

The Innovation Assistant helps verify whether a given idea falls within an R&D project.

The Budget Assistant helps classify project expenses to an appropriate category, and provides guidance on what a proper substantiation should be like.

In 2019, the **Innovation Assistant** app, available on ncbr.gov.pl was used by **1532 persons** interested in applying for NCBR funds. Whereas the **Budget Assistant** app, developed in 2019 and published on ncbr.gov.pl in January 2020, has enjoyed great popularity among NCBR's partners since the very beginning.

In relation to the general trend to transfer a vast part of information activities to electronic media, in 2019 NCBR intensified its activity on social media, which resulted in a systematic increase of persons following the Centre's profile[6].

On **Facebook 375 posts** were published. NCBR profile is currently followed **by 15962 users**.
In relation to 2018 data, **an increase of 28%** was recorded.

The Centre's Twitter profile also recorded increase **in popularity**.
In 2019, **677 tweets were published**.
NCBR has **7121 followers on this channel**, which is a number higher by **23% in relation to 2018**.

In 2019, **the numbers of users following** NCBR profile **on LinkedIn increased by 3892, i.e. by approx. 74%**. During this time, over **170 posts were published**. It is worth noting that the LinkedIn service

6. Statistics as at 31 December 2019

was used as a medium of ongoing and regular communication between the Centre Director and NCBR stakeholders (via comments published on a weekly basis).

On the NCBR NEWS channel on **YouTube** in 2019 **43 new films were published**. The channel currently has **1762 subscribers**, and recorded **an increase of the number of subscribers by 16.5%** in relation to the preceding year. This increase resulted from new activity on the NCBR NEWS channel which effectively supplements the existing multimedia message of the Centre with:

- videos showcasing the achievements of NCBR beneficiaries,
- videos by influencer and youtuber, Katarzyna Gandor – a series of 3 videos about the beneficiaries of the Centre uploaded to her channel (nearly 120,000 views).

The above online information activities are supplemented by a weekly **newsletter**, through which information about the current operations of the Centre reaches **over 18000 subscribers**.

A vital element of activities for creating an effective ecosystem for applicants and beneficiaries is the analysis of effectiveness of promotion and information activities carried out at the Centre. The results are the basis for effective development of communication policy and activities contributing to the promotion of NCBR's proposal. Moreover, they facilitate a prompt response to the needs, ideas and requests voiced by business and science circles.

NCBR AS A BRAND

According to the evaluation survey performed as part of SG OP[7], the visibility of the NCBR brand and the scope of the Centre's operations are significant among entrepreneurs and companies present on the market for more than 2-3 years. The 2018 survey results showed that the visibility of NCBR varied greatly depending on the size, years of operation and sector of activities performed by the respondents.
In a group of companies operating for more than 3 years, medium-sized and large enterprises, the indicator amounted to over 60%, whereas in a group of smaller and younger enterprises – it was only 30%. This seems to result from the investment and growth needs of companies and their priorities, which normally occur some time after the establishment of a company, and which can be catered for by NCBR's proposal.

7. The results of an evaluation survey entitled "Evaluating the effectiveness of implementing SG OP by NCBR, the effectiveness of project management and identification of good practices as part of Measure 1.1 SG OP– Module II Assessment of communication of NCBR's proposal"

NCBR – POSITIVE IMAGE AND APPLICANTS' EXPECTATIONS

The image of NCBR in the light of the SG OP evaluation survey[9] carried out on a representative sample of mid- and high-technology enterprises is positive. The majority of the respondents believe that NCBR is a supportive institution which creates vast opportunities and chances through co-financing.

It can be stated here that due to a number of activities pursued by the Centre in 2019 for startups, young inventors (the Grand Challenge: Energy), and a rapid growth of the gaming sector in Poland this trend is bound to change, and in time the visibility of the brand among representative of young business in the broadly understood ICT and new technology sector will gradually improve.

HIGH VISIBILITY OF THE NCBR BRAND WAS DEMONSTRATED IN THE RESULTS OF THE SURVEY[8] AMONG REPRESENTATIVES OF COMPANIES OPERATING IN THE FOLLOWING SECTIONS OF POLISH CLASSIFICATION OF ACTIVITIES (PKD):

- Professional, scientific and technical activities – 100% visibility,
- Manufacturing – 52% visibility,
- Information and Communication – only 27% visibility.

In terms of geography, the highest visibility of NCBR was recorded in Mazowieckie (approx. 77%) and Dolnośląskie (70%) Provinces, while the Provinces where the lowest visibility was recorded include Warmińsko-Mazurskie (13%) and Podlaskie (15%).

The institution is mainly associated with distributing funds for research projects. Positive perception is mainly caused by the implementation of projects financed by NCBR. Persons with experience in contacting the Centre express more positive opinions about it than those who have not contacted the Centre yet.

Taking into consideration the assessment of the entire application process, the applicants expressed the views that it is complicated, and requires a lot of time and effort. At the same time they stated that the rules & regulations of competitions and the information published on the website of NCBR are clear. Communication with NCBR employees was assessed as good. The applicants hope that the waiting time for a response will be shorter and the replies themselves will become more lucid. A lot of emotions are generated during a panel review. This is mostly because it is a

8 Ibidem
9 Ibidem

key stage from the perspective of application assessment. In their opinions, the applicants are chiefly critical of experts' competencies and the method for substantiating their evaluation of the submitted projects.

COMMUNICATION – UNDERSTANDABLE LANGUAGE

Procedures, guidelines and competition documentation are a crucial and indispensable part of the process of allocating European funds and state budget funds. Every competition requires the preparation of a number of principles and documents, which is always a challenge both for the authors and the applicants, and beneficiaries in a future perspective. The change of management methods at the Centre from clerical to business-type management has become a perfect opportunity to foster actions aimed at simplifying the language used in relationships with the Centre's partners.

In 2019, a language project was implemented at NCBR focusing on the language analysis of competition documentation. The objective of this action was to develop recommendations on formulating the contents of competition documentation and notices, so that they are accessible and understandable to our applicants. The effects of the projects were reflected in "Fast Track" competitions announced in 2019, as the documentation was significantly simplified and prepared in accordance with plain language principles. The graphic layout was also changed, making the documents more legible and reader-friendly. We are planning to implement the developed standards across the entire institution in the form of training sessions on effective use of plain language in communication with applicants and beneficiaries.

The activities are part of a more comprehensive campaign run by the Ministry of Development Funds and Regional Policy, which involves the simplification of language used in official documents and the language of European Funds. In 2019, NCBR joined an agreement for plain communication, by signing the "Plain Language Declaration" and engaging in the Plain Language Forum "Prosto i Kropka" [It's Simple. Full stop!].

THE ECOSYSTEM – AND WHAT'S NEXT?

In 2019, a number of activities were carried out with a view to creating a modern ecosystem focused on our applicants and beneficiaries who are the Centre's partners. Without resigning from traditional communication channels, emphasis was placed on the extension of the online information and notification system to obtain better results in the field of contracting and certification. The direction is due to be supplemented by new forms of communication, information channels and the expected educational measures in the years to come.

The plans entailing the development the applicant and beneficiary ecosystem have been subject to review as a result of the challenges which occurred in 2020. Over a short period of time, the entire organisation of the Centre was subjected to the restrictions imposed due to the state of epidemic announced after the coronavirus outbreak in Poland and globally. However, despite technological limitations and the gaps to be filled in IT infrastructure we have managed to reorganise the operations of NCBR in a short time. The assessment of competition applications, the organisation of panels and the course of project delivery was in a substantial part based on remote work and online meetings with our partners. The effectiveness of the changes can be demonstrated by the results obtained in Q1 2020 – as part of SG OP the contracting was completed at 116% and certification at 150%. As part of KED OP, the contracting was performed at 102%, and certification at 120%. A total of PLN 102 m was transferred as domestic grants.

NCBR PROGRAMME PORTFOLIO

In 2019, NCBR implemented a number of programmes which we are presenting in this part of the report. Most of them are undertakings which started in previous years and were continued in 2019. The programmes which the Centre runs are initiatives planned and implemented in multi-annual cycles. Subsequent years bring both competitions held as part of well-known programmes and new initiatives.

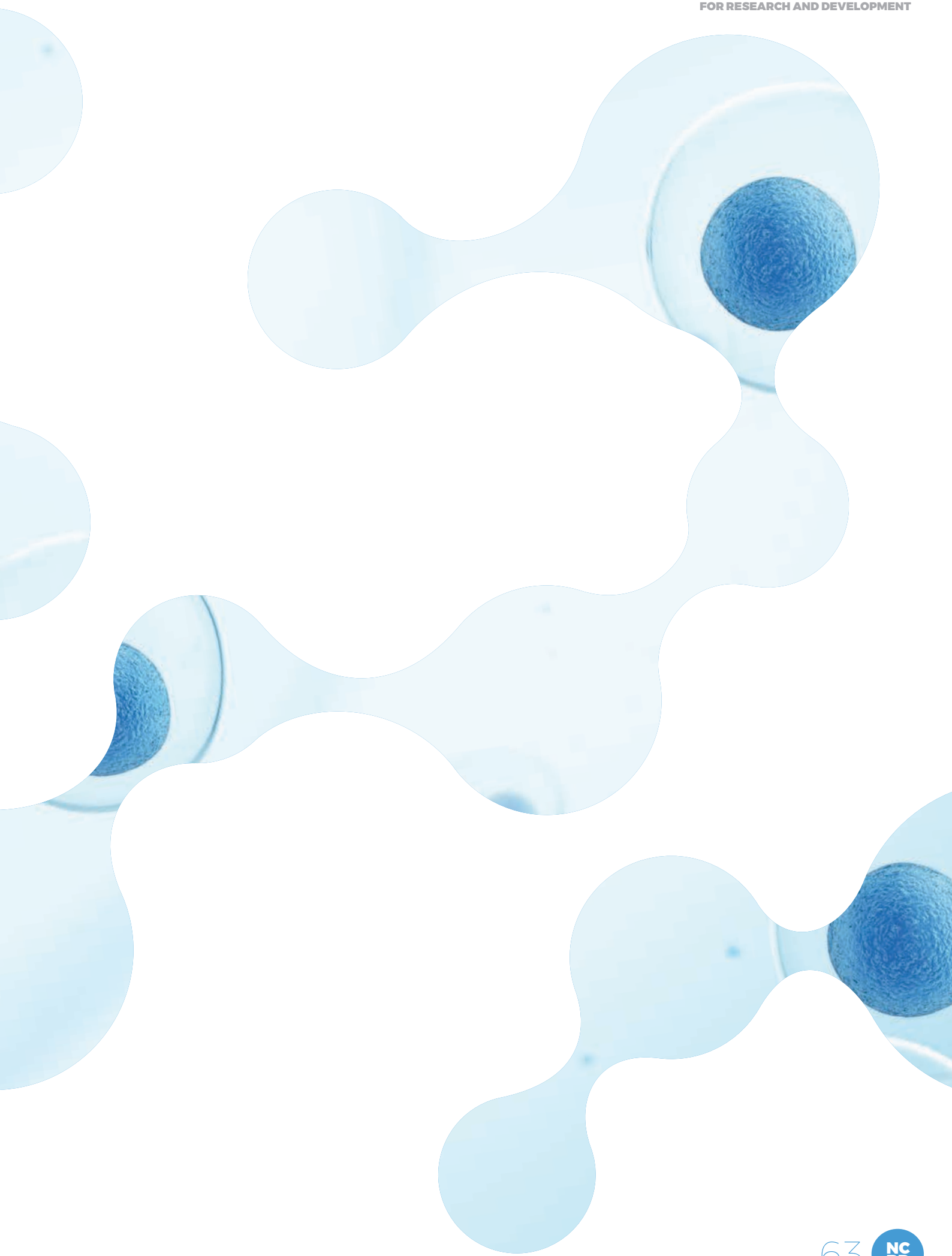
In 2019, the programme portfolio was supplemented by 14 new competitions, including 4 thematic competitions, 2 competitions related to joint undertakings with regions, 7 international competitions and a competition entitled "Track for Mazovia".

The Centre's programme proposal is characterised by considerable diversity. The support which the Centre provides is available to all businesses, notwithstanding their sizes. The beneficiaries of subsequent programmes may induce businesses (from microenterprises to large enterprises), research institutions, and other entities.

The diversity of our proposal is also expressed in the subject matter of subsequent competitions. In addition to horizontal-type competitions, such as "Fast Track", the Centre also organises competitions dedicated to specific fields of economic activities (for example space technologies or projects related to plastic materials, fertilisers or heating devices), as well as competitions supporting innovation in specific regions of the country (i.a. in Lubelskie, Śląskie or Dolnośląskie Provinces).

NCBR Portfolio, which includes strategic, operational, domestic and international programmes, as well as undertakings related to state defence and security have been increasingly reflecting the needs and trends which can be observed in business and science. An example of a flexible and prompt response was the launch of the "Track for Mazovia" competition in 2019, aimed at supporting innovative activities in the region which is not always eligible for support funds due to the high development level. An important undertaking, contributing to the increased significance of environmental issues and the steadily growing trend for generating alternative and cheap energy, is the "Grand Challenge: Energy".

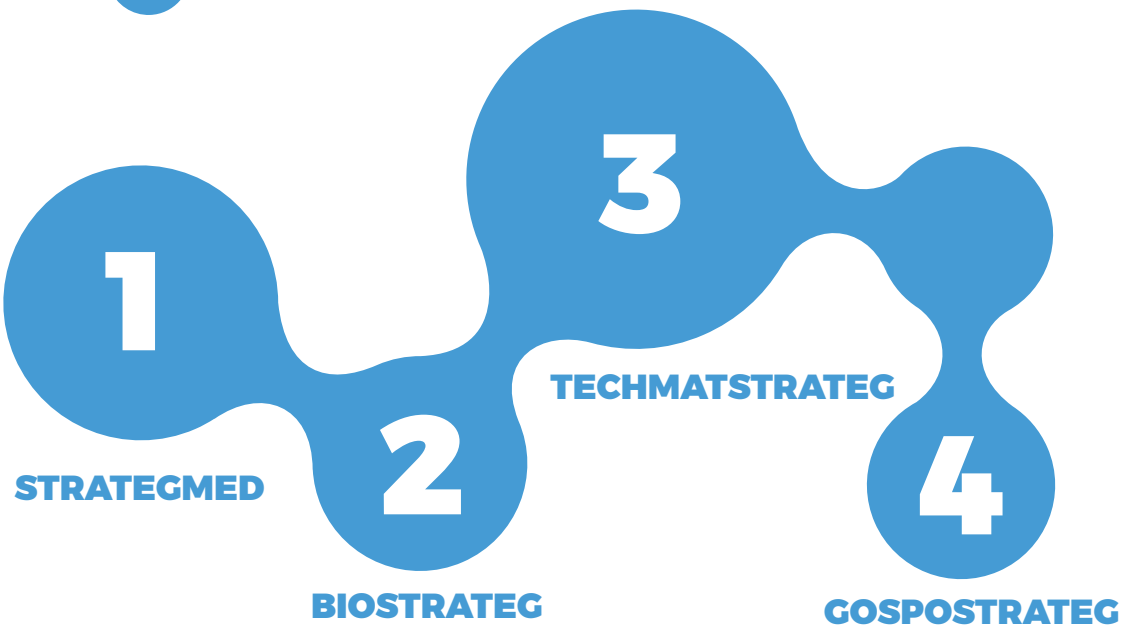
The present part of the report includes a portfolio of programmes implemented by NCBR and selected examples of programme initiatives undertaken in 2019.



STRATEGIC PROGRAMMES

The presentation of NCBR programme portfolio begins with strategic programmes of research and development works – they are high-budget programmes arising from the state's scientific and innovation policy, supporting the social and economic development of Poland.
They are prepared on the basis of the National Research Programme adopted by way of the Resolution of the Council of Ministers of 16 August 2011, which defines the strategic research and development directions. Based on the guidelines laid down in the said document, NCBR Council prepares strategic programme projects, and submits it for approval to a minister responsible for science and higher education affairs. Following approval, the programmes are submitted for implementation with NCBR.

In 2019, 4 programmes were implemented with a total budget of over **PLN 2.3 bn**



We also continued activities aimed at establishing a strategic programme entitled "Advanced information, telecommunications and mechatronic technologies" – **INFOSTRATEG**. The preparation of a project, "New technologies in the energy sector", was initiated as part of this strategic programme.

The **STRATEGMED** programme, established in 2013, is currently in the most advanced stage, and the projects selected in three competitions are at their final implementation stages.
As part of the **TECHMAGSTRATEG** programme, one call was announced, with PLN 197 m allocated for the purpose, and 11 agreements were signed for a total funding amount of nearly PLN 123 m.
The **GOSPOSTRATEG** programme is currently in the implementation stage, as the agreement execution procedure was continued (12 agreements with a funding amount of nearly PLN 70 m) as well as a call was announced for proposals for subjects of top-down projects.

IN 2019 AS PART OF STRATEGIC PROGRAMMES FOR SCIENTIFIC RESEARCH AND DEVELOPMENT WORKS:

nearly **PLN 260 m** was transferred to contractors for project implementation,

delivery of 129 projects was monitored, including the reviews of 99 progress reports,

23 agreements for the performance and financing of projects were made, with a total funding amount of PLN 192m,

supervision was carried out over 40 project during their durability period.

It is worth demonstrating the course of strategic programmes by taking a closer look at **GOSPOSTRATEG**.

GOSPOSTRATEG

Social and economic development of Poland under the conditions of globalising markets.

PLN 500 m

PROGRAMME'S BUDGET

The main objective of the GOSPOSTRATEG programme, in the 2028 perspective, is the increased use of the results of socio-economic research in the development of national and regional development policies. The objective is to be reached by

implementing policies, strategies, operational documents and specific solutions developed as part of the programme,

implementing solutions developed as part of the programme, which boost the social capital which is necessary for the implementation of national and regional development policies.

GOSPOSTRATEG IN 2019:

30 implemented projects,

PLN 31.2m paid funds,

15 institutions using solutions developed as part of the programme,

12 grant agreements made as part of 1st competition in the open formula,

as part of the programme, a call for proposals for the subjects of top-down projects was held. The proposals submitted by specified applicants (Council of Ministers, province governments, Ministers, the President of Poland, the National Bank of Poland) had to be consistent with the assumptions defined in the GOSPOSTRATEG programme. The call for proposals was closed on 30 November 2019 due to the need to introduce changes in response to the needs expressed by entities interested in taking part in the call. Two of the proposals submitted as part of the 1st cut-off received a positive assessment and will be a subject for a competition for contractors of top-down projects.

NATIONAL PROGRAMMES

Pursuant to Articles 29 and 30 of the Act of 30 April 2010 on the National Centre for Research and Development, the task of the Centre is to develop state-of-the-art solutions and innovation-boosting technologies, thus improving the competitiveness of Polish economy. The activities of the Centre are aimed at fostering cooperation between Polish business and science, and contributing to commercialising the results of scientific research to the benefit of Polish economy. NCBR fulfils the objectives by developing programmes of support for applied research and R&D works, transferring their results to economy and supporting the careers of young scientific staff. By implementing these tasks the Centre also initiates cooperation with other entities, developing joint undertakings and sector-specific programmes. The Centre also continues works related to monitoring projects commissioned by the Ministry of Science and Higher Education.

In 2019, 13 programmes were implemented with a total budget of over **PLN 3.63 bn**

IN 2019:

- as part of LIDER, TANGO "CyberSecIdent – Cybersecurity and e-Identity" three competitions were announced, with an allocation of PLN 235.4 m,
- "Track for Mazovia" competition was announced with an allocation of PLN 600 m.
- 148 agreements for the performance and financing of projects were made with a total funding amount of PLN 630 m,
- nearly PLN 195m was transferred to contractors for project implementation,
- delivery of 332 projects was monitored, including the reviews of 300 progress reports,
- supervision was carried out over 895 projects during their durability period,
- the catalogue of applicants as part of the "Fast Track" programme was extended, thank to which consortia with the participation of research units also gained the opportunity to implement projects.

We can trace the delivery of domestic projects, by taking a closer look at "Track for Mazovia" and TANGO projects.

TRACK FOR MAZOVIA

PLN 600m
PROGRAMME'S BUDGET

The decision on launching the competition was made in 2019 as a task commissioned by the Minister of Science and Higher Education. The competition is complementary in relation to Sub-Measure 1.1.1 SG OP "Fast Track", under which the Centre has only been financing projects implemented outside Mazowieckie Province since 2018, as the funds for well-developed regions had been allocated in full. The purpose of the competition is to apply the solutions of R&D work results obtained as part of a competition in business and encourage investments in R&D among entrepreneurs.

"TRACK FOR MAZOVIA" IN 2019:

"Track for Mazovia" competition was announced,

a call for applications for financing was held, applications were subject to evaluation, and the process of concluding agreements was initiated,

51 agreements were made, and the monitoring of 5 projects has begun,

PLN 15m were disbursed.

TANGO

Joint undertaking of NCBR and the National Science Centre (NCN)

PLN 150m
PROGRAMME'S BUDGET

The objective of the programme is to support the development of technologies derived from basic research results, including in particular the identification of strategies for the development of technologies derived from basic research results and verifying the potential for commercialising basic research results.

TANGO IN 2019:

56 implemented projects,

PLN 9.9m funds disbursed,

22 agreements for funding of projects selected as part of the competition were made,

a possibility was introduced to apply for one of three available tracks (A, B or C) addressed to various categories of applicants,

enterprises were invited to participate,

the list of competitions from which initial projects may come from was extended,

a decision was made to hold a continuous call, divided into stages.

INTERNATIONAL PROGRAMMES

International cooperation is a substantial part of NCBR's operations. One of the Centre's tasks is to participate in the implementation of international Research & Development programmes, including those co-financed from foreign funds. The main objective of international cooperation run by NCBR is to improve the international competitiveness of Polish research teams by their collaboration with international partners, gaining international experience, know-how transfer and strengthening Poland's international position. NCBR participates in organising competitions for international research and R&D projects, and provides financing to Polish entities (research units, enterprises, consortia) which implement international projects by participating in numerous competitions as part of bilateral programmes, numerous ERA-NET initiatives, joint undertakings and programmes (including Eurostars, AAL, JU ESCEL) and in CORNET and EUREKA initiatives and many others.

IN TOTAL, THE CENTRE IS IMPLEMENTING OVER 70 INTERNATIONAL INITIATIVES UNDER:

1. **EU FRAMEWORK PROGRAMME INITIATIVES**
2. **BILATERAL COOPERATION PROGRAMMES**
3. **MULTILATERAL COOPERATION**
4. **NORWAY GRANTS AND EEA (EUROPEAN ECONOMIC AREA) GRANTS**

In 2019, the Centre co-organised 40 competitions for research and R&D projects with the participation of Polish entities, as part of 31 international initiatives, including new initiatives which the Centre joined, i.a. EuroHPC Joint Undertaking and ERA-NET CO-FUND ICT-AGRI-FOOD. 494 applications were submitted as part of the competitions with the participation of Polish entities, including, in the 1st stage of the 2nd Polish-Chinese competition, 113 pre-proposals.

As regards initiatives under which the financed projects were monitored, the Centre was supervising the implementation of 305 projects (out of which 93 agreements for funding were made in 2019) and 325 agreements in the durability period. In the reporting period as part of international programmes the Centre disbursed the amount of PLN 71.2m.

**MOREOVER,
AS PART OF PROJECT MONITORING
DURING IMPLEMENTATION:**

we evaluated **157** interim reports,

we evaluated **66** final reports.

ACCELERATION ACTIVITIES WITH THE STATE OF NEVADA (NCBR-NEVADA ACCELERATION PROGRAM)

In 2019, in cooperation with the Ministry of Science and Higher Education and the Nevada Governor's Office of Economic Development, concept works were performed related to the preparation and method of delivering acceleration activities between Poland and Nevada. The activities were the result of a letter of intent signed in October 2017 by Deputy Prime Minister Jarosław Gowin (Ministry of Science and Higher Education) and the previous Governor of Nevada, Brian Sandoval. The works were completed in Q4 2019, and the launch of the activities and the selection of the operator were planned for Q1 2020. The support under the measure will be granted to Polish start-ups planning to expand on the American market.

NCBR acts as an Intermediate Body in transferring funds as part of two operational programmes in the 2014–2020 Financial Perspective, i.e. the Smart Growth Operational Programme (SGOP), The Knowledge Education Development Operational Programme (KED OP) and beneficiary of the Digital Poland Operational Programme (DP OP). NCBR's tasks include mostly the obligation to efficiently disburse and settle grants for innovation, and provide substantive support for the beneficiaries and grantees implementing projects from EU Funds. Through its activities, NCBR connects business and science circles, which translates into the improved innovativeness of the whole economy.

THE SMART GROWTH OPERATIONAL PROGRAMME

The Smart Growth Operational Programme (SGOP) is the largest programme in the European Union for developing research and creating innovations. Thanks to it, entrepreneurs and scientists obtain co-financing, i.a. for joint R&D undertakings, and the results of R&D works find their practical application in the economy. The main assumption behind the programme is "from idea to business". This means support for creating innovation: from the development of a concept for innovative products, services or technologies, through preparing prototypes, pilot lines, all the way to commercialisation.

THE SMART GROWTH OPERATIONAL PROGRAMME (SGOP) IS A PROGRAMME IN WHICH NCBR ASSUMED THE ROLE OF INTERMEDIATE BODY AND FINANCES MEASURES AS PART OF:

Priority Axis I SG OP, called Support for R&D activity of enterprises (the "Fast Track" call for proposals, sectoral programmes, programmes involving capital funds),

and Priority Axis IV: Priority Axis I SGOP, called "Increasing the research potential" (research programmes for economy, joint undertakings, development of modern infrastructure, regional research agendas, application programmes, modern research programmes using the problem-driven research model).

AS PART OF SGOP IN 2019:

programmes were implemented as part of 11 measures and/or sub-measures with a total budget of PLN 2.6bn (together with Measures 4.2, 4.3 and 4.4 implemented by OPI PIB and FNP),

Sub-measure 4.1.3 was implemented in line with non-competition procedures, aimed at delivering research programmes in the problem-driven research model. For example, it includes a research programme announced in 2019, called "Grand Challenge: Energy",

19 competitions with a total allocation of over PLN 5bn were announced (together with measures implemented by OPI PIB and FNP).

As part of SG OP, it is worth noting the following initiatives:

GAMEINN

PLN 245m

PROGRAMME'S BUDGET

GameINN is a sector-specific programme actively supporting the video game market developing in Poland. The purpose of the programme is to boost the competitiveness of the domestic video game industry on the global market by increasing R&D activities and increasing the number of innovations in the video game sector by 2023.

ACTIVITIES IN 2019:

67 implemented projects,

PLN 58.5m disbursed funds,

the 3rd competition was announced as part of the programme – competition documentation was developed, and a call for grant applications was organised, the assessment procedure was completed, and the execution of agreements was commenced, and is due to be continued in 2020,

the 4th competition was also announced as part of which the call for grant applications was commenced,

the implementation of 67 projects and performance of 8 agreements during the durability stage were monitored.

"GRAND CHALLENGE: ENERGY"

PLN 1 m

PROGRAMME'S BUDGET

A research programme entitled "Grand Challenge: Energy" was announced in 2019 and refers to other Grand Challenge competitions initiated in 2004 by American agency DARPA (Defence Advanced Research Projects Agency). Thanks to the open formula of the challenge, inventors have the opportunity to take part in an announced undertaking. The prospective winner does not have to meet any formal requirements, and his/her tasks is to solve a given problem. This formula, similar to a hackathon, allows to find solutions to problems, and also to activate and get to know the broadly understood R&D circles. It also builds social awareness of the existence of vital problems which can be solved and brings social and business benefits.

The aim of the challenge is to stimulate the creation and development of ground-breaking solutions in the area of small-size systems, efficient wind power devices, using wind farms and energy storage solutions.

The outcome of the implementation will be a prototype of a solution characterised by the best parameters possible. It will be disseminated at a large-scale among individual customers. Using environmentally-friendly trends, "Grand Challenge: Energy" programme is aimed at directing our attention to wind power and its potential, as an initiative supporting efforts to reduce the consumption of fossil fuels and expenditures on energy. In addition, wind turbine systems may be operated independently of the power grid, which may be a key factor in filling a market niche.

BLOCKS 200+

PLN 190 m

PROGRAMME'S BUDGET

The objective of the programme is to develop (and verify in the operating conditions of an actual coal power block) a set of technical, organisational or legal solutions for low-cost technology for changing the basic operating and maintenance parameters of class 200 MWe class blocks. These solutions are to be adjusted to new requirements and specific operating regime, increased load variation and a large number of shut-downs.
The programme is carried out under the pre-commercial procurement formula.

ACTIVITIES IN 2019:

- 5 implemented projects,
- PLN 10.1m disbursed funds,
- completion of phase 2 of R&D works,
- selection of entities for phase 3 of R&D works.

KNOWLEDGE EDUCATION DEVELOPMENT EDUCATIONAL PROGRAMME

The Knowledge Education Development Operational Programme (KED OP) is directed towards improving the policy and public operations for the job market, education and the entire economy. European Union grants facilitate the strengthening of higher education focused on the need for development, promotion of social innovation and transnational cooperation.

KED OP is implemented by NCBR which acts as an Intermediate Body for Priority Axis III "Higher education for economy and development".

AS PART OF THE PROGRAMME, THE CENTRE IS IMPLEMENTING THE FOLLOWING MEASURES:

- 3.1 Competences in higher education
- 3.2 PhD studies
- 3.3 Internationalisation of Polish higher education
- 3.4 Management in higher education institutions
- 3.5 Comprehensive university programmes

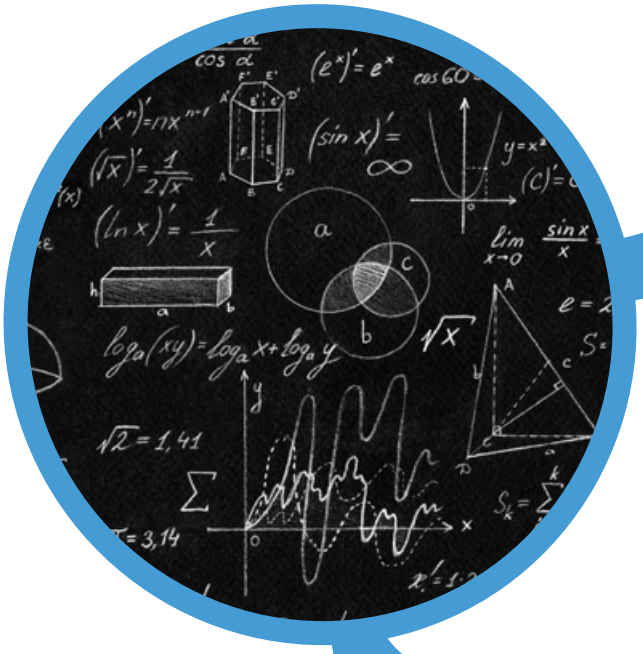
So far, as part of the measures, the Centre has announced 31 competitions with a total budget of PLN 5.94bn, and NCBR has granted PLN 4.48bn for the implementation of projects as part of the competitions.

In 2019, we carried out a comprehensive evaluation of the quality and effects of implementing Priority Axis III KED OP "Higher education for economy and development". Due to the limited possibility of assessing the effects of projects delivered as part of competitions under Priority Axis III KED OP, resulting

from the early stage of project advancement (only 17% of projects were completed by the end of 2018) the evaluation was main focused on the methods of implementing and managing competitions as part of Priority Axis III KED OP. The analysis of the initial outcomes showed strengthened competence and a boost in employment due to projects implemented as part of Measure 3.1, whereas in projects under Measure 3.3 unexpected outcomes were identified in the field of cultural education and the increase of the level of tolerance towards foreigners. As regards Measure 3.4, a visible effect of integration among teaching staff was demonstrated, also leading to participation in joint undertakings (often interdisciplinary ones). The results of the evaluation of completed and pending projects showed their relevance in the context of reaching the targets which were set before public intervention supporting the development of higher education as part of Priority Axis III KED OP.

IN 2019, AS PART OF KED OP:

- 3 competitions with an allocation of PLN 431.2m were announced,
- 477 agreements for the performance and financing of projects were made with a total funding amount of PLN 1.53bn,
- nearly PLN 839m was transferred to contractors for project implementation,
- delivery of 1502 projects was monitored, including the reviews of 201 progress reports,
- supervision was carried out over 201 projects during their durability period.
- 2 evaluations were performed: The analysis of demand for competencies in the economy and on the job market, and The Assessment of the quality and effects of implementing Priority Axis III KED OP "Higher education for economy and development".



DIGITAL POLAND OPERATIONAL PROGRAMME

The Digital Poland Operational programme (DP OP) is an initiative aimed at strengthening the digital foundations for the socio-economic development of the country, and a wide access to fast Internet connection, effective and user-friendly public e-services, and a growing level of the society's digital competence are of particular importance in this area.

As part of the DP OP, NCBR is implementing the e-Pionier Programme.

E-PIONIER

PLN 138 m

PROGRAMME'S BUDGET

The programme was established in 2016, and is aimed at developing solutions in the form of minimum viable products (MVP) in response to specific socio-economic challenges from public institutions. MVP will be created by interdisciplinary teams composed of, i.a. software developers. Therefore, the programme concentrates on unlocking the potential of talented developers to expand the application of digital solutions in administration and economy. The initiative is to support the development of professional competence of developers. From this point of view, it is particularly important to improve project management skills and the understanding of production, logistic and organisational processes, entrepreneurship, R&D works, and interpersonal skills. An additional value is the increased level of social awareness of advanced digital competence in addressing specific social and economic issues.

THE PROGRAMME IN 2019:

- 7 implemented projects,
- PLN 20.2 m disbursed funds,
- the third stage of e-Pionier project evaluation was completed.

PROGRAMMES AND PROJECTS IN THE FIELD OF STATE DEFENCE AND SECURITY

Programmes and projects in the field of state defence and security are implemented by NCBR in agreement with the Minister of National Defence and the Minister of the Interior and Administration. As part of the programmes, 19 competitions, with a total budget of over PLN 4.1 bn, have been held so far.

IN 2019, AS PART OF PROGRAMMES FOR STATE DEFENCE AND SECURITY:

- 2 competitions with an allocation of PLN 500 m were announced and closed,
- a competition was announced as part of The Development of state-of-the-art, ground-breaking technologies for state security and defence, "SZAFIR" (Sapphire) with an allocation of PLN 250 m,
- delivery of 131 projects was monitored, including the reviews of 93 progress reports,
- 17 agreements for the performance and financing of projects were made with a total funding amount of PLN 162 bn,
- nearly PLN 300 m was transferred to contractors for project implementation,
- supervision was carried out over 224 projects during their durability period.

SUMMARY

The programme portfolio of NCBR is evolving each year. In individual financial perspectives, new operational programmes are emerging and will continue to emerge, demonstrating the need for intervention and support in various fields (it is visible based on the example of previous and current operational programme HC OP, OP IE, KED OP).

An important role in the development of the portfolio will be played by the monitoring and analysis of trends emerging in applications filed with the Centre. A vital element will also be closer cooperation with all Centre's stakeholders, including the circles and organisations representing business and science. Both processes will contribute to a better understanding of the needs, capabilities and expectations of the market. The changes will involve the subject-matter of the competitions. Technological and social transformations imply new challenges. In such fields as communications technologies, the use of 5G technology is becoming a challenge, and the significance of biotechnology and Artificial Intelligence is growing.
Social transformations affect the need for works in the field of smart cities or new management and HR methods.
The form of competitions is also bound to change. Greater emphasis will be placed on innovative methods of cooperation and support for innovation, already being applied by NCBR, for example in such competitions as "Grand Challenge: Energy".

ANALYSIS OF RESEARCH TRENDS IN 2016–19 USING THE EXAMPLE OF SGOP

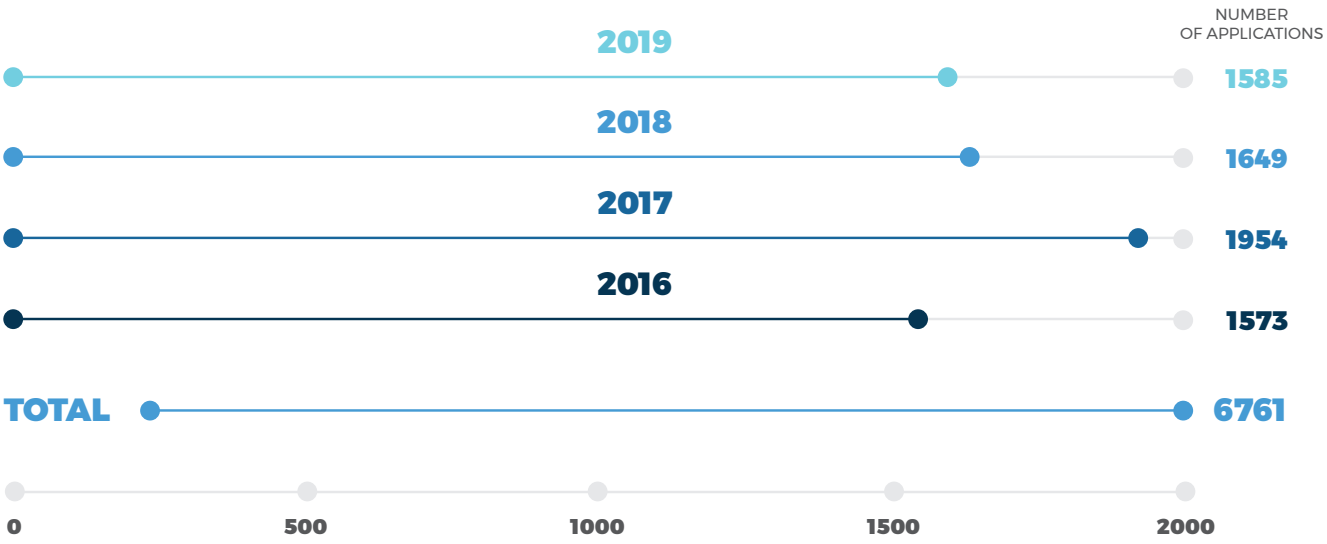
The Smart Growth Operational Programme is the largest programme in the EU for developing research and creating innovations. An analysis of the research trends visible in projects submitted to NCBR as part of SGOP shows the needs, abilities and aspirations of companies and innovators in Poland. A better understanding of the market needs will make it possible to improve the Centre's proposal and the mechanisms of cooperation with applicants. This is the first analysis of this issue based on such extensive data[10].

A total of 6761 grant applications which were evaluated in 2016–19 under numerous competitions held as part of SGOP were analysed.

The report was prepared using the desk research method and on the basis of unstructured individual in-depth interviews (IDI) and interviews with experts. The available data concerning grant applications submitted to NCBR and also data and information regarding the Polish labour market and global trends in R&D were collected and analysed using statistical methods. The quantitative analysis was supplemented by qualitative conclusions based on interviews with the head of the application assessment panel and interviews with experts.

As per the adopted research methodology, the conclusions were divided into 8 groups. It should be noted, however, that a large number of projects are situated at the intersection of various specialisations and are de facto interdisciplinary in nature. A good example are ICT projects which are aimed at solving specific social problems and the IT element is a common denominator of actions in many of the studied groups listed below.

NUMBER OF ANALYSED GRANT APPLICATIONS SUBMITTED UNDER SGOP IN 2016–19



10. „Analiza trendów badawczych we wnioskach o dofinansowanie składanych do NCBR w ramach PO IR w latach 2016–2019", NCBR Expert Management Division, Warsaw, May 2020.

NUMBER OF ANALYSED GRANT APPLICATIONS SUBMITTED TO NCBR UNDER SGOP IN 2016–19 BY AREA

AREAS	2016	2017	2018	2019	2016-2019
CHEMISTRY	110	112	75	71	368
ELECTRONICS AND IT	437	640	489	507	2073
ENERGY	74	68	113	55	310
MATERIALS ENGINEERING	204	227	161	167	759
MEDICINE, PHARMACY AND BIOTECHNOLOGY, BIOLOGY	260	263	231	231	985
AGRICULTURAL SCIENCES AND ENVIRONMENTAL PROTECTION	76	77	71	61	285
SOCIAL AND ECONOMIC SCIENCES	25	42	36	34	137
TRANSPORT AND MECHANICAL ENGINEERING	387	525	473	459	1844
TOTAL	**1573**	**1954**	**1649**	**1585**	**6761**

The table above presents the distribution of applications submitted under SGOP according to the adopted thematic classification.

THEMATIC AREAS ANALYSED:

- Chemistry
- Electronics and IT
- Energy
- Materials engineering (including nanotechnology, etc.)
- Medicine (health, pharmacy, biotechnology)
- Agricultural sciences (including biology, earth science, food processing, environmental protection)
- Social sciences (including economics, law and other humanistic disciplines)
- Transport and mechanical engineering (including civil engineering and other branches of engineering)

MAJOR CONCLUSIONS AND OBSERVATIONS FROM THE ANALYSIS:

Most grant applications are interdisciplinary in nature.

Each of the isolated areas features a significant contribution of information technology.

Such areas as materials engineering, energy, medicine/pharmacy involve projects closely tied with chemistry.

In the coming years the percentage of interdisciplinary projects will increase due to the need to involve specialists from a large number of fields in developing breakthrough innovations. They will respond to the as yet unsatisfied needs of clients and society and will give a competitive edge to enterprises.

Applicants mostly include microenterprises and small enterprises.

More than 30% of the grant applications submitted to NCBR involve research issues connected with electronics and IT.

A similar number of applications (27%) covers the area of transport and mechanical engineering.

The smallest number of applications deal with research issues from the fields of social and economic sciences, as well as agricultural sciences and environmental protection.

The coming end of the current financial perspective and uncertainty as to the new sources of R&D project financing may contribute to an increased interest in competitions among companies and research units in 2020.

The conclusion of most sectoral programmes has not reduced the number of applications submitted by applicants from those specific areas of the economy. These applicants have successfully found their place in other competitions, including interdisciplinary ones announced as part of "Fast Track" competition.

In the coming years we should expect increased interest in IT solutions intended for the chemical industry. Another area of innovative activities in this field will be the process of closing material supply chain loops in production implemented through recycling and resulting from the adopted circular economy model.

A dynamically developing research area will involve technologies utilising artificial intelligence (AI), the Internet of Things (IoT) and blockchain. These will appear in applications in the field of IT, as well as in multidisciplinary projects.

In 2020, there should be a rise in the number of submitted grant applications connected with the development of 5G network products and services.

Energy projects are becoming increasingly interdisciplinary and progressively less dependent on energy generation technology itself, with more focus on process efficiency. Development in the energy industry will be largely based on automation, Big Data and AI projects, which is also reflected by global trends.

An important trend in the area of energy involves projects which allow making ongoing adjustments to comply with the applicable legal regulations, which is why we should expect a rising number of projects in circular economy, including waste management, recycling and enhanced process energy efficiency, The number of projects in what is known as large-scale industrial energy will be smaller and might only involve nuclear power.

Since 2016 there has been a systematic increase in the number of applications connected with recycling and circular economy, and this trend is expected to continue. There are similarly strong rising trends connected with developing new ways of using biomaterials, biodegradable materials and plastics, as well as the intensive development of 3D printing (from printer construction to new filament materials). Another significant trend, especially among large enterprises, is the optimisation and automation of production processes in this respect.

In the area of agriculture and environmental protection, the most important trend is the computer-aided development of food manufacturing and processing.

The leading trend in medicine and biotechnology is the use of machine learning techniques and artificial intelligence.

There has been a significant rise in interest in research in the field of drug therapy in oncology. The rapid development of immunoncology and biological medicines in recent years has sparked huge interest in this area among applicants. It should be noted that such projects are very expensive and the time from the moment of receiving cofinancing until obtaining an authorisation to use the medicine in patients is about 10 years. Due to this, a significant part of the beneficiaries are planning to sell or license the rights to the product to entities from outside Poland and only few have the sufficient financial resources to complete the process within their own enterprise.

An increase in interest in solutions at the intersection of IT and electronics is predicted, including in AI based on social sciences.

NUMBER OF GRANT APPLICATIONS SUBMITTED TO NCBR UNDER SGOP IN 2016-19 BY AREA

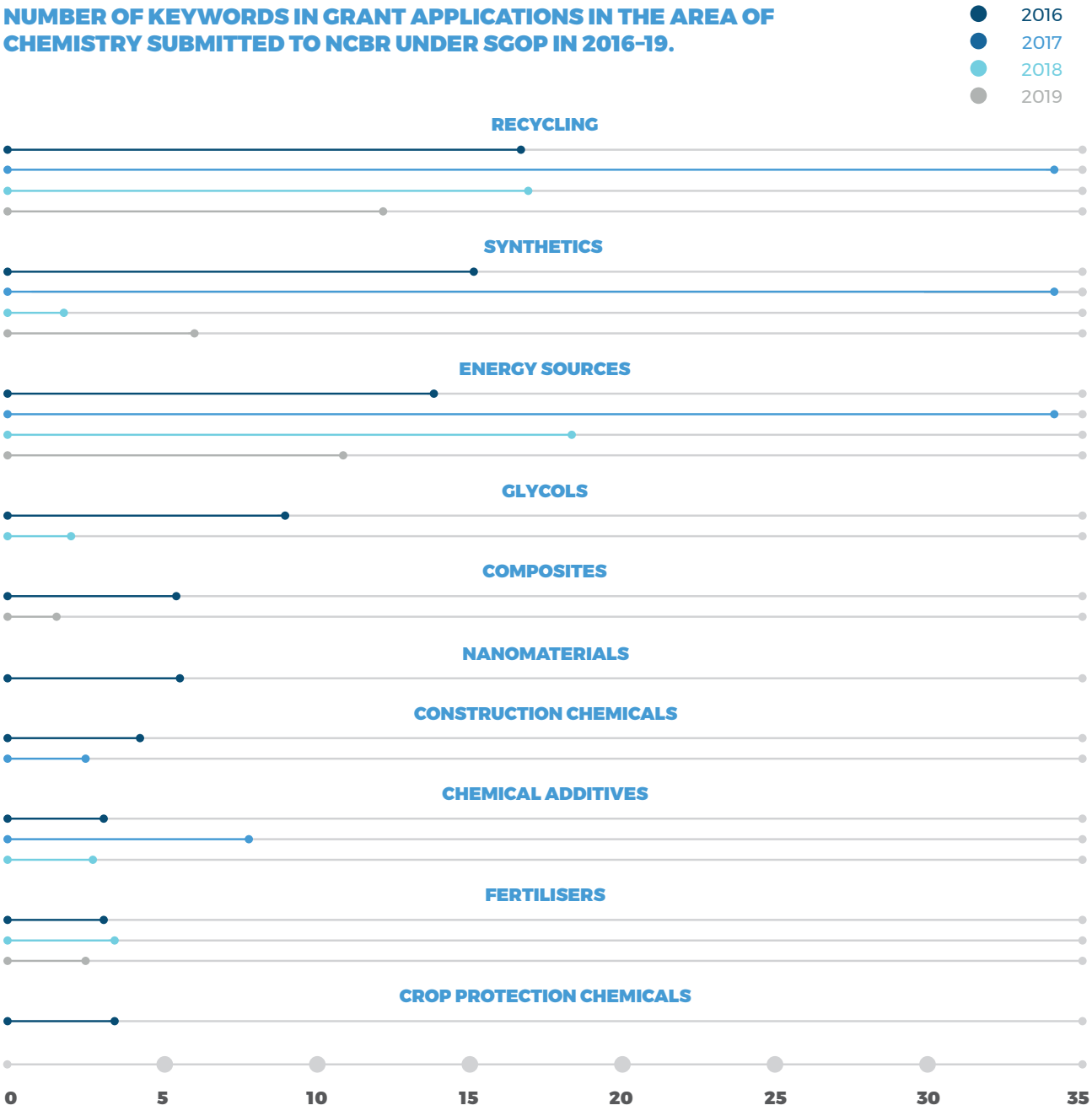
THE AVERAGE VALUE OF THE GRANT APPLICATIONS SUBMITTED TO NCBR UNDER SGOP IN 2016-19 BY AREA

CHEMISTRY

In 2019, there was a 30% decrease in the number of applications in this group when compared to 2016. However, the median value of projects increased – in 2016, it was PLN 6.6 m and in 2019 as much as PLN 9.7 m.
This means a significant increase in the capital intensity of the implemented projects arising from the increasing complexity and scale of undertaken projects.

An analysis of the keywords included in the applications, presented in the chart demonstrates that there are two thematic groups within chemistry projects.
The first group includes highly innovative projects characterised by a low TRL at the moment of submitting the application. These involve nanomaterials, composites, and chemical additives. The second group of projects is large and characterised by a relatively high technology readiness level, but a low innovation level – related to synthetics. Additionally, we should take note of the equally numerous keywords connected with recycling and energy sources.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF CHEMISTRY SUBMITTED TO NCBR UNDER SGOP IN 2016-19.



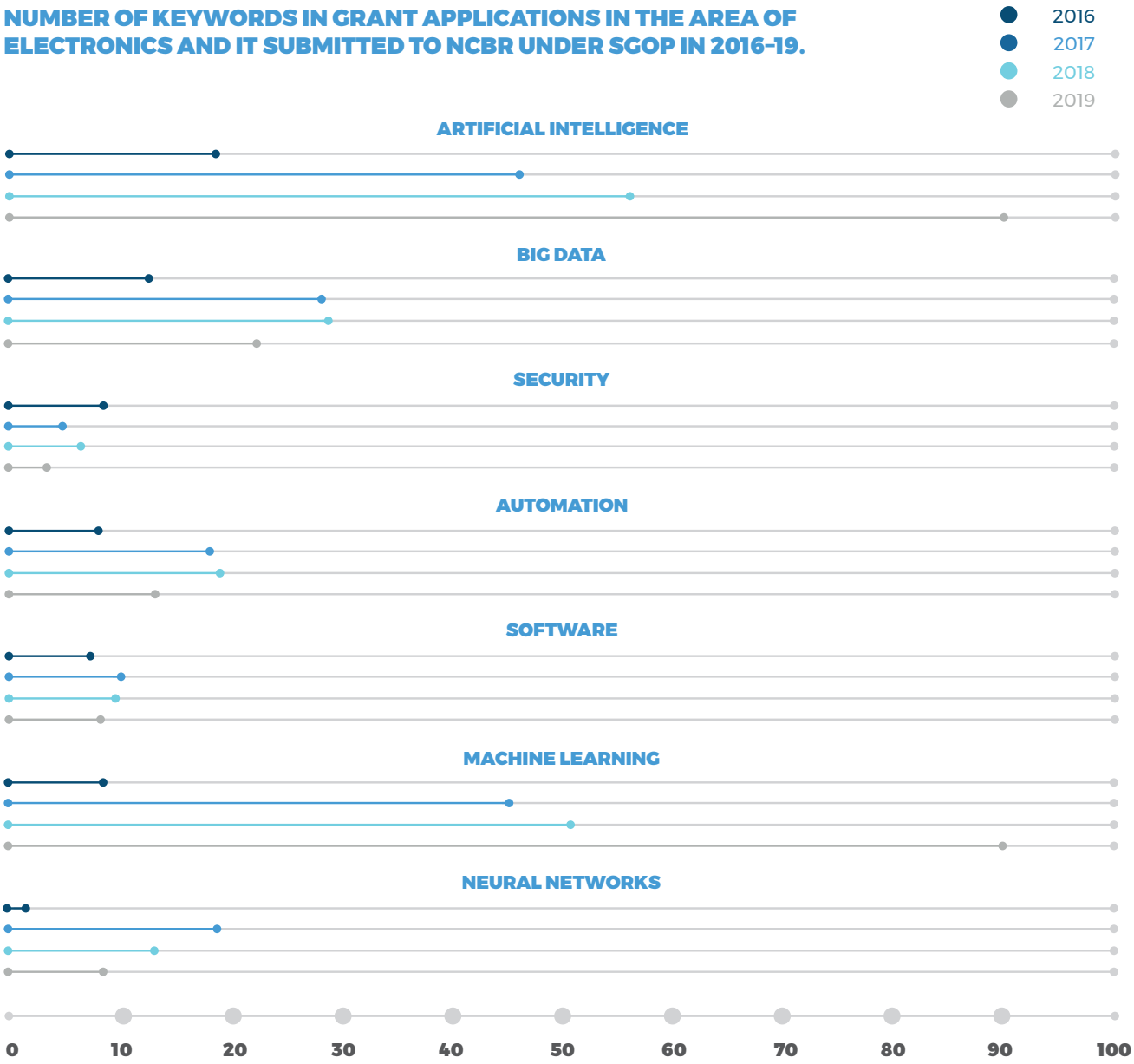
ELECTRONICS AND IT

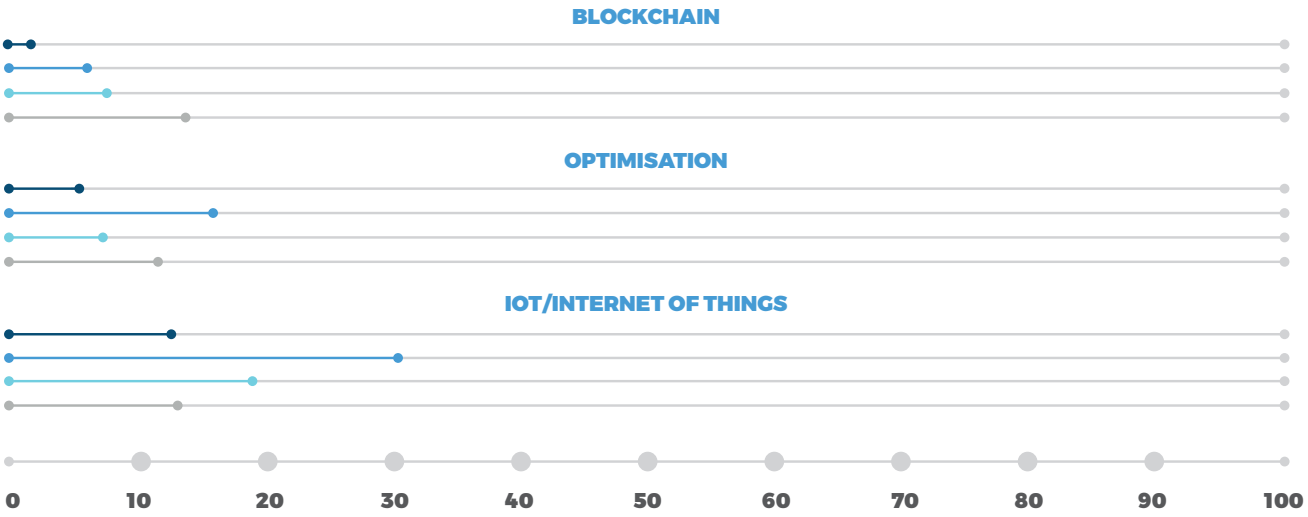
The area of electronics and IT in SGOP competitions covers more than 30% of all submitted applications. In financial terms, these applications have almost the lowest values of eligible costs per project – PLN 8 m on average.

Since 2016 there was a fourfold increase in the number of applications in the field of artificial intelligence (AI) and ninefold in machine learning. This is nearly 20% of all applications in this area. We should expect a continued increase, especially in such areas as data sourcing, processing, circulation and visualisation, AI-driven applications and systems, device and machine system automation, chatbots and virtual assistants.

Another rapidly developing research area is blockchain technology. There is also a rising demand for network bandwidth solutions, as well as Wi-Fi speed and 5G mobile internet.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF ELECTRONICS AND IT SUBMITTED TO NCBR UNDER SGOP IN 2016-19.





ENERGY

In SGOP competitions, energy projects make up about 4.5% of all submitted applications. The reasons for which this industry has expressed little interest in financing under SGOP may be sought in other financing opportunities, such as the competitions addressed at this industry financed from state funds. This is also influenced by the structure of the energy enterprise market in Poland, which is focused in several large groups.

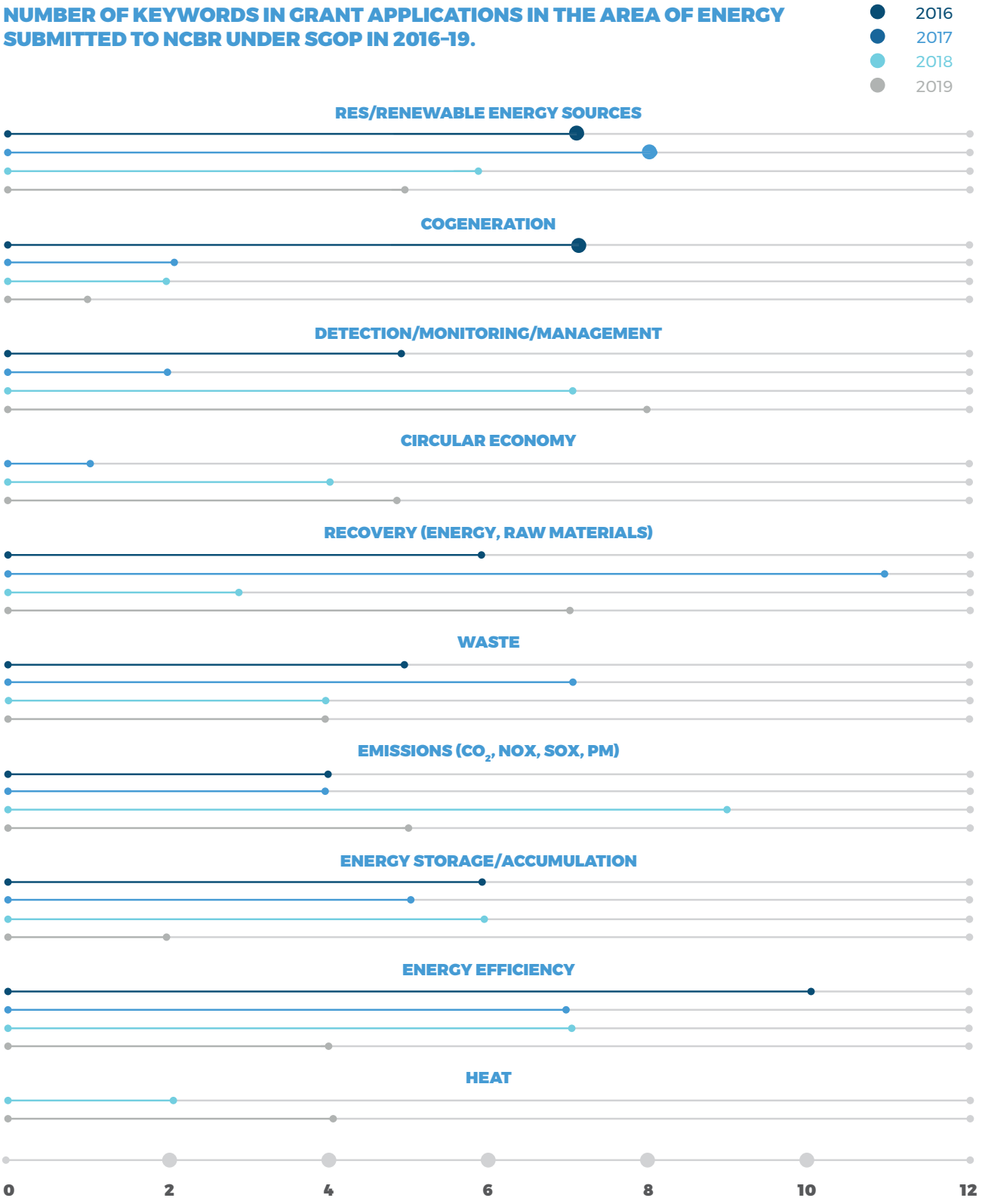
By observing the applications submitted since 2016 it may be concluded that the area of RES continues to be popular. In the recent competitions, the largest number of projects involved photovoltaics.

There is also a clear interest in the subject of circular economy.

Energy storage technologies have developed almost in parallel with RES technologies.

High energy prices and costs of obtaining resources, digitisation and monitoring, CO_2 emissions reductions and a move towards distributed energy are the greatest challenges driving the development and research in this area.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF ENERGY SUBMITTED TO NCBR UNDER SGOP IN 2016-19.



MATERIALS ENGINEERING

The area of materials engineering in SGOP competitions covers about 11% of all submitted applications. In terms of financing, these are large projects with an average value of PLN 14 m.

Since 2016 an increase has been seen in the number of applications connected with recycling, understood as the recovery of non-ferrous materials (e.g. copper, aluminium), as well as packaging recycling. We should expect a heightened interest in this area among companies in the upcoming competitions. This is understandable, especially in the context of the changing legal regulations, including those related to the manufacturer's extended responsibility for the packaging (ROP) or the conditions connected with circular economy.

Similarly, a constant increase can be observed in interest in biomaterials and biodegradable materials, which is aligned with the EU policy for the coming years (2019–24), including the Horizon Europe framework programme.

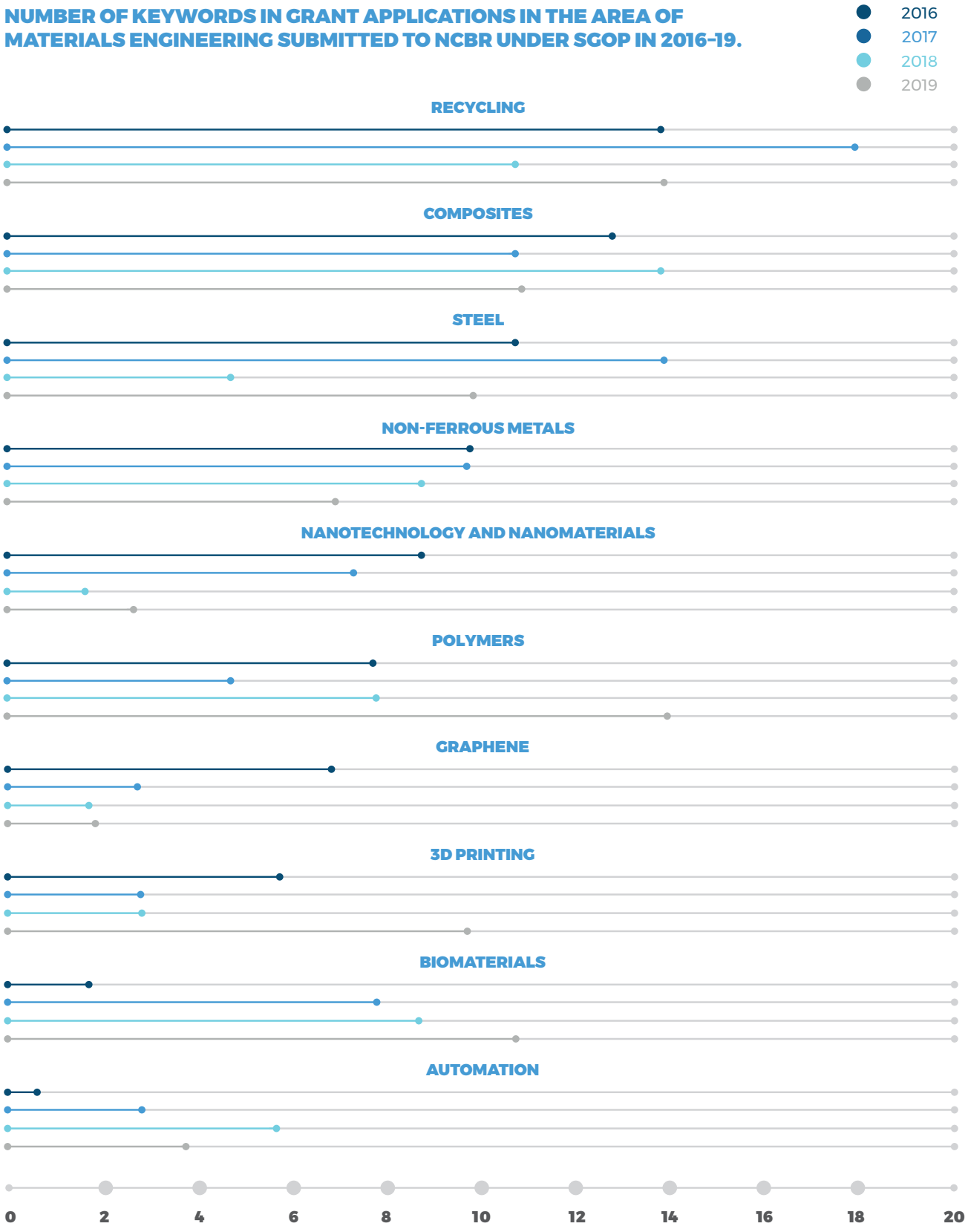
Another rapidly developing area is that of plastics (which was reflected in 2019 in the competition 4/1.1.1/2019 "Fast Track – Plastics").

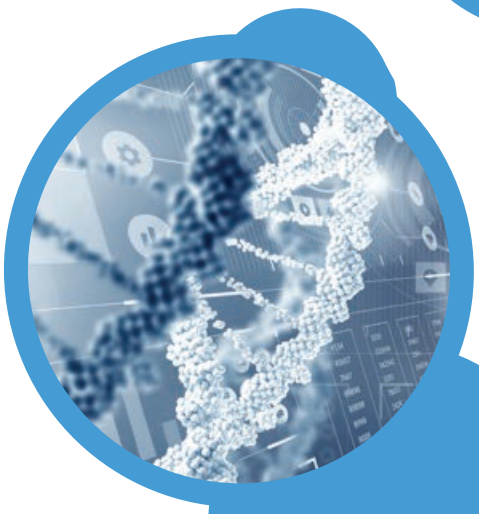
A noticeable increase was also seen in the research area connected with 3D printing. We should expect significant development in this field, especially in terms of work on printing speed and accuracy.

Another area which appears dominant, especially among large enterprises, is optimisation and automation of processing activities.

The areas in which significant drops in the number of submitted applications were observed include those connected with graphene and nanomaterials.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF MATERIALS ENGINEERING SUBMITTED TO NCBR UNDER SGOP IN 2016-19.





MEDICINE

The area of medicine and medical biotechnology in SGOP competitions covers nearly 15% of all submitted applications. In terms of financing, these are medium-value projects with an average value between PLN 10 m and 12 m.

One of the main thematic trends present in the applications is the use of artificial intelligence and machine learning, both in medicine and biotechnology, and research focuses mainly on diagnostics, drug development and telemedicine.

The first highly popular sector is diagnostics support, mainly in the oncology segment. This primarily involves research which monitors the development and location of lesions on the basis of data from Ultrasound, MRI and other imaging techniques.

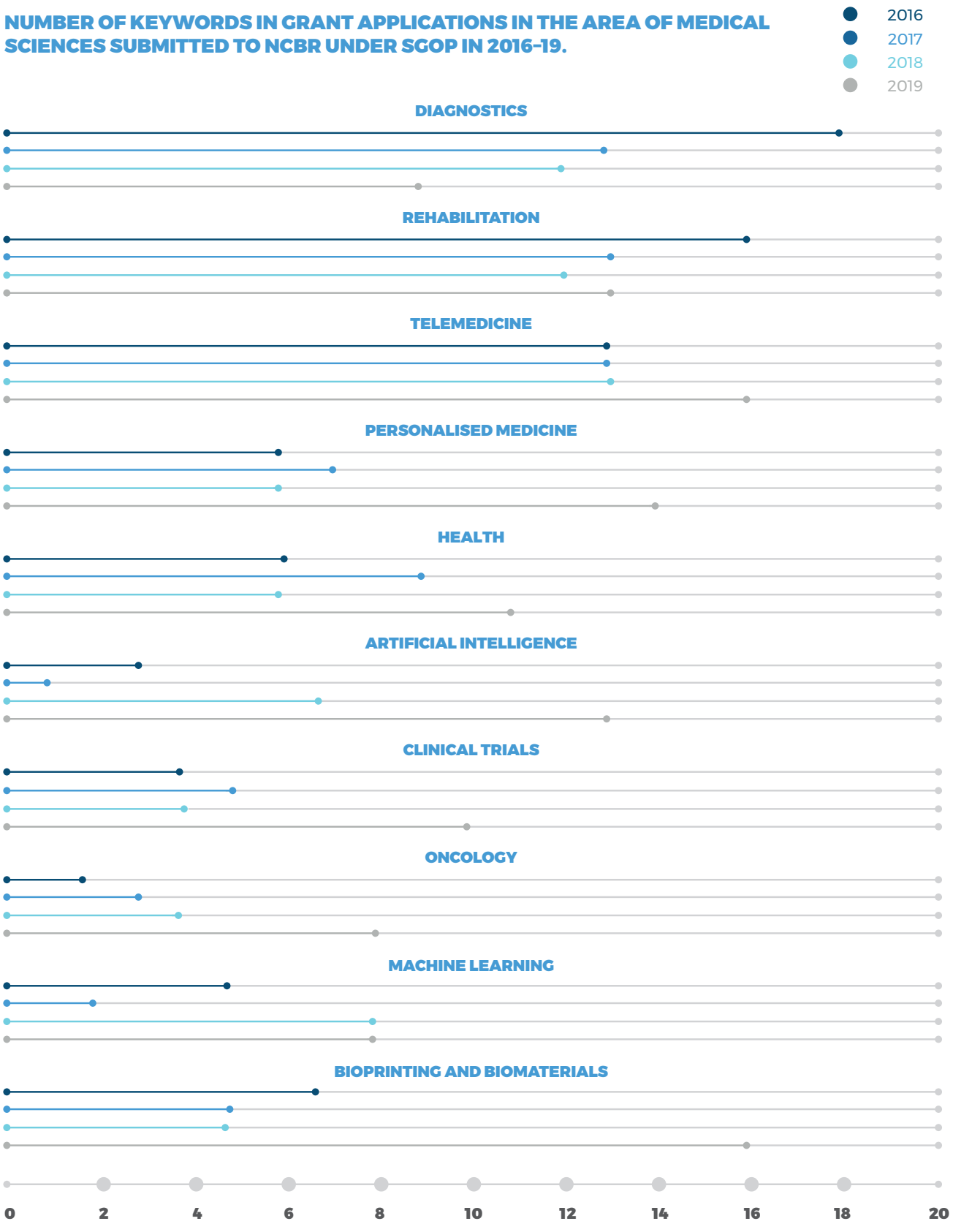
Another very important sector in medicine which uses machine learning is the area of broadly-understood pharmacy, particularly the development of innovative medicines.

The third important segment of medical projects using artificial intelligence mechanisms is support for telemedicine research involving rapid analysis of data obtained from common wearable devices. The use of machine learning (ML) or artificial intelligence (AI) techniques allows integrating information from a large number of different sources and making quick therapeutic decisions.

Another observable and strong trend is the increasing number of projects connected with the development of new pharmaceutical products, particularly concerning advanced drug therapy in oncology.

Interestingly, a clearly visible trend is the dynamic development of the biomaterials and bioprinting sector.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF MEDICAL SCIENCES SUBMITTED TO NCBR UNDER SGOP IN 2016-19.



AGRICULTURAL SCIENCES

The largest number of applications connected with agricultural sciences and environmental protection submitted in 2016–19 concerned broadly-understood production and food processing (125 applications), veterinary medicine, animal well-being and husbandry (27 applications), production of feedstuffs (24 applications) and environmental protection (22 applications).

The subject matter of the largest group of projects revolves around issues connected with safety and quality improvement of food products, as well as functional and pro-health food.

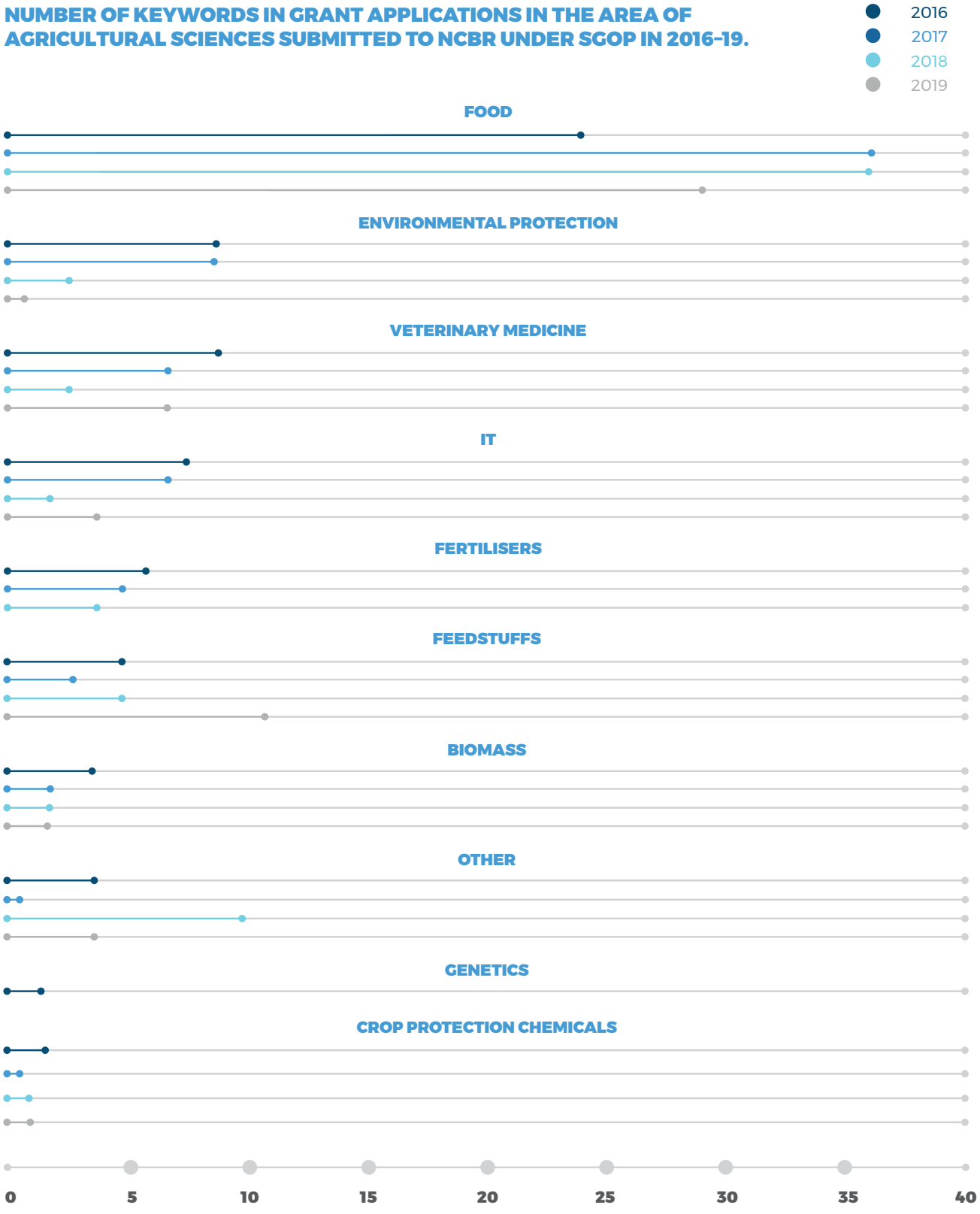
The lowest number of applications submitted in the analysed period involved genetic resources and animal and plant biodiversity.

The average value of funding applied for in the area of agriculture and environmental protection was PLN 7.3 m.

A distinctive trend in research and development work in agriculture is the introduction of process innovations connected with full production and food processing automation.

The submitted applications also show trends responding to issues connected with both already implemented and planned legislation. In the future we should expect an increase in applications involving the innovative labelling of fruit and vegetables, composting organic waste, functional and biodegradable food contact packaging materials, as well as precision farming.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF AGRICULTURAL SCIENCES SUBMITTED TO NCBR UNDER SGOP IN 2016–19.



SOCIAL SCIENCES

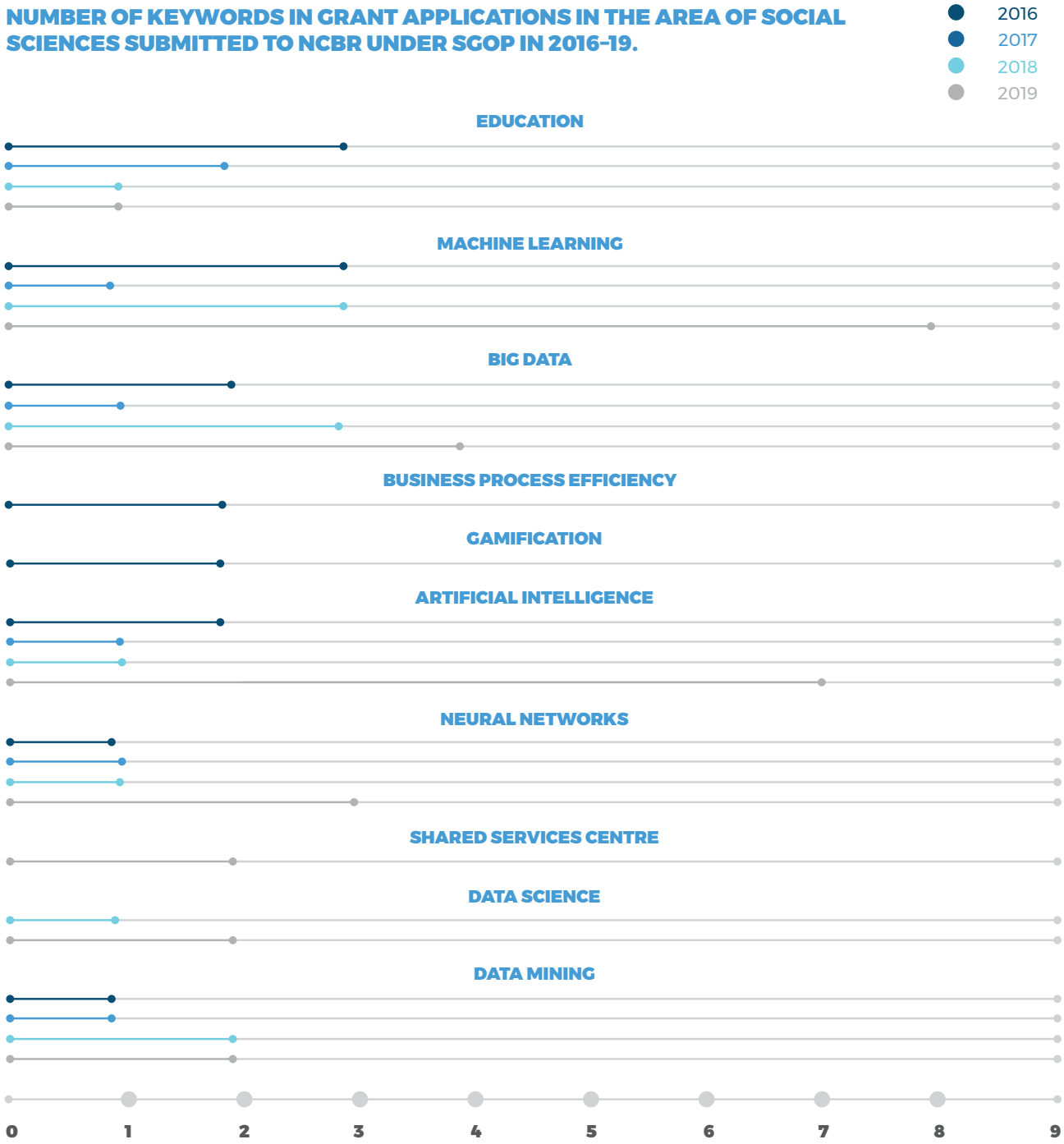
An increasing number of applications submitted to NCBR is indirectly connected with the broadly-understood area of social sciences. Due to the methodology of this type of research and the work undertaken, which is often based on IT solutions, financially these are applications with a relatively low value of eligible costs – PLN 7 m on average.

A LOT OF APPLICATIONS ARE BASED ON COMPUTER DATA ANALYSIS. ANALYSIS AND TREND OBSERVATIONS SHOW THAT THERE IS AN INCREASED MARKET INTEREST IN THE FIELDS OF:

- human resources management – e.g. innovative IT platforms aimed at human resources management,
- linguistics – e.g. natural language processing or sentiment analysis in texts for the purposes of AI and big data processing,
- psychology – mental health, addictions,
- education – electronic education platforms, educational tools (including electronic and IT-based),
- legal – including IT systems for legal services and automatic legal source search based on machine learning,
- logistics and management – such as (electronic) logistics, transport, forwarding systems (including shipments and supply chain management),
- economics and finance – including, especially, solutions in the fields of marketing and sales, developing banking systems (e.g. behavioural signatures, personalised transaction systems, systems assisting in investment processes).

An important observation from the analysis of the thematic areas of applications submitted to NCBR is that there is low interest in the subject of disabilities. This is despite the fact that under "Accessibility Plus" government programme a separate competition dedicated to this subject matter has been created under "Fast Track". Only 24 applications were submitted throughout its three rounds, and just 2 of them received funding.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF SOCIAL SCIENCES SUBMITTED TO NCBR UNDER SGOP IN 2016-19.



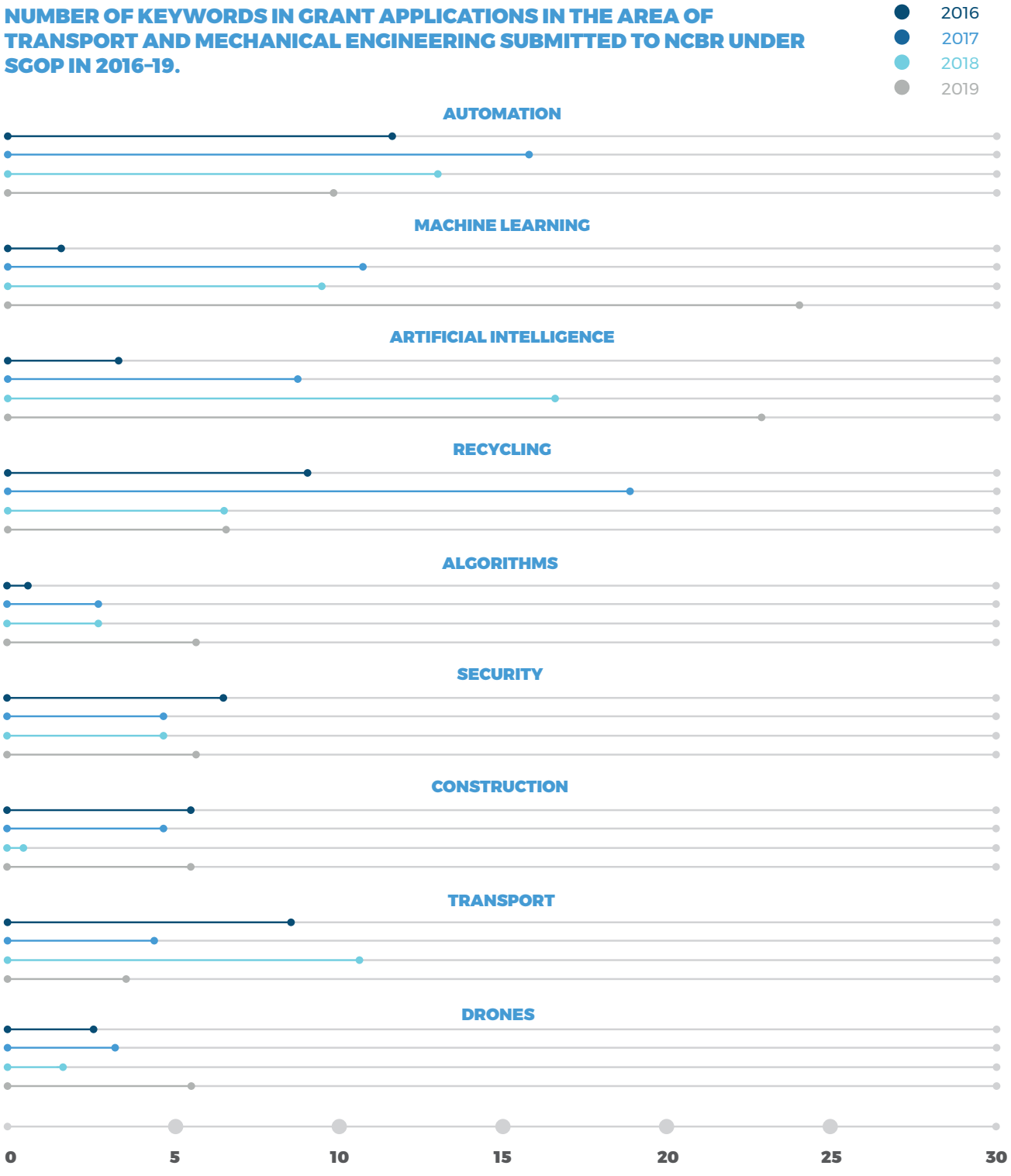
TRANSPORT AND MECHANICAL ENGINEERING

The area of transport and mechanical engineering in SGOP competitions covers more than 30% of all submitted applications. In terms of financing, these are medium-sized and large projects with an average value between PLN 10 m and 12 m.

In 2016–17, research in this area focused on automation and recycling methods. In recent years, the applicants started looking for opportunities in projects closely connected with electronics and IT, i.e. artificial intelligence (AI) and machine learning (ML).

Another rapidly developing research area involves technologies related to data security and protection, product traceability and sustainable development.

NUMBER OF KEYWORDS IN GRANT APPLICATIONS IN THE AREA OF TRANSPORT AND MECHANICAL ENGINEERING SUBMITTED TO NCBR UNDER SGOP IN 2016-19.

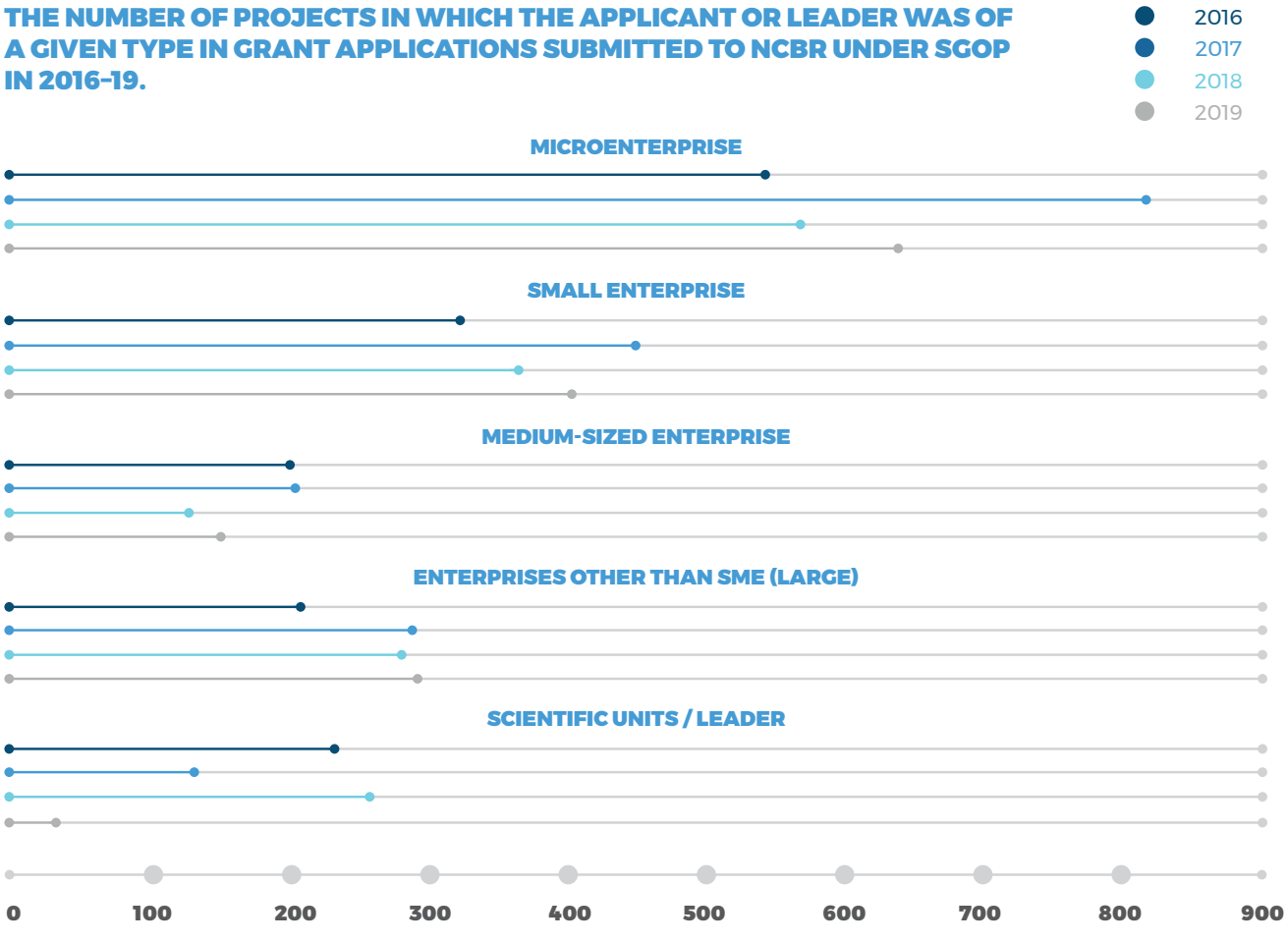


SIZE OF ENTERPRISE

The most numerous group among the entities applying for funding are microenterprises. This is similar to global trends. Their total involvement as applicants or consortium leaders in 2016–19 was nearly 39%.

The percentage of small enterprises was 24%, medium-sized – 11%, large – 16%, while research units (which are not independently authorised to submit applications under SGOP), as consortium leaders submitted 10% of applications received by NCBR.

THE NUMBER OF PROJECTS IN WHICH THE APPLICANT OR LEADER WAS OF A GIVEN TYPE IN GRANT APPLICATIONS SUBMITTED TO NCBR UNDER SGOP IN 2016-19.



INNOVATION LANDSCAPE – SUCCESSES, CHALLENGES & ISSUES

Quality is more important than quantity.

STEVE JOBS

Innovation is one of the main drivers of economic and social development. It is responsible for new products and solutions and gives enterprises a competitive edge. It builds the quality of our life.
The level of innovation in a given country largely determines its place on the economic map of the world. This report is an attempt at describing Poland's innovation landscape, as seen by NCBR, an executive agency which has for years supported research, development and implementation in this country.
It presents the effects of assistance provided by the Centre, and the successes and obstacles connected with building an innovative economy. This is accompanied by an analysis of the current processes connected with the projects and programmes in progress and NCBR's methods of action. Conclusions from the surveys requested by the Centre are be presented. When illustrating such a dynamic and ever-changing reality, it is only ever possible to use an incomplete data set.
Such an analysis, like photography, presents a given moment from a slightly subjective perspective. This is a broad overview, which cannot take into account all the minute details. It is the first such analysis of the effects of NCBR's actions. The reports that will be created in the coming years will make it possible to illustrate the changes and dynamics, and will allow a comparison of the effects of the Centre's actions to be created.

OUR PLACE ON THE INNOVATION MAP OF EUROPE AND THE WORLD

Poland is placed 25th in the EU innovation ranking, which is fourth to last. Although the total innovation indicator for Poland increased by 7.8%, this is still less than the EU average of 8.8%. We are 39th in the Global Innovation Index. There is no doubt that we have a lot to do and make up for in the field of innovation. It is worth noting that the small country of Estonia, which was also burdened by a socialist economy, now occupies a high position in the EU ranking, among strong innovators. In selected areas of innovation the best results in the EU have been achieved by Denmark – human resources and an innovation-friendly environment; Luxembourg – attractive scientific research systems; France – funding and support; Germany – enterprise investments; Portugal – innovative SMEs; Austria – relations; Malta – intellectual assets; Ireland – impact on employment and sales volume.

According to the authors of the report on innovation in EU Member States, in global terms, the European Union has overtaken

the US. The top positions in this ranking are occupied by South Korea, which is before Canada, Australia and Japan. China is behind the EU, but its growth rate in innovation is three times as high.

Stumbling, you can go far.
Do not just fall down and not get up.

J.W. GOETHE

Poland's low position in the European innovation ranking is largely influenced by the years of negligence connected to socialist economy. It was economically ineffective and propaganda-driven rather than consumer-centric, and in terms of innovation it fell behind the economies of states which developed according to free market principles. Initiatives, ideas and solutions proposed by Polish scientists and innovators could not be implemented.

Polish science entered the political transformation period with a host of problems. Following a time of difficult structural changes, a completely new period of change and market economy development began. However, changes in the area of innovation development were not as fast as they were elsewhere. There were legal, capital, organisational and mindset-related obstacles. Eventually, Poland's accession to the European Union in 2004 opened up new perspectives for the Polish economy. Access to EU funds, greater opportunities for international cooperation and the chance to participate in EU initiatives and programmes were significant changes which have contributed to building a favourable environment for developing innovations in Poland. The establishment of NCBR was a logical consequence of these changes.

SUPPORT AND ITS IMPACT

I can accept failure, but I can't accept not trying.

MICHAEL JORDAN

The Centre has a special place in the innovation ecosystem. The resources that NCBR holds as an executive agency are intended for innovation and are to be used by small, medium-sized and large enterprises alike. This way, innovation support interventions support all sectors of the economy. This is clearly visible, if only in the example of the presented analysis of thematic trends contained in grant applications in 2016–19 under SGOP. The Centre supports innovative activities in all areas of the economy.

It is worth trying to assess the effectiveness of the provided support and to estimate the return on investment in innovation supported by NCBR. In making such estimates we should not forget about how difficult it is to accurately assess this. This is connected with the relatively short period of time which has passed since the intervention, difficulties in assessing the financial impact of individual actions and the complex process of assessing the indirect effects of financial intervention.

We should remember that subjective, evaluative indices used to determine the situation in the economy are a constant element of the process of assessing its condition. The best example here is the PMI, which sums up the opinions of managers, who subjectively assess the future state of the economy. Models based solely on numbers do not give a full view of the state of affairs. They fail to take into account the effects which have high economic and social significance, but which are hard or even impossible to express numerically. Such an element, which is often omitted in this kind of analysis, involves the social and awareness-building effects of the actions, such as changes in the attitudes of entrepreneurs towards innovation processes, changes in the organisational culture, creating new activity models, or building a team of innovators. Financial appraisal of this type of social capital presents a challenge, especially

since it is difficult to use quantitative terms here. Nevertheless, it is these factors that many analysts today consider key to building a competitive edge in the digital world. An analysis of NCBR's interventions should necessarily include the elements of the Polish innovation ecosystem. Funding for innovations in Poland today comes from a range of sources. These include internal business funds, financial instruments from the banking system and aid. Notably, the last of the three, although used by different entities, often provides an opportunity for those for whom other forms of financing are too costly, or simply unavailable. Businesses often tap multiple sources of support to fund their investments.

So far, NCBR has provided a total of PLN 59 bn in support for innovative projects, including PLN 4.2 bn in 2019. These figures alone demonstrate the significance of NCBR's efforts.

This support has been provided as part of many programmes. Commissioned by the SGOP's Managing Authority, an SGOP study entitled The evaluation of the initial outcomes of SGOP support related to R&D work and the implementation of R&D results in businesses (NCBR is one of the SGOP's Intermediary Bodies) showed that a total of 4,376 agreements were signed by December 2019. The majority of agreements, almost 40%, involved research & development projects. SGOP funding provided thereunder to beneficiaries totalled more than PLN 22 bn, with more than PLN 8 bn disbursed. These R&D efforts are expected to yield PLN 93 bn in revenue, which means that each zloty invested should yield a return of four zloty.

OTHER OUTCOMES IDENTIFIED BY THE SURVEY:

a total of 1,856 would cooperate with research centres,

1,701 patent applications are estimated to be filed,

and 4,099 R&D results will be implemented.

GIVEN THE EXPECTED INDICATORS IN THE GRANT AGREEMENTS, IT IS REASONABLE TO ASSUME THAT THE SUPPORT PROVIDED AS PART OF THE INSTRUMENTS INCLUDED IN THE STUDY WILL RESULT IN:

R&D support for 3,485 businesses;

cooperation of 1,856 businesses with research centres;

16,000 more full-time equivalents in supported business;

438 research laboratories receiving support;

2,311 product innovations and 744 process innovations being introduced.

KEY CONCLUSIONS OF THE STUDY:

SGOP offers support in carrying out research & development work from the second to the ninth technology readiness level, and to the implementation of the results. Using support from one programme, a single project can finance costs of industrial and experimental research, as well as development and pre-implementation work.

Individual programmes allow the financing of only specific stages of this process.

Businesses reported **the need for R&D project funding of not more than PLN 1 m.**

Applications for financing R&D infrastructure purchases involved amounts of not more than PLN 2 m, limiting investment opportunities in this regard.

Limited funding was provided for the development of R&D staff in businesses. This is a major problem.

Considerable administrative burden was reported in regard to SGOP project application and accounting. Most applicants use the services of advisory companies.

Applicants emphasised the importance of good cooperation **with the institution providing funding.**

RECOMMENDATIONS:

THE FOLLOWING SHOULD BE DONE IN THE NEXT PERSPECTIVE:
beneficiaries should be able to change individual stages of the innovation process more easily, and to carry out various research, implementation and associated work as part of a single project;

support should be unlocked for businesses planning to carry out **research & development projects with a value of less than PLN 1 m;**

equipment purchase costs should be recognised as eligible project costs;

research funding should be provided for research staff development;

grant applications should be simplified.

The summary of the expected outcomes of SGOP projects indicates that the support provided by NCBR has been both financially effective and conducive to the expansion of the innovation ecosystem. Notably, this expansion can multiply the impact of preliminary financial interventions.

PROJECT PROFITS

A preliminary analysis of projects cofinanced by NCBR has been conducted to provide data on profits made by projects carried out in the years 2011–2020.[11] A total of 200 projects implementing R&D results were included in the analysis. Specific examples exist to show some of the already achieved outcomes of the support mechanism. Also, these data serve to determine how NCBR's aid has contributed to increasing employment and investment levels. For the analysed sample of projects in which results were implemented, NCBR provided about PLN 680 m in funding, although implementers had to invest nearly PLN 430 m

11. The outcomes of R&D work financed by NCBR have been of interest to, i.a. the Team of Experts, which evaluates whether the outcomes achieves as part of projects are implemented in business activities. Between 2018 and 2019 this Team evaluated more than 200 implementation reports, which are filed a few years after the completion of R&D work (usually 3 years after project completion). Between 2018 and 2019 experts analysed the outcomes of the following programmes: INNOTECH, the Applied Research Programme (PBS), "DEMONSTRATOR+ – supporting scientific research and development works in demonstration scale" and the so-called targeted (civil) projects. Projects as part of these programmes were implemented from 2011 to 2020 (PBS 2012–20, DEMONSTRATOR+: 2016–18, INNOTECH: 2011–18).

as their own contribution, as required by state aid laws (with the average aid intensity at about 63%). At the same time, implementing R&D results required implementers to incur additional expenditures of more than PLN 360 m. R&D projects implemented in the first two years yielded PLN 1.4 bn in revenue and PLN 164 m in profit. Therefore, revenue exceeded R&D expenditures (incurred by NCBR and implementers) and implementation expenditures (incurred by implementers only) by a large margin. Measurable aid outcomes could be noticed shortly after the aid was provided.

Also, NCBR's support for innovative efforts encouraged beneficiaries to invest in innovation. In 2018, NCBR provided PLN 2.8 bn in aid, with businesses contributing a total of PLN 1 bn. In 2019, these two figures rose to PLN 4.2 bn and PLN 1.6 bn, respectively. Furthermore, a marked increase could be seen in R&D employment in the business sector – from 55,700 employees in 2016 to 75,500 in 2018. R&D employment levels in research units remained stable.

When examining the outcomes of NCBR's financial interventions, it is worth looking at projections regarding the outlooks and expected outcomes of innovation support policies. The European Commission has already made preliminary estimates of projected returns on investment in the Horizon Europe programme[12]. According to these estimates, each euro invested in the Horizon Europe research and innovation programme could yield a return of up to EUR 11 in GDP over 25 years. It is expected that investment in scientific research and innovation will result in extra 100,000 jobs in the scientific research and innovation sector.

APPLICANT – BENEFICIARY

According to NCBR's estimations[13], 10,000 innovative businesses operate in Poland. About 60-80% of businesses are planning to secure grants to cofund their research work. The entities applying to NCBR for grants are largely experienced in R&D.

As shown by studies, 71% of beneficiaries and 54% of applicants who did not secure funding had previous experience in applying to NCBR. Still, as many as a third of businesses who successfully applied to NCBR were first-time applicants. A lack of experience in this process does not seem to be a barrier in securing support from NCBR. Business size does not seem to play a role in obtaining NCBR grants.

THIS IS BEST EXEMPLIFIED BY SGOP THE BENEFICIARY GROUP BREAKS DOWN AS FOLLOWS:

- 30% microenterprises,
- 24% small enterprises,
- 19% medium-sized enterprises,
- 26% large enterprises.

NCBR's aid encourages businesses to make their own investments in innovations. Own investments are worth about 80% of the grant received. What is important is that the so-called input additiveness concerns not only businesses, but also research units. Among SGOP beneficiaries[14], before receiving their grants 36% of businesses did not have any separate organisational structures dealing with R&D, 37% had no R&D employees, 29% were not implementing any research projects, and 39% had no experience in cooperating with research units on R&D work. Support programmes offered by NCBR do not

12. NCBR's "Analysis of the LIDER 2009-2019 programme".
13. estimations based on NCBR's analyses.
14. study commissioned by the SGOP's Managing Authority – "The evaluation of the initial outcomes of SGOP support related to R&D work and the implementation of R&D results in businesses".

eliminate such entities. On the contrary, such aid encourages them to engage in research & development.

Aid has a positive influence on their financial standing. A difference can be seen between beneficiary businesses and companies that have failed to obtain aid. Also, a diffusion of innovation can be observed. In practice, this means that funds invested in innovations, research and development drive the development of the market at large, and not only of businesses which are direct beneficiaries.

But it has also facilitated specific projects, supporting scientific and implementation research. Last edition's maximum project funding was at PLN 1.5 m. A total of PLN 427 m was allocated for all funding competitions, with an average of PLN 1.2 m per project. A total of 379 agreements were concluded (meaning the selection of 379 Leaders). The LIDER[15] programme has proven to deliver outcomes in both academic (higher impact factors) and patent terms. The first four editions have brought about an average of one patent application per project. Most projects have concerned the fields of engineering & technology (66%), nature (16%) and medicine (10%).

INNOVATION LANDSCAPE – PEOPLE

People are key to successful innovation processes. The programmes carried out with NCBR's support help businesses to develop their R&D staff and set up dedicated R&D departments. The LIDER (Leader) programme has been in place since 2009 to aid the development of research staff and support scientists-innovators. This is NCBR's longest running programme. Addressed to young scientists, it serves to exemplify the importance of investing in research staff development. LIDER has been effectively preparing new staff to work on innovations, activating academic communities and stimulating their interest in cooperation with business.

15 NCBR's "Analysis of the LIDER 2009-2019 programme".

INNOVATION, DEVELOPMENT – SKILLS

It is worth looking at the outcomes of the LIDER project in the context of the labour market survey carried out by NCBR[16] to gain insights into what is at the core of innovation – people and their skills. Survey results indicate that we have a long way to go to satisfying market needs and expectations. In their analysis of the results, the report authors noted that the demand for skills varied. When faced with a shortage of staff, businesses often lowered their expectations. However, a number of always-in-demand core skills could be identified:

- ability to work in teams;
- ability to communicate effectively and clearly;
- creativity (being innovative, coming up with new solutions and ideas);
- ability to connect with others effortlessly.

Additional two classes of skills, often mentioned by employers, should complement this set – organisational and professional skills. And we are seeing deficits in both social and professional skills. Based on employer surveys[17] carried out as part of the project, certain skill deficits can be described in professionals from various fields. To quote the study: "Professionals in physical, mathematical and technical sciences had insufficient professional skills and theoretical knowledge. Health professionals were noted for having deficient professional (attestations, certificates), as well as interpersonal skills (communication and teamwork skills). Teaching and education professionals were found to have deficits in almost all types of skills, including primarily language (Polish language), communication, cooperation and creativity. Economics and management professionals had inadequacies in professional, analytical, deductive and creative skills. Among ICT professionals, deficits were found mainly in the ability to learn, cooperate and communicate, as well as in motivation, theoretical and professional knowledge and certificates. Law, social and cultural professionals were noted for having deficiencies mainly in their teamwork skills.

Similar conclusions can be drawn from the qualitative studies carried out as part of the project. These found that deficits in certain general skills, including social skills, and work attitudes, including such qualities as conscientiousness, responsibility and loyalty, were universal for all sectors. The former was particularly noticeable. And there is agreement between analysts and researchers that this factor plays a fundamental role in development. This deficit stems from ill-preparation throughout the educational process, from primary school (and, as increasingly recognised, pre-school education) to university. Current experiences of countries such as Finland, Singapore and Israel suggest that positive outcomes can be achieved through carefully thought-out, well-coordinated plans supported by organisational measures and funding.

16. Employment market/skills – a study commissioned by NCBR "Analysis of the demand for skills in the economy and on the labour market"
17. Ibidem

FIELD OF EXPERIMENTATION

If at first the idea is not absurd, then there is no hope for it.

ALBERT EINSTEIN

Innovation, research and development carry the potential of high returns on investment. But such investments also involve risk. Because of their very nature, a large percentage of R&D projects fail entirely or at some of their expected outcomes.

NCBR has taken risks by engaging in challenging, innovative projects based on new, unique approaches.

One example of this involves the implementation of programmes based on two pathways: PCP (pre-commercial procurement) and IP (innovative partnership).

In this approach NCBR defines the research programme and the problems to be addressed. Next, the invited contractors are working simultaneously to propose solutions. At subsequent, predefined stages (milestones), NCBR examines the presented ideas to choose the one which best addresses a given problem. The intended outcome is a product demonstrator (TRL 9) which can be commercialised. NCBR's has followed the approach of looking at innovation processes from a different angle. This adds to NCBR's offering of programmes, the majority of which are based on a grant system. In grant programmes ideas for projects come from beneficiaries, since they know what their companies or organisations need in terms of development. In non-competitive approaches ideas are analysed from a different perspective – as a "public contracting authority", NCBR takes into account economic, public and/or social needs to define the programme, opening up a slightly different avenue for stimulating innovation.

One of the programmes based on this approach and implemented in 2019 is the innovative research project called **The Grand Challenge: Energy**, inspired by DARPA's Grand Challenge competition, which aims to develop compact wind power generation and storage solutions for private users. Beneficiaries will include private users – consumers, citizens – and the programme is expected to provide them with home wind power generators. The challenge is to stimulate and develop home solutions for small-scale, efficient wind energy generation and storage units.

Another innovative programme addresses the issue of **hydrogen storage**, and its goal is to develop, produce and demonstrate a hydrogen container for use in fuel cells for mobile applications.
According to the report "Hydrogen – the fuel of the future"[18], an estimated 2.5 m fuel cell electric vehicles (FCEV) will be in use globally by 2030. Global trends suggest enormous interest in hydrogen as an energy carrier. The Hydrogen Storage programme (with a total budget of PLN 32 m) aims to develop mobile hydrogen containers for the mobile market. The storage and use of self-produced hydrogen will considerably improve the energy safety of the country, while also driving revenues from hydrogen-related technologies such as the hydrogen storage container. Assuming that only 1% of FCEV containers will be based on Polish technologies, the potential profits from their sales can be as high as PLN 250 m[19]. Adding to this could be technology spillovers from energy storage itself (e.g. using hydrogen as storage of energy generated from RES), as well as revenues and savings from the use of a domestic energy source on a national scale.

18. "Hydrogen – the fuel of the future", Warsaw, October 2019
19. estimations based on data provided in the "Hydrogen – the fuel of the future" report, Warsaw, October 2019.

The **Bloki 200+ (Power Generation Units+)** is an initiative of NCBR designed to support research & development work in the area of energy. It aims to develop new technological, organisational and legal solutions to facilitate the adaptation of power generation units to the changing operating conditions and new challenges associated with the national energy system, increasingly relying on wind and solar energy. It is estimated that the number of 200 MWe units in use after 2021 will exceed 20. All of them will meet existing environmental requirements, as well as the more stringent requirements that the EU is planning to impose. Within this framework, Poland will be poised to apply Bloki 200+ solutions on a wide scale. The R&D work carried out under this programme has also attracted interest abroad. And as far as commercialisation is concerned, NCBR will be entitled to royalties – i.e. it will have the right to share in profits from the sales of commercialised solutions.

Poland's first programme designed to finance the development of solutions in the pre-commercial procurement model is called **e-Pionier (e-Pioneer)**.
It aims to stimulate the potential of talented programmers in expanding the use of digital solutions in public administration and the economy.

By the end of 2019 a total of PLN 38 m was provided to grantees as part of the e-Pionier programme, representing about 34% of the project's total value. Grantees spent these funds to provide professional support to 634 programmers who by the end of 2019, as part of interdisciplinary teams, delivered a total of 32 minimum valuable products (MVP) which addressed the socio-economic problems reported by public institutions. 20 MVPs have been commercialised and six of them were granted another round of funding. It is assumed that once the projects have been completed, with almost PLN 100 m provided to support programmers, the market will gain at least 700 programmers with professional preparation to run their own businesses and a minimum of 38 companies with the potential for commercialisation.

Such non-competitive programmes are geared towards delivering specific user outcomes. The above conservative estimations alone suggest that NCBR' projects have a considerable social, economic and financial potential.

VC FUNDS – MARKET CREATION

NCBR has also been present on the venture capital market, an important part of the innovation landscape. In Poland the market began to emerge after the political transformations of 1989. NCBR intervention and BRIdge Alfa and BRIdge VC programmes have contributed to building it. The years 2017–2018 proved to be a significant period for the VC market in Poland. Launched as part of Measure 1.3 SGOP, the BRIdge Alfa and BRIdge VC programmes have been the subject of multiannual evaluation studies commissioned by NCBR[20], providing insights into how the programme has changed and influenced the Polish VC market. The outcomes of the whole public intervention (which programmes like BRIdge are part of) in the VC market could be clearly seen in 2018. Relative to the pre-intervention period, there was an increase in the number of VC funds, including in particular public funds. A total of 130 funds were identified, with a capital of PLN 7.1 bn. This means that VC fund capital resource grew by 80% relative to end of 2017, a two-fold increase. Two major market support programmes recently launched as part of NCBR and PFR Ventures (and more broadly, as part of SGOP) helped new market players to emerge and attracted new private-market entities. As far as NCBR is concerned, at the end of 2018 there were 26 active BRIdge Alfa investment funds (they had already made 136 investments totalling PLN 201.7 m) and 47 funds which were launching their operations, as well as two funds from the BRIdge VC programme pilot.

With public money being present on the VC market, funds have been increasingly willing to venture into more risky projects, often carrying considerable innovation potential. Investment risk has been mitigated. Private and public funds have been coexisting on the market, without the former being "squeezed out" from the market by public capital.

20. results of the evaluation study "Assessment of the effectiveness of SGOP implementation by NCBR, the efficiency of project support and the identification of good practices under Measure 1.1 SGOP – Module II Assessment of NCBR's communication of its offering".

SUMMARY

The best way to predict the future is to create it.

PETER DRUCKER

NCBR's support brings measurable financial outcomes. In the case of the SGOP programme, it is estimated that each zloty invested will return 4 zloty[21]. NCBR's efforts have encouraged businesses to substantially increase their expenditures on innovative projects, contributing to a faster development of the R&D sector in Poland. Financial support from NCBR has brought about permanent changes in Polish businesses and research institutions.
Providing a full picture of Poland's innovation landscape is not an easy task. It is still difficult to estimate the financial outcomes of measures undertaken last year. The outcomes we are seeing now stem largely from previous work and implementation efforts. In conclusion, it might be useful to look at some of the trends.

Expenditures on innovative solutions and projects increased in 2019. They were financed from many sources, but funding from NCBR and other intermediary bodies provided particularly significant support and encouragement for businesses to engage in innovation, helping to build a market for innovations in Poland. Still, a large percentage of companies continue to be reluctant to undertake innovation efforts, and for a number of reasons. Some managers fail to notice the positive outcomes of such activities. What is important, especially now, is that business decisions also depend on the overall economic situation.
In this case positive market signals provide encouragement. Decisions to venture into innovative projects are usually taken by management or owners, although creative professionals play a role, too. Many Polish companies lack a culture of innovation. Changing the mind-set of many managers is clearly an important factor driving innovation. Science and business continue to struggle with establishing a strong and effective cooperation. While progress has been made in this respect, misunderstandings continues to be common on both ends.

NCBR has been consistently building an ecosystem of innovations to surround itself with. The grant programme portfolio is being constantly expanded, and innovative projects start to gain importance. NCBR has also been actively creating the VC market. NCBR is making increasing use of its data and knowledge resources to better shape and programme its offering. Also, a growing importance is being attached to studies which provide the picture of the needs, aspirations and problems of the innovation market.

In the current situation NCBR must shoulder special responsibility. Indeed, efforts to rebuild the crisis-hit sectors should rely heavily on innovative solutions.
While not being a remedy to all the effects of the unique pandemic situation, they certainly help businesses in staying on top of things when faced with

21. Study commissioned by SGOP Managing Authority: "The evaluation of the initial outcomes of SGOP support related to R&D work and the implementation of R&D results in businesses".

adversity, and in advancing rapidly under normal market conditions.
One important aspect of crating this innovation ecosystem will involve establishing closer ties with NCBR's partners. These include applicants, beneficiaries, as well as potential applicants and economic and trade organisations, and local governments. NCBR's role is to better understand their needs, and to identify new opportunities. Another step will be to expand the stakeholder information and communication system. Existing means of communication will be used in this process, such as social media, the Information Point and meetings with stakeholders. An important aspect will be to strengthen NCBR's position as a centre for knowledge and competence in innovation. Series of recurring webinars will be launched as part of the "NCBR online" project for all those eager to advance in the world of innovation, research and development.
New forms of competitions and their organisation will be employed to stimulate creativity and search for new solutions. Regular evaluations will facilitate quick response and adaptation to changes, bringing our offering in greater alignment with the needs of applicants and, most importantly, the economic and social challenges we are facing. Developing flexible financial support programmes and tools, supporting cooperation between business, research/academic and institutional communities dealing with innovation, and helping managers, scientists and staff to develop their skills and knowledge in the area of innovation will be key to making a qualitative change in the Polish innovation landscape. NCBR is facing great challenges. In 2019, it made a great step towards succeeding in its ambitious plans. Today, NCBR is an important part of the Polish innovation landscape.

This publication is part of NCBR's project aimed at investigating the impact of financial support on the development of the Polish innovation market. NCBR is working to produce a detailed study of this process.