THE IMPACT OF EMERGING ENVIRONMENTAL ISSUES ON THE EUROPEAN ENVIRONMENT AND THEIR IMPLICATIONS FOR EUROPEAN ENVIRONMENTAL POLICY: ARTIFICIAL MEAT, BLOCKCHAIN, DRONES FOR DELIVERY, AND OFF-GRID ELECTRICITY

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Abstract

This paper analyses four specific technological innovations — artificial meat, blockchain, drones for delivery, and off-grid electricity — by looking at them as weak signals and emerging issues with potentially positive and negative impacts on the environment. They are arising at a remarkably fast pace and this work examines the patterns of their emergence. The main purpose of this paper is to challenge the dominant view on their probable future and stimulate policymakers to consider their alternatives, and ultimately increase policymaking resilience. The analysis is based on a systematic review of available academic and non-academic literature, with the aim of synthesising obtainable knowledge on each of the considered technologies and enabling a broad understanding of potential threats and opportunities related thereto.

Reduction of the total greenhouse gas emissions, improvements in energy efficiency, decreased pressure on limited natural resources, and increased protection of ecosystems are the main areas to which the selected technologies could make an important contribution. Yet, the complexity and the wide array of risks associated with their diffusion challenge the conventional view that technological innovations are the panacea for global environmental problems. We argued instead that potential risks and threats related to their dissemination must be addressed through adequate policies, adopted in a timely manner, and founded upon extensive research.

Keywords

new technologies, European environment, emerging issues, weak signals, artificial meat, blockchain, drones for delivery, off-grid electricity.

I. Introduction

At this moment in time the overwhelming majority of the world's human population already live in the shadow of manifold environmental problems and many people have experienced the associated detrimental effects, such as heatwaves, extreme weather conditions, or food insecurity. Environmental risks multiply and environmental stresses amplify at an increasing speed, a state of

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affairs evidenced by the comprehensive reports released by the Intergovernmental Panel on Climate Change (IPCC, 2018) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019). Technological innovations and their swift dissemination are commonly at the centre of measures proposed to ensure that humanity does not fail to preserve the single chance to remain within the finite environmental limits of our planet (Jackson, 2009). Environmentally friendly technologies are envisaged to claw our path towards a low-carbon economy by enabling considerable reduction of all greenhouse gas emissions (GHG) responsible for human-induced climate emergency. Yet, their application might result in a variety of unintended consequences. Thus, governments and institutions, in an increasing fashion, employ horizon scanning to identify emerging issues with potentially substantial impacts on the environment in order to encourage policy-relevant and practical research on those issues in support of designing effective preventative approaches and precautionary measures (Sutherland *et al.*, 2011).

This paper examines four new technologies identified by the European Environment Agency (EEA) horizon scan as being emerging issues: artificial meat, blockchain, drones for delivery, and off-grid electricity. The analysis focuses on the patterns of their emergence. Although their advent is characterised by complexity, only little science and direct hindsight exist to assist the management of these emerging technologies. This work argues that while these technologies can offer significant opportunities to generate environmental benefits, adequate policies based on extensive further research must be adopted prior to their wider application so as to avert the potential risks and threats to the environment.

To begin with, we discuss the importance of looking at new technological innovations as weak signals and emerging issues. While the methodology is explained in the second section, the following section consists of a detailed examination of each of the analysed emerging issues. Outcomes are considered and the main findings outlined in the fourth section.

II. New technological innovations as emerging issues

Mounting evidence suggests that human activity is irreversibly damaging the natural world and posing existential threats to human society. The IPCC (2018) in its report warns of the adverse impacts of climate breakdown, such as extreme weather conditions, accelerated biodiversity loss, and greater risk to human health, the water supply, food security, livelihoods, human security and economic growth. All of these are to be experienced already at the global heating of 1.5°C above the pre-industrial level and considerably amplified should the average global temperature increase to 2°C above the pre-industrial level. In addition, according to the IPBES (2019), 75% of land and 66% of oceans have already been eroded due to food production significantly altering Earth's ecosystems and pushing many species of plants and animals into extinction. Continuing down this path, we risk exceeding Earth's finite ecological limits in the coming decades (if we have not already done so) and causing irreversible damage to the natural environment.

Urgent actions are needed if we are to prevent the worst anthropogenic impact on our planet. According to the IPCC (2018), to keep global heating below 1.5°C, global emissions of carbon dioxide (CO_2) and all GHG emissions need to be reduced to zero by 2050 and 2060–2080, respectively. Radical transformation of global energy systems and rapid decarbonisation of all sectors, including transportation, construction, industry, agriculture and forestry, are required (IPCC, 2018). Enormous investments in new environmentally friendly technologies are necessary (Godthab *et al.*, 2019). Research, development and swift deployment of low-carbon technologies around the world are deemed to be essential should we succeed in reducing cumulative global CO_2 emissions without sacrificing economic growth (Stern, 2009). Indeed, the apparent inability of policy to manage the issues of population growth and increased income leads some to believe solely in the role of technological advancements in averting the anticipated environmental catastrophe (Jackson, 2009). Thus, technological innovations seem to be the key to achieving the desired transition in the foreseeable future.

A similar position towards new technology has been adopted by the European Union (EU). Outlining its vision for 2050 as 'living well, within the limits of our planet', the EEA recognises the great significance of the principal economy sectors' transformation for the future of the European and global natural environment, and emphasises further investment in new low-carbon technologies (EEA, 2015). Yet, the EEA (2013) urges against the unfettered application of new technologies, as science and global industries might be tempted to introduce them without a comprehensive understanding of their full consequences for the social and natural worlds. In situations in which governments exercise ever less control over globalised technologies, employment of any new innovation needs to be balanced by precautionary measures so as to impede the hazardous impacts on the natural environment (EEA, 2013). Forward-looking assessment, as a part of foresight work, also called future studies, can prove to be an indispensable source of information for this purpose.

The task of future studies is prospection, which means creating images of the future through systematic, conscious and explicit employment of prospective thinking and methods (Voros, 2006). In the conditions of growing complexity, insecurity and dynamic evolution of the global environmental problems, forward-looking assessments focused on the application of new technologies can provide policymakers in advance with long-term information that can enable them to develop appropriate environmental policies and prepare them for making timely decisions (EEA, 2011). For this purpose, at the European level, in 2011 the EEA established the knowledge base for Forward-looking Information and Services (FLIS). The main aim of FLIS is to add new forward-looking elements to the already existing EEA knowledge base (EEA, 2011). One of the instruments at the disposal of FLIS is the identification of warning (weak) signals of emerging issues.

First introduced by Igor Ansoff (1975) in the context of a future-oriented approach to planning in business and institutional settings, the concept of weak signals has been integrated into future studies only more recently (Holopainen & Toivonen, 2012). Weak signals are signs of emerging issues, or *"signals of possible change"* (Hiltunen, 2007). That is to say, they indicate the issues that are emerging (Hiltunen, 2008). They concern events that have not been important or influential in the past or at the time of inquiry, but that might be crucial for the emergence of the future. By examining such events as soon as they first appear (just as a sense of threat or opportunity), and well before they become an ordinary occurrence, foresight work aims to understand new processes started and map alternative futures (Halopainen & Toivonen, 2012). This can significantly improve the adaptability and increase the flexibility and resilience of policymaking (Inayatullah, 2013). Above all, weak signals and emerging issues analysis can help to prepare decision makers to act in creative and innovative ways.

Whilst negative anthropogenic impacts at the global level have been increasing at a high speed, investment in new environmentally friendly technologies and their quick dissemination have been recognised as being crucial for achieving the transformation into a low-carbon global economy. Yet, prior to their application, every effort should be made to understand the possible consequences of new technologies for the natural environment and the social world. Future studies allow us to look at new technological advancements as emerging issues. Information obtained in this manner can help policymakers to identify potential future risks and, thus, avert irreversible harm. Overall, unforeseeable and unpredictable consequences of climate emergency and wildlife extinction prompt us to act with every precaution when considering any new technological innovation.

III. Methodology

In the following chapter, four weak signals are analysed: artificial meat, blockchain, delivery drones, and off-grid electricity. They have been identified by the FLIS working group via a horizon scan in 2018 as being emerging issues related to the transformation of three consumption–production systems: food, mobility and energy. Analysis was then conducted and completed by the Institute for Forecasting at the Slovak Academy of Sciences in 2019.

To examine each of the weak signals a systematic review of available literature was carried out. While the main focus of the review was on the EU-relevant information, it was not restricted thereto. The aim was to produce a succinct forward-looking assessment in the form of a factsheet that would synthesise current available knowledge on each of the selected emerging issues and facilitate a broad understanding of possible threats and opportunities related thereto. In particular, attention was paid to less-known but potentially high-impact implications of these new technologies for the EU environment and environmental policy.

Some limitations related to this study exist. The examination consisted of reviewing both available academic and a variety of non-academic sources, including websites, blogs, newspaper articles, and so on. While such a methodological approach is commonly applied in future studies when analysing emerging issues (Inayatullah, 2013), the sources employed inexorably influence the analysis produced. Because of the limited scope and space of this paper, the analysis presented here narrowly concentrates on the processes initiated. It proceeds neither to the outlining of alternative futures nor to the 'making' of a desired future.

Based on the template elaborated upon by FLIS in previous years, each of the assessments consists of the following parts: description, overall impact, impact on the European environment, and implication for environmental policy in Europe.

IV. Emerging issues

IV.I Artificial meat

Description

The term ‘artificial meat’ first appeared at the beginning of the 20th century in referring to plant-based food (soya beans, wheat, a variety of legumes, cereals or fungi), and only at the start of this millennium did it begin to be applied to meat produced from the cells of real meat. This was originally produced in the laboratory and called *in vitro* meat. Artificial meat, alongside other commodities such as artificial leather, hen-free egg whites, artificial milk, rhino horns, and so on, falls into the category of ‘cellular agriculture’, which focuses on the production of agricultural products from cell cultures (Post, 2012). Other names for artificial meat in use include the following: laboratory-grown meat, synthetic meat, or clean meat. Lee (2017) puts forward the following definition:

“In-vitro meat involves injecting muscle tissue from an animal into a cell culture, allowing cells to ‘grow’ outside the animal’s body.”

This process uses stem cells from living animals that are put into a serum, wherein they start growing and multiplying. In approximately three months, meat suitable for eating is formed. In theory, one cell could be used to grow an infinite amount of meat. The process is considerably faster than more traditional meat production, which can last up to or more than a year depending on the particular kind of meat (Lee, 2017).

Several issues with laboratory-grown meat exist. The first problem relates to the accessibility of culture medium stimulating the growth of stem cells, which consists of sugar, amino acids and animal serum. The animal serum is prepared from foetal bovine serum (FBS), which is an animal by-product. This is the liquid component of the blood from a calf’s foetus after it has been depleted of red blood cells, fibrin, and clotting factors (Lee, 2017). The FBS is used because it has an optimum composition of hormones, growth factors and other ingredients necessary for optimal growth and life of the cells. Yet, FBS culture medium is very expensive, which hinders the mass production of laboratory-grown meat. More economical *in vitro* meat production would require an alternative low-cost way of fabricating enough culture medium in an artificial way. While some FBS-free products already exist, this remains the focus of research in cultured meat startups (Lee, 2017). The second problem concerns the high costs of artificial meat production. The first hamburger grown by Dutch University was priced at €250,000 in 2013 (Sacham, 2016). Since then the production costs have decreased to tens of euros and are expected to decline further, reaching the cost of conventional meat eventually. Potential artificial meat producers, such as *Memphis Meat* or *Mosa Meat*, aspire to offer competitively priced products by 2020 (Ireland, 2017). Nevertheless, future research is to concentrate on inventing artificial blood with a similar composition to that of real blood and which is capable of providing stem cells with the energy necessary for their growth.

Overall impact

Several far-reaching consequences in social, environmental, economic and technological domains need to be considered in relation to the further evolution and widespread use of artificial meat. Even if the artificial meat were to be introduced to the market now, the question of its acceptance by the general public would persist. For instance, as of 2019, genetically modified organism products were accepted in the USA but not in Europe (Hocquette, 2016; Johnson *et al.*, 2018). Thus, a survey conducted by Michigan State University (MSU, 2018) in the USA found only 33% of its participants willing to purchase products looking and tasting identically to meat but produced artificially, in comparison to 48% refusing to do so. After receiving further information on artificial meat, 60% of respondents were in favour of trying *in vitro* meat, while 25% still rejected to eat it regularly (MSU, 2018). In Europe, the acceptance of laboratory-grown meat varies considerably. It is somewhere between 16% and 66% (Wilks & Philips, 2017), which could also be attributed to ongoing dramatic changes in the eating habits of Europeans (Fernandéz, 2018). Reduced consumption of 'real' meat and an increasing preference for vegetable-based dishes could also potentially contribute to the improved acceptance of *in vitro* meat.

The major advantages of the introduction of artificial meat can be expected in animal welfare and the health of the human population. Sachan (2016) notes how at present the majority of farmed animals exist in poor conditions, leading them to destruction amongst themselves. Diseases spread quickly in overcrowded spaces, requiring treatment with antibiotics or other medicines. In the USA, 80% of antibiotics produced are used on livestock (Sachan, 2016). Such substances can then be transferred to human bodies and induce their resistance to antibiotics, putting people at risk of infection from antibiotic-resistant microbes. A similar situation might be observed with the indirect consumption of growth hormones via animal products. The animals are administered various hormones in order to grow bigger in specific parts of their body according to the requirements of consumers (Mattic & Allenby, 2013). All of this has repercussions for human health.

On the contrary, several indications of rather positive benefits of artificial meat to human health exist. As Mattic & Allenby (2013) note, artificial meat production requires stem cells from healthy animals free of medication, while the process of meat production in sterile conditions needs no antibiotics. A strictly controlled production process can diminish the incidence of zoonotic and food-borne diseases. Reduced indirect intake of antibiotics by humans through meat consumption could result in less bacterial resistance to antibiotics and a lower propensity for animal diseases to cross to humans (Mattic & Allenby, 2013). Moreover, considerably shorter artificial meat production, in comparison to 'real' meat (Lee, 2017), could make the use of hormones redundant. Production could concentrate on the growing of quality and selected organs only, eliminating those parts that have less or no utility to humans and, thus, making the whole process considerably expeditious. Furthermore, as the production is controlled and the composition of artificial meat regulated, the fat content can be set at a required level, harmful saturated fats can be replaced by healthier omega 3 fatty acids, and some kinds of healthy ingredients, such as vitamins, could be included in the meat (Bhat *et al*., 2015). Thus, as Post (2012) concludes, *in vitro* meat could be a healthier alternative to conventional meat.

All in all, while such transformation in meat production could have an overall positive effect on people's health, the requisite of healthy stem cells could intensify the pressure placed on farmers to provide the reared animals with better living conditions. In turn, improved animal welfare may increase the acceptance of artificial meat, particularly amongst those people who refuse to eat meat just because of animal ill-treatment and the misuse of antibiotics, hormones and other substances in meat production. Moreover, further benefits for people might lie in increased prosperity — for those from the Global North in improved nutritional value of ingested meat, and for those from the Global South through reduced illness due to malnutrition.

Nevertheless, several risks are directly related to the wider use of *in vitro* meat. Thus, the reduced cost of final products induced by improved production efficiency might stimulate consumption or even trigger meat overconsumption, whereby leading to obesity and health problems (The Week, 2018). The process of production through animal-based serum involves the risk of contamination (Orzechowski, 2014). Last but not least, it is not entirely clear as to what such transformation of meat production could mean for the agricultural labour market. What is more, decreased use of chemical substances might have implications for other sectors, such as the pharmaceutical or chemical industry.

<u>Impact on the European environment</u>

The spread of artificial meat production can have significant implications for the European environment, related mainly to GHG emissions, the use of natural resources, fertiliser application, and land use changes. Earth's human population have experienced a dramatic increase from 2.5 billion in 1950 to the present 7.5 billion, being expected to reach 10 billion by 2050 (UN, 2013). This has been accompanied by increasing consumption of meat. The demand for meat is expected to grow further by 73% by 2050, from its level in 2010 (FAO, 2011). The EU (2018) in a recent report claims that livestock raised for meat already uses 30% of global ice-free terrestrial land and 8% of freshwater resources. Thanks to the fast-growing world population, the percentage of land use is to climb to 50% by 2050 (EU, 2018). Consequently, Earth's finite natural resources are likely to remain under increasing pressure from conventional meat production.

First and foremost, meat production is an important contributor to climate emergency. Gerber *et al.* (2013) note that the livestock sector is responsible for 14.5% of all human-induced GHG emissions, while 65% of the amount is due to the feeding of cattle and dairy products. Livestock is, through ruminants, also accountable for 37% of all global methane emissions (FAO, 2006). Yet, the transition to artificial meat production seems to have the potential to reduce the total amount of such produced GHG emissions. Several studies (Tuomisto, 2011; EU, 2018) claim that *in vitro* meat production is more environmentally friendly and more energy-efficient than traditional farm-grown meat. However, the technology for artificial meat mass production still does not exist. Thus, some uncertainty remains regarding its actual potential to reduce GHG emissions (Ireland, 2017). It is estimated that artificial meat is 7–45% less energy-demanding and produces 78–96% less GHG emission than conventionally produced meat in Europe (Tuomisto *et al.*, 2011). Yet, further research is necessary to confirm this.

The reduction of livestock means saving resources such as water and land. It is estimated that the transition to artificial meat production could mean a 99% reduction in land use, as well as a 82–96% decrease in water use, depending on the product (Tuomisto *et al.*, 2011). This might relieve the pressure to enlarge existing cultivated areas. Indeed, according to Bhat *et al.* (2015), more water and land could be available for other more environmentally friendly kinds of production, e.g. ecological agriculture. Some land could even return to the wilderness for the purpose of biodiversity conservation and endangered species protection. Wildlife could further benefit from the decreased use of fertilisers and other chemical substances widely applied in the agricultural production of animal feed, such as cereal and fodder plants (Bhat *et al.*, 2015). Yet, some areas, including mountain pastures in the Alps and the Carpathians, environmentally profit from traditional forms of cattle and sheep breeding. Here, traditional livestock farming contributes to the conservation of biodiversity and the reduction of livestock could result in serious environmental damage (Battaglini *et al.*, 2014). Thus, although European nature might greatly benefit from the transition towards laboratory-produced meat, it would be necessary to ensure that potential negative consequences are being adequately addressed.

Implications for environmental policy in Europe

Considered in the context of the EU 2050 vision of 'living well, within the limits of our planet' (EEA, 2015), a shift towards artificial meat production could make a significant contribution to the fulfilment of EU and global economic, social and environmental goals. Presumed decreased pressure on natural resources can improve the protection of EU ecosystems and, thus, help to implement the targets for biodiversity protection as set out in the EU Biodiversity Strategy to 2020 (EU, 2011). It could further prevent land degradation, which was one of the aims of a new bioeconomy strategy for sustainable Europe announced by the European Commission (EC) in October 2018 (EC, 2018b). Investment with which to enhance the production process of cultivated meat would be in line with the objectives of the Environment Action Programme 2050, calling to stimulate innovation to speed up green growth (EEA, 2017). Last but not least, *in vitro* meat could contribute to better food security, as required in the 2030 Agenda for Sustainable Development (UN, 2015), as well as help to fulfil the United Nations (UN) sustainable development goals (SDGs), especially zero hunger, good health and well-being, and responsible consumption and production.

All in all, the transition to artificial meat production presents important opportunities for the EU and global natural environment; however, adequate and comprehensive EU environmental policy is essential in order to accompany the innovation process and ensure the sustainable character of *in vitro* meat production in all of its facets.

IV.II Blockchain

Description

Blockchain technology, which is one of the digital ledger technologies, is closely connected to cryptocurrencies. Introduced in 2008 to serve as a public transaction ledger for Bitcoin, it has been further promoted by its success (ENISA, 2019), extending its impact well beyond the realm of currency (Boucher *et al.*, 2017). The European Union Agency for Network and Information Security (ENISA) defines it as follows:

"…a public ledger consisting of all transactions taken place across a peer-to-peer network. It is a data structure consisting of linked blocks of data, e.g. confirmed financial transactions with each block pointing/referring to the previous one forming a chain in linear and chronological order. This decentralised technology enables the participants of a peer-to-peer network to make transactions without the need of a trusted central authority and at the same time relying on cryptography to ensure the integrity of transactions." (ENISA, 2019)

Blockchain is a technology-based system that stores data as a chain of blocks. The chain is composed of blocks that represent recorded transactions, with each new block of transactions being linked to the previous blocks (Nakamoto, 2008). 'Mining' is the term used for describing the work through which the chain of blocks (that forms a blockchain ledger) is created. To add a block of transactions to a blockchain, the 'miner' needs to find a solution to a difficult mathematical problem (hashing) (Boucher *et al.*, 2017). Blockchain has a decentralised structure. This means that in the absence of a central authority, where equal access to the same copy of ledgers is shared by all network participants, every new update requires approval by consensus, being voted upon or validated by the majority of participants. To ensure security, each block has a timestamp as well as a unique hash value (block header hash) referring to the previous blocks in the chain. The chain is composed of cryptographic structures that allow its identity to be verified while eliminating unauthorised alteration. Alteration can only be achieved through the consensus of network members. These features of the blocks enhance trust amongst participants. Traceability and information transparency are also guaranteed. Copies of ledgers with updated transactions as well as complete histories of all transactions are equally visible to all participants. Immutability of the blockchain data and the information that it contains is achieved by allowing the new addition of records to ledgers but not their modification or removal. In addition, the validation of transactions and subsequent additions to ledgers is facilitated by the use of smart contracts, which are essentially computer codes containing the terms of contracts and business rules, stored on the blockchain platform. These are executed automatically and without the need for human intervention or judgment. In general, we distinguish between public (‘permissionless’) and private (‘permissioned’) blockchains depending on whether they are accessible to anyone or to only a limited group of people (Kouhizadeh & Sarkis, 2018). When public access is enabled the control of transactions in the blockchain is decentralised and transparent; when access is limited by the private mode, control is retained by a restricted number of persons (Boucher *et al.*, 2017).

In spite of a degree of scepticism towards cryptocurrencies such as Bitcoin, blockchain has already attracted the interest of the European business community and European institutions as a new business process. Beyond the financial sector, wherein its origin lies, the technology could potentially be extended over a great range of other areas, including governance, commerce, healthcare, education, logistics, and so on (ENISA, 2019), although further research and innovation would be required. Finding the solution to reducing the energy consumed during ‘mining’ is essential. Swapping the existing consensus mechanism, also known as the ‘proof-of-work’ algorithm, for alternatives (including ‘proof-of-stake’, ‘proof-of-authority’ and ‘proof-of-elapsed-time’ algorithms) has already been suggested (Jones, 2017). However, a thorough assessment of each mechanism, energy impact and energy efficiency is still required (European Parliament, 2018). Switching to greener sources of energy and the evolution of less energy-demanding computation are also options to be further explored (Jones, 2017). Sources of volatility (related to cryptocurrencies), security of personal data in the digital environment, security of the technological infrastructure used by blockchain platforms, and the enforceability of smart contracts within the Digital Single Market also need careful attention (European Parliament, 2018).

Overall impact

The main implication of blockchain technology is the shift of control (and trust) from a centralised authority to decentralised user networks and the reduction of intermediaries from the transactions performed. Decentralised information datasets could be updated through consensus and trusted by everyone, which would lead to a higher level of accountability (Kouhizadeh & Sarkis, 2018), and perhaps democracy (Boucher *et al.*, 2017). For example, blockchain applied in the election process could transfer the logging and verification tasks from a central electoral authority and distribute them amongst voters. This could foster development towards a more participatory and decentralised society. For example, blockchain-based e-voting was applied to internal elections within a political party in Denmark (Boucher *et al.*, 2017). In addition, the use of smart contracts lessens the need for the involvement of various intermediary professionals (such as legal or financial) and introduces the automation of some processes (e.g. payment execution), thus further reducing the costs and time of transactions (Kouhizadeh & Sarkis, 2018) and improving services by reducing bureaucracy (European Parliament, 2018). The application of blockchain technology in public administration can benefit users by allowing them to create records (e.g. land registries, birth certificates) without the unnecessary involvement of any public administration officials (e.g. notary). Such a blockchain-based system has been tested in Estonia, wherein people were allowed to use their IDs to access a large variety of digital services (Boucher *et al.*, 2017). Numerous other applications of blockchain already exist, such as the protection of authorship and copyright of digital arts (*Ascribe* project), the prevention of internet censorship (alternative verification of DNS registration by *Namecoin*) (Shawn, 2015), and so on. It is claimed that the main positive impact of blockchain technology on European society is that of the enhanced transparency of transactions and more secure, cheaper and faster ways of keeping records (Boucher *et al.*, 2017). An understanding of the benefits that blockchain offers is usually based on the assumption that the information stored on a blockchain is public, accessible, shared and auditable (EC, 2019a).

Nevertheless, several concerns arise in relation to the wider application of blockchain technology. As the case of cryptocurrency Verge demonstrates, smaller blockchains based on the 'proof-of-work' algorithm can be sensitive to malicious attacks (such as the so-called 51% attack) from 'miners' taking advantage of errors in the blockchain protocol in order to modify transactions recorded with the purpose of seeking benefits (e.g. financial) for themselves (Sedwick, 2018). Moreover, by using great computational power, 'miners' can compromise the decentralised character of the blockchain and exercise considerable power and control over the 'mining' process (Shawn, 2015). In conditions in which the cryptographic nature of blockchain platforms may prevent legitimate institutional protection (e.g. law enforcement), decentralised blockchain-based systems can suffer misuse from external powers and evolve into oligarchies (Boucher *et al.*, 2017). In addition, decentralised blockchain-based systems are able to operate across borders (diffusing institutional accountability and legal responsibility), which may complicate their control by central authorities (Boucher *et al.*, 2017). For example, this might facilitate the use of blockchain technologies for illicit purposes, including the use of cryptocurrencies for money laundering and tax evasion (Houben & Snyers, 2018). The elimination of intermediaries raises questions in respect of central authorities losing their power, income and control, leading to possible conflicts of interest (ENISA, 2019), while the automation of the process brings into focus the issue of changes (reduction or alterations of tasks performed) in the patterns of 'white-collar' employment (Boucher *et al.*, 2017). Security, privacy and data protection concerns are related to the possibility of tracking down the identity of individual users. The more personal data is stored on the blockchain, the easier it is to discover to whom it belongs (Boucher *et al.*, 2017). Last, but not least, is the issue of accessibility and equity, important within the context of sustainable development goals. Not all European citizens may have access to the Internet or the services provided by blockchain-based systems (Boucher *et al.*, 2017), or they could be disadvantaged by a lack of knowledge and expertise on blockchain technology fundamentals and its practical application (ENISA, 2019).

Despite the challenges and concerns, the overall impact of the wider use of blockchain technology on European society might be significant. As Shawn (2015) puts it, blockchain technology, by working on a larger scale, reducing friction and increasing efficiency, represents a paradigmatic shift in organising activity.

Impact on the European environment

The current application of blockchain technology indicates that its wider use might accelerate energy consumption and generate an increase in the production of GHG emissions. The process of transaction verification, or 'mining', through which cryptocurrencies are generated, is energy-demanding (Mougayar, 2016). The problem is closely related to the energy intensity, and thus unsustainability, of the commonly used 'proof-of-work' algorithm. The process of finding the solution to a complex mathematical problem (hashing) and value verification requires much processing power and, thus, electrical energy (Vries, 2018). This is best demonstrated in the case of Bitcoin. In 2017 the energy spent on 'mining' Bitcoin was suggested to exceed the requirements of tens of countries for all of their energy needs (Jones, 2017). Vries (2018) estimated the annual energy consumption of the Bitcoin network to be 2.55 gigawatts in 2018. He claims his results to be based solely on the number of hash operations that take place per second in the Bitcoin network (leading players in so-called Bitcoin mining to keep a low profile with regard to hardware, computing power and power consumption). He also predicts the energy consumption of the Bitcoin network to reach potentially 7.67 gigawatts in the near future as a result of the network expansion. By comparison, the annual energy consumption of Ireland is approximately 3.1 gigawatts and of Austria approximately 8.2 gigawatts (Vries, 2018).

When compared to alternative payment methods, in 2017 Bitcoin was claimed to be 20,000 times more energy-intensive than Visa (Brosens, 2017). In 2017 the energy consumed per transaction was estimated to be 200kWh for Bitcoin, 37kWh for Ethereum cryptocurrency (also based on the 'proof-of-work' algorithm), and only 0.01kWh for Visa (Brosens, 2017). In 2019, the value for Bitcoin increased to 413kWh per transaction, which is equal to electricity that could power approximately 14 households in the USA for one day (Digiconomist, 2019). However, the 'proof-of-work' algorithm, or the hybrid 'proof-of-work' and 'proof-of-stake' algorithm, continues to be the most common algorithm used by cryptocurrencies, according to which calculations are carried out by electronic devices, thus relying on energy consumption (Jingming *et al.*, 2019). Although further studies on energy consumed by blockchain-based systems, beyond Bitcoin, remain scarce (Jingming *et al.*, 2019), the more complex these systems are, the more processing power they need for 'mining' and maintenance (Boucher *et al.*, 2017). As the majority of energy is still generated from fossil fuels, which produce greenhouse gas emissions, the energy intensity of blockchain technology can pose a threat to the global environment (Galeon, 2017) and could affect many countries in not reaching their climate change (Truby, 2018) and air quality targets and obligations. For instance, Bitcoin's annual carbon footprint is estimated to be 22,813kt of CO_2 (Digiconomist, 2019). Thus, a broader application of blockchain, without resolving the problem of excessive use of power and energy required by 'mining', might compromise the EU's effort to combat the negative impacts of climate breakdown and save the planet.

Notwithstanding this issue of energy consumption, the environment can also benefit from the technology, especially from the transparency and traceability of information introduced by a wider application of blockchain to existing processes. One such case is the use of blockchain by supply chains. Blockchain allows information on the origin of a product or process, and on the parties involved in its transactions and logistics, to be visible and verifiable by all supply chain partners (Kouhizadeh & Sarkis, 2018). Thus, for example, the application of a blockchain technology supply chain allows the clients of *Everledger* to trace the origin of diamonds from mines to stores (Boucher *et al.*, 2017) and the customers of *Walmart* to track the food that they buy along the supply chain (Aitken, 2017). What is more, as the information is secured and timestamped, it cannot be altered or modified, which eliminates possible fraud. Consequently, this can help to apply sustainability criteria on supplier and vendor selection, improve supplier development programmes, and achieve more sustainable purchasing by selecting more environmentally friendly materials and products, more sustainable designs of logistics networks, and sustainable production and internal operations (Kouhizadeh & Sarkis, 2018). Blockchain technology can also be employed in other applications with environmental benefits. Park *et al.* (2018) envision the technology being used for the development of an energy platform within a smart home environment, enabling efficient electrical energy transactions between prosumers (i.e. individuals who are both producers and consumers of electricity) that could bring economic and environmental benefits.

Implications for environmental policy in Europe

On a global level, the UN Climate Change Secretariat initiated and supported the creation of the Climate Chain Coalition (CCC). The purpose of the CCC is to enhance the collaboration amongst its organisational members and stakeholders to support the application of blockchain for climate action and sustainability (UNCC, 2018). In Europe, the EU Parliamentary Committee on Economic and Monetary Affairs concluded that the regulation of blockchain is not an immediate concern, emphasising the focus on its monitoring (ENISA, 2019). In light of this, in 2018 the EC launched the EU Blockchain Observatory Forum (EC, 2018a). This is set to map key initiatives and monitor developments related to blockchain technology. The European Parliament, in its resolution 2017/2772(RSP), calls for a regulatory framework that would encourage further innovation and remove existing barriers to blockchain applications. Moreover, it emphasised the need for awareness raising and the education of citizens regarding the technology (2018). It also seems essential that any new regulation related to blockchain addresses the concerns surrounding its energy consumption and facilitates ways in which its application promotes, enhances and upholds the principles of sustainability.

IV.III Delivery drones

Description

Drones, which were originally developed and used mainly for military purposes, have, during the course of the last decade, found their way into many areas of the civic sector. First patented in 1898 and converted into a mechanism in 1951, quick evolution of drone technology has occurred in the last 10 years (Molina & Oña, 2018). Although referred to in literature as a remotely piloted aircraft system (RPAS), unmanned aircraft vehicles (UAVs) or unmanned aircraft systems (UASs), drones are commonly defined as flying objects, or ‘robots’, with no pilot on board (Santamarina-Campos, 2018). According to the definition proposed by the European Aviation Safety Agency (EASA), a drone is:

“…an aircraft without a human pilot on board, whose flight is controlled either autonomously or under the remote control of a pilot on the ground or in another vehicle” (EASA, 2015).

Drones can vary in size, speed, endurance and take-off weight (EC, 2014). They can either be a form of airplane with fixed wings or use a tilt rotor system, like a helicopter, that lifts and propels (Nentwich & Horváth, 2018a). Drones can be piloted remotely by an operator. Only those flying automatically without any kind of human intervention in their flight management are considered autonomous. The ability to operate in autonomous mode, without an individual pilot needed for each drone, is essential for drone use in delivery services (Nentwich & Horváth, 2018a). Autonomous flying requires a drone to be equipped with an autopilot, while the route of the drone will be determined by the input (path-planning algorithm) from the user. Other software components are also included. Geolocation devices, such as GPS, are used to determine drone location, while the inertial measurement unit (IMU) communicates other sensor data collected during the flight and enables the autopilot to adjust the flight accordingly. To facilitate navigation, the drone is equipped with a camera(s) or radar. Emergency remote control enables an operator to activate manual operation of the drone at any time (Brunner *et al.*, 2018; Krishna *et al.*, 2016).

Drone technology is evolving at a fast pace with the increasing potential to successfully compete with more ‘traditional’ technological alternatives in a variety of civil industries. Considerable technological progress has allowed for their mass production and commercial application in areas additional to retail and delivery, namely research, mapping, monitoring, leisure, tourism, cultural heritage, nature conservation, agriculture, photography, emergency response, and so on, leading to an exponential increase in drone markets composed of both manufacturers and service providers (Santamarina-Campos, 2018). Approximately 2.2 million drones for personal and commercial use were sold in 2016 worldwide, and the drone world market is expected to be worth more than US$11.2 billion by 2020 (Forni & Muelen, 2017). In Europe alone the estimated number of commercial drones operating in 2016 was that of 10,000 units, along with 1–1.5 million customer drone units (e.g. drones used for leisure) (SESAR Joint Undertaking, 2016). Further growth is expected, as their number in Europe is forecasted to reach 200,000 units by 2025 and 395,000 units by 2035 (SESAR Joint Undertaking, 2016). According to Molina & Oña (2018), based on statistics from Tractica (2017), the revenue from commercial drones in Europe amounted to US$99.53 million in 2015 and is forecasted to reach US$3035.33 million by 2025. Available, albeit insufficiently comprehensive, data suggests that a significant number of drone manufacturers are located in the UK, Italy, Germany and France, while a significant number of drone operators can be found in the UK, Spain, France and Italy (Molina & Oña, 2018).

Several companies use or have already tested drones for delivery services. Alongside smaller enterprises that are already employing drones for delivery, such as *Zipline International* (Markoff, 2016), drones are also being tested by large multinational companies including Amazon, DHL and Google (Nentwich & Horváth, 2018a). Amazon launched its Prime Air delivery in Cambridge, UK, in 2016 (Amazon, 2016). It announced further investment in the research and development (R&D) of technology used in drones for shipping (Kang, 2016), and indicated that its aerial delivery could be available as soon as 2019–2020 (Heathman, 2018). The Austrian Post tested drone delivery of packages weighing up to 3.5kg in 2017 (Nentwich & Horváth, 2018a) and DHL concluded a pilot project using parcel drones for the delivery of medicine to remote areas in 2018 (Deutsche Post DHL Group, 2018). All in all, growing interest in drones in Europe and worldwide attracts further investment in their R&D.

Research efforts focus on the development of solid sense and avoid technology, which is essential for autonomous drones to operate safely and without collision (Nentwich & Horváth, 2018a). Investments in the research of autonomy and the artificial intelligence of drones are also regarded as a priority by the EU in the context of developing a fully operational framework named U-Space, which would enable secure drone management (Ministerie Van Infrastructuur en Waterstaat & EASA, 2018). Other areas of research include: cargo transport and release technology, energy efficiency, noise pollution, safety and security (Brunner *et al.*, 2018).

Overall impact

The steady increase in the number of drones worldwide indicates that they are having a considerable influence on all areas, including economic, social, environmental and legal domains. The total number of commercial drones in Europe is expected to reach 395,000 units by 2035. Delivery drones, with an estimated 70,000 units, are second only to the 150,000 units foreseen for agriculture, surpassing the 60,000 units estimated for public safety and security and the 10,000 units used in the energy sector (SESAR Joint Undertaking, 2016). Drones for delivery remain attractive to manufacturers (Molina & Oña, 2018) because they have the greatest potential for future growth in the longer term (Doole *et al.*, 2018; EC, 2014; SESAR Joint Undertaking, 2016). They are at the forefront of the shipping, transport and logistics industry’s effort to overcome common problems with terrestrial transportation (ageing infrastructure, congestion, emissions) (Manjoo, 2016) and find a cost-effective solution to last-mile delivery (Doole *et al.*, 2018). The EC (2019b) estimates that the drone industry will have a considerable positive economic effect of approximately €10 billion per annum, mainly in services, and that it will create approximately 100,000 new jobs across Europe in the next 20 years. However, the automation of shipping, through drone employment for last-mile delivery, poses a risk to job security in unskilled labour (Nentwich & Horváth, 2018a).

The employment of drones also raises many issues surrounding public health, safety and security as well as privacy. The very obvious legal implication of using drones for delivery is the need for common EU regulation for the operation of drones in autonomous mode (without a pilot), flying over urban, private or protected areas, or in relation to cross-country-border traffic. Existing regulation allows commercial delivery drones to operate only on a case-by-case basis (Nentwich & Horváth, 2018b). Security and safety issues are linked to the risk of drone collision with manned aircraft and to the potential harm caused to people or the damage suffered by property (EASA, 2015). Drones with malfunctioning navigation or those impaired by weather conditions could cause serious injuries, loss of life, and considerable destruction of material assets. Overall harm could be further exacerbated if drone cargo, particularly if heavy or dangerous, consequently falls on urban or populated areas (Nentwich & Horváth, 2018b). There are further security issues surrounding the use of delivery drones for illicit purposes, such as smuggling, transportation of drugs or weapons, or even terrorist attacks (Nentwich & Horváth, 2018a). The serious nature of this problem was highlighted by the disruption caused by a drone sighting at Gatwick Airport, UK, in December 2018. It resulted in the prompt instalment of anti-drone equipment at airports across the UK (BBC, 2019).

Privacy concerns are related to a drone's ability to record and transmit data in real time (EASA, 2015). Data generated and stored during flight and delivery could be linked to specific people, or could reveal sensitive details of private properties and public buildings (Nentwich & Horváth, 2018a). Drones for delivery are equipped with cameras that enable their orientation within the space that surrounds them. They also produce audiovisual material that could potentially be required by law to be stored as evidence that no damage was caused by a drone during its operation. An enormous amount of data collected by drones in this way, especially in combination with other sources, could help to build a complete profile of an individual or area and, thus, provide sensitive information that could be misused by third parties in the worst case (Nentwich & Horváth, 2018b).

Thus, Rice (2019) concludes that there is a chance that the further proliferation in drone numbers in the near future may increase privacy concerns amongst the general public and private companies alike.

Further unease is related to ethical issues such as the question of ethical decisions made by pre-programmed algorithms. Autonomous drones, much like other autonomous vehicles, might need to make an ethical decision, such as where to crash, whom to injure or what damage to cause, in situations in which harm cannot be prevented. As these decisions need to be made and programmed in advance, the question remains as to who will decide and how the implementation of such decisions will be overseen (Nentwich & Horváth, 2018a).

Impacts on the European environment

There are pros and cons in respect of employing drones for delivery from the environmental perspective. The main benefit for the European environment is that, compared to traditional (fossil-fuel-based) methods of delivery, delivery drones can help to conserve energy and reduce CO_2 emissions, whereby assisting the EU in achieving its key climate targets. Several comparative studies (Figliozzi, 2017; Goldchild & Toy, 2017; Park *et al.*, 2018; Stolaroff *et al.*, 2018) demonstrate that delivery drones are considerably more CO_2-efficient than conventional means of transportation, with the amount of CO_2 emissions being greatly reduced, but still depending on other specific factors involved.

Delivery drones perform better than:

- conventional delivery trucks, producing considerably less CO_2 emission when the distance travelled is short, energy requirements are low and the number of recipients is small (Goldchild & Toy, 2017);

- diesel vans, with significantly better results when the payloads are small and customers are clustered around one delivery route (Figliozzi, 2017);

- motorcycles, with higher CO_2 efficiency achieved in rural than in urban environments (Park *et al.*, 2018).

However, Stolaroff *et al.* (2018) point out that emissions related to extra warehousing, as required by a drone-based logistics system, might reduce, if not hinder, the overall positive environmental impact. Thus, attainment of the desired emissions reduction would depend greatly on finding solutions regarding how to diminish the negative impact of extra warehousing, decrease the size of drones (Stolaroff *et al.*, 2018) and continuously increase the use of renewable sources of energy used for drone operation, such as solar and wind power (Park *et al.*, 2018). The life cycle of batteries used by drones also needs to be considered (Nentwich & Horváth, 2018a). Above all, comprehensive assessment of delivery drones' environmental impact — in relation to their energy consumption and CO_2 emissions production — is still pending.

Amongst the significant negative effects that need to be seriously considered is the threat to wildlife, especially birds, as a result of collision, noise or stress caused by the frequent presence of drones in their habitat. Operating at a low altitude, usually below 500m, means that drones are likely to come into contact with wild animals (Mulero-Pázmany *et al.*, 2017). Yet, the consequences of undue stress caused by drones to wildlife have not been systematically studied and are little understood. It has been suggested that animals constantly bothered by drones might use up their finite energy reserves for self-defence, or might start responding incorrectly to other threats as a consequence of exposure to drones (Greenwood, 2018). Moreover, drones can have a detrimental impact on an animal's reproduction and survival (Hodgson & Koh, 2016; Mayntz, 2018; Mulero-Pázmany *et al.*, 2017). The evidence of bird–drone interaction, such as two eagles mistaking a drone for food in Austria (Staufenberg, 2015), is growing. Warnings have been released to inform drone operators about the possibility of drones being perceived as a threat by wild animals (The Local, 2018). In some areas, such as parks in London, drones have been banned from operating due to concerns related to their negative influence on wildlife (Peyer, 2015). This suggests that fears related to drone impact on wildlife will increase with the growing number of drones operating in European skies.

Furthermore, noise and aesthetic pollution can have a negative impact on humans living close to future delivery air corridors. Noise-sensitive individuals in particular could be disturbed by the noise produced by a drone as it moves its cargo close or near to them. This might result in resistance in the population to drones. Other potential environmental risks include the debris resulting from collisions and dropped cargo and the related responsibility for the disposal of such debris (Nentwich & Horváth, 2018a).

Implications for environmental policy in Europe

Under current EU legislation (Regulation 2018/1139), which was adopted jointly by the European Parliament and the Council on 4 July 2018 (European Parliament and the Council, 2018), drones of all categories fall under the regulation of EASA, which works to provide a common regulatory framework. However, as with other fast-developing technologies, existing legislation lags behind the technological development. This applies to the environmental implications of drones used for the shipping of goods, too. A new regulatory framework, under development by EASA, also intends to address the concerns related to environmental protection, amongst other issues, proposing detailed checks on the noise emissions of drones during a conformity assessment (EASA, 2018). It aims to harmonise heterogeneous legislation amongst member states and the EU, and introduce common technical requirements for the mass-produced category of drones, while leaving the member states flexibility to create zones in which flying drones will be permitted, restricted or prohibited.

Areas in need of future EU legislation from an environmental perspective might include the common regulation of the technical parameters of delivery drones that would promote more sustainable design and operation. They might also include environmentally friendly logistics systems for drone deliveries influenced by the need to protect natural habitats, animals and humans from drone-related negative impacts. What is more, as Nentwich & Horváth (2018a) point out, the introduction of drone delivery services in the EU would require common rules for drone traffic.

IV.IV Off-grid electricity

Description

Although off-grid solutions have been traditionally designed for countries in the Global South, the number of households going off-grid in the Global North seems to be increasing (IRENA, 2015). While for the first, off-grid electricity is often the only means by which to provide and maintain energy access in underdeveloped remote areas or for underprivileged low-income households, in the second it is individual or collective decisions which are not always driven by financial calculations (Skea *et al.*, 2011). Off-grid electricity is therefore a rather complex mix of different approaches, technologies and solutions. In analysing this signal, we need to work with different archetypes of the off-grid situations in Europe. We set forth two basics:

- off-grid as a high-tech approach, which uses advanced real estate technologies as well as systems that are controlled by information technology (IT), backed up by high-capacity batteries;

- off-grid as a low-tech approach, which is based on simple and low-cost solutions, and often using technologies and approaches originally designed for the Global South countries.

While more comprehensive information is missing, available information indicates that off-grid solutions are gaining in popularity. According to the International Renewable Energy Agency (IRENA, 2015), almost 26 million households (approximately 100 million people) are served through off-grid renewable energy systems globally, including: 20 million households through solar home systems, 5 million through renewables-based minigrids, and 0.8 million through small wind turbines. What is more, the global renewable energy off-grid capacity increased 3.5 times from 1909.684MW in 2008 to 6574.595MW in 2017 (IRENA, 2018a). This is related to recent advancements in R&D yielding various technological solutions based on renewable energy. Expanding the production of renewable technologies, solar panels, high-efficiency solar technology, and long-lasting batteries leads to an economy of scale effect that decreases the relative price of the materials and equipment required for off-grid solutions. IT evolution supports demand-side management and improves energy efficiency, further decreasing investment and operational costs (Metz *et al.*, 2000). Such synergy amongst R&D, the growing production capacity and the push for more energy efficiency seems to be at the bottom of the off-grid worldwide advance.

Off-grid technology application varies around the world. In the Global South, it is a solution for providing and maintaining energy access in poorer areas and households, or for people who are too far from the grid. While cheaper technologies are commonplace, the most widespread are solar panels (IRENA, 2018). In the Global North, off-grid systems consist of two types: minigrids for rural communities and for institutional, commercial and industrial constructions and buildings, and the self-consumption of solar photovoltaic power generation in residential households (IRENA, 2015). High-tech and low-tech off-grid approaches can be distinguished. The first is a combination of lifestyle decisions and economic considerations. Life quality is meant to be maintained, while electricity needs are addressed through a combination of demand-side management (energy auditing, efficiency improvement, IT), encouraging consumers to optimise their energy use (Metz *et al.*, 2000). Electricity is generated by using solar, wind or geothermal systems combined with batteries for electrical storage and supplying electrical current for use by appliances (e.g. light, computer, stove, and so on) (IRENA, 2018). Equally, off-grid, as a low-tech approach, could also be contemplated as an alternative lifestyle and/or an economic decision. Moreover, in some cases, it might be amongst the essentials of disadvantaged households. Thus, people might go off-grid because of their intention to decrease their ecological footprint, live simpler lives or disconnect from corporations. They usually focus on simple technologies ('small is beautiful'), alternative housing stock, and solar panels. Others might invest in off-grid technologies while seeking to benefit from the increased value of the property or from preventing the uncertainty surrounding the volatile electricity market. In short, behind people's long-term decisions to go off-grid may be a strong economic rationale that is difficult to distinguish from environmental concerns.

Last but not least, debt or illegal dwelling status might obstruct some people from being connected to the mains. Consequently, they might be dependent on more controversial sources of electricity, such as diesel generators. The substantial nature of these issues is underlined by the 50 million EU inhabitants estimated to suffer from 'energy poverty' and who struggle to heat their homes and pay utility bills on time (Thomson & Bouzarovski, 2018). SDGs and the Reflection Paper Towards a Sustainable Europe by 2030 (EC, 2019c) provide a robust framework for policies and approaches linking energy and social policies.

<u>Overall impact</u>

Overall impact in the European context is strongly affiliated with off-grid electricity generated by individual households and communities. The growing number of off-grid users seems to indicate that electric energy could, for a reasonable price, be generated by a combination of high- and low-tech solutions (excluding experimental technologies). Yet, available information (IRENA, 2018) regarding the patterns of individual households' investment in renewable energy sources and the increasing self-generation of electricity shows that only a small minority of these households are completely disconnected from the grid. To be completely off-grid requires substantial investment. SonnenBatterie (2018), in its study for Germany, concludes that batteries combined with a photovoltaic system could help users to meet approximately 75% of their annual energy needs with self-produced and clean energy, while it remains cheaper to cover the remaining 25% with an outside source. In comparison, the Rocky Mountain Institute (2014), based on its HOMER software program experiment, argues that going off-grid with renewables based on solar photovoltaic will be economically more advantageous than staying connected to the grid. Independent of the ongoing research, off-grid villages and installations are springing up in locations as diverse as Denmark, Japan, the USA and Australia. For instance, in Denmark, 270 inhabitants established the first off-grid village in the country called 'Fertile Soils' with the purpose of producing their own heat and electricity (State of Green, 2018). Above all, self-sustained settlements, if properly managed, could have a positive environmental impact. By sharing investments, equipment and batteries, they may optimise costs and better address problems of system efficiency or recycling.

Ultimately, the social dimension of the approach should not be neglected. As Rosen (2010) points out, off-grid systems have the potential to assist in bringing life back to the countryside negatively affected by the declining population trend. What is more, off-grid solutions overlap with approaches outlined in the EU framework for rural development programmes (EC, 2019d).

Impact on the European environment

Off-grid electricity systems based on renewables are subject to the same concerns as those of the renewable industry. Regardless of the degree of household self-sufficiency (50%, 75% or 100%), the examination of their environmental impact should be carried out in a comprehensive way, from the cradle to the grave, and should consider all of the materials, equipment, batteries, etc. used for their production, maintenance and disposal. The main issue surrounding off-grid pertains to the unavoidable and extensive use of batteries. Despite their rapid development, a question remains as to how to deal with their end-of-life problem, i.e. reuse versus dismantling and recycling (EEA, 2018a). Thus, the State of California encourages solar and wind power generation to be connected to the electrical grid, with additional equipment, such as charge controllers, being required (CEC, 2019). Yet, smaller batteries needed for individual off-grid installations, including mobile batteries for e-vehicles, may still prove to be more environmentally friendly than potentially in future manufactured large-scale static batteries providing backup to numerous households (EEA, 2018a). However, concerns related to the use of batteries might form part of a wider solution including battery electric vehicles (BEVs). Ongoing research on BEV batteries is centred on the electricity grid, the storing of excess renewable power and providing grid-stabilising services, either while BEVs are plugged in or as a second-life use of the batteries (EEA, 2018b).

Implications for environmental policy in Europe

Off-grid solutions, especially for villages, communities and remote facilities, may prove to be a more environmentally and economically sounder alternative. It may build on a desire and readiness by a proportion of the population to have a less energy-intensive and a sustainable lifestyle. It also raises the question of whether it is plausible to invest in centralised technical energy or water infrastructure in areas with a decreasing population and/or low purchasing power. Thus, the EU could consider how to promote economically, socially and environmentally sound alternatives to central grids, using tools of economic and social cohesion policies and by providing guidance to the member states on schemes and incentives on the national level.

Energy production and consumption is unavoidably a social problem. Growing economic inequalities, changing demographic patterns, and the depopulation of rural areas, as well as increasing environmental awareness, point to the need to merge energy policies with social interventions in accordance with SDGs and, in particular, the goal of affordable and clean energy.

All in all, the above-presented off-grid analysis makes a strong case for the further strengthening of environmental regulations and incentives for the renewable energy sector. Research should continue and be supported by the EU in respect of energy storage solutions, environmental management of excess renewable power, and grid-stabilising services. Additionally, attention needs to be paid to BEV options and the development of recycling schemes for equipment and materials in accordance with the promoted principles of a circular economy.

V. Discussion

Artificial meat, blockchain, delivery drones and off-grid electricity were identified by FLIS as being emerging issues. They represent new technological advancements with the potential to play an important role in the transition to a global low-carbon economy. To examine their advent a variety of academic and non-academic publications, including outliers, such as blogs and websites, were explored. The purpose of such an approach is to challenge and distort the conventional view on the future and, thus, stimulate the creation of its alternatives (Inayatullah, 2013). Drawing on the triadic concept of the weak signal as proposed by Hiltunen (2008)[1], it is to interpret or make sense of the emerging signal in relation to its future. Yet, while the patterns of the process of the emergence of new technologies were analysed, the elaboration of alternative futures was purposefully excluded so as to be addressed by a later inquiry.

[1] The triadic model of weak signals is based on three dimensions: *representamen*, or a form of the signal; *object*, or the emerging issue that the signal indicates; and *interpretant*, or making sense of the signal regarding its future. Here, a weak signal is called 'future sign' (Hiltunen, 2007, 2008).

Several threats and opportunities were identified in relation to each of the analysed emerging issues. The transition to artificial meat production could greatly benefit the global and European natural environment by reducing the total GHG emissions, decreasing pressure on finite natural resources and improving ecosystem protection. However, appropriate policies designed to guarantee the conformity of the whole production process to principles of sustainability would be imperative in order to achieve the desired outcome. Similarly, regulations addressing the excessive use of power and energy would be required to reap the full environmental benefits of blockchain. Its enhanced transparency of transactions and increased efficiency of recordkeeping could be employed to apply the sustainability criteria on complex organising activities, such as the supply chain. To ensure that a wider application of drones for delivery results in less energy being consumed and less CO_2 emission being produced, future policies need to aim towards achieving more sustainable design and more environmentally friendly logistics. An important increase in energy efficiency and reduced CO_2 emissions are the main rewards related to off-grid electricity generated from renewable resources. However, policies governing the off-grid solutions need to encourage and support innovative solutions for issues, such as material and equipment recycling or the management and storage of excess power produced. Above all, this also demonstrates that the processes through which the analysed issues are emerging are far from being straightforward.

Tracking down information on artificial meat, blockchain, drones for delivery, and off-grid electricity shows that they are fast-emerging issues. They have great potential to deliver environmental benefits and their quick dissemination might assist in averting the looming environmental crises, mainly by reducing the total GHG emissions, increasing energy efficiency, alleviating pressure on Earth's finite natural resources and advancing protection of the ecosystem. However, the complexity and the wide array of risks related to their more extensive application challenge the environmental discourse, also called 'Promethean responses' (McGrail, 2011), whose adherents believe that new technological advancements are the only remedy for global environmental problems and that the currently dominant neoliberal economic model is unproblematic. Consequently, this helps to distort the dominant worldview based on neoliberal ideology and market logic and create stimuli for policymakers to think in novel ways regarding the future application of here-discussed new technologies. They could provide viable solutions only if the threats and risks related to their wider spread are thoroughly addressed by policies that are adequate and adopted in a timely manner. To reiterate the argument put forward by the EEA (2013), a comprehensive understanding of all consequences for the natural and social worlds is essential before further diffusion of these new technologies. As existing legislation commonly lags behind the technological development, further research on these technologies is of the utmost importance.

VI. Conclusions

Human activity is causing irreversible damage to the natural environment and we must begin to act now in order to prevent the worst impact on our planet. Although technological innovations promise to introduce solutions that might help us to overcome the multifaceted environmental catastrophe on the horizon, caution must be exercised when considering their widespread application without a comprehensive understanding of their full implications for society and the environment. The emergence of new technologies is a highly complex process and extensive research is required in order to ensure the timely adoption of adequate policies prior to the diffusion of such technology. Such policies should centre on environmental and social issues instead of being narrowly market-focused.

Future studies and forward-looking assessments of technological innovations are indispensable in this regard. They are essential tools in the hands of policymakers. Knowledge produced through careful examination of new technologies as weak signals and emerging issues can increase the awareness of decision makers in respect of the possible threats and opportunities. Preparedness for a variety of alternative futures enhances the resilience of policymaking and can assist our society and communities in better responding to possible dramatic changes that we are about to experience in the future. All of this is ever more important, as humanity has already begun to walk the path with respect to facing the unpredictable and unforeseeable consequences of global environmental crises, such as climate emergency or fast-paced wildlife extinction.

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EFFECTS OF THE SLOVAK SCIENCE PARKS AND RESEARCH CENTERS

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Abstrakt

Technology gap of the Slovak public R&D organizations hinder overall scientific as well as business capability. In order to reduce structural barriers, several supporting mechanisms were implemented during 2007-2013 programming period. Crucial approach supported key institutional innovation in last decades within public R&D environment. In total, 14 projects were supported to build a comprehensive R&D infrastructure. The science parks and research centers were built with the aim to enhance interaction of public R&D organizations with the real economy and foster technology transfer. They have contributed to overall scientific activity, enhance cooperation with variety of innovation actors as well as create technology transfer mechanisms. Nevertheless, overall effects are still suboptimal due to ban on revenue generation as well as absence of complementary funding.

Kľúčové slová

Efects, reseach, development, infrastructure, science park, research center.

I. Úvod

Vedecké parky predstavujú jednu zo zásadných inštitucionálnych inovácií v oblasti výskumu a vývoja (VaV), ktorá prispela k vyššej miere komercionalizácie výsledkov VaV realizovaného v prostredí verejných VaV organizácií. Vedecké parky možno definovať ako nástroje transferu technológií pre modernizáciu (často regionálnych) výrobných systémov. Vedecké parky predstavujú lokality, ktoré zabezpečujú správu nehnuteľností a vytvárajú možnosti na prenos myšlienok a poznatkov medzi priemyslom a akademickou obcou (Hansson, 2005). Vedecké a technologické parky zohrávajú významnú úlohu v ekonomickom rozvoji, pričom sú dôležitý faktor v konkurencieschopnosti hospodárstva (Guadix, 2016).

Podľa UNESCO tento pojem zahŕňa akýkoľvek technologický klaster ako sú: technopolis, vedecký park, science city, cyber park, hi tech (priemyselný) park, inovačné centrum, VaV park, univerzitný výskumný park (UVP), výskumný technologický park, vedecký a technologický park (VTP), science town, technologický park, technologický inkubátor, technopark, technopolis a technologický biznis inkubátor. UVP a VTP patria medzi najčastejšie zmieňované odnože komplexných VaV infraštruktúr. V súčasnosti však neexistuje jednotná definícia. V princípe uskutočňujú činnosti v oblasti správy nehnuteľností, poskytujú služby týkajúce sa transferu technológií a podporujú partnerstvá medzi akademickými inštitúciami, vládou a súkromným sektorom (Link, 2003). Ich cieľom je podporovať ekonomický rozvoj a transfer technológií z akademického prostredia do praxe. Poskytované služby majú rôzny charakter a závisia od typu parku (EC, 2014).

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Parky častokrát zahŕňajú zložky podporujúce komerčné uplatnenie výsledkov VaV, ktoré však samotný VaV nerealizujú, ale sú orientované na podporu start upov (Link, 2003). Celkové nastavenie závisí od rozsahu, v akom uspokojujú potreby nájomných podnikov (Vanderstraeten a kol., 2016).

Vedecké parky generujú množstvo efektov a vplývajú na činnosť zakladateľov, usadené podniky, ale aj iné organizácie, s ktorými spolupracujú. Umožňujú usadeným podnikom dosahovať vyššiu mieru interakcie s univerzitami prostredníctvom formálnej alebo neformálnej interakcie ľudských zdrojov, ale aj sprostredkujú rôzne zdroje a blízkosť iných spoločností (Henriques, 2018) a výskumníkov, čo podporuje prenos poznatkov do komerčného prostredia (Hansson, 2005). Firmy pôsobiace v parku môžu využívať poznatky vytvorené na univerzite a intenzívnejšie spolupracovať s univerzitou v porovnaní s firmami, ktoré sa v parku nenachádzajú (Albahari, 2017). Podniky pôsobiace v parkoch vo väčšej miere investujú do VaV a sú aktívnejšie v patentovaní. Parky tak stimulujú komercializáciu výsledkov univerzitného výskumu. To umožňuje univerzitám získavať finančné zdroje, špičkových vedcov a zvýšiť publikačnú a patentovú výkonnosť (Löfsten, 2002).

Umiestnenie podniku v parku má pozitívny vplyv na pravdepodobnosť spolupráce v oblasti inovačného rozvoja. Bol zistený pozitívny vplyv na tvorbu nehmotných výsledkov získaných vďaka spolupráci (Vásquez-Urriago, 2016), ale aj v oblasti tvorby nových technologických firiem a s nimi spojený vznik nových pracovných miest, ktorá je vyššia v prípade ich pôsobenia v rámci vedeckých parkov. Z tohto dôvodu plnia vedecké parky dôležitú úlohu v rámci regionálnej rozvojovej politiky (Löfsten, 2002).

Firmy usadené v parkoch spolupracujú aj s inými partnermi a to aj mimo park a región (Minguillo et al., 2015). Parky majú pozitívny vplyv na pravdepodobnosť vzniku a množstvo inovácií produktov vytvorených podnikmi usadenými v parkoch (Vásquez-Urriago, et. al., 2014). Vysoká miera kooperácie a vzájomnej dôvery podporuje vznik klastrov, ktoré sú strešným prvkom inovačných systémov v rozvinutých krajinách. Výhodou klastrovania je geografická blízkosť, zdieľanie zdrojov a spoločných služieb, ako aj možnosť osobnej komunikácie medzi pracovníkmi inovatívnych firiem. Pozitívne efekty klastrovej spolupráce sa môžu prejavovať aj v tradičných odvetviach (Žižka, 2018), avšak závisia od ich externého financovania (Burger, 2017). Aglomerácia firiem, univerzít a iných znalostne intenzívnych organizácií je prospešná pre generovanie a využívanie znalostí (Ponds, 2010)

II. Metodológia

V programovom období 2007-2013 bolo na Slovensku podporených celkovo 14 projektov komplexných VaV infraštruktúr (Tab.1). Veľkosť parkov a centier závisela od ich veľkosti (Balog, 2018). Cieľom realizovaného výskumu bolo identifikovať priame a nepriame efekty činnosti vedeckých parkov a centier. Vybrané efekty ich činnosti boli mapované prostredníctvom dotazníkového prieskumu a série hĺbkových rozhovorov v mesiacoch október 2017 - máj 2018. Boli oslovené všetky vedecké parky a výskumné centrá, ktorým boli zaslané dotazníky s uzavretými a polootvorenými otázkami. Hĺbkové rozhovory sa uskutočnili s manažérmi všetkých podporených projektov.

Tabuľka 1: Podporené projekty komplexných VaV infraštruktúr

Projekt	Označenie
Univerzitný vedecký park „ CAMPUS MTF STU “– CAMBO	CAMBO
Univerzitný vedecký park STU Bratislava	UVP BA
Univerzitný vedecký park TECHNICOM pre inovačné aplikácie s podporou znalostných technológií	UVP TECHNICOM
Univerzitný vedecký park Univerzity Komenského v Bratislave	VP UK
Vybudovanie výskumného centra „AgroBioTech“	AgroBioTech
Výskumné centrum Žilinskej univerzity	VC ŽU
Univerzitný vedecký park Žilinskej univerzity	UVP UNIZA
Medicínsky univerzitný vedecký park v Košiciach (MediPark, Košice)	MEDIPARK
Univerzitný vedecký park pre biomedicínu Bratislava	BIOMED
Výskumné centrum progresívnych materiálov a technológií pre súčasné a budúce aplikácie „PROMATECH“	PROMATECH
Centrum aplikovaného výskumu nových materiálov a transferu technológií	CAV
Martinské centrum pre biomedicínu (BioMed Martin)	BioMed Martin
Centrum výskumu a vývoja imunologicky aktívnych látok	BTL SAV
Výskumné centrum ALLEGRO.	ALLEGRO

Zdroj: vlastné spracovanie autora

III. Efekty na Slovensku

Vybudované vedecké parky a výskumné centrá disponujúce unikátnym technologickým vybavením, vidia svoje pôsobenie široko definované. Jedným z hlavných cieľov je prispievať k rozvoju materských organizácií, ako aj rozvoju (regionálnej) ekonomiky. Vybudované parky a centrá primárne realizujú VaV projekty samostatne, ale aj s rôznymi zložkami materskej organizácie. Realizácia VaV so zložkami zakladateľa považujú za primárnu a najdôležitejšiu činnosť. Z tohto dôvodu rozvíjajú spoluprácu v rámci univerzity a umožňujú využívať infraštruktúru pracovníkom z iných organizačných zložiek. Táto spolupráca je podstatná pre maximalizáciu efektov parkov a centier a zhodnotení potenciálu prítomného v domácich verejných VaV organizáciách. Taktiež realizujú VaV s podnikmi a uskutočňujú iné aktivity a to najmä poskytovanie rôznych odborných konzultácií a návštevy v podnikoch. Každý park/centrum považuje tieto aktivity za dôležité, avšak v závislosti od zamerania a možnosti spolupráce hodnotia tieto aktivity za rôzne dôležité pre ich rozvoj (Tab. 2).

Tabuľka 2: Dôležitosť aktivít

Park/centrum	konzultácie	návštevy v podnikoch	VaV s podnikmi	VaV so zakladateľom
CAMBO	+	++	++	++
UVP BA	+	+	++	+++
ALLEGRO	++	++	+++	++
CAV	+++	+++	++++	+++
PROMATECH	++	++	++++	++++
UVP TECHNICOM	++	+++	+++	++++
VC ŽU	++++	++	+++	++++
UVP UNIZA	+++	+++	+++	++
AgroBioTech	+++	+	++	+++
BTL SAV	++	++	+++	++
BIOMED	+	+	++	+++
VP UK	+	+	++	+++
MEDIPARK	o	+++	o	o
BioMed Martin	o	o	+	++++

Poznámka: žiadna (o), malá (+), priemerná (++), veľká (+++), veľmi veľká (++++).
Zdroj: vlastné spracovanie autora.

Spolupráca s podnikmi je z pohľadu dlhodobej činnosti parkov a centier jednou z kľúčových úloh. Nastavenie podporného mechanizmu vzniku týchto veľkých VaV infraštruktúr určilo vo vybranom móde podpory, že projekty nebudú generovať príjem. Toto obmedzenie spôsobilo zablokovanie využívania veľkých investičných celkov pre potreby rozvoja ekonomiky a využiteľnosť pre podporu spolupráce akademického sektora a priemyslu.

Je umožnené realizovať len spoločné konzorciálne projekty financované z verejných zdrojov (APVV, Horizont 2020), kedy bol vylúčený prvok štátnej pomoci. Tento typ projektov spoločnej spolupráce nie je sankcionovaný počas doby udržateľnosti. Vzhľadom na to k reálnemu rozbehu systematickej spolupráce s podnikmi nedošlo. Celková úroveň (Tab. 3) spolupráce s podnikmi je podľa respondentov v kategórii zlá a priemerná, pričom má vo väčšine parkov/centier vzrastajúcu tendenciu (70%) a v menšej miere je bez zmien (30%).

Aj napriek tomu sa parky a centrá pripravujú na ďalšie fázy svojho rozvoja, kedy bude umožnené spolupracovať s podnikmi. Rozvíjajú perspektívne partnerstvá s budúcimi možnými klientami z podnikateľského prostredia. Jednou z možností je poskytovanie konzultácií a realizácia priamych návštev expertov v podnikoch. Tieto aktivity závisia od odborného zamerania parkov a centier, ale aj od existencie priemyselných partnerov, ktorí by mali byť lokalizovaní v geografickej blízkosti. V prípade geografickej blízkosti je poskytovanie tohto typu špecializovaných služieb omnoho intenzívnejšie, napr. v prípade Promatech, ktorý má organizačnú zložku lokalizovanú v Žiari nad Hronom v blízkosti množstva podnikov pôsobiacich v hliníkarskom priemysle. Špecifickým prípadom sú biomedicínsky orientované infraštruktúry, ktoré majú vzhľadom na objektívne malý počet priemyselných partnerov obmedzenú možnosť spolupráce s domácimi podnikmi (výnimkou je centrum v Šarišských Michaľanoch).

Celkovo možno považovať spoluprácu s podnikmi za nedostatočnú. Tento stav spôsobuje, že je príspevok vybudovaných parkov a centier k rozvoju podnikov a zvyšovaniu regionálnej zamestnanosti suboptimálny.

Tabuľka 3: Spolupráca s podnikmi

Park/centrum	spolupráca	
	úroveň	trend
CAMBO	++	↑
UVP BA	++	↑
ALLEGRO	++	↑
CAV	++	↑
PROMATECH	++	→
UVP TECHNICOM	++	↑
VC ŽU	+++	↑
UVP UNIZA	++	↑
AgroBioTech	+++	↑
BTL SAV	++	↑
BIOMED	++	↑
VP UK	+++	→
MEDIPARK	-	→
BioMed Martin	-	↑

Poznámka: zlá (-), priemerná (+), dobrá (++), rastie (↑), bez zmien (→).
Zdroj: vlastné spracovanie autora.

Za hlavný VaV výsledok rôznych typov VaV projektov možno v súčasnosti považovať zvýšenie publikačnej aktivity v rôznych vedeckých a odborných časopisoch. Celkovo bolo v čase realizácie prieskumu v databáze WOS evidovaných 842 publikačných výstupov, ktoré boli identifikované podľa ITMS kódu projektu uvedenom v publikácii. Z týchto 842 identifikovaných publikačných výstupov v období od januára 2013 do mája 2015 malo 361 výstupov spoluautorov zo zahraničia. Zo zahraničných spoluautorov boli najviac zastúpené Česko, Nemecko, Maďarsko, Poľsko, Srbsko a Ukrajina. Krajiny so silným excelentným výskumom (USA, Veľká Británia, Francúzsko, Japonsko) mali v medzinárodnej spolupráci nízke zastúpenie. Detailné zisťovanie však poukázalo na skutočnosť, že nie všetky publikované výstupy obsahujú ITMS identifikátor. To poukazuje na vyššiu reálnu publikačnú výkonnosť. Vzhľadom na to, že VaV infraštruktúra bola sprístupnená aj iným VaV pracovníkom materskej, ale aj iných VaV organizácií pre realizáciu špecializovaných projektov možno predpokladať vyšší vplyv parkov a centier na publikačnú výkonnosť. Parky a centrá konštatovali, že s inými VaV organizáciami spolupracovali často. Výsledky projektov boli prezentované na rôznych domácich, ale aj zahraničných fórach.

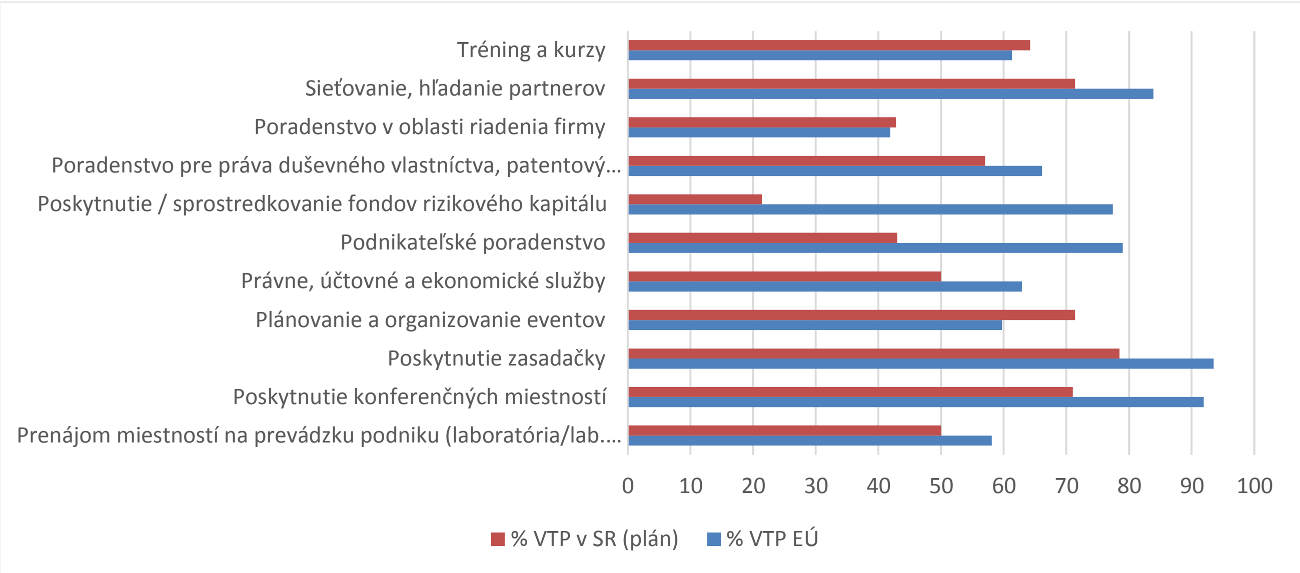
Infraštruktúra bola sprístupnená aj študentom vyšších ročníkov, čo pozitívne ovplyvnilo zvýšenie kvality prác a zvyšovanie znalostí končiacich absolventov. Získané znalosti sa následne môžu prelievať do ekonomiky/spoločnosti.

Kvalitná VaV infraštruktúra umožnila parkom a centrám rozvíjať medzinárodnú spoluprácu, ktorú všetci respondenti považujú za veľmi dôležitú. Respondenti určili, že kľúčovým faktorom celkového zlepšenia spolupráce je zvýšená schopnosť realizovať kvalitnejší VaV z dôvodu zlepšenia technologických možností. To znamená, že nové technológie prispeli výrazným spôsobom k zlepšeniu spolupráce, ale aj k nadviazaniu nových spoluprác. Rozvoj medzinárodnej spolupráce zvýrazňuje potrebu zvládnutia interkultúrneho manažmentu (Cagáňová, 2010).

Kvalitná infraštruktúra je tak kľúčovým determinantom činnosti a spolupráce s rôznymi aktérmi. V ďalšom období je potrebné zabezpečiť jej dobudovanie v perspektívnych oblastiach z hľadiska špecializácie, ale aj infraštruktúry potrebnej pre efektívnejšiu činnosť niekoľkých parkov/centier súčasne (prierezovej infraštruktúry). V prípade biomedicínskeho výskumu bola deklarovaná potreba dobudovať tzv. biobanku, ktorá by slúžila všetkým (bio) parkom/centrám. Biobanky poskytujú zbierky ľudských tkanív v spojení s genetickými, genealogickými, osobnými a zdravotnými informáciami (OECD, 2005; Otlowski, 2010). Biobanky môžu byť rôzne nielen z hľadiska veľkosti, ale aj zamerania (Watson, 2014).

V krajinách EÚ poskytujú podobné typy infraštruktúr štandardne širokú škálu rôznych typov služieb (Tab. 4). Medzi najčastejšie patrí poskytovanie zasadacích miestností, ktoré je možné si prepožičať v až 93,5% všetkých VTP a konferenčných miestností (91,9%). Až 79% poskytuje podnikateľské poradenstvo, 61,3% špecializované tréningy, alebo 83,9% podporuje sieťovanie (EC, 2014). Všetky slovenské parky a centrá však z dôvodu nastavenia parametrov podpory nemôžu reálne poskytovať služby na komerčnej báze. Až 60% všetkých parkov a centier umožní o 5 rokov, po ukončení fázy udržateľnosti, využívať unikátnu VaV infraštruktúru externým subjektom, ale plánuje aj poskytovať rôzne typy služieb. Až 71% parkov/centier plánuje poskytovať konferenčné miestnosti, zasadačky, plánovať a organizovať podujatia či podporovať sieťovanie (Tab. 4). V prípade podujatí a sieťovania sa jedná o vyšší podiel parkov/centier, ako je tomu v prípade európskych krajín. O poskytovanie niektorých typov služieb je nižší záujem.

Tabuľka 4: Najbežnejšie služby poskytované v európskych krajinách a plánované v SR



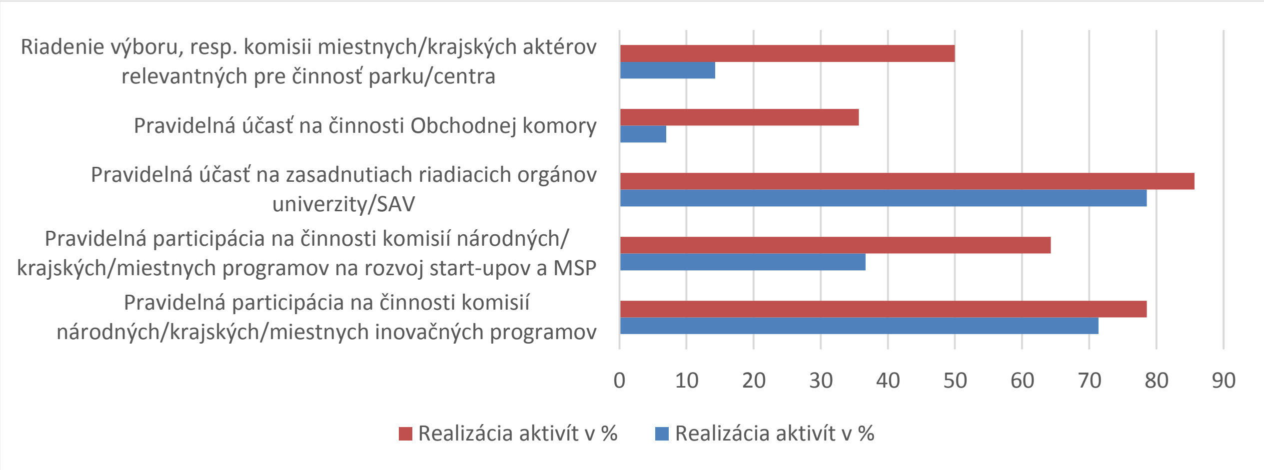
Zdroj: Vlastné spracovanie autora, EC 2014

Parky a centrá sa vzhľadom na ich budúce unikátne postavenie v regionálnych, ale aj národnom inovačnom systéme, snažia spolupracovať s rôznymi aj neekonomickými aktérmi podstatnými pre inovačný a ekonomický rozvoj na národnej, ale aj regionálnej úrovni. Tento prístup je bežný aj v rozvinutých krajinách, pričom manažéri zapájajú do rôznych pracovných skupín, ktoré sa venujú témam ako sú napr. regionálne/lokálne programy rozvoja MSP, podpora start-upov a MSP, resp. skupinám pôsobiacim v rámci univerzít, obchodných komôr, atď. (EC, 2014).

Parky a centrá realizujú už v súčasnosti štandardné aktivity podobne, ako je tomu v rozvinutých krajinách, kde bola identifikovaná vysoká miera účasti na inovačných programoch (viac ako 90%), programoch rozvoja MSP a start-upov (90%), ale aj univerzitných komisií (viac ako 70%).

Na druhej strane participácia na činnosti Obchodných komôr bola relatívne nižšia, podobne ako v prípade spolupráce s inými záujmovými organizáciami (70%). Podobne je to aj v prípade vybudovaných parkov a centier, ktoré realizujú množstvo aktivít v spolupráci s verejným sektorom. Zástupcovia parkov/centier sa pravidelne zúčastňujú (Tab. 6) na činnosti rôznych komisií národných/krajských/miestnych inovačných programov (71,4%), programov zameraných na rozvoj start-upov a malých a stredných podnikov (36,7%). Vysoká aktivita parkov/centier pri participácii na riadiacich procesoch ukazuje na ich integráciu do rôznych znalostných štruktúr štátnej a verejnej správy (napr. programové komisie), ale aj verejných VaV organizácií.

Tabuľka 5: Aktivity s lokálnymi a národnými aktérmi (%)



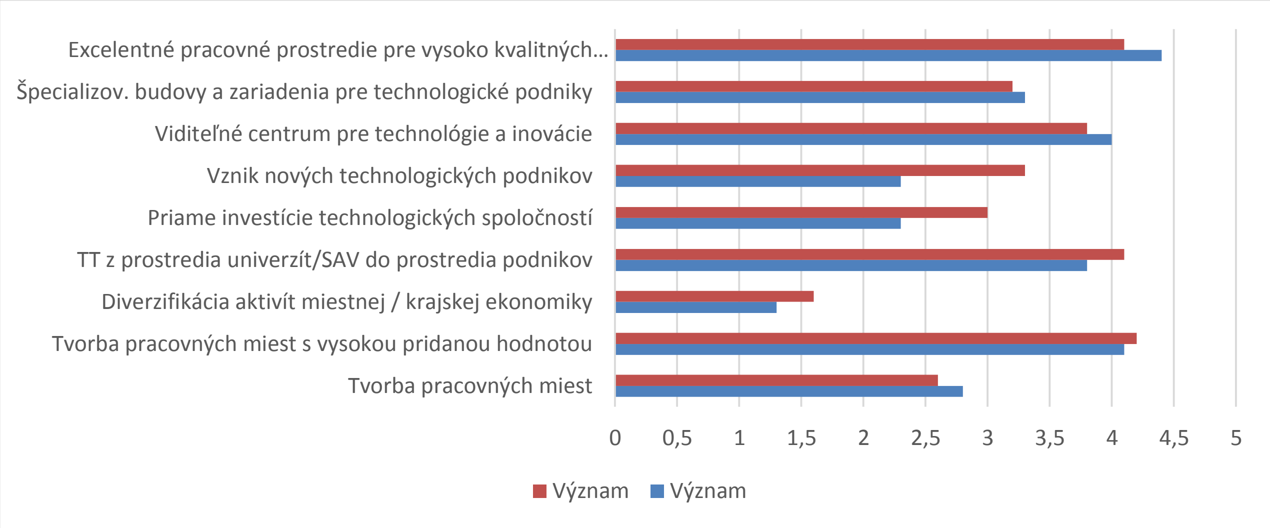
Zdroj: Vlastné spracovanie autora

Úlohou parkov je realizácia širšie definovaných aktivít v oblasti transferu technológií a ochrany práv duševného vlastníctva. Projekty umožnili zriadenie kancelárie transferu technológií, príp. brokerské centrá, ktorých úlohou je podporovať spoluprácu s podnikmi. Unikátny prístup k zefektívneniu transferu technológií bol aplikovaný v rámci Promatechu, ktorý zriadil kanceláriu technologického transferu na pracovisku v Žiari nad Hronom. Unikátnosť spočíva v tvorbe kapacít v lokalite geograficky vzdialenej od materského ústavu (Bratislava).

Iným typom úloh parkov/centier je podpora komercializácie prostredníctvom podpory zakladania technologických start-up a v budúcnosti aj spin-off firiem. Aktuálna činnosť inkubátorov je blokovaná jednak pre počiatočné nastavenie podmienok podpory (resp. výberu módu podpory), z dôvodu chýbajúcich opatrení v oblasti podpory start-up a spin-off firiem, ale aj nástrojov podporujúcich selekciu a podporu projektov s trhovým potenciálom. V budúcnosti by sa parky/centrá mohli špecializovať jednak podľa charakteristík firiem, ako napríklad kvalita podnikateľského nápadu nájomcu alebo fáza vývoja (napr. start up verzus firma dlhodobo pôsobiaca na trhu). Tento typ výberu sa bežne využíva v prípade inkubátorov a akcelerátorov (Bergek a Norrman, 2008). Okrem toho sa môžu špecializovať na konkrétne odvetvia (Vanderstraeten a kol., 2016). V priestoroch parkov/centier budú v budúcnosti pôsobiť inovatívne podniky. V horizonte 5 rokov je kumulatívny odhad pôsobnosti až 136 podnikateľských subjektov, ktoré by mohli priamo využívať priestory, infraštruktúru, ale aj využívať poskytované služby.

Parky/centrá majú veľký potenciál generovania efektov prospievajúcich k regionálnemu ekonomickému rastu. Štúdia (EC, 2014) vnímania vlastných príspevkov k vybraným oblastiam rozvoja ukázala, že až 38% všetkých VTP určilo svoj dominantný príspevok v oblasti tvorby zamestnanosti, a to najmä s vysokou pridanou hodnotou (67%). Podporu transferu technológií určilo ako podstatnú 13,2%, vznik nových technologických podnikov 15,4% a snahu o vybudovanie inovačného centra až 15,4% respondentov.

Tabuľka 6: Vnímanie príspevku k ekonomickému rozvoju



Poznámka: Škála: 1-5 (1 - málo významný, 5 - veľmi významný).
Zdroj: Vlastné spracovanie autora.

Vnímanie slovenských parkov/centier v kontexte ich príspevku k lokálnemu ekonomickému rozvoju (Tab. 6) ukázalo najvýznamnejší príspevok v oblasti tvorby pracovných miest, špecificky s vysokou pridanou hodnotou, ako aj tvorby excelentného pracovného prostredia, snahy o vybudovanie centra s kvalitnými technológiami a vlastnenie technológií atraktívnych pre technologické podniky. Príspevok k vzniku nových technologických firiem v súčasnosti je vnímaný ako málo podstatný, avšak v horizonte 5 rokov sa očakáva zvýšenie. V ostatných oblastiach rozvoja sú očakávané zmeny vo významnosti marginálne.

Napriek uvedeným zisteniam všetky parky a centrá považujú svoju činnosť za nedostatočnú a to jednak kvôli nemožnosti generovať príjem, ale aj výpadku externého financovania vo fáze udržateľnosti. Celkové efekty parkov a centier tak možno považovať za suboptimálne.

III. Záver

Vedecké parky a výskumné centrá podporené zo zdrojov Európskych štrukturálnych a investičných fondov disponujú unikátnou VaV infraštruktúrou postupne rozbiehajú svoju činnosť. Práve vlastníctvo kvalitných technológií vytvorilo podmienky pre ich rozvoj a generovanie rôznych efektov. Za svoju hlavnú úlohu považujú rozvoj materskej organizácie, realizáciu VaV s podnikmi a širší ekonomický rozvoj regiónu.

Vybudované parky a centrá podporujú realizáciu rôznych VaV aktivít v prostredí materských organizácií. Jednalo sa jednak o priame riešenie VaV projektov, ale aj sprístupnenie modernej infraštruktúry iným vedeckým pracovníkom, ako aj študentom vyšších ročníkov. Parky a centrá vytvorili množstvo výstupov, ktoré priamo publikovali v časopisoch evidovaných vo verejných databázach (WoS). Vzniklo niekoľko stoviek vedeckých prác, ktoré vznikali aj v rámci spolupráce s partnermi s rôznych krajín, pričom spolupráca s krajinami s excelentným výskumom ako sú USA, Veľká Británia, Francúzsko, alebo Japonsko bola nižšia. Vzhľadom na umožnenie využívania technológií aj pracovníkom z iných verejných VaV organizácií a študentom došlo ku generovaniu nepriamych efektov. Parky a centrá prispievajú k zvyšovaniu kvality materských organizácií.

Spolupráca s podnikmi je deklarovaná ako priorita. Kvôli nastaveniu vybraného podporného módu, v ktorom nebolo umožnené generovanie príjmov však spolupráca nebola dostatočne rozvíjaná.

Spolupracovať s podnikmi nebolo možné na komerčnej báze, ale len v rámci konzorciálnych projektov financovaných z verejných zdrojov. Toto obmedzenie sa negatívne odrazilo nielen v priamej spolupráci s podnikmi, ale aj na iných aktivitách spojených s transferom technológií. Napriek tomu sa už v súčasnosti snažia parky a centrá budovať vzťahy s podnikmi, ktoré sa podarí kapitalizovať v ďalších fázach existencie po ukončení platnosti obmedzujúcich podmienok.

Parky a centrá realizovali aktivity v oblasti ochrany práv duševného vlastníctva a transferu technológií. Boli zriadené kancelárie transferu technológií, príp. brokerské centrá, ktorých hlavnou úlohou je podporovať spoluprácu s podnikmi a zabezpečovať transfer znalostí a technológií do praxe. Taktiež vznikli inkubátory, ktoré budú podporovať komercionalizáciu prostredníctvom podpory inovatívnych start up a spin off firiem.

V budúcnosti plánujú parky a centrá poskytovať rôzne typy služieb obdobne ako je to v prípade podobných infraštruktúr v rozvinutých krajinách. Vzhľadom na budúcu dôležitú úlohu v regionálnych inovačných systémoch sú už v súčasnosti uskutočňované rôzne typy spoluprác aj s netrhovými aktérmi.

Vedecké parky a výskumné centrá nedosiahli optimálnu mieru svojej činnosti jednak z dôvodu zákazu generovania príjmov, ale ej neexistencie podporných mechanizmov. Z tohto dôvodu sú celkové efekty vybudovaných vedeckých parkov a výskumných centier suboptimálne.

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Článok vznikol vďaka projektu VEGA č. 2/0002/18.

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LABOUR MIGRATION IN THE CONTEXT OF MIGRATION FLOWS IN SLOVAKIA

Lubica Gajdosova[1], Richard Heriban[2]

Abstract

This paper presents a report on migration within the Slovak Republic prepared for the annual OECD Expert Group on Migration conference which took place at the beginning of October 2019 in Paris. This report's structure conforms to the OECD requirements. OECD recommends publication of particular national reports in their home countries. In this paper we introduce an overview of current development in the area of migration and migration policies in Slovak Republic in 2018 and the first half of 2019 with a focus on the context of the past 5 – 10 years. This paper is also updated with the trends for the period until the end of October 2019. In the introductory chapter we describe the main parameters of the macroeconomic development for the period of the past years and we bring it to context with the development on the labour market.

Keywords

Migration, OECD Expert Group on Migration, labour market, population structure, Slovak Republic

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I. Introduction

In 2018 in Slovak Republic the dynamics of economic performance growth remained unchanged. It was accompanied by positive developments in the labour market - overall employment in the economy increased (by 1.4%), the number of unemployed decreased and also the unemployment rate decreased to 6.6% (reaching 8.1% on average in 2017); in the second quarter of 2019 it reached 5.7%. The average monthly wage increased in both nominal and real (by 3.6%) terms; in the second quarter of 2019 the nominal wage increased by 9.7% (reaching EUR 1101), taking into account the inflation rate, real wage growth reached 7%. Gross domestic product (GDP) at constant prices increased by 4.1%, which was by 0.7 pp. b. more than in the previous year (according to ESA 2010 national accounts methodology); In the second quarter of 2019, the year-on-year growth rate GDP slowed to 2.0%. See Table 1 and Graph 1.

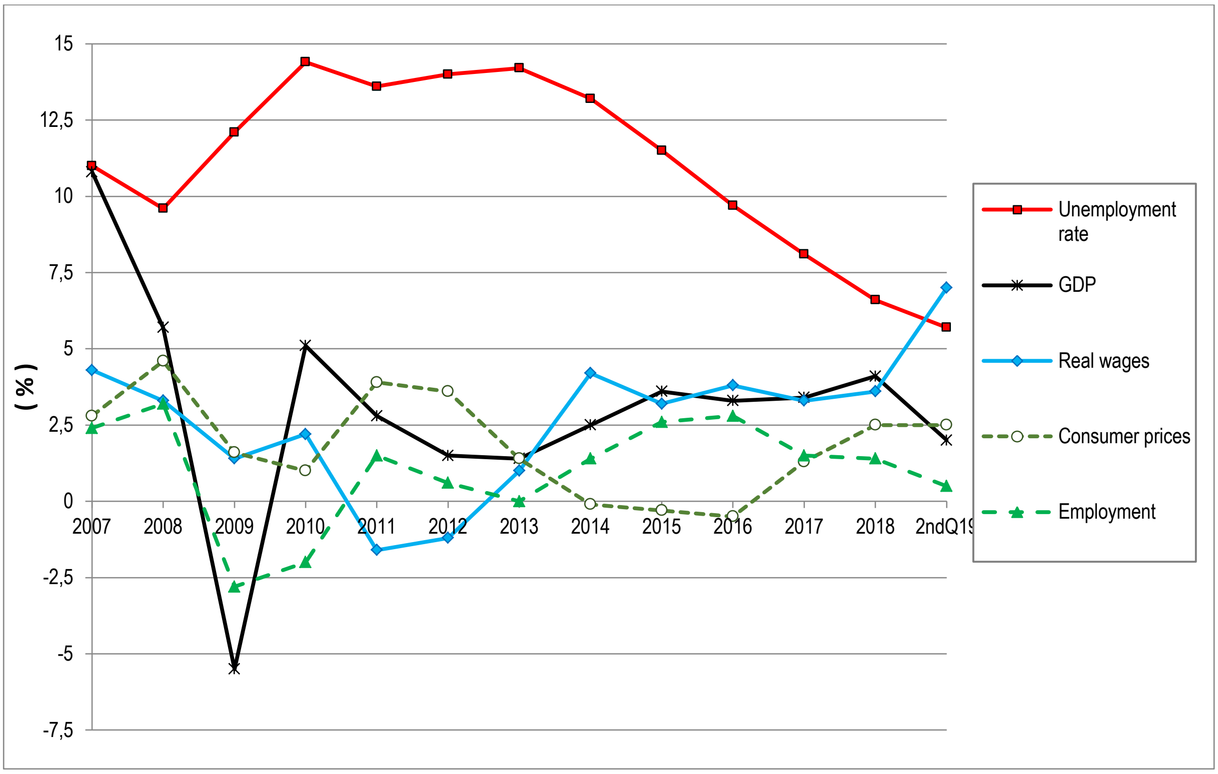
Table 1: Main economic indicators 2011-2019Q2

Main economic indicators[(a)]	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019***
GDP[(b)]	2,8	1,5	1,4	2,5	3,6	3,3	3,4	4,1	2,0
Total employment[(c)]	1,5	0,6	0,0	1,4	2,6	2,8	1,5	1,4	0,5
Real wages	-1,6	-1,2	1,0	4,2	3,2	3,8	3,3	3,6	7,0
Consumer prices[(d)]	3,9	3,6	1,4	-0,1	-0,3	-0,5	1,3	2,5	2,8
Unemployment rate[(e)]	13,6	14,0	14,2	13,2	11,5	9,7	8,1	6,6	5,7

Notes: (a) Annual percentage changes, (b) Real GDP in constant prices of 2000, as of 2012 ESA 95 method chain index base 2005; 2016 (ESA 2010); (c) LFS employment, annual average change, (d) Index of consumer prices according to COICOP classification, base 2000 (e) LFS unemployment rate, annual averages, 2019: GDP, Employment, Real wages: 2019Q2 / 2018Q2; Consumer prices: August 2019; Unemployment rate 2019Q2.*

Source: Authors' own work based on data from Statistical Office of the Slovak Republic

Graph 1: Main economic indicators 2007-2019Q2 (%)



Source: Authors' own work based on data from Statistical Office of the Slovak Republic

For 2019 (respectively 2020), a minimum monthly wage of 520 euros (580 €) and an hourly wage of 2.989 euros (3.333 €) has been approved.

GDP at current prices in 2018 reached 90.2 billion euros, an increase of 6.3% compared to 2017. In the first half of 2019 GDP at current prices reached 45.5 billion EUR, a year-on-year increase by 5.7%.

The year-on-year inflation rate, as measured by the consumer price index, reached 2.5% on average in 2018. Compared to 2017, the rate of growth of prices increased by 1.2 percentage points. b. Consumer prices increased year-on-year in all months of last year and regulated prices also rose (1.3%). In the first 7 months of 2019 the consumer prices increased by 2.5% while in January - August 2018 they were at 2.6%.

Along with the growth rate of economic growth, the labour market situation improved further in 2018. This concerns both the growth of total employment (in 2017 by 1.5%, in 2018 by 1.4% and in the 2nd quarter of 2019 year-on-year by 0.5%) measured according to both methodologies of the Statistical Office of the Slovak Republic (according to the LFS and statistical reporting) as well as the decrease in the unemployment rate (it reached 8.1% on average annually in 2017, 6.6% in 2018 and 5.7% in 2nd quarter of 2019) surveyed by the Statistical Office of the Slovak Republic (LFS). The registered unemployment rate (it reached 5.4% on average annually in 2018 and 7.2% in 2017) as well as the total average number of registered unemployed (182 thousand persons in 2018, 228 thousand in 2017) maintained the downward trend from the previous year, while the long-term unemployment reduction contributed significantly to the positive development. At the end of August 2019, the registered unemployment rate reached 4.97%; 5.02% on average over 8 months in 2019.

The deficit of general government finances in Slovakia decreased by 0.1 p.p. year-on-year in 2018 to 0.7% of GDP, reaching its historical low and was comparable to the EU28 average deficit (0.6%). The main reason for the improvement was an increase in budget revenues supported by rapid economic growth.

II. Population

At the end of 2018 (or early 2019) there were 5 450 421 inhabitants in the Slovak Republic, of which 2 661 077 were men and 2 789 344 were women (51.2%). The average age reached 40.82 years (men 39.21; women 42.36), 40.59 years in 2017.

The population increased by 7 301 compared to 2017, of which 4 563 were men and 2 738 were women. The share of men in the total population growth was 62.5%.

At the end of 2018, 4 444.8 thousand inhabitants of the Slovak **nationality** lived in the Slovak Republic, which accounted for 81.55% of the total population. The second largest nationality on the territory of Slovakia was the Hungarian nationality (8.29%; 451.9 thousand), which was followed by the Roma nationality (2.05%; 111.9 thousand). Compared to the previous year, the number of the Slovak nationals increased by 11.2 thousand. Increases in the number of national minorities are minimal, with most Roma (0.8 thousand), Ukrainian (0.5 thousand), Czech, Moravian and Silesian (0.4 thousand), Polish (0.2 thousand) and German (0.1 thousand). The decrease was reflected in the number of the Hungarian (1.7 thousand) and Ruthenian national minorities (0.4 thousand). The year-on-year differences in structure are minimal.

At the end of 2018, the population structure of the Slovak Republic **by citizenship** consisted of 5 374 305 Slovaks (98.6%) and 76 116 foreigners (1.4%). The share of foreigners has been gradually increasing by 0.1 p.p. since 2011 (when data are available). (99.0% in 2011, 98.7% in 2017).

The total population of the Slovak Republic at the end of 2018 increased by 0.8% compared to 2011 (men by 1.1% and women by 0.6%). The number of foreigners with non-Slovak citizenship grew dynamically by 42.5% (men by 45.6%, women by 37.6%). Number of foreigners, i.e. citizens with non-Slovak citizenship increased by 3 233 persons year-on-year (an increase of 3 188 persons in 2017).

Male foreigners accounted for 62.3% and women 37.3% of foreigners. The composition of the Slovaks is more balanced, in 2018 men accounted for 48.6% and women 51.4%. By age, almost 82% of foreigners are aged 15-64, only 5% are 0-14 and 13% are over 65. For Slovak citizens, the composition of the main age groups is (16%; 68%; 16%).

76.6% (58 308 persons) of foreigners are citizens of EU countries, 21.4% are non-EU citizens and 2% are non-citizens. The largest group of foreigners with permanent residence in the territory of the Slovak Republic were persons with Czech citizenship - 14 021 persons - which is 18.4% (in 2017 the number was 13.5 thousand, 18.6%) of the total number of foreigners, followed by Hungarian citizenship 10 713, i.e. 14.1% (in 2017: 10.2 thousand; 14.1%), Romanian 6 923, i.e. 9.1% (2017: 6.5 thousand; 8.9%), Polish 5 931, i.e. 7.8% (2017: 5.8 thousand; 7.9%) and with German citizenship 4 195 persons, i.e. 5.5% (almost 4.1 thousand in 2017; 5.5%). Out of the EU, the number of Ukrainian citizens is 3 745 persons, 4.9% (in 2017: 3 482 persons; 4.8%).

The largest groups of male foreigners by citizenship are Czech, Hungarian, Romanian, German and Polish. The largest groups of female foreigners by citizenship are Czech, Hungarian, Polish, Ukrainian and Romanian.

In the population structure of the SR by **country of birth**, 96.4% (5 256 032 persons) were born in Slovakia and 194 389 persons (3.6%) abroad. The year-on-year increase in the number of births abroad was 4 081 persons. The share of births abroad increased slightly by 0.1 p.p. from 3.5% in 2017, when the increase was 4 091 persons. In 2017, the Slovak Republic was the country of birth for 96.5% of the population, while 3.5% of the Slovak population were born abroad.

Of the total number of births abroad in 2018, 81.8% (159 024 persons) were born in EU countries and 18.2% outside the EU countries.

The largest group of inhabitants born outside the territory of Slovakia were inhabitants born in the Czech Republic (88 123 persons), who accounted for 45.3% of those born abroad (in 2017 it was 46.2% with a slightly lower absolute number of 88 017). 16 058 people from Slovakia were born in Hungary (8.3%), 11 418 (5.9%) in Ukraine, 9 624 (5%) in Romania and 9 057 (4.7%) in the United Kingdom.

The largest population groups of men born abroad by country of birth are: Czech Republic, Hungary, Romania, United Kingdom and Ukraine. The largest groups of women in the country of birth are: Czech Republic, Hungary, Ukraine, the United Kingdom and Poland.

Men accounted for 51.4% and women 48.6% of the number of births abroad. The composition of births in Slovakia is only slightly higher in favour of women, in 2018 men accounted for 48.7% and women 51.3%. By age, 59% of foreign-born people are 15-64 years old, 15% are 0-14 years old and 26% are over 65 years old. For citizens born in Slovak Republic the composition of the main age groups is (16%; 69%; 15%).

According to the Statistical Office of the Slovak Republic in 2018, 721 persons were **granted citizenship of the Slovak Republic**, including 335 men and 386 women. According to age, citizenship was granted to 90 persons (12.5%) aged 0-14, 597 persons (82.8%) aged 15-64 and 34 persons (4.7%) aged 65+. Of the EU countries, 307 were granted citizenship of the Slovak Republic, most from the Czech Republic 119, the United Kingdom 60, Germany 41, Romania 25 and Hungary 15. Out of the EU 413, most from Ukraine 127, Vietnam 54, Serbia 42, USA 39, Russia 27 and Canada 19 persons.

In 2018 there were 98 414 (95 132 in 2017) internal residents-migrants and 10 551 (10 654 in 2017) residents by international migration. The largest share (44.9%) in the volume of **internal migration** was due to inhabitants migrating between municipalities within the district (44.8% in 2017), from district to district in the region accounted for 29.3% (29.2% in 2017). Approximately a quarter of the internal migration volume was made up of persons who changed the region's borders with migration (25.8% in 2018 and 26%) in 2017. The share of women in the volume of internal migration was 53.6% in both 2017-2018; in the volume of foreign migration 50.5% in both years. See Table 2.

Table 2: Internal mobility by type and gender (in persons; ‰), 2014 – 2018

Year	Total number of migrating persons								
	Among towns and villages within district			Among districts within regions			Among regions		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
2014	20 193	22 833	43 026	12 855	14 671	27 526	10 779	12 708	23 487
2015	18 786	21 306	40 092	12 382	14 660	27 042	10 752	12 945	23 697
2016	19 846	22 763	42 609	13 038	15 303	28 341	11 384	13 502	24 886
2017	19 906	22 684	42 590	12 889	14 911	27 800	11 367	13 375	24 742
2018	20 694	23 528	44 222	13 393	15 416	28 809	11 625	13 758	25 383
Per 1 000 inhabitants									
2014	7,6	8,2	7,9	4,9	5,3	5,1	4,1	4,6	4,3
2015	7,1	7,7	7,4	4,7	5,3	5,0	4,1	4,7	4,4
2016	7,5	8,2	7,8	4,9	5,5	5,2	4,3	4,9	4,6
2017	7,5	8,1	7,8	4,9	5,4	5,1	4,3	4,8	4,5
2018	7,8	8,4	8,1	5,0	5,5	5,3	4,4	4,9	4,7

Source: Statistical Office of the Slovak Republic.

In 2018 - compared to the previous year - the volume of internal migration increased by 3.3 thousand persons (by 3.4%) and there was a slight decrease in the volume of foreign migration by 0.1 thousand (1%); In 2017, compared to 2016, there was a slight year-on-year decrease of 0.7 thousand persons (0.7%) and a decrease in the volume of foreign migration by 0.8 thousand (7.3%). The year-on-year increase in internal migration increased more in women by 1732 cases, in men by 1550 (in 2017 compared to 2016 a decrease in women by 598 cases, in men the decrease was by 106 cases).

According to the Statistical Office of the Slovak Republic, 57 639 (10.6‰) **live children were born** in 2018, which is 330 less than in 2017 (10.7‰). Numbers of live births in the 21st century in the Slovak Republic continuously increased with the highest level in 2009-2011 in an annual average of 61 thousand. After the statistical decrease in 2012 to 55.7 thousand (since 2012, the number of births does not include children born abroad to mothers with permanent residence in the Slovak Republic) the number of births increased until 2017. The average age of mother at all live births has been continuously increasing (reaching 29.68 years in 2018) and the average age of mother at 1st live births has been increasing also (27.98 years); both indicators have increased by 1 year over the past 10 years. The **number of deaths** increased to 54 293 persons (10.0‰), which is an increase of 379 persons compared to the previous year (9.9‰).

Marriages after growth in 2017 decreased slightly and disrupted the upward trend from 2013-2017. Divorce rate continued the downward trend from 2009 to 2016 and decreased slightly compared to the previous year 2017. In 2018, 31 177 (5.7‰) marriages were entered into and there were 9 560 (1.8‰) married couples divorced. Compared to 2017, the number of marriages was lower by 132 and the number of divorces was lower by 58. This development was reflected in a drop in the divorce index, with 30.66 divorces per 100 marriages concluded. See Table 3.

Table 3: Basic demographic trends (in ‰) over the period 2009 – 2018

Per 1000 inhabitants	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Marriages	4.9	4.7	4.7	4.81	4.71	4.94	5.3	5.5	5.8	5.7
Divorces	2.34	2.21	2.06	2.0	2.0	1.9	1.8	1.7	1.8	1.8
Live births	11.3	11.1	11.3	10.3	10.1	10.2	10.3	10.6	10.7	10.6
Deaths	9.8	9.8	9.6	9.7	9.6	9.5	9.9	9.6	9.9	10.0
Abortions	3.3	3.2	3.1	3.0	3.0	2.9	2.9	2.8	2.7	2.6
Natural population increase	1.5	1.3	1.7	0.57	0.51	0.68	0.3	1.0	0.8	0.6
Net migration	0.8	0.6	0.6	0.6	0.4	0.3	0.6	0.7	0.7	0.7
Total population increase	2.3	1.9	2.2	1.2	0.9	1.0	0.9	1.7	1.4	1.3

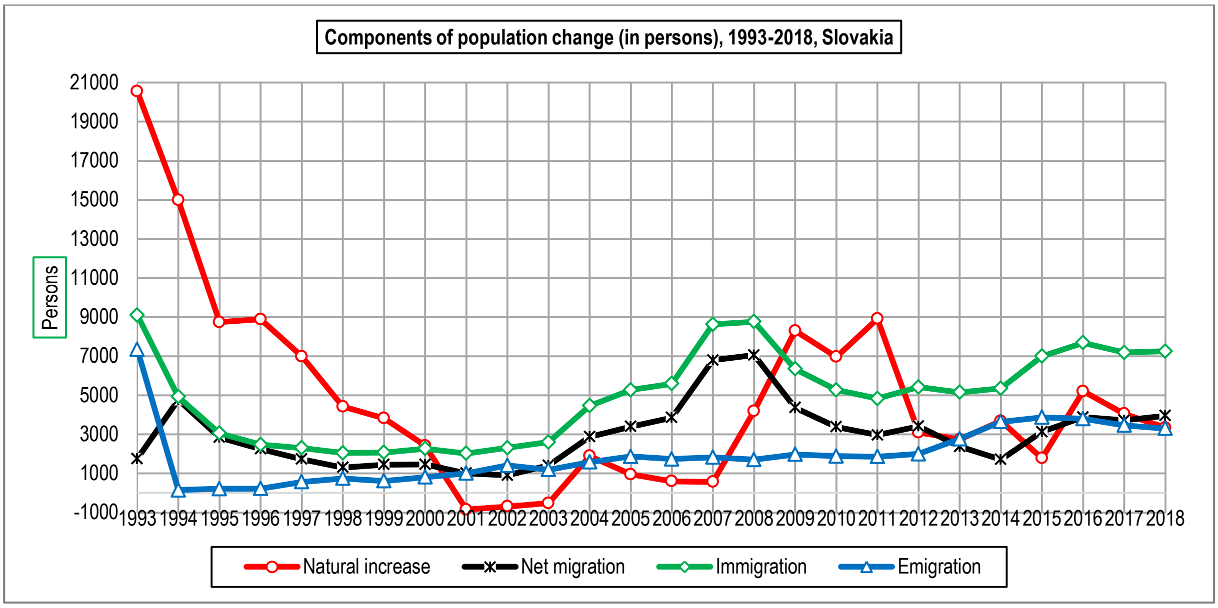
Source: Statistical Office of the Slovak Republic, Population movement in the Slovak Republic.
Note: Number of permanent residents as of 30.6. (1.7.) in Slovak demographic statistics was used up to 2010 inclusive. From 2011 on, it is counted as an arithmetic average of the states.

As a result of the increase in mortality and the decrease in birth rate, in 2018 the **natural population increase** decreased to 3 346 persons (0.6‰), which means a decrease by 709 compared to 2017 (0.8 ‰). In 2017, the natural population increase was 4 055 persons. In the first half of 2019, the natural increase was 382 persons (27 344 children were born and 26 962 persons died).

The Slovak Republic gained 3 955 foreign migrants (0.7‰), while 7 253 immigrated and 3 298 emigrated. Net migration increased year-on-year by 233 persons. In the first half of 2019, 3 020 immigrated and 1 566 emigrated - there was an 1 454 net migration increase.

The **total population increase** (natural plus net migration) thus decreased by 476 persons compared to 2017 (7 777 persons, i.e. 1.4 ‰) to 7 301 persons (1.3 ‰). In the first half of 2019 the total population increase was 1836 persons. See Graph 2.

Graph 2: Components of population change (in persons), 1993-2018, Slovakia



Source: Authors' own work based on data from Statistical Office of SR

In 2018, the **population density** in the Slovak Republic was 111.2 inhabitants per 1 km^2, the population lived in an area with a total area 49 034.1 km^2. Since 1996, the Slovak Republic has been divided into 8 regions and 79 districts, while Bratislava is divided into five districts and Košice into four districts. In 2018, the total number of municipalities, including three military districts, was 2,890. 140 municipalities had the status of a town. In 2018, no village or military district was established or perished. Compared to the previous year, in terms of area and population density, there were no significant changes, the density increased only minimally (by 0.3).

More than half of the population lives in cities. In 1993, 53% of the population lived in cities and 47% in rural areas. Since 1996, when the proportion of urban population has reached its maximum (57%), the proportion of urban population has been steadily decreasing. In 2018, 53.4% of the population (2912.1 thousand) lived in cities (53.6% in 2017), in the countryside 2538.4 thousand, i.e. 46.6% (46.4% in 2017).

51.9% of women and 48.1% of men in towns lived in cities; their proportion did not change compared to the previous year.

50.3% of women (50.4% in 2017) and 49.7% of men (49.6% in 2017) lived in rural areas at the end of 2018.

Population density since the establishment of the Slovak Republic, i.e.. since 1993 slightly increased. Compared to 1993, it is almost three inhabitants per 1 km^2 more. During the period under review, the number of municipalities in Slovakia increased by 37, from 2 853 in 1993 to the current 2 890.

III. Migration

Data on **residence permits administered by the Ministry of Interior** show that the dynamics of granted permits to foreigners is growing dynamically. The number of newly granted permits to aliens was 23.8 thousand in 2015, 24.7 thousand in 2016, 29.5 thousand in 2017 and 38.7 thousand in 2018. Most of the increase was due to third country nationals, whose inflow increased from 17.4 thousand in 2015-2016 to 22.9 thousand in 2017 and more than 32 thousand in 2018. New permits for third country nationals have been concentrated mainly in the categories of temporary residence (29.5 thousand), while new permanent residence permits were granted mainly to the EEA citizens (more than 6.6 thousand in 2017-2018). See Tables 4 and 5.

Table 4: Newly granted permits and stocks (in persons) by type in 2015-2018

By type	Newly granted				Stocks 31. 12.			
	2015	2016	2017	2018	2015	2016	2017	2018
Temporary	14 255	14 452	20 480	29 474	21 089	26 590	34 570	48 316
Third-country nationals	14 255	14 452	20 480	29 474	21 089	26 590	34 570	48 316
Permanent residence	8 430	9 543	8 883	9 174	62 796	66 362	69 645	72 933
Third-country nationals	2 042	2 244	2 282	2 541	13 270	14 347	15 589	17 050
EEA citizens	6 388	7 299	6 601	6 633	49 526	52 015	54 056	55 883
Tolerated residence	1 100	738	150	33	902	295	236	15
Third-country nationals	1 100	738	150	33	902	295	236	15
Total	**23 785**	**24 733**	**29 513**	**38 681**	**84 787**	**93 247**	**104451**	**121264**
Third-country nationals	**17 397**	***17 434***	***22 912***	***32 048***	***35 261***	***41 232***	***50 395***	***65 381***
EEA citizens	***6 388***	***7 299***	***6 601***	***6 633***	***49 526***	***52 015***	***54 056***	***55 883***

Note: Granted residence permit – includes granted, renewed residence permits and validity extensions of residence permits within the period from 1st January to 31st December of respective year.
Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

Table 5: Newly granted permits and stocks (in persons) by type in 2016-2019–1st half years

By type	Newly granted 1.1.-30.6.				Stocks 30. 6.			
	2016	2017	2018	2019	2016	2017	2018	2019
Temporary	6 176	8 603	11371	17123	22871	29554	38 039	55 953
Third-country nationals	*6 176*	*8 603*	*11371*	*17123*	*22871*	*29554*	*38 039*	*55 953*
Permanent residence	4 653	4 420	4 548	5 089	64618	68129	71 177	74441
Third-country nationals	*1 132*	*1 082*	*1 243*	*1 360*	*13869*	*14942*	*16 237*	*17 893*
EEA citizens	*3 521*	*3 338*	*3 305*	*3 729*	*50749*	*53187*	*54 940*	*56 548*
Tolerated residence	555	93	17	22	477	251	17	24
Third-country nationals	*555*	*93*	*17*	*22*	*477*	*251*	*17*	*24*
Total	**11384**	**13116**	**15936**	**22234**	**87966**	**97934**	**109233**	**130418**
Third-country	***7 863***	***9 778***	***12631***	***18505***	***37217***	***44747***	***54 293***	***73 870***

nationals								
EEA citizens	***3 521***	***3 338***	***3 305***	***3 729***	***50749***	***53187***	***54 940***	***56 548***

*Notes: * Slovak nationals residing abroad (the so-called foreign Slovaks) constitute a special category of aliens. They are not granted temporary residence permit; however, their residence results from Article 17 (2) of the Act on Stay of Aliens, which stipulates that alien who was granted the status of foreign Slovak (as specified under Act No 474/2005 Coll.) is not required to hold temporary residence permit and can stay on the territory of Slovak Republic for unlimited period.*
Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

Out of the total number of newly granted permits for third-country nationals in the first half of 2019, more than half (52%) were for 9 612 nationals of Ukraine. In 2018 Ukrainian nationals accounted for 46.5% (14 917 persons), 35.1% (8 036 persons) in 2017. The number of granted permits for nationals of Serbia also increased dynamically (6 327 in 2018, 4 654 persons in 2017). Numbers of granted stays for other top countries grew less dynamically for nationals of Russia (1 882 in 2018, 1 835 persons in 2017) and Vietnam (1 501 in 2018, 1 473 persons in 2017). See Table 6.

Table 6: Residence permits for third-country nationals by nationality in 2018–2019 (Top 20)

2018	**Inflows (new permits)**				**2019 half year**	**Inflows (new permits)**			
	Total	Temp	Perm	Toler		Total	Temp	Perm	Toler
Ukraine	**14 917**	14 235	682		Ukraine	**9 612**	9 152	460	
Serbia	**6 327**	6 156	168	3	Serbia	**3 087**	3 016	71	
Russia	**1 882**	1 616	264	2	Vietnam	**1 172**	1 115	57	
Vietnam	**1 501**	1 402	96	3	Russia	**919**	790	128	1
Korea	**735**	631	104		Macedonia	**346**	328	18	
Iran	**687**	650	37		Korea	**315**	277	38	
Macedonia	**634**	561	73		Bosnia & Herz	**281**	273	8	
China	**576**	440	135	1	Georgia	**250**	250		
Bosnia&Herz	**532**	514	18		China	**250**	185	65	
Turkey	**433**	393	40		Iran	**223**	203	20	
U.S.	**324**	216	107	1	Turkey	**200**	172	28	
India	**317**	290	27		India	**185**	170	15	
Belarus	**231**	196	35		U.S.	**141**	93	47	1
Kazakhstan	**225**	202	23		Thailand	**119**	97	22	
Thailand	**219**	180	39		Philippines	**81**	62	19	
Syria	**191**	148	43		Moldova	**80**	74	5	1
Georgia	**149**	143	6		Belarus	**78**	67	10	1
Moldova	**118**	112	6		Kazakhstan	**78**	70	8	
Brazil	**117**	100	17		Brazil	**71**	64	7	
Mexico	**114**	83	31		Syria	**69**	51	18	
Others	**1 819**	1 206	590	23	Others	**948**	614	316	18

Total	**32 048**	**29 474**	**2 541**	**33**	**Total**	**18 505**	**17 123**	**1 360**	**22**

Notes: Temp = temporary, Perm = permanent, Toler = tolerated
Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

In 2018, a total of 878 persons were **granted residence permit – includes granted, renewed residence permits and validity extensions of residence permits to third-country nationals** of which previous permission granted to 171 persons for family reasons, 412 for education reasons, 225 for remunerated reasons and to 70 persons for other reasons.

Previous permission granted to 412 persons for **education reasons** were granted to 50 persons for family reasons, 331 for remunerated reasons and to 70 persons for other reasons. Almost three quarters (73%) of the status change of international students (300 persons) were for nationals of 4 countries, namely Ukraine 163, Vietnam 67, Russia 41 and Serbia 29 persons.

End of year stocks of residence permits continue to grow, from about 76.7 thousand in 2014 to almost 84.8 thousand in 2015, 93.2 thousand in 2016, 104.5 thousand in 2017 and 121.3 thousand by the end of 2018, 46.1 per cent (55.9 thousand) of them were EEA citizens. The number of third country nationals has been increasing and by the end of 2018 it reached 65.4 thousand persons (as compared to 50.4 thousand in 2017). Data from mid-2018 indicate further increase in the stocks of permits: 130.4 thousand in total, of that 73.9 thousand for third country nationals and 56.5 thousand for EEA citizens.

From 55 883 EEA nationals with valid registration for residence at the end of 2018 the number was the highest for Czech Republic´ nationality (10 970), 8 503 Hungary, 7 420 Romania, 5 872 Poland, 4 568 Germany, 2 948 Italy, 2 420 Austria, 2 369 United Kingdom.

The number of valid **temporary** residence permit of third-country nationals was 48 316 at the end of 2018 of which 15 387 were for employment for 10 921 Slovaks living abroad, 8 062 for business, 7 672 for family reunification, 5 102 for study and 140 for volunteering activities. The year-on-year growth in the number of valid residence permit for employment, business and study grew most dynamically. See Table 7.

Table 7: Number of valid residence permits of third country nationals by purpose of temporary residence in Slovakia, 31.12.2016–2018 and 30.6.2017-2019

Purpose of residence	**31.12.**			**30.6.**		
	2016	**2017**	**2018**	**2017**	**2018**	**2019**
Total (persons)	**26 590**	**34 570**	**48 316**	**29 554**	**38 039**	**55 953**
Slovaks living abroad	7 955	9 283	10 921	8 754	10 032	11 408
Employment	3 485	7 272	15 387	4 915	9 748	21 022
Family reunion	6 111	6 910	7 672	6 439	7 014	8 085
Business	4 879	6 112	8 062	5 315	6 655	9 340
Study	3 141	3 924	5 102	3 119	3 568	4 918
Specific activity – Sport	428	450	513	407	415	505
Subsidiary protection	165	177	159	179	163	168
Specific activity- Volunteering	108	118	140	108	123	141

Purpose of residence	**31.12.**			**30.6.**		
Specific activity – Programmes approved by Slovak Republic government or the EU	90	81	79	97	72	49
Specific activity – Lecturing	72	67	76	74	60	73
Other purposes of temporary residence	156	176	205	147	189	244

Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

The number of valid **permanent** residence permits of third-country nationals was 17 050 at the end of 2018 (15 589 at the end of 2017). Individual purposes of residence were: 7 177 long-term residence; 5 432 permanent residence (unlimited); 2 988 permanent residence (for 5 years); 1 017 (807 in 2017) family member of EU national; 289 refugee; 147 (105 in 2017) family member of EU national - permanent. Year-on-year, the most dynamic increases were granted to family members by 26%, resp. 140%; long-term residence increased by more than 13%.

Data about **legal passages across the Slovak external borders** are summarized in table. The overall picture shows that the legal flows of passengers across the borders have been moderate, but have continued to increase over the last few years. See Table 8.

Table 8: Total pressure at the state border - legal passages, 2015-2019

(in million of persons)	**2018 – half year**			**2018**			**2019 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**
Total	**1,988**	**0,998**	**0,990**	**4,646**	**2,290**	**2,356**	**2,057**	**1,020**	**1,037**
Border with:									
Ukraine	**1,242**	0,640	0,602	**2,706**	1,326	1 ,380	**1,217**	0,616	0,601
Airports	**0,746**	0,358	0,388	**1,939**	0,964	0,975	**0,840**	0,404	0,436
(in million of persons)	**2016**			**2017 – half year**			**2017**		
	Total	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**
Total	**3,468**	**1,758**	**1,710**	**1,700**	**0,869**	**0,831**	**4,028**	**2,019**	**2,009**
Border with:									
Ukraine	**2,163**	1,104	1,059	**1,104**	0,579	0,525	**2,480**	1,246	1,234
Airports	**1,305**	0,654	0,651	**0,596**	0,290	0,306	**1,548**	0,773	0,775
(in million of persons)	**2015 – half year**			**2015**			**2016 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**	**Total**	**In**	**Out**
Total	**1,336**	**0,672**	**0,664**	**3,114**	**1,567**	**1,547**	**1,513**	**0,777**	**0,736**
Border with:									
Ukraine	**0,868**	0,450	0,418	**1,853**	0,940	0,913	**0,991**	0,522	0,469
Airports	**0,468**	0,222	0,246	**1,261**	0,627	0,634	**0,522**	0,255	0,267

Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

In 2018, 4.646 million persons crossed the external borders legally at border crossing points, which - compared to 2017 - is more by 0.618 million persons. At the same time there were 0.780 million vehicles - compared to 2017 less by 0.047 million - mainly due to a 7% drop in passenger car movements, more at the entry points than at the exit points of the Slovak external border with Ukraine.

In 2015, the total number of persons of crossings was 3.114 million, in 2016 increased to 3.468 million, in 2017 to 4.028 million and there was a further significant growth of 4.646 million in 2018. In the first half of 2019 (2.057 million) there was a more moderate growth compared to the first half 2018 (1.988 million).

The breakdown between crossings at the Ukrainian (land) borders and at airports shows that, on a year-on-year basis, person numbers are growing faster through airports by 25% (an increase of 9% over land borders), so air traffic increased from 38% in 2017 to 42% in 2018.

Almost two thirds (64%) of persons crossing the land border cross it through the Vyšné Nemecké and the year-on-year number of crossing at this border crossing also increases the fastest. Of the other 4 border crossings, Ubľa accounts for 25%, Veľké Slemence 9%, Čierna nad Tisou and Maťovské Vojkovce with less than 2%.

The breakdown of legal crossings by nationality shows that third-country nationals mostly cross the land border (about 1 546 thousand in 2017 and 1 890 thousand persons in 2018), only a minor part crossing the air border (235 thousand in 2017, more than 272 thousand in 2018).

For EU / EEA citizens, including citizens of Slovakia, the number of crossings over the air border - 1 667 thousand in 2018- dominated over the 816 thousand persons crossing the land border and these land border crossings by EU / EEA citizens are falling year on year (by more than 12%).

Illegal migration in the Slovak Republic is not very high, but is growing at a relatively fast pace, reaching 1 304 persons in 2014, a significant increase to 2 535 in 2015, with a subsequent decline to 2 170 in 2016 and an intensive increase to 2 706 in 2017 and 2 819 persons in 2018. In the first half of 2019, the growth seems to relax as illegal migration reached 1 020 persons, compared to 1 254 in the first half of 2018. See Table 9.

Table 9: Pressure at the state border - illegal migrants, 2014-2019

(in persons)	**2014**			**2015 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**
Total	**1 304**			**943**		
Illegal State border crossing:	**240**	**236**	**4**	**103**	**102**	**1**
External land border between BCPs	189	189		72	72	
External land border at BCPs	42	40	2	30	29	1
External air border	9	7	2	1	1	
Illegal stay	**1 064**			**840**		
Inland	634			546		
At BCPs at the exit from SR	351			224		
After return from other Member States	79			70		
(in persons)	**2015**			**2016 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**
Total	**2 535**			**977**		
Illegal State border crossing:	**222**	**217**	**5**	**80**	**71**	**9**

External land border between BCPs	134	134		38	36	2
External land border at BCPs	74	71	3	34	34	
External air border	14	12	2	8	1	7
Illegal stay	**2 313**			**897**		
Inland	1 237			579		
At BCPs at the exit from SR	637			312		
After return from other Member States	439			6		
(in persons)	**2016**			**2017 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**
Total	**2 170**			**1 251**		
Illegal State border crossing:	**208**	**186**	**22**	**71**	**69**	**2**
External land border between BCPs	132	126	6	44	42	2
External land border at BCPs	56	56		24	24	
External air border	20	4	16	3	3	
Illegal stay	**1 962**			**1 180**		
Inland	1 045			785		
Inland – at airports	2					
At BCPs at the exit from SR	896			381		
After return from other Member States	19			14		
(in persons)	**2017**			**2018 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**
Total	**2 706**			**1 254**		
Illegal State border crossing:	**248**	**243**	**5**	**141**	**139**	**2**
External land border between BCPs	205	202	3	90	90	
External land border at BCPs	37	37		29	29	
External air border	6	4	2	22	20	2
Illegal stay	**2 458**			**1 113**		
Inland	1 317			469		
Inland – at airports						
At BCPs at the exit from SR	1 112			606		
After return from other Member States	29			38		
(in persons)	**2018**			**2019 – half year**		
	Total	**In**	**Out**	**Total**	**In**	**Out**
Total	**2 819**			**1 020**		
Illegal State border crossing:	**348**	**337**	**11**	**94**	**88**	**6**
External land border between BCPs	262	256	6	71	69	2
External land border at BCPs	57	56	1	11	11	
External air border	29	25	4	12	8	4
Illegal stay	**2 471**			**926**		
Inland	919			358		
Inland – at airports						
At BCPs at the exit from SR	1 472			493		
After return from other Member States	80			75		

Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

The numbers of detected illegal border crossings (IBC) are traditionally low. The highest number of IBC was recorded in 2012 - 658 cases - of which 514 at the external land border between border crossing points (BCPs), 139 at the external land border at BCPs and 5 the external air border. Subsequently, since 2013 (398 cases) the number of IBCs has decreased to 208 in 2016. In 2018 there were 348 IBCs (248 in 2017) detected, of which 262 at the external land border between BCPs (of which, in a maximum of 230, on foot without own travel document, and 27 on foot with own travel document), 57 at the external land border at BCPs (of which 34 persons on whom an alert has been issued in national registry for purposes of entry refusal) and 29 the external air border (of which 23 asylum applicant at the BCP entering the territory of the Slovak Republic with own genuine travel document). Almost all IBC (long-term approx. 96-98%) were found at the entry and only a small part at the exit.

Among the 348 persons IBC in 2018, the TOP5 countries of nationality were 168 Vietnam (127 in 2017, 17 in the first half of 2019), Ukraine 60 (35 in 2017, 37 in the first half 2019), 27 Turkey, 19 Yemen, 10 Iraq. Ukraine, Vietnam and most recently also Serbia are the countries from which IPC migrants come from for a long time. See Table 10.

Table 10: Overview of illegal migrants (in persons) by nationality (TOP 10) between 2017 and 1st half 2019

Apprehended at the border				Unauthorised Residence			
Nationality	**2018**	**Nationality**	**1st half 2019**	**Nationality**	**2018**	**Nationality**	**1st half 2019**
Vietnam	168	Vietnam	17	Ukraine	1 874	Ukraine	617
Ukraine	60	Ukraine	16	Serbia	207	Serbia	88
Turkey	27	Turkey	12	Moldova	63	Afghanistan	49
Yemen	19	Bangladesh	8	Afghanistan	48	Iran	30
Iraq	10	Sri Lanka	7	Vietnam	33	Moldova	15
Afghanistan	8	Russia	6	Macedonia	23	Macedonia	12
Bangladesh	4	Albania	4	Russia	21	Yemen	11
India	4	Azerbaijan	3	Azerbaijan	16	Bangladesh	10
Iran	4	Iran	3	Iran	15	Russia	10
Pakistan	4	Uzbekistan	3	Iraq	14	Albania	8
Other	40	Other	15	Other	157	Other	76
Total	**348**	**Total**	**94**	**Total**	**2 471**	**Total**	**926**
Apprehended at the border				**Unauthorised Residence**			
Nationality	**2017**	**Nationality**	**1st half 2018**	**Nationality**	**2017**	**Nationality**	**1st half 2018**
Vietnam	127	Vietnam	66	Ukraine	1 751	Ukraine	813
Ukraine	35	Ukraine	27	Serbia	227	Serbia	104
India	17	Yemen	19	Iraq	107	Moldova	45
Turkey	13	Turkey	9	Vietnam	33	Vietnam	19
Syria	9	Afghanistan	4	Afghanistan	32	Afghanistan	17
Russia	7	Azerbaijan	3	Moldova	31	Russia	12
Georgia	6	Russia	3	Iran	22	Azerbaijan	11
Armenia	3	Belarus	2	Syria	22	Pakistan	11
Czech Rep.	3	Iraq	2	Russia	21	Macedonia	9

Libya	3	Pakistan	2	Bosnia&Her	16	Bosnia&Her	7
Other	25	Other	4	Other	196	Other	65
Total	**248**	**Total**	**141**	**Total**	**2 458**	**Total**	**1 113**

Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

Of the illegal migration of 2 819 persons in 2018, the highest number of 2 471 persons with illegal stay (IS) was recorded in the last 7 years. In 2018, the IS of illegal migration accounted for 88%; 2 458 persons in 2017 were 91% of illegal migration.

In 2018 the IS were detected inland in 919 persons, at border crossing points (BCPs) at the exit from Slovak Republic in 1 472 persons and in 80 persons after return from other Member States. In 2017, the IS were detected inland in 1317 persons, at BCPs at the exit from Slovak Republic border crossing point when leaving the SR in 1112 persons and in 29 persons after return from other Member State.

In the first half of 2019, the IS was detected total in 926 persons in that: inland in 358 persons, at the BCPs at the exit from Slovak Republic in 493 persons and in 75 persons after return from other Member States.

Among the 2 471 cases of detected illegal stays (IS) in Slovakia in 2018, the top five nationalities were 1 874 persons from Ukraine (almost 76%), Serbia 207, Moldova 63, Afghanistan 48 and Vietnam 33 persons. In 2017, the top five nationalities were 1 751 people from Ukraine (over 71%), Serbia 227, Iraq 107, Vietnam 33 and Afghanistan 32 persons. In the first half of 2019 the top five nationalities were from Ukraine 617 (67%), Serbia 88, Iraq 49, Iran 30 and Moldova 15 persons.

Unaccompanied minors apprehended for IBC and IS in 2018 there was a total 17 of which 2 were for IBC and 15 IS. According to nationality, there were 9 from Afghanistan, 4 from Pakistan, 2 from Vietnam, 1 from Albania and 1 person from Belarus. There were 16 men (including 1 aged 0-13 and 15 aged 14-17) and 1 woman aged 14-17.

The total of 25 unaccompanied minors were apprehended for IBC and IS in 2017 of which 25 were IS. According to nationality, there were 10 persons from Vietnam, 6 from Iraq, 4 from Bangladesh, 3 from Afghanistan and Syria. There were 22 men (all aged 14-17) and 3 women (including 1 aged 0-13 and 2 aged 14-17).

Unaccompanied minors apprehended for IBC and IS in the first half of 2019 were a total of 24 persons (10 in the first half of 2018) of which 24 IS (1 IBC, 9 IC in the first half of 2018). Depending on nationality, 19 were from Afghanistan and 5 from Bangladesh.

The Migration Office is a professional division of the Ministry of Interior acting in the area of asylum, integration of refugees and foreigners, who were provided subsidiary protection and in the field of documentation and foreign cooperation to this extent.

ASYLUM FACILITIES are 1. Reception Centre in Humenne, 2. Accommodation Centre in Opatovska Nova Ves, 3. Accommodation Centre in Rohovce, 4. Transit Centres in the premises of Bratislava, Košice and Poprad international airports and 5. Transit Centre at Humenne reception centre.

Information in this section is based on the data from the Migration Office and the Border and Alien Police Office of the Ministry of Interior. See Table 11.

Table 11: The number of applicants for refugee status monthly, 2008-2019 (October)

	Total	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
2008	**909**	45	61	66	75	76	93	76	80	86	121	66	64
2009	**822**	53	43	71	39	62	77	96	61	103	79	66	72
2010	**541**	57	18	49	52	67	55	53	57	43	35	26	29
2011	**491**	33	43	29	22	37	39	43	41	49	73	52	30
2012	**732**	36	24	28	34	62	92	115	70	75	79	65	52
2013	**441**	30	34	30	36	54	48	33	48	21	41	38	28
2014	**331**	22	13	52	22	18	31	14	22	22	32	39	44
2015	**330**	16	12	36	10	23	12	13	8	10	14	15	161
2016	**146**	7	3	11	14	17	5	5	22	17	8	18	19
2017	**166**	25	20	14	6	9	18	5	10	9	23	9	18
2018	**178**	29	12	9	11	31	12	12	8	14	16	14	10
2019[(a)]	**208**	24	17	22	12	20	13	28	27	13	32		

Note: (a) Until 31.10.2019
Source: Ministry of Interior SR, Migration Office.

In 2018 in Slovakia 178 persons **applied for refugee status** and 166 in 2017 and 208 persons in 2019 until to end October; in 2019 most persons from Afghanistan 79, Iran 45, Armenia 14, Bangladesh 13, Ukraine 10, India 6, Russia 5, Sudan 5, Myanmar 4, Pakistan 4, Syria 4.

The refugee status was granted to 14 persons in 2014, 8 persons in 2015 (to nationals of Afghanistan, Cameroon, Cuba and Syria), 167 in 2016 (namely Iraq to 152 persons), 29 persons in 2017 (Cuba 8, Syria 7, Cameroon 3, Iraq 3, Afghanistan 2, Bangladesh 2, Egypt 1, Jordan 1, Russia 1, Turkey 1), 6 persons in 2018 (Afghanistan 3, Iraq 2, Syria 1) and to 4 persons in 2019 (Burundi 1, Cameroon 1, Syria 1 and Ukraine 1).

Traditionally, the majority of applicants for asylum continue to be males in the age groups 18-25 and 26 – 39 years. In 2017, there were 133 males and 33 females among the asylum applicants. In 2018, there were 135 males and 43 females among the asylum applicants. The share of children under 14 that previously represented more than 1 % of all applicants increased to about 20 % in 2014 and to almost 25 % in 2015; 21% in 2016, 9% in 2017 and 15% in 2018.

Return Policy and Persons Taken over to the Slovak Republic (following table summarizes the main readmission flows in 2014 – 2019). See Table 12.

Table 12: Readmissions on the basis of readmission agreements in 2014-2019

Readmission Agreement with State:	**2014**		**2015**		**2016**	
	Readmitted persons out Slovakia	Accepted persons in Slovakia	Readmitted persons out Slovakia	Accepted persons in Slovakia	Readmitted persons out Slovakia	Accepted persons in Slovakia
Ukraine	**116**		**112**		**118**	**5**
Austria	**2**	**3**				**3**
Hungary	**39**	**3**	**338**	**12**	**3**	**3**
Czech Rep	**3**	**36**	**3**	**376**		**5**
Poland		**12**		**20**		

Total	**160**	**54**	**453**	**408**	**121**	**16**

Readmission Agreement with State:	2017		2018		1st half 2018/2019	
	Readmitted persons out Slovakia	Accepted persons in Slovakia	Readmitted persons out Slovakia	Accepted persons in Slovakia	Readmitted persons out Slovakia	Accepted persons in Slovakia
Ukraine	**184**	**2**	**241**	**1**	**86 / 66**	**- / 2**
Austria	**2**	**6**	**1**	**9**	**- / 1**	**6 / 1**
Hungary	**2**	**1**				
Czech Rep		**10**		**20**		**1 / 32**
Poland		**4**	**1**	**15**		**10 / 3**
Germany		**2**				
Serbia			**1**		**1 / -**	
Switzerland		**1**				
Total	**188**	**26**	**244**	**45**	**87 / 67**	**17 / 38**

Source: Presidium of the Police Corps, Bureau of Border and Alien Police.

Note: Illegal migration – this category includes handed over and taken over persons within the reference period regardless the period in which they were apprehended for illegal migration by authority of the Slovak Republic or other country.
Other – this category includes handed over and taken over persons according readmission agreements within the reference period who were not apprehended for illegal migration on the territory of the Slovak Republic and at the time of readmission their stay in the SR or other member state of the EU was legal.
„Persons handed over (from Slovak Republic)“ – this category includes persons, who were sentenced for a crime that is not regarded to illegal migration (i.e. theft) and who were sentenced to judicial expulsion and they were handed over to the territory of other EU member state, where they were permitted to stay.
„Persons taken over (to Slovak Republic)“ – this category includes persons, who were returned from other EU member state and they are permitted to stay on the territory of the SR.

In 2018, according to readmission agreements 244 foreigners - illegal migrants were handed from Slovakia, compared to 2017 (188 persons) - the increase was by almost 30%. In 2018 the country of hand-over from Slovakia was predominantly Ukraine (a total of 241), of whom there were mainly Vietnamese nationals (166), Turkey (18), Iraq (10), Bangladesh (4), India (4), Pakistan (4), Russia (4) and Ukraine (4). Overall, these were nationals of 23 countries. In addition, Russians (1 person) were handed to Austria, to Ukraine (1 person), to Poland and Serbia (1 each).

Also in 2017 from the 188 persons handed-over from the territory of the Slovak Republic 98% were handed to Ukraine, i.e. 184 of them from Vietnam 115, India 17, Syria 9, Ukraine 7, Georgia 6; furthermore, 2 persons to Austria and 2 persons to Hungary.

In the first half of 2019 according to readmission agreements 67 persons were handed from the Slovak Republic, compared to the first half of 2018 (87 persons) – a decrease by 23%. 1 Jordan national was transferred to Austria, the other 66 to Ukraine, especially Vietnam 16, Turkey 10, Bangladesh 8, Sri Lanka 7, Russia 6.

According to readmission agreements, 45 illegal migrants were taken over in 2018 to Slovakia, compared to 2017 (26 persons) – an increase by 73%. Foreigners taken over were 20 from the Czech Republic, 15 from Poland, 9 from Austria and 1 from Ukraine. Most of the nationalities were Afghanistan 18 (including 6 from AT, 7 from CZ, 5 from PL), Iraq 6, Syria 6, Pakistan 5, Iran 3.

Foreigners taken over to the Slovak Republic in 2017 were 10 from the Czech Republic, 6 from Austria, 4 from Poland, 2 from Ukraine and also Germany, and one migrant from Hungary and Switzerland. The highest number of nationalities were from Afghanistan 9 (including 5 from AT, 1 from CZ, 3 from PL), Iraq 6, Syria 6, Pakistan 5, Iran 3.

In the first half of 2019, 38 persons were taken over to the SR, compared to the first half of 2018 (17 persons) it was by 124% more. Foreigners taken over were 32 from the Czech Republic, 3 from Poland, 2 from Ukraine and 1 from Austria. The most nationalities were Yemen 11 (all from CZ), Afghanistan 10 (7 from CZ, 3 from PL), Iraq 6 (all from CZ), Bangladesh 3 (2 from CZ, 1 from AT).

IV. Main changes in the labour market and foreign workers

The **employment** and labour market situation in Slovak Republic is improving every year. See Table 13.

Table 13: Labour market performance, 2012 –1st half 2019

(%) Annual averages	2012	2013	2014	2015	2016	2017	1-2Q 2018	2018	1-2Q 2019
Employment rate (20-64)	65.0	65.0	65.9	67.7	69.8	71.1	72.0	72.4	73,2
Employment development (y-o-y)	0.6	0,0	1.4	2.6	2.8	1.5	1.2	1.4	1,2
Unemployment rate	14.0	14.2	13.2	11.5	9.7	8.1	6.8	6.6	5,8
Unemployment development (y-o-y)	3.5	2.3	-7.1	-12.4	-15.3	-15.8	-18.9	-19.9	-16.2
Number of vacancies (average)	14072	15048	16046	17198	20054	21123	24560	25088	23460

Note: In 2012 all data have been calculated using population as of the 1st January 2012 according to the 2011 Population and Housing Census.
Source: Statistical Office of the Slovak Republic.

Economic growth contributed to maintaining positive labour market trends throughout 2018. Employment levels according to the Labour Force Sample Survey (LFS) reached a new all-time high, its growth rate accelerated by 0. 8 p.p. to 1.9%. In absolute terms, the number of workers increased by 49.1 thousand. to 2 589.3 thousand persons. On average, in 2018, employment grew by 1.4% year on year to 2 566.7 thousand persons.

Employment also increased in the second quarter of 2019, in the domestic economy or abroad there was a total of 2 569.9 thousand persons. The year-on-year growth of employment reached 0.5%. Growth rate slowed by 0.7 p compared to Q2 2018. In absolute terms the number of the employed increased by 13.9 thousand persons. The employment rate increased year-on-year by 1 p. b. to 73%. After deduction of persons working abroad, employment in Slovakia territory increased by 1.1% to 2 442.2 thousand persons.

Seasonally adjusted total employment decreased by 0.5% compared to Q1 2019, to 2 576.1 thousand workers.

On average for the first half of 2019, total employment grew by 1.2% year-on-year to 2,579.2 thousand persons. The employment rate for the first half of 2019 reached 73.2%.

The trend (permanent since 2013) of decreasing **unemployment** continued throughout 2018. In 2018, unemployment fell by 19.9% year-on-year to 179.5 thousand persons. The unemployment rate decreased by 1.5 p.p. to 6.6%.

Unemployment decreased year-on-year also in the second quarter of 2019, the unemployment rate reached 5.7%, compared to the second quarter of 2018 it decreased by 0.9 p.p. According to LFS, the total number of unemployed decreased by 26.5 thousand year-on-year (by 14.6%) to 155 thousand persons, which was again the lowest value of unemployment since the beginning of its LFS measurement. The rate of decline slowed year-on-year by 4.1 p.p. The unemployment rate for both sexes reached the same value of 5.7%, with a year-on-year decrease in men by 0.5 p.p. and in women by 1.5 p.p. Unemployment decreased in all regions, relatively the highest in the Bratislava region (by 28.8%) and the Košice region (by 24%). The regional unemployment rate reached the highest levels in the Prešov (9.4%) and Banská Bystrica region (8.1%). The year-on-year decrease in the unemployment rate was in all regions, the most significant in the Košice region (by 2.3 p.p.).

In the first half of 2019 the unemployment rate reached 5.8% (year-on-year the rate of decline decreased by 1.1 p.p.). The number of unemployed decreased by 16.2% to 157.4 thousand persons.

On average the **registered unemployment rate** reached 5.42% in 2018, which was lower by 1.74 p.p. compared to 2017 (7.16%). In the first 10 months of 2019, the unemployment rate averaged at 5.01%, at the end of October at 4.94%.

In 2018, active labour market measures (ALMP) **aimed to foster labour mobility**, foster the creation of real jobs at local and regional level, and to support the employment of a wider group of disadvantaged jobseekers (jobseekers).

As of 1st May 2018, the amendment to the Employment Services Act:
- made the conditions for entitlement to work and work mobility benefits more attractive. The maximum monthly allowances have been increased, the allowance for commuting to work has been made irrespective of the definition of the mode of transport to work, the restriction of its provision within one municipality has been removed and the period of its provision for disadvantaged jobseekers has been extended. At the same time, the possibilities of promoting mobility for work have been expanded by introducing a combination of both contributions to allow for the granting of mobility allowance for work to employees moving to their place of employment during or immediately after receiving their work allowance;
- a move-to-work allowance has been introduced to cover the costs of moving a citizen to a new place of residence;
- the obligations of the employer, to which third-country nationals are posted, are extended to include the obligation to provide adequate accommodation for posted workers, as well as the obligation to provide relevant documents proving their posting;
- the conditions of employment of third-country nationals in selected professions have been simplified, showing a lack of skilled labour and in districts with an average registered unemployment rate of less than 5%.
At the same time, the amendment to the Act on the Residence of Aliens regulated the conditions of employment of third-country nationals carrying out work in the territory of the Slovak Republic.

*On October 10th, 2018, the Government of the Slovak Republic approved the **Strategy of Labour Mobility of Foreigners in the Slovak Republic**. The priority objective of the strategy is to address the current shortage of skilled labour in the Slovak labour market, which resulted in legislative measures, particularly in the area of work of the Ministry of Labour, Social Affairs and Family and the Ministry of the Interior. Legislative changes were subsequently adopted with effect from 1st January 2019, the aim of which is, in particular, to streamline, speed up and make more flexible the system governing the entry and residence of third-country nationals into the territory of the Slovak Republic for employment purposes, particularly in professions with identified labour shortages.*

The **Employment Services Act** with effect from 1st January 2019 was amended by:

- changing the periodicity of updating the list of jobs with labour shortages from annual to quarterly;
- extending the possibilities of third-country nationals entering the labour market through temporary employment agencies in the case of jobs; - adaptation of the supporting documents submitted to the application, in particular the evidence of formal qualifications and documents relating to the secondment of third-country nationals through temporary employment agencies;
- shortening the deadlines for assessing applications for seasonal employment permits;
- introduction of an obligation for employers to report vacancies and the fixing of a maximum fine for failure to comply with this obligation;
- harmonizing the length of the period of non-infringement examined for the purpose of employing third-country nationals.

With effect from 1st January 2019, the Aliens Residence Act was amended by:

- shortening the deadlines for assessing applications for temporary residence for the purpose of employment from 90 to 30 days in the case of jobs with labour shortages or technology centre employees;
- reassessment of the number of supporting documents for the application for temporary residence;
- change of territorial jurisdiction to receive the application for temporary residence and the case.

From 1st January 2019 the **Labour Code** also introduced a ban on employers in any way restricting the employee's ability to report their wages. This is a measure designed to prevent the abuse of citizens' arrivals from third countries on to the Slovak labour market for social dumping, especially in the wage area.

The number - especially women - of short-term work migration abroad is decreasing. According to LFS, the number of **employed with workplace outside the Slovak Republic for up to 1 year** also decreased in the second quarter of 2019, reaching 127.7 thousand persons. Compared to Q2 2018 their number decreased by 8.7% (by 12.1 thousand persons), the dynamics of decline accelerated by 2 p.p. year-on-year. See Table 14.

Table 14: Slovaks employed abroad 2013 - 1st half 2019

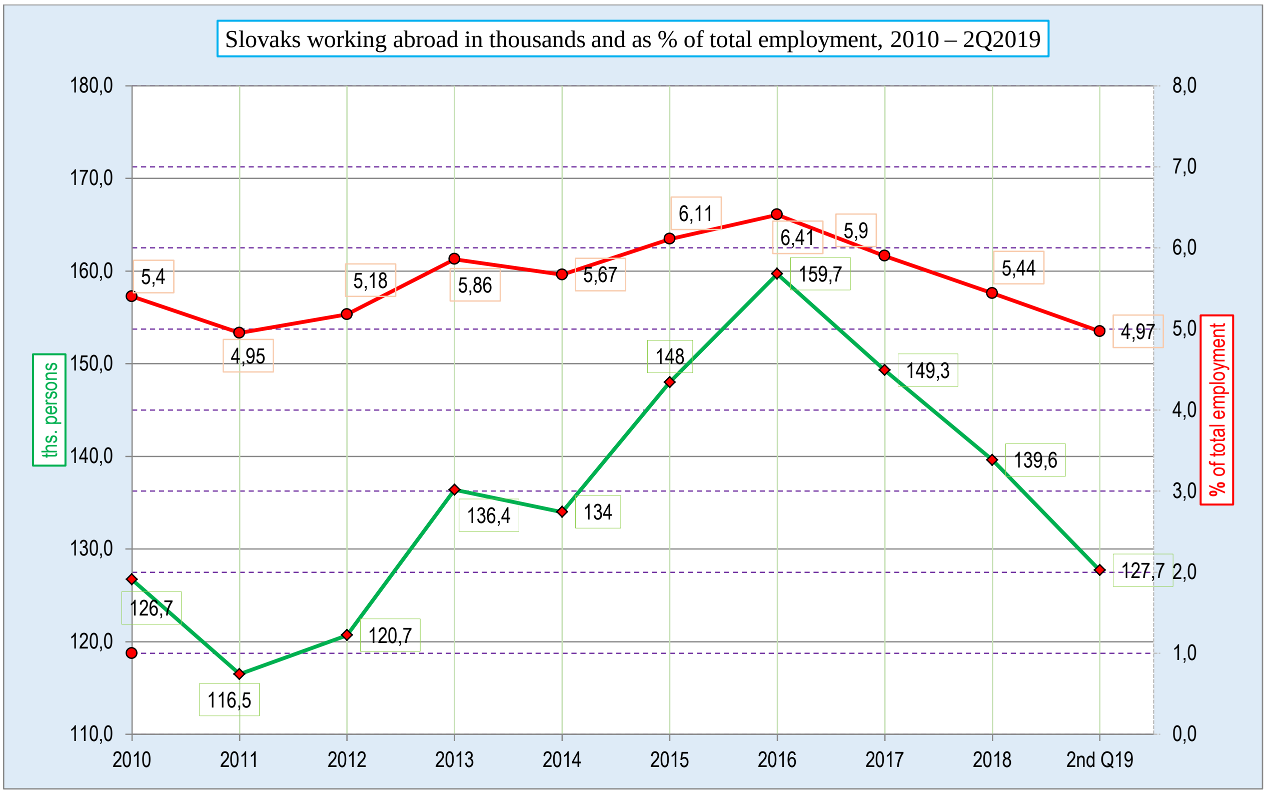
(thousand of persons)	Annual averages						2018	2019
	2013	2014	2015	2016	2017	2018	1.-2.Q	1.-2.Q

Employed total	2329,2	2363,0	2424,0	2492,1	2530,7	2566,7	2549,3	2579,2
Employed abroad	**136,4**	**134,0**	**148,0**	**159,7**	**149,3**	**139,6**	**140,9**	**127,1**
Males	91,6	90,8	96,9	103,4	95,1	91,5	89,3	88,5
Females	44,8	43,2	51,1	56,3	54,2	48,1	51,7	38,7
Destination country								
Czech Republic	43,5	38,1	38,8	39,5	36,5	31,7	32,0	29,3
United Kingdom	10,6	10,1	8,6	7,4	4,2	3,9	4,2	3,6
Hungary	6,1	4,9	5,9	6,6	8,7	8,3	6,9	9,4
Austria	37,9	39,3	42,1	51,0	54,6	48,6	53,5	40,4
Ireland	1,8	1,3	1,5	1,2	0,5	0,2	0,3	0,3
Germany	14,8	17,3	24,9	27,7	24,0	26,8	25,2	23,9
Italy	4,3	3,4	2,5	3,6	3,8	2,5	2,3	1,3
Netherlands	5,2	5,7	3,2	4,8	5,0	3,1	2,7	5,3
France	1,6	1,4	3,1	3,4	1,4	2,0	2,1	1,5
Spain	1,0	1,3	1,1	0,4	0,5	0,3	0,5	0,4
Other	9,8	11,3	16,3	14,4	10,1	12,2	11,4	11,7
Age brackets								
15-24	13,3	13,7	14,2	14,7	13,8	15,0	14,4	10,8
25-34	47,8	46,1	52,0	50,5	38,9	37,1	36,9	34,8
35-44	37,5	36,1	38,2	44,3	43,1	39,0	40,6	32,7
45-54	27,2	25,0	29,5	34,1	32,4	30,2	30,5	31,0
55+	10,6	13,2	14,1	16,2	21,1	18,3	18,7	17,9
Education								
Basic	2,6	3,3	4,2	5,3	5,0	5,1	4,4	6,4
Lower secondary	54,5	60,0	64,4	67,9	56,5	47,1	48,4	41,8
Higher secondary	64,2	55,3	58,8	63,5	71,5	69,1	70,3	62,7
University	15,2	15,5	20,6	23,0	16,3	18,3	17,8	16,3

Source: Statistical Office of the Slovak Republic, Labour Force Survey (LFS).

The number of women (40.0 thousand) working abroad in the second quarter of 2019 accounted for 31.3% (35.2%, i.e. 49.2 thousand, in 2Q 2019) of the total number of working abroad. See Graph 3.

Graph 3: Slovaks working abroad in thousands and as % of total employment, 2010 – 2018 and 2Q2019



Note: Y axis in thousands of workers, annual averages, right axis in %
Source: Authors' own work based on data from Statistical Office of the Slovak Republic; Labour Force Survey (LFS).

According to Statistical Office of the Slovak Republic in Q2 2019 - among the migrants for work - workers in the industry (34.4 thousand persons) were predominant, followed by the construction (31.2 thousand persons) and health and social assistance (25.7 thousand persons). Despite the overall decrease of 10.3 thousand persons, most Slovak citizens worked in Austria (40.2 thousand). Within the European countries, the Slovaks, apart from Austria, went to work in larger numbers to the Czech Republic (29.2 thousand persons) and Germany (23.9 thousand persons). From the regional point of view, the highest number of persons who found work abroad was from the Prešov region (27 thousand persons).

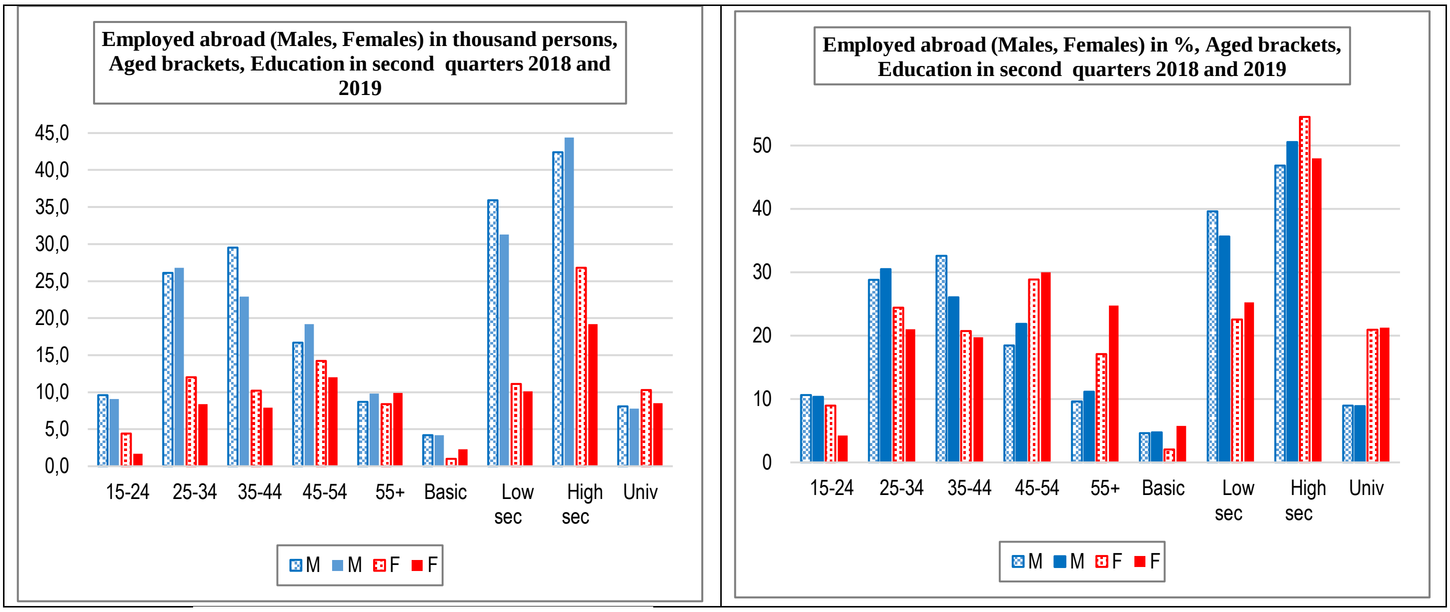
The number and proportion of young people under the age of 24, but also at the age of 35-44, is the most decreasing. On average, the number and share of people aged 25-34 is falling. There is a slight increase in the number and share of working abroad over 45 years and especially over 55 year olds.

The number of men in the age groups 25-34 years and older than 45 years increased slightly year-on-year. The number of women increased year-on-year only in the group older than 55 years.

According to education, only the number of men with full secondary education with maturity exam (includes higher professional) increased in 2Q2019 year-on-year. With secondary vocational education without maturity exam, the number of men (31.3 thousand persons) is three times the number of women (10.1 thousand). With full secondary education with GCSE, the number of men (44.4 thousand) is more than three times the number of women (19.2

thousand). With university degree the differences are not great in the numbers between men and women; however, women make up more than 20% of the total number of women and men 9% of the number of working women, respectively, men abroad. See Graph 4.

Graph 4: Employed abroad (Males, Females) in thousand and in %, Aged brackets, Education in second quarters 2018 and 2019



Source: Authors' own work based on data from Statistical Office of the Slovak Republic; Labour Force Survey (LFS).

V. Foreign workers in Slovakia

The number of **working foreigners in the Slovak Republic** is growing, reaching **76 946** persons at the end of October 2019. The development of the number of foreign workers in individual months in 2013-2019 is shown in Table 18 in Annex.

More than a third (36.2%) of foreigners work in Bratislava; another 43,6% in the other 3 regions (Trnava, Trenčín, Nitra) of western Slovakia, 8.99% in the territory of eastern Slovakia (Košice, Prešov) and 11,4% in the territory of central Slovakia (Banská Bystrica, Žilina). During 2019 the numbers of working foreigners in the territory of Bratislava have been slightly decreasing (on the territory of the Capital city Bratislava the numbers keep at the 27-28 thousand level however the overall share decreased from 41% at the beginning of the year to 36% at the end of October), increasing significantly in regions with well-known car factories (Trnava, Nitra, and Žilina). The number of working foreigners from the EU / EEA (32 657) is growing slower than the numbers from other foreign countries, of which, in total, the most of them are 21.9 thousand from Ukraine and 13.0 thousand from Serbia. Especially on the basis of permits from the labour offices, foreign workers are directed to districts with the lowest unemployment rate, i.e. to districts with insufficient number of workers.

At the end October 2019 - on the basis of permits of labour offices in Slovakia of this example - there worked 15 910 persons from Ukraine, 5 611 from Serbia, 1 068 from Vietnam, 562 from Bosnia and Herzegovina, 533 from Georgia and 498 from Macedonia.

The EU (32 657) is dominated by working citizens of Romania 9 374, Czech Republic 5 801, Hungary 5 624, Poland 2 541, Bulgaria 2 316, Italian 1259 and Croatia 1 117 persons.

Based on the information card (which does not require a work permit) there worked 7 407 Serbs, 5 969 Ukrainians, 427 Korea, 372 people from Russia and 359 people from Bosnia and Herzegovina.

At the end of August 2019, **73 405 foreigners** worked in the Slovak Republic, of which 44.2% (32,459) were EU / EEA citizens. Year-on-year, the total number of foreigners increased by 10,942 (17.5%) of which EU / EEA citizens decreased by 340 persons (-1%); the number (stock) of foreign workers of EU / EEA citizens decreased year-on-year and also month-on-month for the first time in August 2019. The number of working foreigners on the basis of an information card without a work permit increased by 995 to 17 297 persons, i.e. by 6.1%. The number of working foreigners on the basis of the permits of labour offices is growing the fastest and almost doubled year-on-year (an increase of 77%), i.e. from 13 362 to 23 649 persons at the end of August 2019).

At the end of October 2019, **76 946 foreigners** worked in the Slovak Republic, of which 42.4% (32 657) were EU / EEA citizens. Year-on-year, the total number of foreigners increased by 11 687 (17.9%) of which the number of EU / EEA citizens decreased by 1 084 persons (-3.2%). The number of working foreigners on the basis of an information card without a work permit increased by 1 069 to 17 413 persons, i.e. by 6.5%. The number of working foreigners on the basis of the permits of labour offices is growing the fastest and almost doubled year-on-year (increase of 77%), i.e. from 15 174 to 26 876 persons at the end of October 2019).

Seasonal employment *is an activity the performance of which does not exceed 180 days during 12 consecutive months and is bound to a certain time of the year with a significantly higher volume of work in a specific field. May be performed based* ***on a work permit****, or* ***based on temporary residence*** *for the purpose of seasonal employment.*
Not all types of professions may be performed in the seasonal employment regime. The range of professions is regulated Regulation of the Ministry of Labour, Social Affairs and Family: No. 190/2017, stipulating the list of seasonal employment fields: agriculture, forestry, fishing, industrial production, construction, accommodation and catering services.

The inflow of **foreign workers for employment not exceeding 6 months** from year to year increases. In 2018, the inflow of employees for a period not exceeding 6 months reached 18.9 thousand, of which 5.2 thousand women (27.6%). The inflow in 2018 was 56% higher than the inflow in 2017 (12.1 thousand of which 2.9 thousand were women, i.e. 23.6%). A high inflow of 11.6 thousand (23.4% of women) was also recorded in 2016.

The highest numbers of inflows of foreign workers to employment not exceeding 6 months in 2018 are from Serbia 3593 persons, Romania 3544, Ukraine 3073, Hungary 2506, Czech Republic 1314, Poland 801, Croatia 799, Bulgaria 785. In 2017 the highest numbers of foreign workers not exceeding 6 months were from Romania 2975, Serbia 2299, Hungary 2134, Czech 928, Ukraine 917, Poland 775, Croatia 564 persons.

Regional labour market characteristics are summarized in the following Table 16:

Table 16: Regional labour market characteristics 2017 – 2019

Region	Population as of 1.1.2017		2017, (2Q) Rates (%)					
			Economic activity	Employment			Unemployment	
	Total	15+		15+	15-64	20-64	LFS	Registered
Bratislavsky	641,9	537,9	65,9	62,9	75,7	79,8	4,5	3,60
Trnavsky	561,2	481,9	62,5	58,6	70,4	74,9	6,3	3,11
Trenciansky	588,8	509,7	58,9	56,2	68,9	73,7	4,6	4,09
Nitriansky	680,8	589,1	58,6	54,9	67,0	71,4	6,2	4,99
Zilinsky	690,8	583,5	59,0	55,3	66,3	71,6	6,2	5,43
Banskobystricky	651,5	556,5	60,1	52,4	63,5	68,2	12,9	10,07
Presovsky	822,3	675,3	59,2	51,7	61,0	66,9	12,6	11,31
Kosicky	798,1	661,3	56,0	50,2	59,8	65,2	10,4	11,08
SR total	**5 435,3**	**4 595,1**	**59,8**	**55,0**	**66,1**	**71,1**	**8,1**	**6,90**
SR Men	2 651,7	2 220,8	67,8	62,4	72,0	77,5	8,0	5,85
SR Women	2 783,7	2 374,3	52,4	48,1	60,1	64,6	8,3	8,16
Region	**Population as of 1.1.2017**		**2017, (4Q) Rates (%)**					
			Economic activity	**Employment**			**Unemployment**	
	Total	**15+**		**15+**	**15-64**	**20-64**	**LFS**	**Registered**
Bratislavsky	641,9	537,9	65,1	62,4	74,8	78,8	4,2	3,05
Trnavsky	561,2	481,9	61,5	58,0	69,8	74,2	5,7	2,60
Trenciansky	588,8	509,7	59,0	57,0	69,5	74,2	3,5	3,53
Nitriansky	680,8	589,1	58,7	55,6	67,9	72,4	5,2	4,05
Zilinsky	690,8	583,5	58,4	54,6	65,4	70,5	6,4	4,70
Banskobystricky	651,5	556,5	61,1	54,2	65,7	70,4	11,4	8,67
Presovsky	822,3	675,3	59,8	52,5	62,1	68,0	12,2	9,68
Kosicky	798,1	661,3	56,8	50,3	59,8	65,0	11,4	9,94
SR total	**5 435,3**	**4 595,1**	**59,9**	**55,3**	**66,4**	**71,3**	**7,7**	**5,94**
SR Men	2 651,7	2 220,8	67,5	62,7	72,3	77,7	7,2	5,10
SR Women	2 783,7	2 374,3	52,8	48,4	60,5	64,9	8,4	6,95
Region	**Population as of 1.1.2018**		**2018, (2Q) Rates (%)**					
			Economic activity	**Employment**			**Unemployment**	
	Total	**15+**		**15+**	**15-64**	**20-64**	**LFS**	**Registered**
Bratislavsky	650,8	542,1	65,8	63,6	76,4	80,1	3,3	2,89
Trnavsky	562,4	481,9	60,0	56,8	67,7	72,0	5,4	2,58
Trenciansky	587,4	507,4	59,5	57,7	71,0	75,7	3,1	3,19
Nitriansky	678,7	586,5	58,0	55,2	67,4	71,6	4,8	3,51
Zilinsky	691,0	583,1	59,1	55,7	67,0	72,1	5,7	4,19
Banskobystricky	649,8	554,5	60,1	54,0	66,1	71,0	10,1	7,50
Presovsky	823,8	676,1	58,1	52,5	62,5	68,4	9,5	9,11

Kosicky	799,2	661,8	57,3	51,6	62,0	67,1	10,0	8,88
SR total	**5 443,1**	**4 593,5**	**59,6**	**55,6**	**67,1**	**72,0**	**6,6**	**5,43**
SR Men	2 656,5	2 220,7	67,8	63,6	73,6	79,0	6,2	4,40
SR Women	2 786,6	2 372,7	51,9	48,2	60,5	64,8	7,2	6,64
Region	**Population as of 1.1.2018**		**2018, (4Q) Rates (%)**					
			Economic activity	**Employment**			**Unemployment**	
	Total	**15+**		**15+**	**15-64**	**20-64**	**LFS**	**Registered**
Bratislavsky	650,8	542,1	65,6	64,2	76,6	80,5	2,2	2,62
Trnavsky	562,4	481,9	59,8	56,8	69,1	73,7	5,0	2,31
Trenciansky	587,4	507,4	59,4	57,8	71,3	76,0	2,7	2,93
Nitriansky	678,7	586,5	58,9	56,3	69,3	73,5	4,5	3,12
Zilinsky	691,0	583,1	59,4	56,7	68,2	73,6	4,5	4,04
Banskobystricky	649,8	554,5	59,9	54,5	66,9	71,9	9,0	7,03
Presovsky	823,8	676,1	59,8	54,0	64,3	70,0	9,7	8,61
Kosicky	799,2	661,8	57,8	52,2	62,6	68,0	9,6	8,17
SR total	**5 443,1**	**4 593,5**	**60,0**	**56,4**	**68,2**	**73,1**	**6,1**	**5,04**
SR Men	2 656,5	2 220,7	67,9	64,1	74,4	79,8	5,5	4,13
SR Women	2 786,6	2 372,7	52,7	49,1	61,9	66,3	6,7	6,10
Region	**Population as of 1.1.2019**		**2019, (2Q) Rates (%)**					
			Economic activity	**Employment**			**Unemployment**	
	Total	**15+**		**15+**	**15-64**	**20-64**	**LFS**	**Registered**
Bratislavsky	659,6	546,4	65,6	64,0	76,9	81,0	2,4	2,84
Trnavsky	563,6	482,0	59,8	56,9	69,9	74,5	4,8	2,58
Trenciansky	585,9	505,2	59,0	57,2	71,3	75,9	3,0	3,03
Nitriansky	676,7	584,1	58,3	55,5	68,8	73,3	4,7	2,95
Zilinsky	691,4	582,7	58,8	56,2	67,8	73,0	4,4	3,89
Banskobystricky	647,9	552,6	59,4	54,6	67,0	71,9	8,1	6,65
Presovsky	825,0	676,8	58,6	53,1	63,6	69,3	9,4	8,54
Kosicky	800,4	662,7	56,2	51,8	62,5	67,9	7,7	7,81
SR total	**5 450,4**	**4 592,4**	**59,3**	**56,0**	**68,1**	**73,0**	**5,7**	**4,97**
SR Men	2 661,1	2 220,9	67,4	63,6	74,1	79,5	5,7	3,95
SR Women	2 789,3	2 371,4	51,8	48,8	61,9	66,5	5,7	6,18

Note: Population as of 1 January. Rate of economic activity, employment, unemployment as of 2Q and 4Q; Registered unemployment: 30.6.2017, 31.12.2017, 30.6.2018, 31.12.2018, 30.6.2019. Regions correspond to territorial level II.

Source: Authors' own work based on data from Statistical Office of the Slovak Republic (LFS), Centre of Labour, Social Affairs and Family (registered unemployment).

There is a gradient of worsening labour market situation from the west to the east. This means that there is an inverse relationship between the regional share in total unemployment and the share in total number of foreign workers. Bratislava region has the lowest share in total unemployment and highest share of foreign workers.

According to the LFS, while in the fourth quarter of 2017 the regional differences in the employment rate of 20-64 year olds were 13.8 p.p. (78.8% in the west of Slovakia's Bratislava region, 65.0% in the east Košice region), in the fourth quarter of 2018 the differences were 12.5 p.p. (Bratislava region 80.5%, Košice region 68.0%).

Regional disparities in the unemployment rate decreased significantly in the fourth quarter of 2017 by 8.2 p.p. (4.2% in the west of Slovakia Bratislava region, 12.2% in the east Prešov region), in the fourth quarter of 2018 it was 7.4 p.p. (Bratislava Region 2.2%, Prešov Region 9.7%).

Further reduction of the differences (down to 7 p.p.) was achieved in the 2nd quarter of 2019.

Also in the registered unemployment rate, regional disparities were reduced, at the end of August 2018 the reduction was 15.15 p.p., at the end of August 2019 it was 13.23 p.p. (however, the highest UnR remains in the district of Rimavská Sobota at 15.17%; at the end of October 2018 it was 15.13 p.p., at the end of October 2019 it was 12.99 p.p. (however, the highest UnR remains in the district of Rimavská Sobota at 14.93%; 17.03% at the end of October 2019).

Inflow of foreign workers to Slovakia was about 14.3 thousand persons in 2016. Growth continued in the coming years: In 2017 inflow reached 20.1 and in 2018 to 34.7 thousand workers, and 26 thousand in January-June 2019. (See Table 19 in Annex).

Much more than half of the number of the inflow (18.8 thousand in 2018 and 14 thousand for mid-2019) worked on the basis of a work permit. The inflow in 2018 on the basis of information cards of EU/EEA workers reached 10.7 thousand and 5.1 thousand from other countries. Inflow of foreign workers in the first half of 2019 was 12 thousand on the basis of information cards (half of them EEA nationals).–Women accounted for 23% of the inflow over the past 3 years. At the end of the year (stocks), respectively at the end of half-year, women make up 24-25% of foreign workers.

Tables 3-6 in Annex provide data about foreign workers by detailed breakdowns, such as by duration of stay, gender, age groups, education, occupation (ISCO) and sector of economic activity (NACE). Three tables contain the above data separately for groups of foreign workers: on the basis of the authorization granted at work, EU/EEA information card, information card of other countries.

Prevailing characteristics for foreign worker in total are (as compared to the whole in a given period):

- <u>Inflows 2018</u> (34 709 persons in total): male (77%), short-term i.e. less than 3 months (53%), age group 25-29 years (17%), secondary vocational with maturity exam (31%), Occupation 8 ISCO (48%), NACE - Manufacturing (41%);

- Inflows 2019 (January-June): Total of 25 974 persons: male (75%), short-term i.e. less than 3 months (50%), age group 25-29 years (16%), secondary vocational with maturity exam (35%), Occupation 8 ISCO (45%), NACE - Manufacturing (38%);

- Stocks as of 31st December 2018 (69 116 persons): male (76%), long-term i.e. over 12 months (69%), age group 25-29 years (16%), secondary vocational with maturity exam (26%), Occupation 8 ISCO (38%), NACE - Manufacturing (27);

- Stocks as of 30th.June.2019: Total 73 080 persons: male (75%), long-term i.e. over 12 months (71%), 25-29 years (16%), secondary vocational with maturity exam (29%), Occupation 8 ISCO (34%), NACE - Manufacturing (30%).

Prevailing characteristics for foreign workers working on the basis of the authorization granted at labour offices in total are (comparison to the whole in a given period):

- Inflows 2018 (18 848 persons in total): male (81%), short-term i.e. less than 3 months (62%), age group 25-29 years (19%), secondary vocational with maturity exam (36%), Occupation 8 ISCO (63%), NACE - Manufacturing (55%);

- Inflows 2019 (January-June): Total 14 051 persons: male (78%), short-term i.e. less than 3 months (72%), age group 25-29 years (17%), secondary vocational with maturity exam (45%), Occupation 8 ISCO (55%), NACE - Manufacturing (46%);

- Stock as of 31st December 2018 (17 064 persons): male (81%), long-term i.e. over 12 months (76%), age group 25-29 year (19%), secondary vocational with maturity exam (36%), Occupation 8 ISCO (61%), NACE - Manufacturing (25%);

- Stock as of 30th June 2019: total of 22852 persons: male (80%), long-term i.e. over 12 months (80%), 25-29 years (18%), secondary vocational with maturity exam (41%), Occupation 8 ISCO (58%), NACE - Manufacturing (45%).

Prevailing characteristics for foreign workers EU/EEA working on the basis of information cards in total are (comparison to the whole in a given period):

- Inflows 2018 (10 749 persons in total): male (72%), short-term i.e. less than 3 months (100%), age group 25-29 years (14%), secondary vocational with maturity exam (25%), Occupation 8 ISCO (33%), NACE - Administrative services 25%);

- Inflows 2019 (January-June): Total 5971 persons: male (72%), short-term i.e. less than 3 months (100%), age group 30-34 years (14%), secondary vocational with maturity exam (22%), Occupation 8 ISCO (27%), NACE - Administrative services (23%);

- Stock as of 31st December 2018 (36 265 persons): male (75%), long-term i.e. over 12 months (70%), age group 30-34 year (15%), secondary vocational with maturity exam (26%), Occupation 8 ISCO (33%), NACE - Administrative services (17%);

- Stock as of 30th June.2019: total 33191 persons: male (75%), long-term i.e. over 12 months (72%), 30-34 years (15%), secondary vocational with maturity exam (25%), Occupation 8 ISCO (31%), NACE – Administrative services (17%).

In inflows the **length of employment** is up to 3 months (53% (63% for women) in 2018, 50% (60% for women) in the first half of 2019) and then for more than 1 year (34% (for women 25%) in 2018, 39% (for women 30%) in the first half of 2019). In stock of periods, employment for more than one year is increasing, from 64% at the end of 2016, 66% in 2017, 69% in 2018 and 71% at the end of June 2019.

In stocks of workers authorized by employment offices for more than 1 year, the share is growing faster than the total, gradually 61% in 2017, 76% in 2018 and 80% at the end of June 2019. In stock EU / EEA of workers working on an information card, the share of those employed for more than one year is stable at around 70% in final numbers, on the other hand, for workers from other countries on the basis of an information card, the share of those employed for more than one year gradually decreased from 60% in 2017 also 2018 to 56% at the end of June 2019.

According to the **level of education** of foreign workers, the highest numbers are (at the end of 2018) with secondary vocational with maturity exam (18 thousand persons), secondary specialised with maturity exam (12.2 thousand), university – master's degree (10.5 thousand) and basic education (8.3 thousand).

The share of foreign workers in the number of employees in Slovakia is about 2.7%. When comparing the structure of foreign workers with the structure of workers by the level of education, the highest numbers above average saturate the above-mentioned levels of education, when foreign workers account for 10% of the secondary specialised with maturity exam, 11% for the secondary vocational with maturity exam, 4% university – bachelor's degree (2 thousand persons), 2% university – master's degree and more than 8% with basic education.

VI. Students, Graduates

The number of student of the Slovak nationality in full-time studies (in Universities and colleges – public, private, state) increased from 1989 to 2009. In the last decennium, the number of the Slovak students decreased from 140.7 thousand in 2009 to 95.8 thousand in 2018 (31st October.). The number of **foreign students** has steadily increased since from 2009 (3.3 thousand), to 9.4 thousand in 2018 (31.10). Owing to the faster growth of the number of foreign students over the number of the Slovak students, the share of foreign students in the total number of students rose from 2.3% in 2009 to 9% in 2018. In 2018 the share of foreign women was 54% (43% in 2009); Slovak female students are 58% (57% in 2009). In 2018, the number of Slovak students dropped by 3.4% year-on-year, while the number of foreign students increased by 21%. See Table 17.

Table 17: Universities and colleges - public, private, state, students (Oct. 31.) and graduates (in calendar year), Slovak nationality, foreigners, 2016-2018

Year	Students, Full-time study (31.10.)	Graduates, Full-time study in calendar year

		Slovak nationality		Foreigners		Slovak nationality		Foreigners	
		Total	Women	Total	Women	Total	Women	Total	Women
2016	**Public**	99140	58233	5796	2967	33580	20816	859	459
	Private	4721	2816	416	315	2302	1374	120	86
	State	1827	1108	192	89	545	335	1	0
	Total	**105688**	**62157**	**6404**	**3371**	**36427**	**22525**	**980**	**545**
2017	**Public**	92444	54217	6865	3545	31164	19313	946	510
	Private	4834	2880	704	432	1749	1023	113	88
	State	1906	1177	214	99	530	327	2	1
	Total	**99184**	**58274**	**7783**	**4076**	**33443**	**20663**	**1061**	**599**
2018	**Public**	88774	51738	8098	4163	29258	18115	1035	544
	Private	5042	2976	1131	789	1533	941	190	129
	State	2014	1283	199	98	506	294	26	14
	Total	**95830**	**55997**	**9428**	**5050**	**31297**	**19350**	**1251**	**687**

Source: Slovak Centre of scientific and technical information, Support of science, research and development, innovation and education, Ministry of education, science, research and sport of the Slovak Republic.

The number of **graduates** in full-time study in the calendar year 2018 reached 32.5 thousand, of which 1.2 thousand were foreigners (3.8%). In the previous year the total was: 34.5 thousand, foreigners 1.1 thousand (3.1%). So in 2018 the number of Slovak nationality graduates dropped by 6.4% year-on-year and the number of foreign graduates increased by 17.9%.

VII. Conclusion

There is a gradient of worsening labour market situation from the west to the east. This means that there is an inverse relationship between the regional share in total unemployment and the share in total number of foreign workers. Especially on the basis of permits from the labour offices, foreign workers are directed to districts with the lowest unemployment rate, i.e. to districts with insufficient number of workers.

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Annex

Table 18 Foreign workers – total foreign nationals (persons) in months 2013-2019 (October)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Average
2013	11 056	10 856	11 231	11 587	11 995	12 444	12 699	12 640	13 099	13 248	13 379	13 400	12 303
2014	13 144	13 508	14 505	14 910	15 352	17 028	18 833	19 499	19 742	20 027	20 320	20 055	17 244
2015	20 070	20 662	21 310	21 792	22 505	22 865	22 780	22 992	23 645	24 281	24 856	25 537	22 775
2016	25 484	26 600	27 349	28 375	29 507	30 222	31 172	32 143	33 266	34 237	34 999	35 090	30 704
2017	36 231	37 536	39 110	40 202	41 578	42 405	43 245	44 135	45 922	47 871	49 287	49 478	43 083
2018	49 519	50 498	51 860	53 690	56 109	57 998	60 136	62 463	64 449	65 259	66 610	69 116	58 976
2019	68 887	69 519	70 793	71 845	72 090	73 080	72 961	73 405	74 510	76 946			72 404

Source: Centre of Labour, Social Affairs and Family.

Table 19 Foreign workers – total foreign nationals in 2015-2019 by gender and by form of access to the labour market

Indicator	Stock 31.12.2015		Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
(persons)	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total nationals working on the basis:	**25537**	**6356**	**35091**	**8564**	**49478**	**11741**	**34709**	**8088**	**69116**	**16870**	**25974**	**6552**	**73080**	**18181**
1. of the **authorization granted at work**	3033	763	3686	869	8937	1846	18848	3594	17064	3236	14051	3048	22852	4628
2.a of **information cards (EU/EEA)**	19428	4692	24054	5613	27726	6408	10749	3018	36265	8915	5971	1691	33191	8380
2.b of **information cards (other countries)**	3076	901	7351	2082	12815	3487	5112	1476	15787	4719	5952	1813	17037	5173

Source: Centre of Labour, Social Affairs and Family.

Table 20 Employment of foreign workers – total foreign nationals in 2016-2019 in Slovakia by gender, length of stay, age, education, occupation and economic activity

Foreign workers, total foreign nationals in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**35 091**	**8 564**	**49 478**	**11 741**	**34 709**	**8 088**	**69 116**	**16 870**	**25 974**	**6 552**	**73 080**	**18 181**
Length (stay):												
short-term (- 3 months)	**1 874**	535	**2 951**	725	**18 532**	5 129	**4 202**	1 228	**13 112**	3 911	**5 851**	1 810
short-term (3 – 6 months)	**3 356**	1 002	**3 222**	761	**412**	93	**4 557**	1 363	**228**	49	**4 599**	1 242
long-term (6 – 12 months)	**7 250**	1 536	**10 380**	2 493	**4 112**	857	**12 784**	3 062	**2 526**	607	**10 800**	2 957
long-term (over 12 months)	**22 611**	5 491	**32 923**	7 761	**11 653**	2 009	**47 572**	11 216	**10 108**	1 985	**51 829**	12 171
Age groups:												
- 19	**506**	135	**764**	248	**1 382**	458	**1 074**	353	**1 000**	342	**1 249**	439
20 – 24	**3 304**	862	**5790**	1460	**5 589**	1 450	**7 478**	2 144	**4 068**	1 178	**8 017**	2 397
25 – 29	**5 252**	1 448	**7670**	1899	**5 910**	1 215	**11 038**	2 694	**4 128**	942	**11 675**	2 946
30 – 34	**5 563**	1 422	**7650**	1873	**5 092**	932	**10 691**	2 500	**3 947**	767	**11 356**	2 705
35 – 39	**5 188**	1 182	**6830**	1488	**4 413**	934	**9 313**	2 045	**3 490**	772	**10 045**	2 265
40 – 44	**4 629**	1 021	**6407**	1409	**4 421**	1 035	**9 199**	2 071	**3 421**	977	**9 763**	2 354
45 – 49	**4 096**	926	**5503**	1264	**3 553**	888	**7 740**	1 815	**2 816**	737	**8 221**	1 978
50 – 54	**2 766**	610	**3947**	886	**2 225**	604	**5 770**	1 327	**1 804**	463	**6 088**	1 380
55 – 59	**1 845**	456	**2500**	564	**1 264**	335	**3 507**	843	**802**	206	**3 509**	787
60 – 64	**942**	281	**1304**	367	**470**	135	**1 885**	561	**303**	91	**1 789**	470
65 +	**459**	161	**598**	215	**180**	84	**945**	440	**138**	58	**913**	375
Not identified	**541**	60	**515**	68	**100**	18	**476**	77	**57**	19	**445**	85
Education:												
Incomplete basic education	**27**	3	**107**	10	**161**	25	**308**	21	**69**	13	**245**	25
Basic	**5 059**	1 134	**7562**	1694	**4 731**	1 413	**8 254**	2 016	**3 100**	901	**7 545**	1 988

Foreign workers, total foreign nationals in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**35 091**	**8 564**	**49 478**	**11 741**	**34 709**	**8 088**	**69 116**	**16 870**	**25 974**	**6 552**	**73 080**	**18 181**
Secondary vocational without maturity exam	**2 472**	651	**3704**	903	**2 392**	662	**4 665**	1 223	**1 273**	373	**4 071**	973
Secondary vocational with maturity exam	**7 559**	1 386	**11158**	2023	**10 667**	1 836	**17 978**	3 256	**9 013**	1 857	**21 031**	4 057
Secondary specialised with maturity exam	**6 512**	1 782	**8438**	2164	**6 317**	1 422	**12 209**	3 191	**4 921**	1 243	**13 712**	3 596
Secondary general with maturity exam	**2 744**	945	**4218**	1402	**3 483**	916	**6 154**	1 982	**1 997**	647	**6 043**	1 875
Higher professional	**75**	26	**175**	53	**344**	101	**439**	144	**289**	117	**654**	244
University – Bachelor degree	**992**	258	**1545**	417	**1 977**	509	**3 196**	914	**1 563**	421	**3 863**	1 140
University – Master degree	**6 299**	1 849	**7404**	2153	**3 580**	963	**10 515**	3 133	**2 579**	690	**10 964**	3 284
University – PhD. Degree	**132**	43	**181**	62	**134**	47	**299**	77	**97**	24	**362**	95
Not identified	**3 220**	487	**4986**	860	**923**	194	**5 099**	913	**1 073**	266	**4 590**	904
Occupation (ISCO-08):												
1 Managers	**2 153**	325	**2318**	358	**612**	97	**2 797**	428	**411**	73	**2 908**	451
2 Professionals	**3 847**	1 171	**4465**	1343	**1 837**	609	**6 139**	1 888	**1 235**	369	**6 370**	2 000
3 Technicians and associate professionals	**2 581**	865	**3056**	1038	**979**	385	**3 804**	1 364	**807**	313	**4 005**	1 458
4 Clerical support workers	**1 172**	440	**1630**	600	**939**	326	**3 014**	1 113	**793**	277	**3 511**	1 360
5 Service and sales workers	**2 488**	1 480	**3148**	1843	**2 141**	1 268	**4 968**	3 153	**1 759**	915	**5 007**	2 861
6 Skilled agricultural, forestry and fishery workers	**192**	62	**250**	81	**277**	78	**298**	93	**125**	30	**340**	99
7 Craft and related trades workers	**3 236**	697	**4442**	774	**5 622**	612	**7 972**	1 184	**4 487**	386	**9 823**	1 318
8 Plant and machine operators, and assemblers	**9 853**	1 020	**17433**	2468	**16 693**	3 188	**25 971**	3 887	**11 601**	2 504	**25 081**	4 814
9 Elementary occupations	**6 503**	1 889	**9879**	2689	**5 436**	1 495	**11 891**	3 358	**4 671**	1 663	**11 440**	3 498
Not identified	**3 066**	615	**2857**	547	**173**	30	**2 262**	402	**85**	22	**1 595**	322
Economic activity (NACE Rev.2):												

Foreign workers, total foreign nationals in Slovakia 2016-2019 (persons)	**Stock 31.12.2016**		**Stock 31.12.2017**		**Inflow 2018**		**Stock 31.12.2018**		**Inflow 2019 (Jan-June)**		**Stock 30.6.2019**	
	Total	**Women**	**Total**	**Women**	**Total**	**Women**	**Total**	**Women**	**Total**	**Women**	**Total**	**Women**
Total	**35 091**	**8 564**	**49 478**	**11 741**	**34 709**	**8 088**	**69 116**	**16 870**	**25 974**	**6 552**	**73 080**	**18 181**
A Agriculture	**562**	152	**793**	211	**1 125**	367	**820**	228	**672**	222	**1 122**	321
B Mining and quarrying	**83**	2	**81**	2	**142**	2	**190**	4	**44**	2	**181**	4
C Manufacturing	**6 571**	1 832	**11596**	2974	**14 392**	3 342	**18 836**	4 705	**9 781**	2 554	**22 049**	5 726
D Electricity, gas supply	**132**	12	**136**	14	**19**		**146**	13	**7**	3	**146**	16
E Water supply, waste	**81**	6	**111**	5	**75**	1	**180**	8	**34**	4	**149**	11
F Construction	**1 739**	57	**2559**	97	**2 160**	70	**3 733**	201	**2 008**	54	**4 950**	203
G Wholesale, retail trade	**3 276**	1 033	**3928**	1298	**2 371**	693	**5 718**	1 809	**1 769**	531	**5 823**	1 873
H Transportation, storage	**5 788**	202	**7837**	341	**4 777**	228	**11 997**	665	**3 479**	248	**12 174**	712
I Accommod, food services	**704**	198	**1069**	333	**693**	243	**1 290**	444	**773**	308	**1 836**	699
J Information, communication	**770**	164	**943**	206	**362**	97	**1 475**	358	**373**	96	**1 520**	366
K Financ., insur. activities	**209**	63	**218**	68	**51**	17	**332**	107	**26**	14	**322**	116
L Real estate activities	**415**	130	**533**	149	**164**	41	**613**	200	**164**	44	**717**	204
M Profession., techn. activ.	**4 459**	1 186	**4864**	1593	**1 095**	484	**5 563**	1 977	**717**	260	**4 597**	1 470
N Administrative services	**3 552**	1 411	**9130**	2512	**3 743**	1 208	**9 579**	3 432	**3 369**	1 142	**9 494**	3 704
O Public admin., social secur.	**57**	18	**66**	25	**12**	4	**108**	33	**24**	7	**116**	39
P Education	**739**	282	**817**	318	**283**	130	**2 295**	678	**171**	61	**1 954**	606
Q Health, soc. work activ.	**763**	333	**852**	376	**502**	240	**1 244**	641	**339**	182	**1 383**	729
R Arts, recreation	**216**	95	**232**	101	**108**	56	**321**	157	**281**	139	**427**	212
S Other service activities	**503**	273	**518**	322	**306**	232	**725**	440	**225**	183	**856**	451
T Activities of households	**4**	4	**3**	3	**2**	2	**5**	5			**4**	4
U Extraterritorial org. activ.	**3**	1	**2**	1	**3**	1	**6**	3			**6**	3
Not identified	**4 465**	1 110	**3190**	792	**2 321**	630	**3 940**	762	**1 718**	498	**3 254**	712

Source: Centre of Labour, Social Affairs and Family.

Table 21 **Employment of foreign workers working on the basis of the authorization granted at work in 2016-2019 in Slovakia by gender, length of stay, age, education, occupation and economic activity**

Foreign workers working on the basis of the authorization granted at work in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**3 686**	**869**	**8937**	**1846**	**18 848**	**3 594**	**17 064**	**3 236**	**14 051**	**3 048**	**22 852**	**4 628**
Length (stay):												
short-term (- 3 months)	**2**		**745**	161	**2 698**	638	**329**	100	**1 205**	417	**542**	207
short-term (3 – 6 months)	**90**	18	**173**	29	**400**	93	**225**	70	**216**	39	**165**	38
long-term (6 – 12 months)	**780**	152	**2604**	553	**4 101**	855	**3 587**	738	**2 524**	607	**3 770**	900
long-term (over 12 months)	**2 814**	699	**5415**	1103	**11 649**	2 008	**12 923**	2 328	**10 106**	1 985	**18 375**	3 483
Age groups:												
-19	**13**	5	**178**	57	**461**	119	**216**	53	**294**	90	**290**	82
20 – 24	**212**	59	**1241**	291	**3 014**	715	**2 298**	566	**2 042**	564	**2 950**	786
25 – 29	**718**	217	**1711**	395	**3 602**	680	**3 326**	653	**2 406**	507	**4 199**	882
30 – 34	**790**	196	**1574**	304	**3 106**	481	**2 932**	492	**2 334**	373	**3 845**	644
35 – 39	**628**	136	**1347**	240	**2 589**	448	**2 514**	413	**2 044**	398	**3 425**	585
40 – 44	**517**	108	**1129**	233	**2 438**	489	**2 289**	460	**1 960**	495	**3 169**	712
45 – 49	**371**	79	**857**	181	**1 849**	357	**1 756**	339	**1 567**	347	**2 556**	532
50 – 54	**236**	33	**521**	89	**1 158**	220	**1 115**	195	**929**	192	**1 546**	296
55 – 59	**115**	21	**247**	29	**495**	68	**463**	46	**365**	65	**650**	77
60 – 64	**46**	8	**79**	16	**111**	10	**118**	10	**92**	14	**177**	21
65 +	**15**	4	**17**	4	**11**	3	**19**	5	**10**	2	**27**	6
Not identified	**25**	3	**36**	7	**14**	4	**18**	4	**8**	1	**18**	5
Education:												

Foreign workers working on the basis of the authorization granted at work in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**3 686**	**869**	**8937**	**1846**	**18 848**	**3 594**	**17 064**	**3 236**	**14 051**	**3 048**	**22 852**	**4 628**
Incomplete basic education	**3**		**4**	1	**5**	1	**6**	1	**7**	1	**8**	1
Basic	**131**	41	**769**	205	**1 511**	390	**1 052**	270	**793**	205	**1 236**	305
Secondary vocational without maturity exam	**129**	35	**429**	95	**612**	115	**512**	106	**292**	44	**592**	111
Secondary vocational with maturity exam	**836**	128	**2710**	351	**6 842**	953	**6 107**	808	**6 283**	1 170	**9 277**	1 468
Secondary specialised with maturity exam	**452**	73	**1527**	283	**3 239**	631	**2 798**	517	**2 488**	576	**3 920**	859
Secondary general with maturity exam	**187**	27	**836**	203	**2 284**	447	**1 921**	342	**1 051**	262	**2 090**	406
Higher professional	**51**	20	**99**	26	**213**	63	**198**	60	**113**	36	**238**	77
University – Bachelor degree	**612**	136	**883**	199	**1 432**	323	**1 543**	354	**1 067**	263	**1 936**	481
University – Master degree	**1 190**	386	**1566**	456	**2 600**	643	**2 810**	747	**1 822**	466	**3 364**	877
University – PhD. Degree	**31**	16	**29**	16	**22**	8	**29**	12	**10**	5	**30**	13
Not identified	**64**	7	**85**	11	**88**	20	**88**	19	**125**	20	**161**	30
Occupation (ISCO-08):												
1 Managers	**520**	97	**519**	91	**322**	53	**495**	87	**179**	38	**471**	85
2 Professionals	**1 105**	372	**1174**	390	**845**	312	**1 246**	444	**528**	171	**1 333**	467
3 Technicians and associate professionals	**209**	60	**253**	76	**305**	98	**341**	111	**277**	112	**438**	136
4 Clerical support workers	**78**	39	**147**	57	**339**	96	**390**	119	**284**	96	**523**	157
5 Service and sales workers	**504**	252	**672**	330	**833**	410	**964**	466	**726**	346	**1 302**	609
6 Skilled agricultural, forestry and fishery workers	**35**	15	**46**	15	**165**	54	**124**	45	**103**	25	**163**	53
7 Craft and related trades workers	**183**	4	**639**	66	**2 782**	186	**2 062**	156	**2 563**	163	**3 397**	250
8 Plant and machine operators, and assemblers	**1 039**	23	**5039**	679	**11 946**	2 041	**10 348**	1 499	**7 785**	1 474	**13 233**	2 233
9 Elementary occupations	**12**	6	**446**	140	**1 311**	344	**1 093**	308	**1 606**	623	**1 991**	637

Foreign workers working on the basis of the <u>authorization granted at work</u> in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**3 686**	**869**	**8937**	**1846**	**18 848**	**3 594**	**17 064**	**3 236**	**14 051**	**3 048**	**22 852**	**4 628**
Not identified	1	1	2	2			1	1			1	1
Economic activity (NACE Rev.2):												
A Agriculture	44	16	69	17	251	77	165	58	282	105	294	95
B Mining and quarrying					122	1	97	1	37	1	93	1
C Manufacturing	593	61	3291	711	10 396	2 304	8 175	1 718	6 485	1 659	10 290	2 467
D Electricity, gas supply	7		0	0	12		4		5	3	7	3
E Water supply, waste	2		6	0	9		8		14		19	
F Construction	104	3	413	16	1 153	22	824	24	1 027	25	1 473	31
G Wholesale, retail trade	335	81	417	111	721	169	670	150	697	212	1 027	272
H Transportation, storage	961	22	2366	103	3 763	138	4 233	195	2 677	95	5 212	202
I Accommod, food services	228	52	288	63	442	142	484	126	493	178	773	240
J Information, communication	137	28	173	38	165	49	246	71	135	39	300	90
K Financ., insur. activities	29	11	16	7	5	1	12	5	6	3	13	6
L Real estate activities	9	5	12	6	115	19	112	25	92	22	146	25
M Profession., techn. activ.	362	145	385	156	344	147	507	211	329	109	606	222
N Administrative services	78	25	604	148	534	93	581	115	1 293	331	1 533	370
O Public admin., social secur.	1		2	0	1		1		2	1	3	1
P Education	78	45	72	45	48	31	66	43	24	12	78	46
Q Health, soc. work activ.	402	154	426	168	389	183	499	219	258	133	555	251
R Arts, recreation	40	17	35	11	32	19	38	21	52	25	69	34
S Other service activities	212	174	248	211	217	175	287	236	102	89	308	258
T Activities of households	4	4	3	3	2	2	5	5			4	4
U Extraterritorial org. activ.					2		2				2	

Foreign workers working on the basis of the authorization granted at work in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**3 686**	**869**	**8937**	**1846**	**18 848**	**3 594**	**17 064**	**3 236**	**14 051**	**3 048**	**22 852**	**4 628**
Not identified	**60**	26	**111**	32	**125**	22	**48**	13	**41**	6	**47**	10

Source: Centre of Labour, Social Affairs and Family.

Table 22 Employment of foreign workers working on the basis of information cards (EU/EEA) in 2016-2019 in Slovakia by gender, length of stay, age, education, occupation and economic activity

Foreign workers working on the basis of information cards (EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**24 054**	**5 613**	**27 726**	**6 408**	**10 749**	**3 018**	**36 265**	**8 915**	**5 971**	**1 691**	**33 191**	**8 380**
Length (stay):												
short-term (- 3 months)	**1 331**	364	**1603**	388	**10 733**	3 017	**1 894**	563	**5 955**	1 681	**2 762**	826
short-term (3 – 6 months)	**2 108**	540	**2216**	478	**5**		**2 722**	803	**12**	10	**2 464**	614
long-term (6 – 12 months)	**3 570**	735	**3889**	961	**8**	1	**6 312**	1 537	**2**		**3 985**	1 073
long-term (over 12 months)	**17 045**	3 974	**20018**	4581	**3**		**25 337**	6 012	**2**		**23 980**	5 867
Age groups:												
- 19	**279**	61	**328**	84	**511**	170	**396**	121	**238**	76	**333**	93
20 – 24	**1 549**	411	**1743**	433	**1 476**	412	**2 303**	670	**737**	210	**2 067**	605
25 – 29	**3 170**	898	**3492**	956	**1 501**	346	**4 632**	1 261	**819**	206	**4 340**	1 214
30 – 34	**3 649**	907	**4076**	1030	**1 333**	304	**5 422**	1 382	**831**	205	**5 002**	1 341

Foreign workers working on the basis of information cards (EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**24 054**	**5 613**	**27 726**	**6 408**	**10 749**	**3 018**	**36 265**	**8 915**	**5 971**	**1 691**	**33 191**	**8 380**
35 – 39	**3 610**	784	**3944**	875	**1 242**	328	**4 785**	1 066	**722**	186	**4 394**	1 073
40 – 44	**3 362**	672	**3966**	761	**1 447**	368	**5 171**	1 034	**779**	217	**4 684**	1 035
45 – 49	**3 127**	628	**3612**	729	**1 230**	372	**4 615**	1 001	**684**	193	**4 147**	962
50 – 54	**2 098**	440	**2710**	572	**866**	284	**3 698**	814	**540**	161	**3 467**	746
55 – 59	**1 508**	365	**1832**	413	**618**	225	**2 469**	615	**299**	105	**2 246**	528
60 – 64	**820**	251	**1071**	313	**302**	119	**1 530**	485	**170**	69	**1 371**	386
65 +	**405**	147	**529**	195	**160**	80	**858**	412	**117**	53	**800**	341
Not identified	**477**	49	**423**	47	**63**	10	**386**	54	**35**	10	**340**	56
Education:												
Incomplete basic education	**12**	1	**87**	7	**144**	24	**280**	17	**59**	10	**208**	19
Basic	**1 940**	406	**2575**	536	**2 119**	712	**3 511**	835	**1 240**	360	**3 369**	835
Secondary vocational without maturity exam	**1 800**	296	**2376**	402	**1 626**	514	**3 251**	708	**656**	215	**2 731**	630
Secondary vocational with maturity exam	**5 979**	*1 070*	**6945**	1287	**2 676**	562	**9 314**	1 749	**1 308**	263	**8 439**	1 701
Secondary specialised with maturity exam	**5 321**	1 505	**5335**	1486	**1 701**	414	**6 190**	1 785	**1 025**	301	**5 974**	1 701
Secondary general with maturity exam	**2 221**	775	**2603**	895	**763**	323	**3 081**	1 190	**462**	214	**2 510**	930
Higher professional	**15**	4	**47**	15	**59**	12	**112**	28	**73**	33	**166**	59
University – Bachelor degree	**264**	83	**414**	120	**358**	124	**1 159**	379	**141**	37	**1 143**	347
University – Master degree	**4 172**	1 172	**4602**	1290	**601**	194	**5 885**	1 748	**389**	115	**5 456**	1 645
University – PhD. Degree	**90**	23	**128**	39	**90**	31	**224**	55	**68**	12	**253**	60
Not identified	**2 240**	278	**2614**	331	**612**	108	**3 258**	421	**550**	131	**2 942**	453
Occupation (ISCO-08):												
1 Managers	**1 397**	190	**1559**	217	**231**	36	**1 996**	281	**187**	30	**2 091**	302
2 Professionals	**2 246**	623	**2583**	705	**557**	159	**3 635**	1 000	**412**	115	**3 567**	1 021

Foreign workers working on the basis of information cards (EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**24 054**	**5 613**	**27 726**	**6 408**	**10 749**	**3 018**	**36 265**	**8 915**	**5 971**	**1 691**	**33 191**	**8 380**
3 Technicians and associate professionals	**2 044**	719	**2399**	856	**548**	255	**2 893**	1 092	**367**	167	**2 736**	1 103
4 Clerical support workers	**897**	319	**1151**	405	**457**	167	**2 089**	764	**387**	108	**2 135**	807
5 Service and sales workers	**1 542**	1 011	**1723**	1130	**862**	638	**2 877**	2 074	**474**	280	**2 160**	1 408
6 Skilled agricultural, forestry and fishery workers	**109**	30	**138**	42	**101**	21	**98**	23	**16**	2	**96**	20
7 Craft and related trades workers	**2 802**	642	**3142**	633	**1 875**	265	**4 411**	758	**874**	112	**4 448**	794
8 Plant and machine operators, and assemblers	**6 834**	591	**9108**	1042	**3 583**	796	**11 996**	1 446	**1 608**	361	**10 229**	1 417
9 Elementary occupations	**3 343**	940	**3337**	905	**2 444**	665	**4 319**	1 161	**1 581**	502	**4 411**	1 259
Not identified	**2840**	548	**2586**	473	**91**	16	**1 951**	316	**65**	14	**1 318**	249
Economic activity (NACE Rev.2):												
A Agriculture	**418**	101	**590**	150	**841**	281	**512**	125	**354**	108	**667**	174
B Mining and quarrying	**83**	2	**81**	2	**22**	1	**91**	2	**4**		**83**	1
C Manufacturing	**3 725**	1 251	**4477**	1402	**1 681**	440	**5 629**	1 746	**1 070**	332	**5 901**	1 860
D Electricity, gas supply	**122**	12	**130**	14	**4**		**134**	13			**128**	13
E Water supply, waste	**77**	6	**100**	5	**65**	1	**167**	8	**19**	4	**125**	11
F Construction	**1 503**	43	**1948**	69	**825**	40	**2 499**	148	**463**	13	**2 486**	120
G Wholesale, retail trade	**2 079**	463	**2243**	514	**1 093**	308	**3 217**	741	**583**	117	**3 014**	821
H Transportation, storage	**4 592**	152	**5090**	192	**817**	58	**7 026**	347	**450**	42	**6 054**	338
I Accommod, food services	**300**	84	**484**	151	**75**	25	**336**	124	**49**	20	**353**	127
J Information, communication	**535**	114	**633**	131	**90**	12	**935**	183	**126**	31	**898**	181
K Financ., insur. activities	**158**	40	**175**	47	**33**	7	**274**	73	**16**	8	**254**	74
L Real estate activities	**83**	19	**185**	29	**28**	10	**127**	37	**35**	5	**178**	41

Foreign workers working on the basis of information cards (EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**24 054**	**5 613**	**27 726**	**6 408**	**10 749**	**3 018**	**36 265**	**8 915**	**5 971**	**1 691**	**33 191**	**8 380**
M Profession., techn. activ.	**3 741**	944	**3985**	1275	**633**	290	**4 352**	1 517	**275**	100	**3 193**	923
N Administrative services	**2 912**	1 194	**3968**	1382	**2 634**	948	**6 160**	2 567	**1 367**	525	**5 642**	2 466
O Public admin., social secur.	**51**	16	**49**	14	**8**	3	**89**	23	**18**	4	**88**	25
P Education	**567**	192	**618**	216	**185**	73	**899**	308	**121**	36	**827**	291
Q Health, soc. work activ.	**186**	104	**203**	114	**46**	20	**439**	277	**25**	16	**451**	290
R Arts, recreation	**139**	60	**154**	68	**49**	23	**193**	87	**45**	19	**180**	79
S Other service activities	**192**	47	**168**	47	**65**	41	**293**	118	**106**	87	**296**	104
T Activities of households												
U Extraterritorial org. activ.	**3**	1	**2**	1	**1**	1	**4**	3			**4**	3
Not identified	**2 589**	768	**2443**	585	**1 554**	436	**2 889**	468	**845**	224	**2 369**	438

Source: Centre of Labour, Social Affairs and Family.

Table 23 Employment of foreign workers working on the basis of **information cards (other countries; without EU/EEA) in 2016-2019 in Slovakia by gender, length of stay, age, education, occupation and economic activity**

Foreign workers working on the basis of information cards (other countries; without EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**7 351**	**2 082**	**12 815**	**3 487**	**5 112**	**1 476**	**15 787**	**4 719**	**5 952**	**1 813**	**17 037**	**5 173**

Foreign workers working on the basis of information cards (other countries; without EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**7 351**	**2 082**	**12 815**	**3 487**	**5 112**	**1 476**	**15 787**	**4 719**	**5 952**	**1 813**	**17 037**	**5 173**
Length (stay):												
short-term (- 3 months)	**541**	171	**603**	176	**5 101**	1 474	**1 979**	565	**5 952**	1 813	**2 547**	777
short-term (3 – 6 months)	**1 158**	444	**833**	254	**7**		**1 610**	490			**1 970**	590
long-term (6 – 12 months)	**2 900**	649	**3887**	979	**3**	1	**2 885**	787			**3 045**	984
long-term (over 12 months)	**2 752**	818	**7492**	2078	**1**	1	**9 313**	2 877			**9 475**	2 822
Age groups:												
- 19	**214**	69	**258**	107	**410**	169	**462**	179	**468**	176	**626**	264
20 – 24	**1 543**	392	**2806**	736	**1 099**	323	**2 877**	908	**1 289**	404	**3 000**	1 006
25 – 29	**1 364**	333	**2467**	548	**807**	189	**3 080**	780	**903**	229	**3 136**	850
30 – 34	**1 124**	319	**2000**	539	**653**	147	**2 337**	626	**782**	189	**2 509**	720
35 – 39	**950**	262	**1539**	373	**582**	158	**2 014**	566	**724**	188	**2 226**	607
40 – 44	**750**	241	**1312**	415	**536**	178	**1 739**	577	**682**	265	**1 910**	607
45 – 49	**598**	219	**1034**	354	**474**	159	**1 369**	475	**565**	197	**1 518**	484
50 – 54	**432**	137	**716**	225	**311**	100	**957**	318	**335**	110	**1 075**	338
55 – 59	**222**	70	**421**	122	**151**	42	**575**	182	**138**	36	**613**	182
60 – 64 (Note: 2014-2015 = 60+)	**76**	22	**154**	38	**57**	6	**237**	66	**41**	8	**251**	63
65 +	**39**	10	**52**	16	**9**	1	**68**	23	**11**	3	**86**	28
Not identified	**39**	8	**56**	14	**23**	4	**72**	19	**14**	8	**87**	24
Education:												
Incomplete basic education	**12**	2	**16**	2	**12**		**22**	3	**3**	2	**29**	5
Basic	**2 988**	687	**4218**	953	**1 101**	311	**3 691**	911	**1 067**	336	**2 940**	848
Secondary vocational without maturity exam	**543**	320	**899**	406	**154**	33	**902**	409	**325**	114	**748**	232

Foreign workers working on the basis of information cards (other countries; without EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**7 351**	**2 082**	**12 815**	**3 487**	**5 112**	**1 476**	**15 787**	**4 719**	**5 952**	**1 813**	**17 037**	**5 173**
Secondary vocational with maturity exam	**744**	188	**1503**	385	**1 149**	321	**2 557**	699	**1 422**	424	**3 315**	888
Secondary specialised with maturity exam	**739**	204	**1576**	395	**1 377**	377	**3 221**	889	**1 408**	366	**3 818**	1 036
Secondary general with maturity exam	**336**	143	**779**	304	**436**	146	**1 152**	450	**484**	171	**1 443**	539
Higher professional	**9**	2	**29**	12	**72**	26	**129**	56	**103**	48	**250**	108
University – Bachelor degree	**116**	39	**248**	98	**187**	62	**494**	181	**355**	121	**784**	312
University – Master degree	**937**	291	**1236**	407	**379**	126	**1 820**	638	**368**	109	**2 144**	762
University – PhD. Degree	**11**	4	**24**	7	**22**	8	**46**	10	**19**	7	**79**	22
Not identified	**916**	202	**2287**	518	**223**	66	**1 753**	473	**398**	115	**1 487**	421
Occupation (ISCO-08):												
1 Managers	**236**	38	**240**	50	**59**	8	**306**	60	**45**	5	**346**	64
2 Professionals	**496**	176	**708**	248	**435**	138	**1 258**	444	**295**	83	**1 470**	512
3 Technicians and associate professionals	**328**	86	**404**	106	**126**	32	**570**	161	**163**	34	**831**	219
4 Clerical support workers	**197**	82	**332**	138	**143**	63	**535**	230	**122**	73	**853**	396
5 Service and sales workers	**442**	217	**753**	383	**446**	220	**1 127**	613	**559**	289	**1 545**	844
6 Skilled agricultural, forestry and fishery workers	**48**	17	**66**	24	**11**	3	**76**	25	**6**	3	**81**	26
7 Craft and related trades workers	**251**	51	**661**	75	**965**	161	**1 499**	270	**1 050**	111	**1 978**	274
8 Plant and machine operators, and assemblers	**1 980**	406	**3286**	747	**1 164**	351	**3 627**	942	**2 208**	669	**4 619**	1 164
9 Elementary occupations	**3 148**	943	**6096**	1644	**1 681**	486	**6 479**	1 889	**1 484**	538	**5 038**	1 602
Not identified	**225**	66	**269**	72	**82**	14	**310**	85	**20**	8	**276**	72
Economic activity (NACE Rev.2):												

Foreign workers working on the basis of information cards (other countries; without EU/EEA) in Slovakia 2016-2019 (persons)	Stock 31.12.2016		Stock 31.12.2017		Inflow 2018		Stock 31.12.2018		Inflow 2019 (Jan-June)		Stock 30.6.2019	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Total	**7 351**	**2 082**	**12 815**	**3 487**	**5 112**	**1 476**	**15 787**	**4 719**	**5 952**	**1 813**	**17 037**	**5 173**
A Agriculture	**100**	35	**134**	44	**33**	9	**143**	45	**36**	9	**161**	52
B Mining and quarrying			**0**	0	**1**		**2**	1	**3**	1	**5**	2
C Manufacturing	**2 253**	520	**3828**	861	**2 315**	598	**5 032**	1 241	**2 226**	563	**5 858**	1 399
D Electricity, gas supply	**3**		**6**	0	**3**		**8**		**2**		**11**	
E Water supply, waste	**2**		**5**	0	**1**		**5**		**1**		**5**	
F Construction	**132**	11	**198**	12	**182**	8	**410**	29	**518**	16	**991**	52
G Wholesale, retail trade	**862**	489	**1268**	673	**557**	216	**1 831**	918	**489**	202	**1 782**	780
H Transportation, storage	**235**	28	**381**	46	**197**	32	**738**	123	**352**	111	**908**	172
I Accommod, food services	**176**	62	**297**	119	**176**	76	**470**	194	**231**	110	**710**	332
J Information, communication	**98**	22	**137**	37	**107**	36	**294**	104	**112**	26	**322**	95
K Financ., insur. activities	**22**	12	**27**	14	**13**	9	**46**	29	**4**	3	**55**	36
L Real estate activities	**323**	106	**336**	114	**21**	12	**374**	138	**37**	17	**393**	138
M Profession., techn. activ.	**356**	97	**494**	162	**118**	47	**704**	249	**113**	51	**798**	325
N Administrative services	**562**	192	**4558**	982	**575**	167	**2 838**	750	**709**	286	**2 319**	868
O Public admin., social secur.	**5**	2	**15**	11	**3**	1	**18**	10	**4**	2	**25**	13
P Education	**94**	45	**127**	57	**50**	26	**1 330**	327	**26**	13	**1 049**	269
Q Health, soc. work activ.	**175**	75	**223**	94	**67**	37	**306**	145	**56**	33	**377**	188
R Arts, recreation	**37**	18	**43**	22	**27**	14	**90**	49	**184**	95	**178**	99
S Other service activities	**99**	52	**102**	64	**24**	16	**145**	86	**17**	7	**252**	89
Not identified	**1 817**	316	**636**	175	**642**	172	**1 003**	281	**832**	268	**838**	264

Source: Centre of Labour, Social Affairs and Family.