DIGITISATION: ECONOMIC AND SOCIAL IMPACTS IN RURAL AREAS

NATIONAL POLICY ANALYSIS

POLAND

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National Policy Analysis | Poland

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Executive Summary

Poland is one of the countries in the region that, due to its digital potential, might be considered as the European Digital Challenger. The level of digitalisation, measured by fixed broadband coverage, Network Readiness Index (RDI) or Digital Economy and Society Index (DESI) in Poland is far lower than in the case of Digital Leaders from Northern and Western Europe. Both digital connectivity and digital skills continue to be a problem, with many of those with poor digital skills located in rural areas. Poor digital skills are associated with demographic factors such as age, disability status and gender which correspond with rural demographics. The COVID-19 pandemic increased the interest in use of digital public services in Poland, but as it was a general tendency in Europe, the gap remains.

Nonetheless, Poland has strong foundations to accelerate the digitalisation of its economy and everyday lives of Polish citizens. There are a few areas that should and that are addressed by government agencies in order for Poland to fully use its digital potential. Several policies and initiatives that have already been undertaken between 2014-2020 within the operational program Digital Poland ('Polska Cyfrowa'), i.e.: National Broadband Plan, National Interoperability Framework. As in the current EU programming period, 2021-2027, operational program Digital Poland is being continued, new policies are being implemented, i.e.: Digital Competence Development Program, Strategy for Responsible Development. They all focus on 1) developing digital skills and the use of digital tools by the entire Polish population, companies and the public sector, 2) increasing the number of ICT specialists and lifelong learning of employees, 3) supporting innovations, 4) providing legal, political and business environment for smart (rural) development.

Analysis presented in this report show that in recent years there has been a clear progress in Poland in terms of development of digital tools, open data or accessible public e-services that are well integrated digitally. However, although COVID-19 caused a higher demand for digital solutions in society, citizens with low levels of access or skills are continuously excluded, to an even higher extent, from key services.

1. Introduction

This report, framed according to the template designed for the DESIRA project, presents policies and initiatives undertaken between 2014-2020 or framed by goals of 2021-2027 EU perspective, relevant to digitalisation in Poland – both in general terms, i.e. operational program Digital Poland, Efficient and Modern State Development Strategy 2030 as well as focusing on rural areas and their smart development framed by digital infrastructure, tools and skills, i.e. Common Agricultural Policy cross-cutting objective on knowledge, innovation and digitalisation.

In the first part of the paper the current context for digitalisation in Poland is outlined, mainly focusing on the progress of digital infrastructure and connectivity levels as well as on the remaining digital divide between urban and rural areas. Many of those who lack in digital skills are located in rural areas. Poor digital skills are associated with a number of different demographic characteristics. Older people, women, people with low incomes and those with a disability are more likely to struggle with digital competencies. These demographic characteristics correspond with those often found in rural areas. This is a recurring theme for the policy analysis, which was carried out in the following part of our report.

The second chapter of the report is focused on national policies impacting the digitalisation of Poland. Although the policy framework seems somehow fragmented, with different policies targeting different aspects of the digital transformation of Poland, it is one of the priority issues, especially in terms of COVID-19 experiences. Open data infrastructure seems to be relatively well developing, both following European policy and as a focus of the Polish government. For agriculture and rural areas, data platforms exist in order to share data and provide access to government data.

Apart from European strategies, framing digitalisation of economy and social life implemented through national policies and programs in Poland, the agriculture and forestry sectors are poorly supported through innovation hubs. The main message of our report is that both the infrastructure and the use of digital technologies have improved in Poland, including rural areas in recent years. Nevertheless, there is still need for improvement in comparison with the rest of Europe. Remaining deficits regarding digitalisation relate to the topics of broadband coverage, education, networking of competencies and become the greatest challenges for the future.

In terms of the Next Generation EU (NGEU) Fund, Poland has laid out five components of the National Reconstruction Plan, which refers to the national priorities. These are: (1) resilience and competitiveness of the economy, (2) increase in green energy and decrease in energy consumption, (3) digital transformation, (4) effectiveness, availability, and quality of the healthcare system, (5) green and intelligent mobility. The plan was submitted to the European Commission on 1 June 2021 however it remains as not approved due to Poland's undermining the primacy of EU law.

2. Context for (rural) digitalisation

On 7 January 2014, Poland adopted a National Broadband Plan (NBP, 'Polska Szerokopasmowa'), aiming to fulfill the Digital Agenda for Europe (DAE) targets. It envisaged 100% coverage with 30 Mbps and 50% of households accessing broadband with 100 Mbps by 2020. Broadband infrastructure funding in Poland comes from both EU and state funds (State aid), as well as private investments. Between 2014-2020 EU monetary resources were available through the operational program 'Digital Poland' ('Polska Cyfrowa'), operated by the Digital Poland Project Centre (CPPC). Despite having completed a number of tasks in its NBP, Poland is still far from achieving goals 2 and 3 of the European Digital Agenda. **The main difficulties are related to geographic conditions that cause high costs in the developing of networks. In Poland there are many rural areas that are not attractive enough for operators to build up a solid business case for investment.** Another factor challenging the implementation of the NBP's objectives is the lack of adequate demand for very high-speed networks (over 100 Mbps) which is accounting for the lack of private investments. Poland has made significant progress on mobile broadband. **However, more investment is needed in fixed broadband, mainly in rural areas.** This could be financed from EU funds or State aid. Despite indications of increasing FTTP investments, there is a need for further intensive financing both from private investors and financial institutions. By combining funding from these sources with State aid funds, it is possible that Poland will improve its infrastructure and prepare itself for its digital future (Europe's Digital Progress Report – 2017).

According to the study on Broadband Coverage in Europe (BCE), designed to monitor the progress of EU Member States towards their specific broadband coverage objectives, in 2019 Poland was the country with the lowest overall fixed broadband coverage, far below the EU's average (97.1%) (Figure 1, Figure 3). Situation was even worse in terms of rural areas as Poland recorded the coverage of only 62.2% whereas the EU's average was 90% (Figure 2). Only few urban centers of Warsaw, Lodz, Poznan and Trojmiasto recorded fixed broadband coverage levels over 90%, which is still below the EU's average. There was no region to report fixed broadband coverage level below 60% and there was a significant improvement to mid-2018 as only one region (sandomiersko-jędrzejowski) was below 70%, compared to 13 such regions in a previous study (Figure 4).

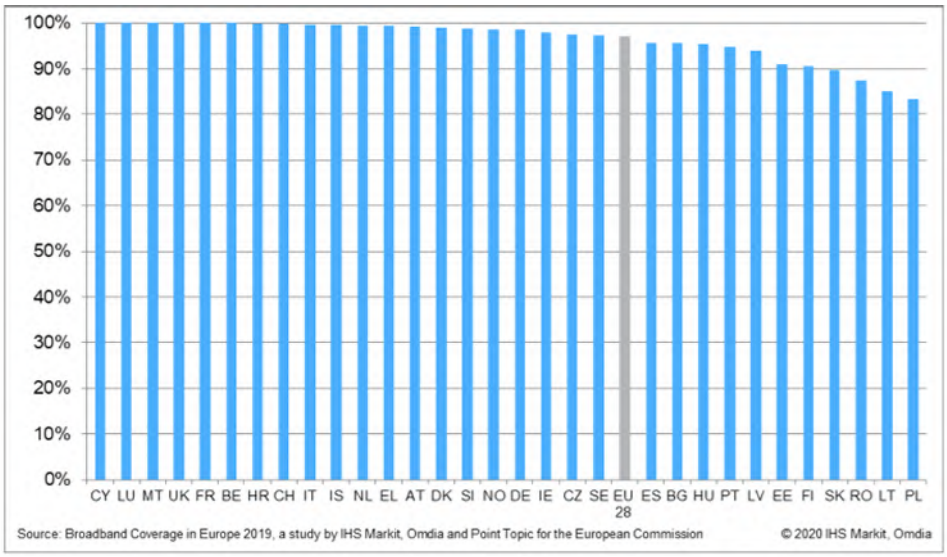


Figure 1. Overall fixed broadband coverage in Europe, by country.

Source: https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2019

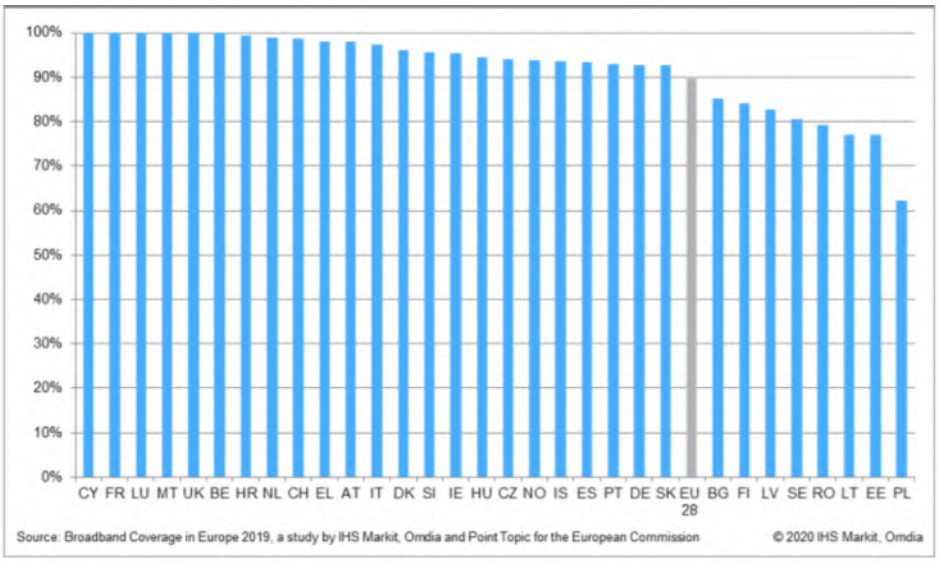


Figure 2. Overall fixed broadband coverage in rural areas of Europe, by country.

Source: https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2019

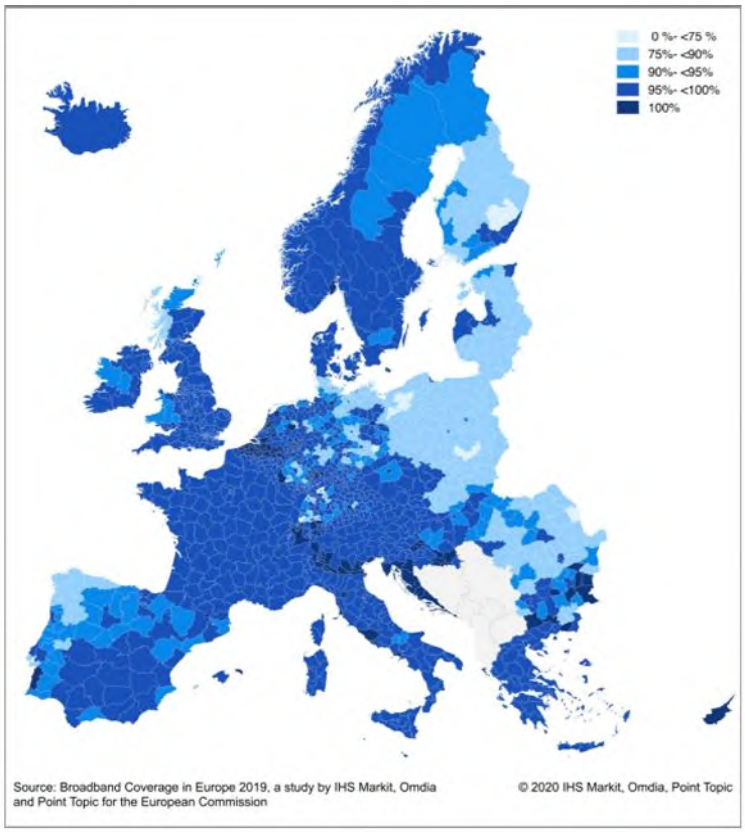


Figure 3. Overall fixed broadband coverage in Europe, by NUTS 3 regions.

Source: https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2019

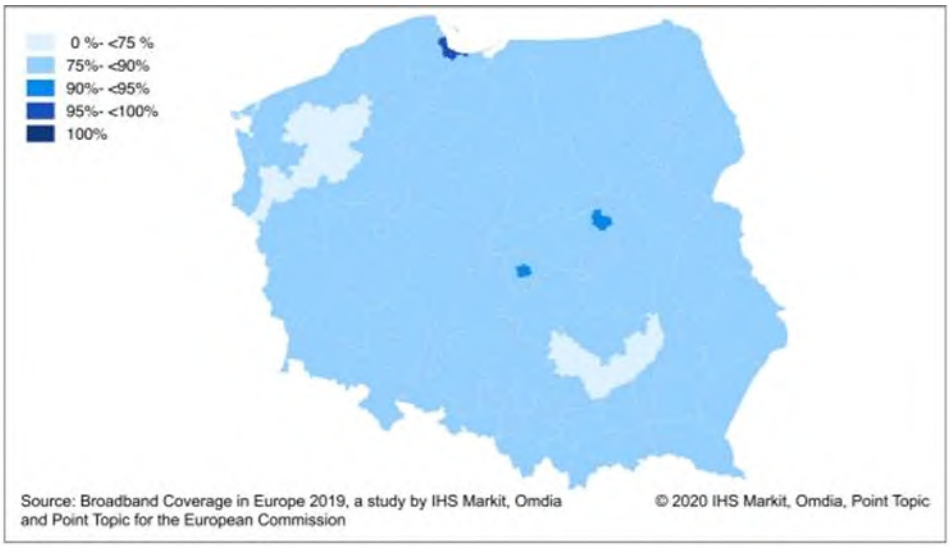


Figure 4. Overall fixed broadband coverage in 2019, in Poland, by NUTS 3 regions

Source: https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2019

Network Readiness Index (NRI). The Network Readiness Index (NRI) developed by the World Economic Forum is one of the leading global indices on the application and impact of information and communication technology (ICT) in economies around the world. In its latest version of 2020, the NRI Report maps the network-based readiness landscape of 134 economies based on their performances in four different pillars: Technology, People, Governance, and Impact (Figure 5). Each of these pillars is itself comprised of three sub-pillars that have been populated by a total of 60 variables.

Global NRI position of Poland: Poland ranks 33rd out of the 134 economies included in the NRI 2020. Its main strength relates to Governance. The greatest scope for improvement, meanwhile, concerns People and Technology. In terms of pillar performance, it has a score below the income group average in each of the four pillars. At the sub-pillar level, it outperforms high income countries in three of the twelve sub-pillars: Trust, Inclusion and SDG Contribution. Poland is ranked 24th within Europe. It has a score above the regional average in two of the four pillars: governance and impact.

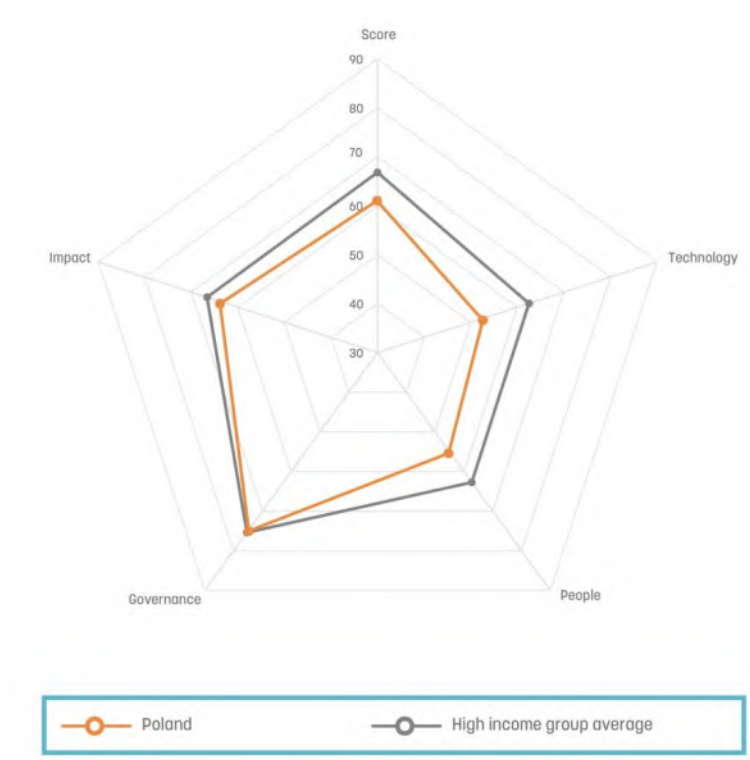


Figure 5. Global Network Readiness Index (RDI) for Poland in 2020.

Source: https://networkreadinessindex.org/countries/poland/

When it comes to sub-pillars, the strongest positions of Poland relate to Trust, Inclusion and Quality of Life, among others. More could be done, though, to improve the economy's performances in the Individuals, Governments and Future Technologies sub-pillars. With regard to sub-pillars, it outperforms the average in Europe in five of the twelve sub-pillars: Access, Trust, Inclusion, Quality of Life and SDG Contribution (Figure 6).

Figure 6. RDI sub-pillars for Poland in 2020.

Source: https://knoema.com/infographics/ljisicg/the-global-information-technology-report-country-profiles?country=Poland&origin=knoema.es

Digital Economy and Society Index (DESI). This is a composite index elaborated by the European Commission that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness. It attends to five different areas: Connectivity, Human Capital, Use of Internet Services, Integration of Digital Technology, and Digital Public Services.

Poland ranks 23rd out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020 (Figure 7). Based on data prior to the pandemic, Poland's score has increased in line with the EU average. Poland continues to have the highest mobile broadband take-up in the EU and very competitive prices. High scores in fixed very high-capacity network and 4G coverage improved its overall score in connectivity. The score in digital public services domain improved, but this has not translated into a change in its position. Poland improved its performance in using pre-filled forms, online service completion, and is an above-EU-average user of open data. However, its performance is offset by lower scores in integration of digital technology and use of internet services, which remain the most challenging areas. In particular, 15% of people in Poland are not yet online and nearly half still lack basic digital skills. The supply of ICT specialists and graduates is growing steadily, but it is still below the EU average. Polish businesses are in favour of using new technologies, a trend reflected in the increasing use of social media, electronic information sharing, and online selling. However, according to the Digital Intensity Index, 60% of companies have a very low level of digitalisation (EU: 39%), and only 11% are highly digitised (EU: 26%)

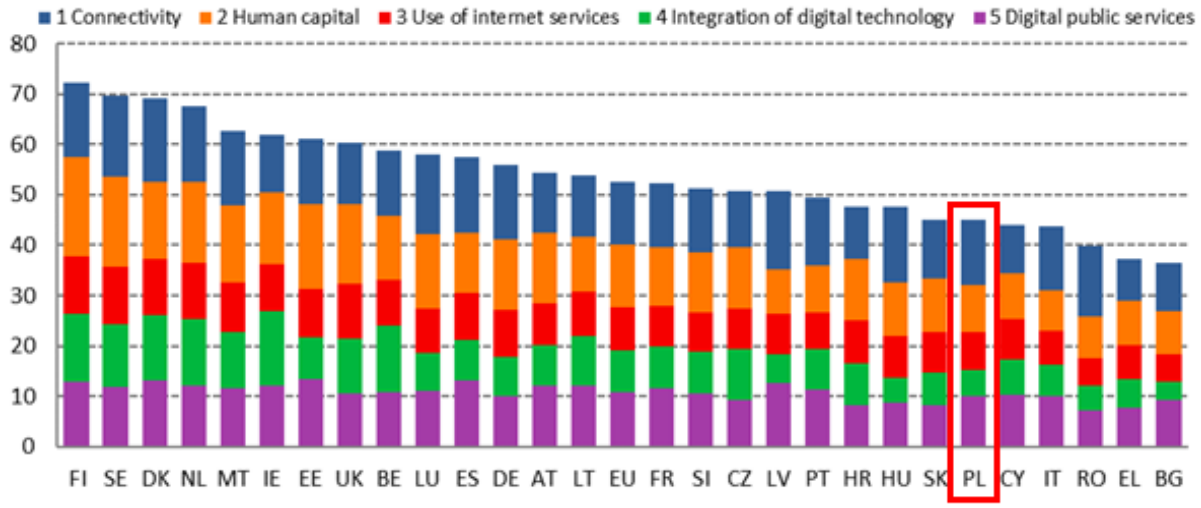
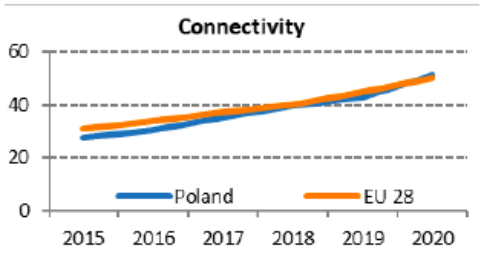


Figure 7. Digital Economy and Society Index (DESI) in 2020

Source: Digital Economy and Society Index (DESI) 2020. Poland, https://digital-strategy.ec.europa.eu/en/policies/desi-poland

Poland ranks 15th in the connectivity dimension of DESI. It has achieved significant progress on the fixed very high-capacity networks coverage (60% comparing to 29% one year earlier), thanks to both increase in FTTP deployment and upgrade of cable networks to DOCSIS 3.1. In both take-up of fixed broadband with speeds of at least 100 Mbps, and mobile broadband take-up, it achieves better results than the EU average. As regards mobile broadband take-up, Poland ranks first in the EU, with 176 subscriptions per 100 people. The Polish market boasts one of the lowest retail prices in the EU – it scores 81 on the broadband price index, compared with the EU average of 64. It remains slightly above the EU average in terms of average 4G coverage (99%) but is significantly below the EU average in terms of NGA broadband coverage (76%) (Figure 8).

1 Connectivity	Poland		EU
	rank	score	score
DESI 2020	15	51.3	50.1
DESI 2019	20	42.8	44.7
DESI 2018	18	39.4	39.9



	Poland			EU
	DESI 2018 value	DESI 2019 value	DESI 2020 value	DESI 2020 value
1a1 Overall fixed broadband take-up % households	61% 2017	60% 2018	62% 2019	78% 2019
1a2 At least 100 Mbps fixed broadband take-up % households	13% 2017	23% 2018	28% 2019	26% 2019
1b1 Fast broadband (NGA) coverage % households	65% 2017	66% 2018	76% 2019	86% 2019
1b2 Fixed Very High Capacity Network (VHCN) coverage % households	21% 2017	29% 2018	60% 2019	44% 2019
1c1 4G coverage % households (average of operators)	91% 2017	93% 2018	99% 2019	96% 2019
1c2 Mobile broadband take-up Subscriptions per 100 people	144 2017	163 2018	176 2019	100 2019
1c3 5G readiness Assigned spectrum as a % of total harmonised 5G spectrum	NA	0% 2019	0% 2020	21% 2020
1d1 Broadband price index Score (0 to 100)	NA	NA	81 2019	64 2019

Figure 8. Changing values of DESI connectivity dimension in Poland between 2018 and 2020

Source: Digital Economy and Society Index (DESI) 2020. Poland, https://digital-strategy.ec.europa.eu/en/policies/desi-poland

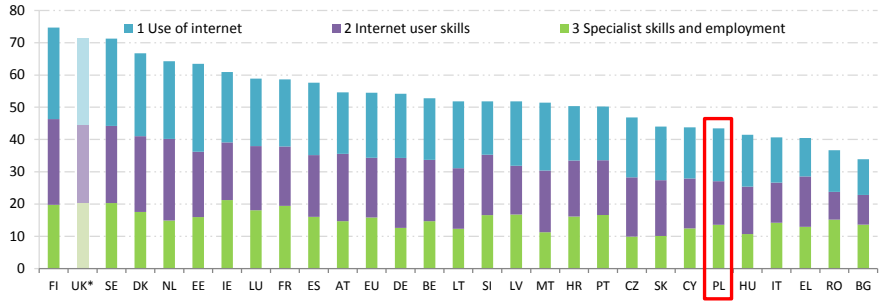
The **Women in Digital Scoreboard 2020**

Poland ranks 23ed with a score of 43.5 in the Women in Digital Scoreboard 2020 ranking. It is more than 10 p.p. below the EU average. The highest ranking in the subcategories is achieved in "Specialist skills and employment" with 20th place. Poland ranks 3ed with a score of 18.5 for indicator "STEM graduates" which represents number of females (16-74y) with a degree in a science, technology, maths or engineering-related subject per 1 000 inhabitants aged 20-29 years.

European Commission | **Women in Digital** Scoreboard 2020

Poland

Rank: 23, score 43.5 *(EU: 54.5)*



	Poland Women value	Poland Women rank	Poland Men value	EU Women value	EU Men value
1 Use of internet					
1.1 Internet users % individuals, 2019	78%	22	79%	84%	86%
1.2 People who have never used the internet % individuals, 2019	16%	22	15%	10%	9%
1.3 Online banking % internet users, 2019	60%	18	58%	65%	67%
1.4 Doing an online course % internet users, 2019	7%	19	6%	11%	11%
1.5 Online consultations or voting % internet users, 2019	7%	19	7%	12%	12%
1.6 e-Government users % internet users submitting forms, 2019	56%	18	52%	66%	68%
1 Use of internet Score (0-100)	49	22		60	
2 Internet user skills					
2.1 At least basic digital skills % individuals, 2019	43%	25	46%	56%	60%
2.2 Above basic digital skills % individuals, 2019	21%	25	22%	31%	36%
2.3 At least basic software skills % individuals, 2019	45%	25	48%	59%	63%
2 Internet user skills Score (0-100)	41	25		55	
3 Specialist skills and employment					
3.1 STEM graduates Per 1000 individuals aged 20-29, 2018	18.5	3	23.3	14.3	26.3
3.2 ICT specialists % total employment, 2019	1.0%	24	4.8%	1.6%	6.2%
3.3 Unadjusted gender pay gap % difference in pay, 2018	29%	27		18%	
3 Specialist skills and employment Score (0-100)	41	20		48	
Women in Digital Index Score (0-100)	43.5	23		54.5	

Notes:

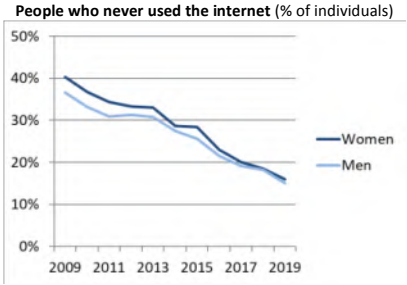
**As the figures refer to 2019, the United Kingdom is still included in index and EU averages are calculated for 28 Member States*

Unadjusted gender pay gap: EU average estimated based on Eurostat data.

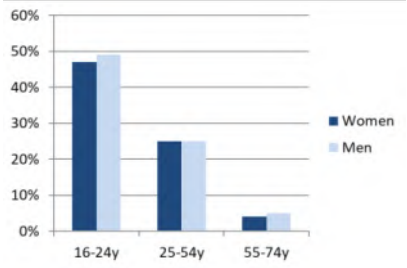
Data source: Eurostat

For the definitions and the methodology please consult the Methodological note.

People who never used the internet (% of individuals)



Above basic digital skills by age and gender
(% of individuals)



Female ICT specialists (% of total)

3. Policy framework for (rural) digitalisation

3.1. European Digital Policies

Between 2014-2020 Poland invested EU funds to boost levels of digitalisation by implementing projects under the operational program 'Digital Poland' ('Polska Cyfrowa'). The program was operated by the Digital Poland Project Centre (CPPC). Although successful in many tasks, Poland is still far from achieving goals 2 and 3 of the European Digital Agenda. Reasons for such situation are related to geographic conditions, especially of remote and dispersed rural areas which are not attractive enough for operators to build up a solid business case for investment. Another factor challenging the implementation of 'Digital Poland' objectives was the lack of adequate demand for very high-speed networks (over 100 Mbps) causing the lack of private investments.

Under the recent programming period of EU, the policy program: "A path to the digital decade" aims to set up a governance framework to help achieve the 2030 digital decade targets – communicated to the wider public as "The digital compass". These are: 1) a digitally skilled population and highly skilled digital professionals; 2) secure and sustainable digital infrastructures; 3) digital transformation of businesses; 4) digitalisation of public services. The framework will be based on projected trajectories and annual cooperation between the Commission and Member States.

The Commission would first develop projected EU trajectories for each target, to track progress towards the targets. In turn, the Member States would define national projected trajectories, where possible, and propose national strategic roadmaps, outlining their plans, to attain them. Progress along EU and national trajectories would be assessed yearly.

3.2. National Policies boosting digitalisation

3.2.1. National Digital Agenda or similar strategies

Poland finalised a new strategy, the Digital Competence Development Program (*Program Rozwoju Kompetencji Cyfrowych*), which targets development of digital skills and is coordinated centrally by the Ministry of Digital Affairs. The new Program will focus on digital skills needed by citizens, ICT specialists and for employees of SMEs and public administration. The Program is expected to be adopted by the Council of Ministers in the first half of 2020. The new Operational Program Digital Poland for 2021-2027, co-funded by European Regional Development Fund, is also being prepared. The strategy will include among others support for broadband infrastructure, e-services (e-government and e-health), basic and advanced digital skills, upskilling and re-skilling and skills needed for the future.

In order to address the difficulties with broadband roll-out, a number of amendments to the so-called 'Megaustawa' ('Mega-law') were adopted in 2019. These amendments include provisions creating a new Broadband Fund (budget of PLN 140 million, or approximately €33 million) to provide parallel or complementary support, from 2021, for actions financed under the country's operational Program

Digital Poland (POPC). Other amendments to the Megaustawa address the bottlenecks that have been preventing application of the Broadband Cost Reduction Directive (BB CRD). Those amendments include: better mapping of the existing infrastructure (including fibre and other cable networks; data will have to be provided twice a year starting in 2022), facilitation of permits (significantly lower fees applicable to all local authorities) and amended rules for access to buildings. Poland has also finally adopted an updated national broadband plan (on March 10th 2020), which reflects the gigabit society goals and includes actions regarding 5G implementation, foreseen in the '5G Strategy for Poland'. In addition, despite its efforts, Poland is still far from achieving goal 2 of the Digital Agenda for Europe (connectivity of 30 Mbps or more for all citizens by 2020). The main difficulties are still related to the geographical conditions that raise the cost of network deployment.

Overall, Poland adopted a number of regulatory measures in 2019 to facilitate broadband roll-out and to prepare for spectrum assignment in view of deploying 5G networks. Nevertheless, 5G deployment may be delayed in non-urban areas, mainly due to postponed assignment of spectrum in the 700 MHz band and the overall uncertain future of its use. Poland continues to face difficulties in achieving the 2020 EU objectives despite the efforts it has made. The Polish market would benefit from more regulatory certainty, especially for 5G planning, ensuring timely market reviews and resolving long-standing issues related to a number of regulatory decisions.

3.2.2. Other policies and strategies influencing (rural) digitalisation

The Strategy for Responsible Development for the period up to 2020 (including the perspective up to 2030)

The Strategy for Responsible Development until 2020 (with a perspective until 2030) was adopted by the Polish Council of Ministers on February 14, 2017. It is a binding, key document of the Polish state in the area of medium- and long-term economic policy. The Strategy includes recommendations for public policies. It is also the basis for other strategic documents concerning development management (strategies, policies, programs).

The Strategy lists specific objectives:

I. Sustainable economic growth increasingly based on knowledge, data and organisational excellence

II. Socially sensitive and territorially sustainable development

III. Effective state and institutions for growth as well as social and economic inclusion

Within the framework of the Strategy, areas influencing the achievement of the objectives of the Strategy have also been indicated. One of them is **digitisation.** Within this area, the following directions of activities were indicated:

- development of a modern digital network (including supporting the development and modernisation of ICT and telecommunications infrastructure, **in particular in rural areas**),
- data security (including creating a lifelong education model that takes into account the needs of the digital economy)

- building the information society (including support addressed to groups with different levels of digital competences, with particular emphasis on activities for **digital inclusion**)

In order to achieve these goals, the following strategic projects have been prepared:

1. National Broadband Plan
2. Integrated System of Ongoing Cyberspace Security Management of the Republic of Poland
3. Competences in the information society
4. Public Open Data
5. Nationwide Educational Network

National Strategy for Regional Development 2030

The main goal of the 2030 National Strategy for Regional Development is the effective use of the internal potentials of territories and their specialisations to achieve sustainable development of the country, which will create conditions for increasing the income of Polish residents while achieving social, economic, environmental and spatial cohesion. Therefore, it specifies the specific objectives of the Responsible Development Strategy.

The Strategy recognises that **digitisation is the basic factor stimulating citizens' access to services along with the resulting economic and social benefits. Therefore, the strategy sets the directions for the development and modernisation of the ICT and telecommunications infrastructure and assumes the creation of a modern electronic communication infrastructure with the implementation of next-generation wireless networks (5G).**

Moreover, the Strategy defines tasks to be performed as part of further computerisation of the economy and increasing the network capacity. Its priority is to provide broadband access to the Internet to the widest possible group of recipients as part of strengthening the development opportunities of areas at risk of permanent marginalisation.

Regarding the challenge of providing human resources for a modern economy, it will be crucial to increase the proportion of people with basic digital skills. Digital education is to enable citizens to use new IT solutions to facilitate the implementation of administrative procedures, and entrepreneurs to acquire employees ready to act in new economic realities.

Activities aimed at modern digital technologies in the development processes of regions

- development of economic innovations and information and communication technologies;
- increasing digital accessibility, quality and efficiency of public services;
- construction of next-generation wireless networks;
- implementing the concept of a smart city and village using the latest technologies and open data;

- creating the information society by reducing the phenomenon of digital exclusion and developing digital skills at every level.

Additionally, it is worth mentioning the activities of the Ministry of Digital Affairs which, in order to provide a legal environment for the implementation of digital solutions, started to prepare a **Digital Code** that will regulate all the issues related to broadly understood informatisation, today scattered in various legal acts. It is assumed that the Digital Code will, among others, establish an institutional system for managing digitisation processes in the public sphere, define the key elements of the national information infrastructure, introduce basic rules governing the provision of public electronic services and establish rules aimed at ensuring broadly understood security of public services and data protection. It will also legitimise the use of the digital by default principle in the implementation of state tasks for citizens and ensure a more complete application of the once-only principle. Priority will be given to solutions that ensure settling issues and communicating with the public administration via mobile devices.

In addition, the Ministry of Digital Affairs is working on the following documents that may incentivise digital innovations:

- Operational Program in the area of Digitisation for 2021-2027 - developed in cooperation with the Ministry of Funds and Regional Policy; it will constitute, similarly to the Operational Program Digital Poland 2014-2020, a source of funding for I.e. development of broadband networks, digital competence development, projects ensuring cyber security,
- the new version of the Program for Opening Public Data - which is intended to help stimulate the reuse of open public data, including in innovation and modern technologies,
- the policy for the development of Artificial Intelligence in Poland from 2020 - which aims to build a strong internal market for the construction of AI solutions in Poland by increasing the use of artificial intelligence by Polish companies and administration.

Table 1: National Policies

Ministry / Authority	Policy	Objective	Expected Impact
Ministry of Digital Affairs	Digital Competence Development Program	Improvement of digital skills needed by citizens, ICT specialists, employees of SMEs and public administration	Digital skills on EU average level
	Operational Program Digital Poland for 2021-2027	Support for broadband infrastructure, e-services (e-government and e-health), basic and advanced digital skills, upskilling and re-skilling	Fixed broadband coverage in Poland and digital skills of citizens on EU average level

		and skills needed for the future	

3.2.3. Policies and strategies to boost digital literacy and tackle the digital divide

In order to boost digital literacy and tackle the digital divide there are many initiatives undertaken by both state and private institutions. Their main aim is to counteract digital exclusion and eliminate causes of the digital divide.

Digital skills are covered under the third priority, 'Digital competences of society' of the Operational Program Digital Poland for 2014-2020, co-funded by the European Regional Development Fund. As part of this program, as many as 191 projects devoted to the development of digital competences for children, adolescents, adults and the elderly were implemented. These projects were both local, regional and nationwide. Additionally, the follow-up of the Operational Program Digital Poland for 2021-2027 is being prepared. It will include support for broadband, e-services (e-government and e-health), digital skills, upskilling and re-skilling and skills needed for the future.

Poland finalised preparation of a new Digital Competence Development Program (*Program Rozwoju Kompetencji Cyfrowych*), which targets development of digital skills, coordinated centrally by the Ministry of Digital Affairs. It will focus on digital skills needed by citizens, ICT specialists and for employees of SMEs and public administration.

IT Talent Development Program for 2019-2029

Program initiated by the Ministry of Digital Affairs in 2019. The goal is to manage IT talents and reduce the labour gap in the IT sector. The Program consists of two paths: (*i*) championships in algorithmic and programming; and (*ii*) championships in designing computer games. During the Program, 10,000 pupils and 1,500 teachers will receive dedicated support (training, workshops and webinars).

Campaign "E-Pole can do it!"

The campaign is part of the project "Educational and information campaigns for the dissemination of the benefits of using digital technologies", which is implemented jointly by the Ministry of Digitisation, Scientific and Academic Computer Network - National Research Institute and the Copernicus Science Center since 2017 (the Copernicus Science Center joined in 2020). The campaign aims to promote the use of technology in everyday life by people of all ages, overcome the related barriers and increase the digital competences of the society. It focuses on four main areas:

(1) quality of life:

Aim: Increasing the possibility of using and raising citizens' awareness of:

- using e-services,
- use of cultural goods and entertainment
- use of educational materials

- communicating with other people

(2) public e-services:

Aim: Building trust and positive attitudes towards e-services and increasing citizens' skills in using public e-services and e-administration

(3) cyber security

Aim: Increasing awareness of:

- the risks associated with using the Internet,
- the importance of personal data protection,
- the risks for children related to their online activity

(4) coding

Aim:

- increasing citizens' awareness of the benefits of learning programming among schoolchildren in terms of opportunities on the labour market
- encouraging parents to motivate and support their children in learning to program
- encouraging the organisation of initiatives under CodeWeek (initiative of the Ministry of Digital Affairs)

Some examples are included in Table 2:

Table 2: Programs and initiatives addressing digital literacy and digital divide. (*) International, National, Regional or Local

Initiative	Objective	Key words	Period	Area of impact	Link	Public / Private	Scale of action *	Rural / General
IT Talent Development Program for 2019-2029 (Program Rozwoju Talentów Informatycznych na lata 2019-2029)	The main goal of the program is to support the development of mathematical and IT talents and young people with special abilities in the field of computer game design. During the Program, 10,000 pupils and 1,500 teachers will receive dedicated support (training, workshops and webinars).	game development, game design, digital skills of young people,	2019-2029	Poland	https://www.gov.pl/web/cyfryzacja/rusza-program-wsparcia-mlodych-talentow-informatycznych	Public	National	G
Lesson: Enter (Lekcja: Enter)	It is the biggest, nationwide digital education project in Poland addressed to school teachers and schools. Its main goal is to prepare and encourage teachers to use available dedicated digital content and tools more often in their everyday work. It aims to train 75,000 teachers (approximately 15% of all teachers in Poland) within 4 years period (2019-2023).	digital skills, e-learning, schools	2019-2023	Poland	https://lekcjaenter.pl/o-projekcie/projekt-lekcja-enter	Private/Public	National	G
IT Master Centre (Centrum Mistrzostwa Informatycznego	The aim of the project is to increase the competences of the teaching staff, i.e. people conducting extracurricular activities developing IT interests, as well as activating IT-talented youth, stimulating creativity and promoting team cooperation within IT science school clubs.	digital skills of young people, schools	2018-2023	Poland	https://cmi.edu.pl/mod/page/view.php?id=1	Public	National	G
Campaign "E-Pole can do it!" (Kampania "e-Polak potrafi!")	The main goal of the project is to increase awareness and skills in the use of information and communication technologies by Polish citizens in four main areas: quality of life (1), public e-services (2), cyber security (3), coding (4).	digital literacy, cyber security, e-services, e-inclusion	2018-2020	Poland	https://www.gov.pl/web/cyfryzacja/cyfrowe-kompetencje-spoleczenstwa	Public	National	G
E-Leader as an opportunity to counteract digital exclusion for the inhabitants of the communes of Moszczenica Ujazd, Będków, Czarnocin	The main objective of the investment is to reduce the currently very high level of digital exclusion in the municipalities of Moszczenica, Ujazd, Będków, and Czarnocin, by implementing a project and building a broadband network allowing access to the Internet for digitally excluded people	broadband network, digital divide, digital exclusion	2018, 2019	Łódzkie Voivodship	http://www.eleader.moszczenica.eu/	Public	Regional	R

3.2.4. Policies and strategies that incentivise digital innovations

Operational Program Digital Poland for 2014-2020

The Operational Program Digital Poland for 2014-2020 was published in 2014 by the Ministry of Funds and Regional Policy. It was created in response to the recommendations of the Council of the European Union on the Polish National Reform Program of 2013 and containing the Council's opinion on the Convergence Program presented by Poland for 2012-2016, as well as in coherence with such European documents as the Europe 2020 Strategy and the European Strategy Digital Agenda. **Its primary goal is to strengthen the digital foundations for the country's development**. These foundations are considered to be: broad access to high-speed internet (1), effective and user-friendly public e-services (2) and the constantly growing level of digital competences of the society (3). The main directions of support will be the development of broadband networks and the improvement of the quality and efficiency of public services through their digitisation.

Under this program, the following priority axes and specific objectives have been distinguished:

I. Universal access to high-speed internet
   - Eliminating territorial differences in the ability to access broadband Internet with high capacity

II. E-government and open government
   - High availability and quality of public e-services
   - Digitisation of back-office processes in government administration
   - Digital accessibility and usefulness of public sector information

III. Digital competences of society
   - Increasing the degree and improving the skills of using the Internet, including public e-services

IV. Technical Support

V. Digital development of local government units and strengthening digital resilience to threats (The entire priority axis V is dedicated to the REACT-EU instrument)

Although the program itself is not specifically targeted at rural areas, it draws attention to the problem of digital exclusion in the diagnosis part. Many of the projects implemented under this program also apply to rural areas, especially in terms of the implementation of the objectives of Axes I and III. Currently, the Program European Funds for Digital Development 2021-2027 has already been initiated, which is a continuation of the Digital Poland Operational Program 2014-2020 and **is the next stage of the digital transformation of the country.** Its goals include building a gigabit society in Poland, providing advanced e-services allowing for fully electronic settlement of citizens and entrepreneurs

matters (4th and 5th degree of e-maturity of services) and development of cooperation for the creation of digital solutions to socio-economic problems.

Table 3: Policies influencing digitalisation in rural areas

Initiative	Brief Description	Objectives	Area of impact	Period of implementation	Budget (if any)	Public / Private	Are rural areas specifically mentioned or addressed? Y/N	Link
Digital Poland Operational Program ("Program Polska Cyfrowa")	It is a national operational program financed by the European Regional Development Fund. The program implementation area covers the entire territory of Poland, ie 15 regions classified as less developed, and Mazovia as a more developed region with a special status resulting from the framework regulation, as a former underdeveloped region.	The program aims to strengthen the digital foundations for the country's development. These foundations are: broad access to high-speed internet, effective and user-friendly public e-services and the constantly growing level of digital competences of the society.	National	2014-2020	~ 2 172 500 000 EUR	Public	N	https://www.polskacyfrowa.gov.pl/media/102878/POPC_2021_REACTEU_11082021.docx
Strategy for Sustainable Development of Rural Areas, Agriculture and Fisheries 2030 ("Strategia Zrównoważonego Rozwoju Wsi, Rolnictwa i Rybactwa 2030")	It is the basic strategic document of the agricultural policy and rural development of the state presenting the goals, directions of intervention and actions that should be taken in the perspective of 2030.	The main goal is to define the key directions of rural development, agriculture and fisheries in the perspective to 2030	National	2020-2030	-	Public	Y	https://www.gov.pl/attachment/5473c321-ae03-471d-b25d-8473a00fda8f
"Efficient and Modern State" Strategy 2030 ("Strategia Sprawne i Nowoczesne Państwo 2030")	The strategy indicates the principles of providing access to a wide range of public administration services by electronic means and the use of standardised and interoperable IT solutions in all areas of the state's functioning. Particular attention was paid to the digital transformation of public administration.	The main goal of the Efficient and Modern State 2030 Strategy is an efficient and modern state serving citizens, the environment and the economy.	National	2020-2030	-	Public	Y	https://www.gov.pl/web/ia/strategia-sprawne-i-nowoczesne-panstwo-2030-ssnip2
Rural Development Program 2014-2020 ("Program Rozwoju Obszarów Wiejskich 2014-2020")	Rural Development is the second Pillar of the Common Agricultural Policy, providing Member States with an envelope of EU funding to manage	The main objective of the Rural Development Program 2014-2020 is to improve the competitiveness of agriculture, sustainable	National	2014-2020	13 612 211 428 EUR	Public	Y	https://www.gov.pl/attachment/1ed71aba-447c-4363-a411-061b0016a429

	nationally or regionally under multi-annual, co-funded Programs.	management of natural resources and climate action, and balanced territorial development of rural areas.						
National Strategy for Regional Development 2030 (“Krajowa Strategia Rozwoju Regionalnego 2030”)	The National Strategy of Regional Development 2030 is the basic strategic document of the state's regional policy until 2030. The Strategy recognises that digitisation is the basic factor stimulating citizens' access to services along with the resulting economic and social benefits. Therefore, the strategy sets the directions for the development and modernisation of the ICT and telecommunications infrastructure and assumes the creation of a modern electronic communication infrastructure with the implementation of next-generation wireless networks (5G).	The main goal of the 2030 National Strategy for Regional Development is the effective use of the internal potentials of territories and their specialisations to achieve sustainable development of the country, which will create conditions for increasing the income of Polish residents while achieving social, economic, environmental and spatial cohesion.	National	2020-2030	-	Public	Y	https://www.gov.pl/web/fundusze-regiony/krajowa-strategia-rozwoju-regionalnego
The Strategy for Responsible Development for the period up to 2020 (including the perspective up to 2030) (“Strategia Odpowiedzialnego Rozwoju”)	The Strategy determines basic conditions, objectives and directions for the country development in social, economic, environmental and spatial terms in the perspective of 2020 and 2030. The strategy recognises the use of digital technologies, and in particular connectivity via high-speed networks telecommunications, will be a condition for the improvement of the situation in each area of the Strategy.	The main goal of the strategy is to create conditions for the growth of incomes of Polish residents with a simultaneous increase in social, economic, environmental and territorial cohesion.	National	2020-2030	-	Public	Y	https://www.gov.pl/documents/33377/436740/SOR.pdf

3.3. Contributions from the Structural and Investment Funds and the Cohesion Policy

Poland keenly invests in digital technologies through EU-coordinated programs. It is a member of the EuroHPC Joint Undertaking. It participates in PRACE (Partnership for Advanced Computing in Europe) and the PIONIER-LAB - National Platform for Integration of Research Infrastructures. It is an active member of the European Blockchain Partnership Policy Group.

Poland launched extensive work on the Artificial Intelligence Development Policy for 2019-2027. Its goal is to enter a narrow group of 20-25% of countries building Artificial Intelligence (AI) and increase investments, coordinate research funding and monitor the impact of AI on the labour market. The policy will also be a part of the Polish Strategy of Productivity as well as of the Strategy of the Efficient State 2030. The new Cybersecurity Strategy of the Republic of Poland for 2019-2024 (replacing the previous strategy for 2017-2022) aims to increase the country's resilience to cyber-attacks and improve data protection. Development of the National Cyber-security System, expanding its cyber-threat information exchange and enhancing coordination are key elements of the new strategy.

The National Centre for Research and Development announced the 'Infostrateg' - a project in the area of advanced information, telecommunications and mechatronic technologies. It will support high-budget research and development in many strategic areas ranging from image processing (satellite imagery) to IT methods in personalised medicine, diagnostics, therapy and chemoinformatics. Additionally, the 'Program with PO WER' (Programuj z PO WER) offers dedicated programming loans (455 loans of up to €4,250 per participant) for workshops and training. The loans are available for people outside of the IT industry and interested in upskilling and reskilling.

The Industrial Development Agency (Polski Fundusz Rozwoju) supports the start-up ecosystem through various projects. The flagship Program, 'Start in Poland', creates favourable conditions for start-ups at every stage of their development. It is the largest Program for start-ups in Central and Eastern Europe, with an estimated future creation of 1,500 innovative start-ups within 7 years. Meanwhile, the Open Innovation Network supports the purchase of licences and technology for enterprises. The Poland Prize Program is the first Polish Program focusing on foreign start-ups. The Polish Development Fund, a 'fund of funds', offers financing to innovative start-ups through venture capital funds or business angels. SMES and scientific units are also allowed to apply for 'Innovation Vouchers for SMEs' (Bon na innovacje).

Beefing up support for new digital and innovative business models and further encouragement to digitise would help to increase productivity, enable SMEs to achieve more efficiency and boost their competitiveness. Structural Funds and Cohesion Policy provide funding for different initiatives to boost digital transition.

3.3.1. Broadband infrastructure

On 7 January 2014, Poland adopted a National Broadband Plan (NBP, 'Polska Szerokopasmowa'), aiming to fulfill the Digital Agenda for Europe (DAE) targets. It envisaged 100% coverage with 30 Mbps and 50% of households accessing broadband with 100 Mbps by 2020.

In 2020, the government passed amendments to Poland's National Broadband Plan, which has been adjusted to meet the EC's new e-communication targets. The plan foresees a fully developed 5G network in major Polish cities by 2025, with options of extending capacities of 100 Mb/s and over to capacities measured in Gb/s. Capacities of at least 1 Gb/s will be guaranteed for schools, transport hubs and public service points.

Poland's national broadband plan targets are fully harmonised with the targets set by the European Commission's Digital Agenda for Europe (DAE) and set sight on Gigabit Society targets. The Strategy of the Office of Electronic Communications (UKE) describes the priority areas for activities of the regulator in the telecommunications and postal markets. The Act on supporting development of services and telecommunication networks delivers the legal environment for the faster, more cost-efficient roll-out of next-generation networks. The Operational Program Digital Poland 2014-2020 provides funding for investments in digitally excluded areas. A multi-stakeholder Agreement for the Strategy 5G for Poland has been formed to respond to challenges, identify and implement measures aiming at coverage by 5G networks.

Responsible authorities:

- The Department of Telecommunications of the Ministry of Digital Affairs (Ministerstwo Cyfryzacji), a policy maker, supports the development of telecommunication networks and services, coordinates the construction of broadband networks and co-operates with international telecommunication organisations.
- Digital Poland Project Centre (Centrum Projektów Polska Cyfrowa) is responsible for spending structural funds, i.e., organising calls for proposals under the Operational Program Digital Poland (Program Operacyjny Polska Cyfrowa 2014-2020, POPC) funding broadband network development.
- The Ministry of Funds and Regional Policy is responsible for implementation of European Funds and regional development. The Department for Digital Development (Departament Rozwoju Cyfrowego) deals with digitalisation and e-government.
- The Office of Electronic Communications (Urząd Komunikacji Elektronicznej, UKE) is the national regulatory authority for the market of telecommunications and postal services.

Poland's national broadband plan was adopted in January 2014 and updated in 2020. Poland's national broadband plan foresees that 100% of households and companies should have access to internet connectivity of at least 30 Mbps until 2020, and that 50% of households and companies use

internet connectivity of at least 100 Mbps by 2020. Furthermore, additional objectives of the plan are aligned with those of the Gigabit Society. The national broadband plan mainly focuses on promoting broadband investments and expansion through initiating regulatory, legal and financial measures.

Poland has adopted a Program for Nationwide Education Network (Ogólnopolska Sieć Edukacyjna), which aims at providing all schools in Poland (circa 19.500 locations) with free of charge access of at least 100 Mbps, along with advanced cybersecurity measures and educational e-resources/e-tools.

Poland has also established an Agreement for the Strategy 5G for Poland as a multi-stakeholder platform, gathering entities from central and local governments, telecom operators, research institutions, technical universities and tech suppliers, working in different thematic teams for the development of 5G networks in Poland.

Main measures for broadband development:

- The Act of 16 July 2004 (Telecommunications Law) and the Act of 7 May 2010 (Act on supporting development of services and telecommunication networks, known as the MEGA-act) have been passed in order to support the development of broadband networks in Poland.
- The 2016 revision of the MEGA-act implemented Cost-Reduction Directive and envisages further broadband-oriented measures.
- The Office of Electronic Communications (UKE) offers models of building broadband networks for local governments, providing direct services and making infrastructure accessible for new providers. In addition, it aims at reducing administrative burdens for telecommunication operators and public authorities. The UKE supports the development of broadband networks, i.e. by providing access to properties and buildings, while assuring as much infrastructure sharing as possible between telecom operators.
- The Office of Electronic Communications' annual infrastructure inventory and the Ministry of Digital Affairs' open public consultations help identify the areas (down to individual addresses) with no NGA access on a commercial basis within the next 3 years.

National and regional broadband financial instruments:

- Under the financial perspective 2014-2020, the dedicated Operational Program (OP) Polska Cyfrowa (Digital Poland) includes funding for broadband. The overall budget for the OP Digital Poland is EUR 2.57 billion, of which more than EUR 1 billion is dedicated to broadband.
- Under the thematic objective Universal access to high-speed Internet, more than 1.3 million households and almost 10 000 schools will be provided with Next Generation Access (NGA).

- Access to services related to the Nationwide Education Network is financed by state budget (circa EUR 310 million by 2027). The implementation phase (2018-2020) is also co-financed by the OP Digital Poland.

3.3.2. Digital Public Services

The Strategy for Responsible Development and the Integrated State Digitalisation Program (PZIP) lays down the basis for the digitalisation of public administrations. After recent reviews, the PZIP will focus more on modernisation and on improving the quality of the administration's relations with the public.

Following the migration of governmental websites to one portal *gov.pl*, all websites of ministries, four voivodships. Additionally, the 'My gov' functionality, a newly-added intuitive user panel, allows access to e-services and data contained in public registers. The user dashboard includes 'My inbox' for exchanging messages between the public administration and the public. There is also 'My electricity' for submitting co-financing applications for photovoltaic micro-installations. Setting up a business is also becoming easier and faster. The biznes.gov.pl website is in the process of combining functionality with CEIDG(26) and 12 thematic websites were migrated. 27), which will enable further simplifications.

The Polish Council of Ministers adopted the 'Common IT Infrastructure of the State' Initiative. It will focus on the development, maintenance and management of the government cloud and facilitate purchases of public cloud computing services.

The 'Trusted Profile' (*Profil Zaufany*), which can confirm user identity on the internet and submit a trusted signature, reached 4.5 million users in 2019. The Ministry of Foreign Affairs launched its e-Election registration system service (*e-Wybory*). Voters receiving a voting card for elections to the European Parliament, as well as to the Sejm and Senate of the Republic of Poland, could authenticate their identity using the mCitizen (mObywatel) mobile application.

In 2019, the Ministry of Digital Affairs started implementation of the project Open Data Plus (Otwarte Dane Plus). It aims to increase the quantity and quality of open public data and further data reuse. The Ministry also continues its cooperation with the National Centre for Research and Development (NCBR) on the CyberSecIdent Program – Cybersecurity and E-Identity. The goal of CyberSecIdent is to raise the level of security of Polish cyberspace by increasing the availability of hardware and programming tools by 2023. Poland has signed the Declaration on Quantum Communication Infrastructure facilitating Quantum Key Distribution (QKD). QKD aims to secure European infrastructure, a backbone of Europe's Quantum Internet.

Poland finalised work on a new ID card, enabling electronic identification with a high level of security. All ID cards issued from March 2019 contain a special electronic layer in the form of a chip. Users can identify themselves online and sign electronic documents. Moreover, e-delivery services and the Electronic Address Database (Baza Adresów Elektronicznych - BAE) are also underway. All users will

be able to search in BAE for the electronic delivery address of public bodies and entrepreneurs. Public bodies will be able to additionally search for the addresses of citizens.

The Ministry of Health continues to pursue digital projects to further transform healthcare in Poland. It has successfully implemented national e-prescription (mandatory from January 2020), piloted e-referral (mandatory from January 2021), launched the Patient's Internet Account (IKP) and developed a free IT application gabinet.gov.pl, allowing physicians to issue e-prescriptions and e-referrals.

Easier access, more user-friendly e-services for the public and businesses could lead the way to more improvements in digital public administration. Additional measures enabling everyone to use e-health services, regardless of geographical location, could boost their take-up.

However, as indicated in the table below, the usage of digital public services in Poland is much lower than in European digital leaders. The distance between Poland, indicated as a digital challenger and digital leaders of EU measured by the usage of digital services is estimated higher than for digital skills or fixed broadband coverage(27). There are also strong disproportions between urban and rural areas underlying a sharp digital divide in geographical terms.

Table 4: Digital Public Services usage in Poland

		Extremely common	Very common	Fairly common	Not common for most of the population	It is not a possibility nowadays
e-Administration procedures	In general in the country			X		
	In rural areas				X	
e-Health	In general in the country			X		
	In rural areas				X	
e-Education	In general in the country			X		
	In rural areas			X		
Digital identity	In general in the country				X	
	In rural areas				X	
Digital signature	In general in the country			X		

	In rural areas				X	
On-line banking (account management, payments)	In general in the country		X			
	In rural areas			X		
Bills (council taxes, water, electricity)	In general in the country	X				
	In rural areas			X		

3.3.3. Research and Innovation Strategies for Smart Specialisation (RIS3)

Current development policy for Poland assumes that there will be the responsible growth characterised with social and territorial sustainability The Polish economy should be more innovative, and it should use its strengths in a better way.

The assumption of current policy for growth is resigning from the so-far support for all sectors/lines of trade and focusing on support for the strategic sectors, that may become drives for the Polish economy.

Detailed assumptions of the Poland's policy for growth can be found in the strategic documents and these are:

1. Strategy for Responsible Development
2. Strategy for Innovation and Efficiency of the Economy
3. Enterprise Development Program
4. National Reform Program

The Strategy for Productivity is currently in consultation phase, and the National Smart Specialisation forms an appendix thereto

In the years 2014-2020 there is the available support in the scope of the EU Programs:

1. Smart Growth Operational Program
2. Operational Program Eastern Poland
3. Horizon 2020 Program
4. Regional Operational Programs

    4.1. Regional Operational Program for Zachodniopomorskie Voivodeship
    4.2. Regional Operational Program for Pomorskie Voivodeship
    4.3. Regional Operational Program for Kujawsko-Pomorskie Voivodeship
    4.4. Regional Operational Program for Warmińsko-Mazurskie Voivodeship
    4.5. Regional Operational Program for Podlaskie Voivodeship

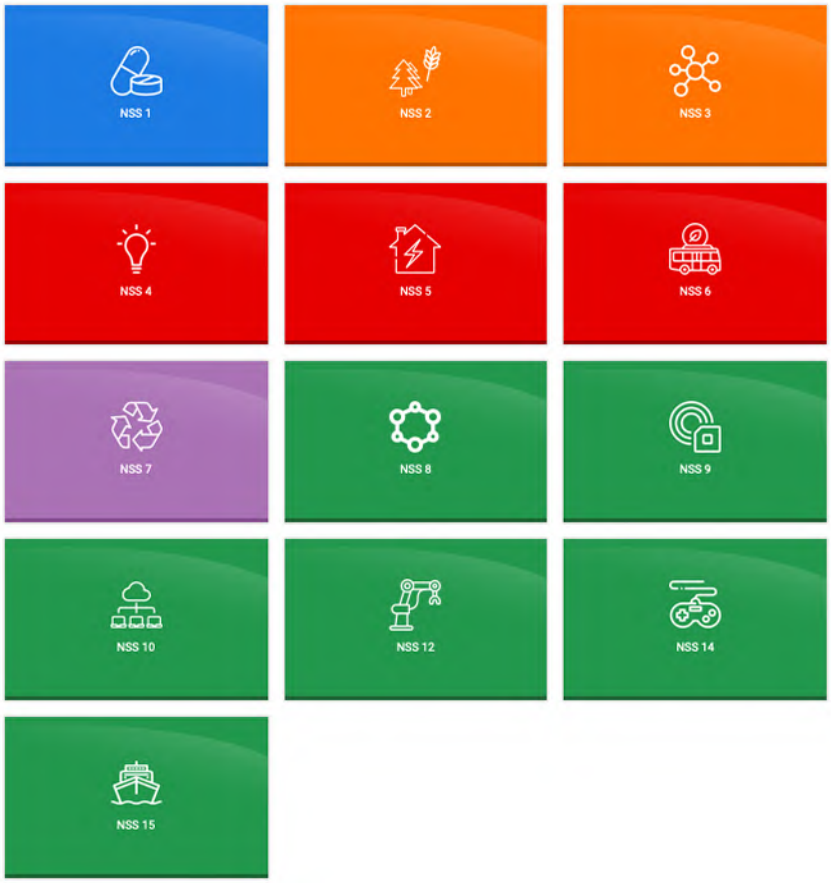
4.6. Regional Operational Program for Mazowieckie Voivodeship
4.7. Regional Operational Program for Łódzkie Voivodeship
4.8. Regional Operational Program for Wielkopolskie Voivodeship
4.9. Regional Operational Program for Lubuskie Voivodeship
4.10. Regional Operational Program for Dolnośląskie Voivodeship
4.11. Regional Operational Program for Opolskie Voivodeship
4.12. Regional Operational Program for Świętokrzyskie Voivodeship
4.13. Regional Operational Program for Małopolskie Voivodeship
4.14. Regional Operational Program for Śląskie Voivodeship
4.15. Regional Operational Program for Lubelskie Voivodeship
4.16. Regional Operational Program for Podkarpackie Voivodeship

In the scope of the **Smart Growth Operational Program (SG OP)** the Priority Axes I, II and IV are directed solely at the national smart specialisations. In the priority axis III, preferences (additional points during evaluation of applications) are applied for the projects that fit in the national smart specialisations.

The below table shows the allocation aimed for financing of NSS in SG OP 2014-2020

Priority axis	Allocation
I axis - Support for R+D works by enterprises	EUR 3,85 billion
II axis – Support for the environment and potential of enterprises pursuing activity in the scope of R+D+I	EUR 1,04 billion
III axis – Support for innovation in enterprises	EUR 2,2 billion
IV axis – Increase in science and research potential	EUR 1,22 billion

National Smart Specialisations in Poland



Source: https://smart.gov.pl/en/

NSS 2 - Innovative technologies, processes and products of the agriculture and food and forest-based sector – addresses directly rural digitalisation and influences agriculture, forestry, and rural areas.

3.3.4. Digital Innovation Centres (DIH)

According to European Commission's Smart Specialisation Platform, there are 14 Digital Innovation Centers (DIH) in Poland: 7 fully operational and 7 in preparation. None of them is directly linked to rural areas, agriculture or forestry sectors. DIHs established in Poland focus mainly on developing and implementing digital technologies in manufacturing. They have emerged in the framework of collaborative clusters funded by the Commission itself or by different European initiatives, eg.: Horizon 2020, with different types of management and the joint participation in these clusters of universities, science parks, technology centres, business associations in the sector, among others.

3.4. CAP National Strategic Plans

During the meeting of the AGRIFISH Council taking place on 28-29 June in Luxembourg, ministers accepted the compromise arrangements for the CAP reform for 2023-2027. These arrangements are the result of tripartite negotiations between the EU Council, the European Commission and the European Parliament. Works on the CAP legislative package, consisting of regulations on CAP strategic plans, on CAP financing, management and monitoring (the so-called horizontal regulation) and on the common organisation of agricultural markets, lasted for more than three years.

Poland has made its expectations and proposals clear since the beginning of the months-long negotiation process. Reaching a common position was not easy, especially due to the fact that the CAP is undergoing a major reform. From the beginning of works on the reform, the Polish position unequivocally indicated that the proposed solutions should take into account individual needs and expectations of member states, focus on the achievement of main objectives of the common agricultural policy and strive for a further simplification of the CAP. It was also stressed that the pace of works on the compromise must not be at the expense of the quality of the solutions worked out. In the end, it was possible to find a common position for all Member States, but also for the other co-legislators.

Final arrangements taking into account the position presented by Poland on the CAP reform for 2023-2027:

- Transfer of funds between CAP pillars - the adopted compromise allows for the transfer of up to 30% of funds from the 2nd CAP pillar to the 1st CAP pillar;
- Definition of an active farmer - farmers receiving direct support of up to EUR 5,000 will be eligible to be automatically considered active;
- Expenditure limit on production-related payments - we are satisfied with the arrangements for the level of financing of production-related payments, i.e. (13% +2%) for support for protein crops, although relating this support to the Water Framework Directive is unfounded;
- Redistributive payments and payments to young farmers - the compromise on redistributive payments and payments to young farmers should be perceived as a positive outcome. The proposed provisions leave sufficient flexibility to the Member States to ensure adequate support for family farms and generational change, taking into account local needs and specificities;
- Transitional National Aid - will be maintained in the following years and the reference period for granting this aid may be updated;
- Pillar II environmental expenditure limit - the level of environmental expenditure under Pillar II of the CAP was an important issue for Poland. The Parliament had proposed a limit of 37%. In the end it will not exceed 35%. Additionally, support for farms located in less-favoured areas

will be included in the limit of expenditure on the environment in 50%. This percentage has been increased from the initial EC proposal by 10 percentage points;

- GAEC standards - we welcome the use of derogations from GAEC 9 and GAEC 8 standards for farms up to 10 ha of arable land;
- Trade issues and the sugar sector - we are pleased to note that joint Council, Parliament and Commission statements on trade issues and the sugar sector are part of the compromise. Poland has advocated strengthening the safety net and protection against imports from third countries, and these statements meet our expectations;
- Agricultural reserve - we welcome the adopted solutions regarding the agricultural reserve, which are in line with the arrangements on the multiannual financial framework for 2021-2027; The amount of the reserve will be EUR 450 million per year, in 2023 there will be no reimbursement to farmers for financial discipline for 2022, and unused funds will be allocated to the agricultural reserve. Farmers receiving up to €2,000 in direct payments will be exempt from financial discipline. The funding discipline is to be applied only after other budgetary sources have been exhausted.

Commission recommendation for Poland's CAP strategic plan – in context of digitalisation are as follows:

It is important that Poland engage in the digital transition of the farming sector by making good use of the EU's technological capacity in satellite observation, precision farming, geolocation services, autonomous farm machinery, drones, etc., to better monitor and optimise agricultural production processes and the CAP implementation.

Poland uses mostly traditional digital infrastructure and technologies in agriculture. Poland was ranked 23rd out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2020. However, steady digital growth in terms of connectivity, human capital, use of internet services, integration of digital technology and digital public services is taking place.

To address the above interconnected economic, environmental/climate and social challenges- the Commission considers that the Polish CAP Strategic Plan needs to focus its priorities and concentrate its interventions on the following points, while adequately taking into account the high territorial diversity of the Polish agriculture and rural areas:

Fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake:

- Contribute to the EU Green Deal target on broadband by further developing broadband networks to help overcome connectivity gaps in the rural and remote areas. In parallel, invest in digital skills development. In doing so it will be important to ensure synergies and complementarities among the EU and national funds.

- Invest in a well-developed AKIS and further integration of information, knowledge, advice, innovation and digital skills, by supporting better links between public and private advisors and investing in their training and skills. Advisory services should be prepared to respond to the growing information needs of farms (including small farms) regarding economic, environmental as well as social aspects, and able to provide innovation support.

Cross-cutting objective on knowledge, innovation and digitalisation:

Knowledge and innovation have a key role to play in helping the farmers and rural communities meet the challenges of today and tomorrow. A well-functioning AKIS should deliver knowledge flows between its actors responding to the growing information needs of farmers, to achieve the CAP objectives. AKIS covers not only "Agriculture" but also other rural activities related to the landscape, environment, climate, biodiversity, food and non-food systems.

There is untapped potential of the AKIS structure in Poland, characterised as strong and relatively well integrated, for better creation and dissemination of knowledge. There is a wide range of training and advisory services available for farmers, offered by public advisory centres, agricultural chambers and private advisory companies.

Among them, decentralised public agricultural advisory is playing a dominant role. It is available for all farmers and implemented by 16 Regional Agricultural Advisory Centres (WODR) supported by the Agricultural Advisory Centre (CDR) in Brwinow. Since 2006, the number of full-time posts in provincial advisory centres has declined. There is too weak integration and cooperation between providers of advisory services and still a need to develop back office for all advisors. Advisory services need to be diversified and tailored to the requirements of small farmers regarding business developments and new production systems.

Poland has a wide-spread body of agricultural educational and research institutions. There are 10 agricultural research institutes supervised by the Ministry of Agriculture and Rural Development, 19 institutes of the Polish Academy of Sciences, which are part of the Faculty of Biological and Agricultural Sciences, 6 agricultural universities supervised by the Ministry of Education and Science and 54 (59 from 1 January 2021) agricultural schools supervised by the Ministry of Agriculture and Rural Development. There is also a growing involvement of researchers and agricultural advisors in implementation of interactive innovation projects. To link research with agricultural practice, the Polish rural development Program allocates 59 million EUR to 'cooperation' and eight groups under the European Innovation Partnership (EIP-AGRI) have been officially established out of the targeted 136 to be set up.

The EIP-AGRI Network in Poland is coordinated by the CDR in Brwinow. This set-up provides greater organisational potential and ensures the operational groups are anchored in a nationwide structure, with experienced and impartial staff and easier contacts with all stakeholders. Network implementation is mostly dependent on so-called 'innovation brokers' (4 brokers at national and 19 at regional level) experienced in working with farmers, rural entrepreneurs and researchers and on

coordinators (administrative and supporting roles). Brokers play crucial role also in the promotion and supporting the creation of partnerships aiming at implementation of innovation projects.

The future national CAP network can play a much bigger role in promoting synergies between the CAP and European Research Area (ERA).

Under the programming period 2014-2020, Poland estimated 1.6% of their total rural development envelope (EAFRD + national contribution) under M01: knowledge transfer and information actions, M02: advisory services, farm management and farm relief services and M16: Co-operation-EIP, compared to the EU-28 average of 3.6%.

In this context, significant synergies are also expected from linking CAP support to activities on soil health (so-called 'living labs and light houses') under the forthcoming Horizon Europe mission on Soil Health.

In Poland, 44% of the total farm managers have attained at least basic agricultural training in 2016 (above the EU average of 31.6%). This share is rather stable over the last six years. At 27% in 2016, the share of farmers that attained full agricultural training was significantly above the EU (9%).

Poland has rather traditional digital infrastructure and technologies in agriculture. Looking at the Digital Economy and Society Index (DESI) 2020 ranking, which considers rural and urban areas, Poland ranks 23rd out of 28 EU Member States, indicating its low, below EU average performance but steady digital growth in terms of connectivity, human capital, use of internet services, integration of digital technology and digital public services

3.4.1. CAP Integrated Administration and Control System (IACS)

The Integrated Administration and Control System (IACS) is an information system for the management of direct payments to farmers in EU countries under the principle of share management. The main aims of IACS in the farm context are: 1) to carry out transactions correctly, 2) to recover unduly paid amounts, 3) to support farmers in making correct applications. It is also important to manage and control the support in a standardised way throughout the EU. To meet these goals, IACS consists of digital databases, such as:

– Land Parcel Identification System (LPIS) – for the identification of plots in EU countries,

– Geospatial Aid Application (GSAA) – for farmers to graphically indicate the agricultural area for which they are applying,

– an integrated control system based on computational cross checks and physical on-farm controls.

In Poland, since June 2001, the institution responsible for implementing CAP Integrated Administration and Control System (IACS) is the Agency for Modernisation and Restructuring of Agriculture (AMRA). Every year, this system supports approximately 1.4 million beneficiaries for whom direct payments are implemented. ARMA is also responsible for keeping and updating the LPIS - the

system which is based on plans and cadastral documents, cartographic materials, geographic information system (GIS) and aerial or spatial imagery. Non-IT part of IACS in Poland is created by ARMA, and an IT part created by the Asseco Poland company.

During the current programming period, within the deadline provided for by EU regulations (no later than 01/01/2024), the satellite system for monitoring areas (agricultural activities) will be implemented using Sentinel satellite imagery. This system will be implemented gradually until it reaches the national level.

In cases where the results of the satellite monitoring will appear inconclusive, the control system will be supplemented by the use of other data of at least equivalent value, e.g. photos with geo-location and traditional on-site control system.

3.5. Data management

Open Data

The open data portal www.dane.gov.pl is the national initiative addressing open data for public use. It is the example of strategy aiming at harmonisation of access, regulation and reliability of data, information and data exchange systems. The www.dane.gov.pl website pursues the objective of the Central Public Data Repository as one of the modes of accessing and reusing public information. The portal is co-financed from projects: "Open Data - access, standard, education" and "Open Data Plus" POPC (Operational Program Digital Poland)

It gathers data from over 100 public institutions, including agencies focused on agriculture, forestry and fishery in Poland. The website is a source of reliable, constantly updated data, made available free of charge for re-use. An up-to-date list of data providers is available in the Suppliers section. It addresses citizens interested in the activities of the state; companies that build innovative products and services based on data; NGOs using data in their daily work; scientists carrying out research; officials preparing reports and analyses.

Cybersecurity and data safety

In Poland, at national level Cyber Security Department was established. The department deals with the broadly understood topic of security in cyberspace. Its main tasks include developing and implementing cyber security strategy papers and legislation, guidelines regarding relevant measures aimed at protecting information and communication systems, analyses, as well as central training courses, exercise and testing plans. Tasks of the Department are as follows:

- Handling matters pertaining to the security of the cyberspace of the Republic of Poland, in particular related to the shaping of the policy for the protection of the cyberspace of the Republic of Poland.
- Developing, implementing and reviewing strategy papers on cyber security issues.
- Disseminating knowledge concerning cyber security.
- Initiating research and development works in the field of cyber security and disseminating knowledge on cyber security.
- International cooperation in the field of cyber security.
- Keeping a register of cyber security plenipotentiaries.
- Ensuring the execution of the Minister's tasks in the field of state defence, implementing projects in the field of non-military defence preparations of the Ministry, as well as planning and coordinating the execution of defence tasks at the Ministry, in offices supporting entities subordinate to the Minister or supervised by them, and in units subordinate to the Minister or supervised by them.
- Handling matters pertaining to crisis management.
- Ensuring the fulfilment of obligations regarding defence, state security and public safety in the field of telecommunications.
- Acting as a national point of contact, whose task is to collect information on incidents on a national scale and keeping in touch with relevant institutions in other Member States of the European Union in order to exchange information on international incidents.
- Supervising information and communication security of the Ministry.
- Handling matters arising from Article 6 of Regulation (EU) No 211/2011 of the European Parliament and of the Council of 16 February 2011 on the citizens' initiative.
- Handling matters pertaining to the ministerial supervision over the Research and Academic Computer Network.

There are two main strategic documents purely dedicated to cyber security issues that set up the cyber security landscape by providing the main goals and framing the organisational structure: Cyberspace Protection Policy of the Republic of Poland, 15 produced in June 2013 by the former Ministry of Administration and Digitalisation (Ministerstwo Administracji i Cyfryzacji, MAC) and the Internal Security Agency (Agencja Bezpieczeństwa Wewnętrznego, ABW); and Cyber Security Doctrine of the Republic of Poland published in January 2015 by the National Security Bureau (Biuro Bezpieczeństwa Narodowego, BBN).

The strategic objective of the **Cyberspace Protection Policy** is to achieve 'an acceptable level of cyberspace security of the state'. The draft of the new Strategy maintains this goal and provides

broader explanation by stating that 'the acceptable level' should be understood as safeguarding capabilities that:

- enable realisation of the state's functions;
- allow to ensure access to essential goods and services for citizens and entrepreneurs;
- ensure undisrupted access to the Internet.

The Policy (and the draft of the Strategy) announces measures that should be undertaken to achieve this objective. It details the creation of a legal and organisational framework and a system for effective coordination and exchange of information between the entities. These actions are to be built on a risk-based approach. The strategic goal should be met by achieving a set of specific objectives that includes:

1. Increasing the level of security of the state ICT infrastructure.
2. Improving the capacity to prevent and combat threats from cyberspace.
3. Reducing the impact of incidents threatening the ICT security.
4. Determining the competence of entities responsible for the security of cyberspace.
5. Creating and implementing a coherent system of cyberspace security management for all government administration entities and establishing guidelines in this area for non-state actors.
6. Creating a sustainable system of coordination and exchange of information between the entities responsible for the security of cyberspace and the cyberspace users.
7. Increasing awareness of the cyberspace users on the methods and safety measures in cyberspace.

The National Security Bureau (BBN) published the Polish cybersecurity doctrine. The document outlines further lines of work on improving national security in cyberspace. The doctrine maps out tasks for state institutions, notably security agencies and armed forces, private sector and NGOs. The threats coming from cyberspace and identified in the doctrine include cybercrime, like "cyberviolence, destructive cyberprotests and cyberdemonstrations," attacks against telecommunications systems important for national security, data and ID theft, and hijacking of private computers. External threats listed by the doctrine are cybercrises and cyberconflicts, cyberwar included, as well as cyberespionage involving states and other entities. "Threats (for Poland) coming from cyberspace include extremist, terrorist and international criminal organisations whose attacks in cyberspace can have ideological, political, religious, business or criminal motivations," the document points out. It emphasises the need for "pursuing active cyberdefence, including offensive actions in cyberspace, and maintaining readiness for cyberwar," protection and defence of Polish teleinformation systems and accumulated data, and supporting key private firms in their cybersecurity efforts.

Interoperability

The core of the Polish interoperability is built around the legal dimension through its National Interoperability Framework (NIF) for public administration, directly structured through a Council of Ministers regulation. Apart from the NIF, the regulation sets out the minimum requirements for the exchange of information among public base registries and the minimum requirements for electronic systems, including the specification of data formats, communication protocols, encryption to be used in the software interfaces, ways to provide security and technical standards for the exchange of information. Together with this regulation, Poland has come up with several Programs and strategies to improve their e-Government and deliver efficient public services to citizens and businesses.

One of the most important Programs in terms of base registries is the System of National Registries (SRP), which started in March 2015 and is led by the Ministry of Digital Affairs. The goal of the Program is to modernise the information systems and to support the integration and reconstruction of public records in Poland. The System of National Registries, consists of inter alia: the Population Registry (PESEL), the ID Cards Registry and the Social Security Registry. Furthermore, it included the creation of a reference data model of natural persons located in the Social Security System.

The Regulation on National Interoperability Framework can be considered as the main legal source covering interoperability in Poland, divided into five different chapters. The first chapter describes the general provisions setting the scope of the regulation and a glossary. The second chapter describes the national interoperability framework providing details regarding what interoperability is and how it can be achieved on the different interoperability levels. The third chapter provides a summary of the regulation for the minimum requirements for public records and information in electronic form. The fourth one sets a synthesis of the regulation for the minimum requirements for the communication systems. Finally, the fifth chapter shares the transitional and final provisions of the regulation.

The regulation concludes with four additional annexes. The first annex sets the identifiers of objects which are available in the base registries' architecture. The second annex sets the data formats and standards which ensure access to information resources through the ICT systems that carry out public services. The third annex deals with data formats handled by public services in read mode. The fourth annex places the requirements for ICT systems of the Web Content Accessibility Guidelines (WCAG 2.0)11 of W3C12. The WCAG ensures that the access to public services is available in an electronic form and equal access to market information is guaranteed.

Organisational interoperability is achieved by public operators when the information is shared in ways that allow for effective review, social access and the terms of use of the services are provided by those very same entities/operators. A clear indication of which Ministry is responsible for the information technology for the publication of information is also necessary. There is also ongoing standardisation and harmonisation of procedures, which takes into account the need to ensure proper cooperation among the bodies pursuing public tasks. The publishing and updating of the descriptions of procedures

in the Bulletin of Public Information is also to be considered when dealing with cases from the scope of its electronic properties.

In the area of e-Government, information interoperability has to face a recurrent issue. Due to the still non- electronic nature of many public sector services, there is a lack of common fields, standardisation and adherence to common definitions. In Poland (and according to the NIF), interoperability at the semantic level is achieved by the use and application of structured data. Whereby its meaning is to be published on the inter-operational repository as well as by the use of public reference records kept by the operators containing reference data. In line with the previous, the regulation recommends using a common taxonomy, to agree on formalised specifications and to support communities related to semantic interoperability.

Technical interoperability covers the applications and the infrastructures linking systems and services including aspects such as interface specifications, interconnection services, data integration services, data presentation and exchange, secure communication protocols etc. In Poland (and according to the NIF), the technical interoperability is achieved by the application of the minimum requirements for electronic systems, considering the provisions of the relevant Polish and international standards. The regulation, in its annexes, describes the concrete data sets, data formats and standards to be used through ICT systems which carry out public services.

Poland is a participant of EUCARIS and is making use of its technology for information exchange based on the EU Prüm Council Decisions, the 3rd Driving Licence Directive and the Road Safety Directive. Poland is also a member of the ECRIS and ELRA through the Polish Association of Registrars.

4. Challenges and Opportunities

4.1. Barriers to digitalisation

The progressive digitalisation of the Polish economy will increase the demand for skilled workers who know how to work with digital technology, innovative and flexible. This demand will be even higher in sectors where the automation potential is high, and the current coverage of the digital technology is low. In Poland, agriculture is one of such sectors, being at the same time the sector with the large resources of the labour force, who will require retraining. Today it is poorly digitalised but have great automation potential.

Table 5: Barriers to digitalisation

Barriers to digitalisation		Influence of COVID-19
Technical	Uneven access to connectivity especially between urban hubs and remote rural regions	Negative: Rural residents excluded from key services which moved online; socially isolated when unable to connect to friends and family, etc.
Training / Education	Lack of digital skills, Lack of awareness about public data and services available on-line	Negative: People with low level digital skills were unable to move to online for communications, work, e-commerce and e-health.
Economic	Low-income households unable to afford basic technology (e.g. laptop) or broadband connectivity	Negative: Economic, educational, social exclusion of disadvantaged groups

4.2. Actions to boost sustainable digitalisation

Table 6: Actions to boost sustainable digitalisation

	Key rural development domains			
	Human capital	**Innovation**	**Investments**	**Governance**
Creating the basic conditions for digitalisation	Education and skills improvement	Digital hubs	Access to broadband	Monitoring DESI indicators
Anchoring digitalisation to sustainable development	Rural business start-ups and developing the bioeconomy		Digital skills development	Providing innovation support
Adapting digitalisation to different context	Advisory services should be prepared to respond to the growing information needs of farms (including small farms) regarding economic, environmental as well as social aspects, and able to provide innovation support			
Favouring digital inclusion	Mapping vulnerable groups	Encouraging peer-to-peer networking	Support to vulnerable groups	Monitoring DESI indicators progress
Developing digital ecosystems	Further integration of information, knowledge, advice, innovation, and digital skills			
Developing adaptative governance models	Knowledge transfers and bottom-up approaches as well as providing innovation support by local/regional governments			
Designing policy tools for sustainable digitalisation	Designing digitalisation centres at regional level to develop and apply technologies			

5. Conclusions

Poland is one of the countries in the region that, due to its digital potential, might be considered as the European Digital Challenger.

The level of digitalisation, measured by fixed broadband coverage, Network Readiness Index (RDI) or Digital Economy and Society Index (DESI) in Poland is far lower than in the case of Digital Leaders from Northern and Western Europe. Despite efforts that have been made, Poland continues to face difficulties in achieving the 2020 EU objectives in terms of digitalisation process.

The most important problem, well visible in DESI reports, is the rural-urban divide. The attention should be given here especially to remote rural regions with the relatively slower connections speeds when compared with urban or sub-urban areas. Also, many of those with low levels of digital skills are located in rural regions as poor digital skills are associated with demographic characteristics relating to age, gender, income levels and disability status which correspond with those often found in rural regions. However, the subsequent national lockdowns in 2020 and 2021 due to COVID-19 pandemic showed, that digital exclusion also applies to many urban dwellers in Poland: economically disadvantaged groups, but also people lacking skills or unaware of possibilities provided by digital transformation of the economy and the society.

In this respect a number of policies and initiatives have been undertaken by both the state and private institutions in order to support the rapid digitalisation of Polish society, boosting digital literacy and tackling the digital divide. The extent to which these policies support rural regions will depend upon their implementation as rural digitalisation has so far not been a topic of concern for the government, and there is little information available on studies or policies directly addressing rural areas.

This leads to our main recommendation to reframe current general policies focused on digital transformation of the country, so that they well answer needs of vulnerable groups and rural regions (especially in peripheries) supporting their digital connectivity and skills.

6. Annex

Annex A

Table A.1: Policies influencing digitalisation in Poland

Areas being addressed / supported by the policies	Policy	Brief Description	Objectives	Area of impact	Period of implementation	Budget (if any)	Public / Private	Address rural areas (Y/N) Specify how	Link
Rural access to technologies	National Broadband Plan	Poland's national broadband plan targets are fully harmonised with the targets set by the European Commission's Digital Agenda for Europe (DAE), and set sight on Gigabit Society targets.	Poland's national broadband plan was adopted in January 2014 and updated in 2020. Poland's national broadband plan foresees that 100% of households and companies should have access to internet connectivity of at least 30 Mbps until 2020, and that 50% of households and companies use internet connectivity of at least 100 Mbps by 2020. Furthermore, additional objectives of the plan are aligned with those of the Gigabit Society. The national broadband plan mainly focuses on promoting broadband investments and expansion through initiating regulatory, legal and financial measures.	National	2014-2020	Under the financial perspective 2014-2020, the dedicated Operational Programme (OP) Polska Cyfrowa (Digital Poland) includes funding for broadband. The overall budget for the OP Digital Poland is EUR 2.57 billion, of which more than EUR 1 billion is dedicated to broadband. Under the thematic objective Universal access to high-speed Internet, more than 1.3 million households and almost 10 000 schools will be provided with Next Generation Access (NGA). Access to services related to the Nationwide Education Network is financed by state budget (circa EUR 310 million by 2027). The implementation phase (2018-2020) is also co-financed by the OP Digital Poland.	Public		https://digital-strategy.ec.europa.eu/en/policies/broadband-poland
Broadband, connectivity, affordability	Operational Program Digital Poland for 2021-2027	Operational Program Digital Poland for 2021-2027 is being prepared.	Support for broadband infrastructure, e-services (e-government and e-health), basic and advanced digital skills, upskilling and re-skilling and skills needed for the future	National	2021-2027	-	Public		2014-2020: https://www.funduszeeuropejskie.gov.pl/media/1655/POPC_eng_1632015.pdf
Creation of digital innovation ecosystems in or with influence in rural areas									
New digital business models in rural areas, agriculture, and forestry									
Funding of digitalisation (access to technologies, digital education, broadband access, etc.) in rural areas, agriculture, and forestry.	Strategy for Responsible Development until 2020 (with a perspective until 2030)	The Strategy was adopted by the Council of Ministers on 14th February 2017. It is an applicable and key document the Polish State in the field of the medium- and long-term economic	The Strategy lists specific objectives: I. Sustainable economic growth increasingly based on knowledge, data and organisational excellence, II. Socially sensitive and territorially sustainable development III. Effective state and institutions for growth as well as social and economic inclusion. Within the framework of the Strategy, areas	National	until 2020 (with a perspective until 2030)		Public	One of the Strategy goals is digitisation. Within this area, the following directions of activities were indicated: development of a modern digital network (including supporting the development and modernisation of ICT and telecommunications	https://www.gov.pl/documents/33377/436740/SOR_2017_streszczenie_en.pdf

		policy. This document constitutes the development and operationalisation of the so-called Morawiecki Plan that in response to the challenges faced by the Polish economy defines a new vision and the country development model.	influencing the achievement of the objectives of the Strategy have also been indicated.					infrastructure, in particular in rural areas),	
National rural development networks' initiatives	Rural Development Program 2014-2020								
Digital Literacy and Digital Divide	Digital Competence Development Program (Program Rozwoju Kompetencji Cyfrowych)	The program targets development of digital skills and is coordinated centrally by the Ministry of Digital Affairs.	Improvement of digital skills needed by citizens, ICT specialists, employees of SMEs and public administration	National	Since 2020	-	Public		https://www.gov.pl/web/cyfryzacja/kompetencje-cyfrowe
Open data, standardisation of data, data access, etc…	National Interoperability Framework (NIF)	The core of the Polish interoperability is built around the legal dimension through its National Interoperability Framework (NIF) for public administration, directly structured through a Council of Ministers regulation	Support for broadband infrastructure, e-services (e-government and e-health), basic and advanced digital skills, upskilling and re-skilling and skills needed for the future	National	Since: 2015	-	Public		https://joinup.ec.europa.eu/sites/default/files/inline-files/Poland%20Factsheet%20final%202nd.pdf
Cybersecurity	Cyberspace Protection Policy		The strategic objective of the Policy is to achieve an acceptable level of cyberspace security of the State	National	Since: 2013	-	Public		https://www.enisa.europa.eu/topics/national-cyber-security-strategies/ncss-map/copy_of_PO_NCSS.pdf
Rural development networks' initiatives									

PORTULANS INSTITUTE

NRI 2020 At-A-Glance: Poland

Network Readiness Index — Rank: 33 (out of 134) — Score: 61.80

Pillar/ sub-pillar	Rank	Score	Pillar/ sub-pillar	Rank	Score
A. Technology pillar	36	52.99	C. Governance pillar	27	75.00
1st sub-pillar: Access	32	80.50	1st sub-pillar: Trust	20	74.58
2nd sub-pillar: Content	34	49.78	2nd sub-pillar: Regulation	47	71.39
3rd sub-pillar: Future Technologies	60	28.68	3rd sub-pillar: Inclusion	20	79.02
B. People pillar	40	55.14	D. Impact pillar	31	64.08
1st sub-pillar: Individuals	48	59.62	1st sub-pillar: Economy	41	34.37
2nd sub-pillar: Businesses	33	58.38	2nd sub-pillar: Quality of Life	25	79.02
3rd sub-pillar: Governments	50	47.43	3rd sub-pillar: SDG Contribution	27	78.85

The Network Readiness Index in detail

Indicator	Rank	Score	Indicator	Rank	Score
A. Technology pillar	36	52.99	C. Governance pillar	27	75.00
1st sub-pillar: Access	32	80.50	*1st sub-pillar: Trust*	20	74.58
1.1.1 Mobile tariffs	10	91.61	3.1.1 Secure Internet servers	26	79.26
1.1.2 Handset prices	42	57.01	3.1.2 Cybersecurity	31	87.43
1.1.3 Internet access	35	84.15	3.1.3 Online access to financial account	15	70.34
1.1.4 4G mobile network coverage	1	100.00	3.1.4 Internet shopping	23	61.28
1.1.5 Fixed-broadband subscriptions	63	67.89	*2nd sub-pillar: Regulation*	47	71.39
1.1.6 International Internet bandwidth	95	62.86	3.2.1 Regulatory quality	36	70.84
1.1.7 Internet access in schools	1	100.00	3.2.2 ICT regulatory environment	35	89.77
2nd sub-pillar: Content	34	49.78	3.2.3 Legal framework's adaptability to emerging technologies	56	45.62
1.2.1 GitHub commits	28	29.66	3.2.4 e-commerce legislation	1	100.00
1.2.2 Wikipedia edits	32	73.13	3.2.5 Privacy protection by law content	57	50.73
1.2.3 Internet domain registrations	*	*	*3rd sub-pillar: Inclusion*	20	79.02
1.2.4 Mobile apps development	40	75.37	3.3.1 E-Participation	9	96.30
3rd sub-pillar: Future Technologies	60	28.68	3.3.2 Socioeconomic gap in use of digital payments	23	92.30
1.3.1 Adoption of emerging technologies	61	48.92	3.3.3 Availability of local online content	51	67.13
1.3.2 Investment in emerging technologies	73	37.21	3.3.4 Gender gap in Internet use	29	65.60
1.3.3 ICT PCT patent applications	39	19.58	3.3.5 Rural gap in use of digital payments	42	73.79
1.3.4 Computer software spending	43	25.13	D. Impact pillar	31	64.08
1.3.5 Robot density	31	12.54	*1st sub-pillar: Economy*	41	34.37
B. People pillar	40	55.14	4.1.1 Medium and high-tech industry	38	45.17
1st sub-pillar: Individuals	48	59.62	4.1.2 High-tech exports	48	19.14
2.1.1 Internet users	47	77.20	4.1.3 PCT patent applications	40	2.65
2.1.2 Active mobile-broadband subscriptions	3	68.16	4.1.4 Labor productivity per employee	35	49.64
2.1.3 Use of virtual social networks	79	49.48	4.1.5 Prevalence of gig economy	46	55.24
2.1.4 Tertiary enrollment	35	49.35	*2nd sub-pillar: Quality of Life*	25	79.02
2.1.5 Adult literacy rate	NA	NA	4.2.1 Happiness	40	69.76
2.1.6 ICT skills	60	53.92	4.2.2 Freedom to make life choices	39	86.34
2nd sub-pillar: Businesses	33	58.38	4.2.3 Income inequality	18	85.82
2.2.1 Firms with website	37	70.49	4.2.4 Healthy life expectancy at birth	37	74.16
2.2.2 Ease of doing business	39	81.63	*3rd sub-pillar: SDG Contribution*	27	78.85
2.2.3 Professionals	20	49.98	4.3.1 SDG 3: Good Health and Well-Being	50	77.05
2.2.4 Technicians and associate professionals	28	56.36	4.3.2 SDG 4: Quality Education	8	71.56
2.2.5 Business use of digital tools	36	74.78	4.3.3 SDG 5: Gender Equality	12	88.25
2.2.6 R&D expenditure by businesses	30	17.04	4.3.4 SDG 7: Affordable and Clean Energy	62	80.56
3rd sub-pillar: Governments	50	47.43	.	.	.
2.3.1 Government online services	22	85.45			
2.3.2 Publication and use of open data	47	33.95			
2.3.3 Government promotion of investment in emerging tech	65	38.08			
2.3.4 R&D expenditure by governments and higher education	57	32.23			

* Confidential data

Source: https://networkreadinessindex.org/countries/poland/

Annex B

Description of the specialisation: NSS2

I. ELEMENTS COMMON TO INNOVATIONS IN THE AGRI-FOOD AND FORESTRY AND WOOD SECTORS

1. Optimisation of production, processing and storage processes in line with the idea of sustainable development.
2. Genetic research, breeding work, molecular and biotechnological methods as well as alternative lines of production allowing to obtain high quality vegetable and animal raw materials.
3. Innovative systems and intelligent methods and tools for monitoring the production process and evaluating the quality of raw materials and finished products.
4. Innovative technologies of agri-food and forestry and wood processing to reduce the energy and water consumption and improve the production quality.
5. Acquisition and processing of bioactive compounds and other raw materials from plant material (including waste biomass) and livestock material from the agri-food and forestry and wood sectors for different industries.
6. Optimisation of management of waste and by-products from the agri-food and forestry and wood industries, including for energy purposes.
7. Methods of monitoring and counteracting the effects of natural hazards, including natural disasters disrupting the sustainable development of agricultural and forestry areas and food security.
8. Methods of monitoring the social effects of technological progress disrupting the sustainable development of agricultural and forestry areas and food security.
9. Processes, materials, measures to increase the efficiency of the protection and use of materials of agricultural and forestry origin from natural disasters and the restoration of land affected by natural disasters for economic use.
10. Innovative business models for organisation of the production, processing, storage, distribution and sale of products of the agri-food and forestry and wood economy.

II. SOIL AND FARMLAND

- Innovative efforts to improve soil fertility and productivity, such as, *inter alia*:

2. counteracting soil degradation, improving the reaction of acid soils, increasing the absorption of fertilisers,
3. nutrients for plants in soils, forms of their presence and availability to plants.
4. live organisms and organic matter in soil, humus compounds, humification processes, mineral and organic compounds.
5. physical, mechanical and aquatic properties vs three-phase soil system, soil porosity and structure in combination with the mechanisation of agriculture.

- innovative reclamation of degraded soils and protection of farmland.
- rationalisation of water management in the plant and animal production.

- measures to reduce the negative impact of agriculture on groundwater and surface water.

III. BIOLOGICAL PROGRESS IN PLANT AND ANIMAL PRODUCTION

- Creative breeding of plants, animals and fungi with improved usefulness, with a possibility of using molecular and biotechnological tools, taking into account the issues of biodiversity and resilience of climate and environmental change.
- Innovative production of high-quality seed and nursery material, with theincreased resistance to diseases and pests.
- New sources of protein in animal nutrition, high protein plants taking into account the characteristics of these raw materials and health safety.
- Varieties (or species) which provide the high biological value for use in the processing and formulation of final food products.
- Methods to improve and implement breeding effects in the production of plants and animals, *inter alia*, taking into account increasing the productivity and reducing environmental nuisance.

IV. TECHNOLOGY OF PLANT AND ANIMAL PRODUCTION

- Agricultural biologisation methods improving the soil quality and nutritional value of plant resources (*inter alia*, biopreparations, microorganisms, integrated protection of plants and fungi against diseases and pests using innovative biopreparations, biotechnological methods and agricultural treatments).
- Solutions to increase safety and improve the quality of plant raw materials as regards the application of fertilisers and plant protection products, including the use of the principles of integrated plant protection and sustainable production.
- Detection and identification of pathogens and pests of plants and fungi using innovative techniques.
- Innovative methods to improve animal welfare and animal health protection.
- Nutrition methods and animal breeding systems with a beneficial effect on the nutritional value and health values of products of animal origin, *inter alia*, increasing the productivity and reducing environmental nuisances, including animal welfare.
- Automated milking and milking robots.
- Increasing the efficiency of pollination using pollinating insects, including bumblebees and solitary bees.
- Methods to improve the sanitary and health status of commercial animals and animal breeding farms.
- Processes and systems for optimising management of various types of farms.

V. AGRICULTURAL MACHINERY AND EQUIPMENT

1. Innovative technologies and machinery for agriculture, including precision farming.

2. Developing energy-efficient, environmentally friendly technologies and machinery and equipment for tillage, sowing and fertilising, planting, care and protection of plants, harvesting, preservation and storage of agricultural crops, improving agronomic parameters and guaranteeing the high quality of agricultural products.
3. Innovative, energy-efficient, low-cost machinery and equipment working in farms, barns, pigsties and fish breeding pools.
4. Equipment and systems for monitoring, support, evaluation, improvement of the production (technological) process taking into account the latest analytical methods e.g. remote sensing (GPS), comprehensive chromatography, spectral analysis, etc. to produce raw materials of the highest biological, health and technological quality.
5. Machinery, technical and organisational implementations for production processes at all stages of the food chain in farms, centres of buying-in, processing (raw materials, products) and slaughtering of animals (including fish) taking into account the factor reducing contamination with pathogenic bacteria.

VI. ORGANIC AND MINERAL FERTILISERS, PLANT PROTECTION PRODUCTS AND GROWTH REGULATORS

1. Innovative organic and mineral fertilisers and biological preparations with dedicated application or controlled release of components.
2. Innovative biologically active substances (natural and synthetic) intended for the production of plant protection products and veterinary medicines.
3. Modern formulations of plant protection products and biocides, reducing their negative impact on humans and the environment, compatible with the principles of integrated plant protection.
4. Innovative organic and organic-mineral fertilisers and microbiological vaccines to enrich soils with biomass and restore their proper microflora.

VII. PRODUCTION AND STORAGE

1. Technologies and equipment for the harvesting and storage of agricultural and agri-food products, reducing storage and transport losses or increasing the durability of these products
in the food chain.
2. Intelligent warehouses, pigsties, barns, farms, fish-breeding pools using renewable energy sources to complement the energy needs of livestock buildings and structures.
3. New technologies for the production, packaging and storage prolonging the durability of food products, enabling the preservation of high quality, including food safety.
4. New packaging and storage technologies to monitor the food quality *inter alia*, using active and smart packagings.

VIII. PROCESSING OF AGRICULTURAL CROPS AND ANIMAL PRODUCTS

1. High-quality food production including:

2. product innovation in terms of the composition, nutritional value and bioavailability of ingredients,
3. reformulation of existing products aimed at improving their quality,
4. improvement of existing and introducing new innovative food production and processing technologies,
5. measures to minimise the food processing level and to maintain, to the greatest possible extent, nutrients and beneficial bioactive substances,
6. measures to maximise the share of natural raw materials and to reduce the use of food additives,
7. measures allowing to limit the content of or eliminate the antinutrients and allergens in food.

1. Production and evaluation of the quality of foodstuffs for special nutritional uses and other products with dedicated nutritional and health characteristics adapted to various groups of consumers.
2. New processing methods and technologies for meat products with the increased dietary value.
3. Innovative processing of agricultural products, including vegetables and milk, promoting the quality and increased consumer awareness for health nutritional values.
4. Innovative food preservatives, allowing fresh products to be distributed to the consumer.
5. Production and evaluation of the quality of organic, traditional and regional food.
6. Research, characteristics and implementation of solutions (including technological ones) for raw materials of agricultural and agri-food origintaking into account their usefulness, use and health and food safety in the feed industry.
7. Innovative production and evaluation of the quality of feed and petfood.

IX. FOOD AND CONSUMERS

1. Creating innovative communication and education tools allowing consumers to make informed food choices.
2. Use of innovative technologies to develop tools supporting better nutrition planning and evaluation of the diet at the individual and collective level.
3. Innovative methods to increase the recognisability of high quality food.
4. Creating innovative tools to detect food adulteration.
5. Developing tools and modern research techniques and food quality markers (including bioavailability of ingredients) for the purposes of assessing the impact of food products on human health.
6. Developing methods of analysis and selection of food dedicated at the population and individual level.

X. MODERN FORESTRY

1. Processes of obtaining woody plants with increased immune properties and/or taking into account climate, soil, aquatic and other conditions of biocenoses as well

as systems to manufacture and acquire raw materials of plant origin using remote sensing to determine forest characteristics.
2. Environmental management using LCA techniques in forestry and tree farming.
3. Research on biodiversity to improve the quality of treestands and the quality of raw material for the wood industry.
4. Modern methods of acquiring, selecting, taking care and implementing selected species of trees
and shrubs, taking into account selected tree genotypes, so as to select the desired wood performance parameters for the selected branches of the wood sector and for the cultivation, sustainable use and processing of plantation wood, developing processes of using the DNA methods
in forestry.
5. Modern systems for monitoring, early warning (e.g. satellite observations) and organisation of the reduction in fires and losses they cause.
6. Development of energy crops with the large increase in mass, resistance and high dryness for the production of fuels.
7. Innovative means and methods of protecting treestands against biological pests.

XI. INNOVATIVE WOOD AND WOOD-BASED PRODUCTS

- Use of wood and forestry biomass to produce substitutes for other non-renewable raw materials.
- Development of technologies, applications of engineering wood, use and offer of glued construction, building elements of wood, construction of wooden houses for residential purposes and other utility purposes.
- Searching for new innovative applications of wood and wood-based materials as consumables, wood biocomposites, including those from recycled
- Products, processes and technologies for obtaining wood and wood-based materials with the extended durability in the conditions of internal and external use, increased resistance to destructive factors, *inter alia*, biotic factors, fire, atmospheric factors, photolytic aging, intended for: furniture, woodwork, flooring materials, boat-building products, wooden garden architecture.
- Modern means for the protection of wood and wood-based materials as well as means protecting against erosion and stabilising biologically active substances, including ecological wood preservatives, *inter alia*, based on natural biocides, plant extracts and synthetic products imitating natural ones.
- High-efficient and energy- and material-saving machinery and lines for milling, processing and treatment of wood and wood-based materials, including cellulose, paper and cardboard.
- Studies on wood drying technologies combined with technologies to reduce wood swelling and shrinkage.
- Innovative adhesives to join wood with wood and wood with non-wood materials, varnishes/oils/wood stains and fillers, which take into account the needs of woodwork, industry of floors, wood-based panels and furniture.
- Modern woodwork with the increased durability, including the use of microcoatings, nanotechnology, mimetics.

- Large wood and wood-based structures where wood is the main building element.
- Technologies for the modern wood construction industry based on renewable materials, especially wood.
- Development of wood-based materials for modern construction applications: new generation materials that would demonstrate better properties, less emissions, biodegradability, but also, during normal operation, resistance to biological agents (fungi, insects, rodents).
- Technologies for extraction of bioactive compounds from forest goods, wood industry waste,
  including coniferous trees, to be used in the economy.
- Modern, biodegradable, reusable, demountable wood and wood-based,
  paper, cardboard packagings.
- Products, processes and technologies for management of waste from the wood-based industries, optimisation of management of post-production residues of solid wood processing, for value added

XII. INDIVIDUALISATION OF FURNITURE PRODUCTION

1. Special purpose furniture, including fixed joinery; high comfort furniture; furniture to eliminate health deficits, furniture to support the proper development and staying in good shape, eliminating adverse effects of civilisation factors, as well as integration of furniture with digital and electronic systems.
2. Process innovations in furniture design understood as the work of interdisciplinary teams (from examining needs, through design brief, prototype and its testing, improving the prototype, implementation into the production, to market verification), including the dDevelopment and calibration of tools for the early evaluation of the prototype and design as well as logistic efficiency of the product.
3. Searching for and exploring the possibilities of using materials: new, alternative and with new functional properties (including micro-and nanotechnological modifications) for the furniture industry.
4. Innovative designs and manufacturing processes for furniture fittings and accessories.
5. Technical and technological innovations increasing the productivity, reducing the consumption of materials
   and energy for furniture production.
6. Development of modern systems for joining and assembling wood and wood-based elements and accessory materials in the furniture industry.
7. Innovative furniture production systems, including the development of processes for individualisation of the product or 3D printing techniques.

XIII. INNOVATIVE PROCESSES AND PRODUCTS IN THE CELLULOSE AND PAPER AND PACKAGING INDUSTRIES

7. Technologies and research aimed at smart tools, methods and processes leading to producing cellulose pulp, paper, cardboard, corrugated cardboard and derived products to minimise the share of basic raw material for the conservation of forest resources (*inter*

alia,
with the increased share of waste paper and other fibres, including synthetics), while achieving high strength parameters.

8. Technologies and processes to produce cellulose and paper products to achieve the effect of reducing the consumption of energy, water and CO_2emissions and products with new utility functions.
9. Smart packagings, highly specialised improvements to increase the environmental friendliness, durability and safety of food, their structure and design.
10. New specialised technological solutions aimed at developing and implementing technologies to minimise waste generation in the paper and cardboard production and new forms of waste management.