Psychiatria Danubina 2021; Vol. 33, Suppl 3, pp S361-S370
Science, Art & Religion 2021, Vol. 1, No 1-2, pp 126-135

Review article

TECHNOLOGICAL, ECOLOGICAL AND ENERGY ASPECTS OF THE DEVELOPMENT OF BOSNIA AND HERZEGOVINA

Žarko Primorac

SUMMARY

Bosnia and Herzegovina has generally opted to join the European Union. Preliminary decisions have already been taken, but BiH needs to meet some of the standards/criteria contained in the 14 recommendations made by the European Commission before formal negotiations with the EU begin. One of the important assumptions of a successful path to the EU is that BiH accelerates economic development and modernizes the economic structure as a whole. In this regard, it is especially important that BiH advances technological development, improves its environmental policy and accelerates the energy transition. The text analysed the current development level of these areas and suggested some measures that should improve the current unsatisfactory situation in them.

Particular attention was paid to measures to increase innovation capacity, the need for more vigorous interventions in solving environmental problems and the energy transition as a precondition for entry into Industry 4.0, the introduction of the green economy and the acceptance of decarbonisation as long-term policies. It was stressed that these are the ultimate targets by 2050, in agreement with the long-term development orientation of the European Union.

Key words: technological development, research and development, green economy, decarbonization, efficiency

INTRODUCTION

The future of Bosnia and Herzegovina has been strategically determined by the decision to join the European integrations, primarily the European Union. It is true, although, that the realization of that decision has not been entirely certain, partly because of the internal obstruction, but more because of the fact that fundamental reforms of the political-organizational structures are needed, as well as the improvement of the functioning of the legal system, and significant improvement of the references of the currently nonfunctional state. The program of the reforms needed to start dialog with the EU has been formulated in 14 criteria/priorities, defined in the Avis of the European Commission, and adopted by the Presidency and the Council of Ministers of Bosnia and Herzegovina. Although the work on the realization of the program has started as a priority, so far there are no any visible progress. In addition to internal difficulties and misunderstandings regarding already adopted the 14-priority program, some new, big problems are being cumulated: still unpredictable consequences of the Covid-19 pandemic and emigration wave that has been sweeping over Bosnia and Herzegovina.

The structural improvement and efficiency enhancement are among the central subjects in the 14-priority program. There is no need to stress that Bosnia and Herzegovina has achieved, since the 1990-s, the weakest development performances among the transition countries. That is, partly, the consequence of the devastating war, but also, in a high degree, of the inadequate economic policy and actually nonfunctioning state. That is why is Bosnia and Herzegovina is currently confined to the very bottom in all the rankings within the transition circle of the European economies.

Having in mind the generally outlined development path for the future, here I will deal with some

key development aspects, which will significantly affect the fulfillment of the 14 priorities, and hence the future economic and social development of the country. These are, as the title of this text says, the technological development and overall innovation capacity of the country, ecology, and energy transition. There is no doubt that all the three mentioned frameworks belong to the very top of the developmental priorities in the future of every country, also the most developed ones. Simply, the modern world witnesses revolutionary changes in the fields of technology, energetics, biotechnology, medicine, and other fields.

Since the economy in Bosnia and Herzegovina legs significantly by the members of the European Union, and also by other transition countries, in all aspects of technological development, its priority goal is to achieve some breakthroughs in those sectors. This text will analyze the achieved level, potentials, and limitations regarding the development in the fields of technology, ecology, and energy transition, and then suggest certain measures that could dynamize the developmental processes in them.

It should be mentioned that the lack of statistical data made the work on this work fairly difficult. The internal statistics is not developed enough in analytical sense, and the external one is oriented more generally, insufficiently representing domestic specific characteristics. Still, I think that enough data and analytical materials has been gathered to enable a general outline of the current situation and the developmental possibilities in the above mentioned sectors.

SOME GENERAL CHARACTERISTICS OF THE ECONOMIC POSITION OF BOSNIA AND HERZEGOVINA

In order to understand the importance of the technological development, ecology, and energy transition in the economic, as well as in social development, the economic position of Bosnia and Herzegovina will be described in short, as compared to the developed transition countries, especially the countries formed after the breakdown of ex-Yugoslavia. The latter comparison is especially indicative since the states we compare B&H with came from the same economic and legal environment; they have partly inherited the advantages and flaws of the self-management system, but they achieved significantly more dynamic economic growth.

It is common knowledge that Bosnia and Herzegovina emerged from the war, in mid-nineties, severely devastated both in material and spiritual sense. By way of illustration, in 1993 Bosnia and Herzegovina achieved only 12-13 per-cent of the gross domestic product compared to the 1990 (WIIW Handbook of Statistics 2011, Central, East and Southeast Europe, Wien, 2011). The war did not destroy only the economy, but also the entire society. During the war, hundreds of thousands men, women and children were killed or wounded; over million people left the country – mostly younger generations; public infrastructure was destroyed; manufacturing, and transportation systems were devastated; education and schooling system was neglected, cultural institutions were devastated, as well as all other social segments.

After the peace was restored and the county established based on the Dayton Agreement, the gradual recovery has begun. At first, with the generous financial and material help from abroad- but that help later practically stopped flowing in. The total foreign help, in various forms, has been estimated at 5 billion USD. Still, Bosnia and Herzegovina significantly lagged behind during the whole period of postwar recovery and transition, trailing behind other countries formed after the breakdown of Yugoslavia. The table below illustrates that.

The above numerical illustrations point convincingly to the considerable lagging of the overall development in Bosnia and Herzegovina behind the comparable countries. The gap is especially evident in relation to Slovenia, whose GDP per capita today is over four times bigger than the average of Bosnia and Herzegovina. Even before the war, Slovenia was the most dynamic socialistic republic, but the developmental gap, compared to other republics, was not nearly so deep. Bosnia and Herzegovina lags also behind Croatia, although in a lesser degree than is the case with Slovenia. That is probably the consequence of the fact that Croatia, too, suffered significant wartime damages, and, also, its developmental policy during the last quarter of the century shows high oscillations.

In addition to the size and dynamics of the GDP, Table 1. also shows certain elements of economic structure, which are directly connected to the focus of this text. Namely, the indicators of the manufacturing industry share in the domestic product are really

		Bosnia and Herzegovina	Croatia	Slovenia	Serbia
1	GDP per capita in eur	4,900	12,600	22,100	6,100
2	GDP growth rate /average,10 years/ in %	1.7	0.7	1.5	1.5
3	Unemployment rate /%/	20.8	8.9	5.5	13.5
4	Average monthly gross salary/ wage, in eur	697	1,139	1,682	580
5	Share of the manufacturing industry in the BDP (%)	13.2	12.3	20.4	14.5
6	Share of investments in the GDP (%)	18.9	20.1	19.2	20.1
7	Share of education in the GDP (%)	4.1	4.1	4.6	3.4
8	Share of investments in education in the total investments, in %	1.8	1.2	2.8	1.2

Table 1.
Selected indicators of the level of development of Bosnia and Herzegovina in 2018.

symptomatic. They illustrate how the current economic structure in all the included countries, except Slovenia, has been considerably changed in relation to the pre-war condition.

The illustrated relation of the manufacturing (not the total industry) to the GDP aims at drawing attention to that industrial segment, because the future overall technological development of the manufacturing will strongly depend on it. Industry 4.0: circular economy, digital economy, energy transition, as well as the most of the traditional technologies, have been realized mostly through the development and progress of the manufacturing. The size of the manufacturing industry in the GDP shows how much Slovenia, with share of 20.1%, has pulled away from all the others. The other countries – Bosnia and Herzegovina with 13.2%, Croatia with 12.3%, Serbia with 14.5% - are far deep at the bottom on the list of other transition countries (WIIW: Handbook of Statistics 2019).

Next illustrative indicator of the growth potential and the dynamics of the economic structure transformation is the share of investments (fixed capital formation) in the gross national product. The relations here are somewhat more balanced, since all the analyzed countries maintain roughly the same investment dynamics. However, it should be noticed that Slovenia, with the biggest share, has built and modernized its industry, which is not the case with other countries.

Also interesting for Bosnia and Herzegovina are the figures on investments in education, where Slovenia stands out again according to that indicator. In 2018, Slovenia invested in education 2.8% of total investments, while in other countries these percentages are considerably lower: Bosnia and Herzegovina 1.8%, Croatia 1.2%, Serbia 1.2%.

Bosnia and Herzegovina's falling behind in all sectors could be, partly, explained by the war and its consequences. However, it has been 25 years since the war ended, Bosnia and Herzegovina received considerable international aid for material reconstruction and establishment of institutions, so there is a legitimate question: what other reasons affected such a big lagging behind?

Apart from the consequences of war, the post-war slow development of Bosnia and Herzegovina was

	Criteria	B&H	Croatia	Serbia	Slovenia
1	Global rank	92	63	72	35
2	Public sector performance	137	122	74	84
3	Institutions	114	77	75	33
4	Government responsiveness to change	139	136	75	97
5	Government long-term vision	138	137	80	97
6	ICT adoption	80	60	77	40
7	Skills o current work force	134	128	75	41

Table 2
Some indicators of the quality and efficiency of the public sector

under the influence of other processes, among them nonfunctioning state, lack of clear strategic basis for the economic growth, that is, low quality of managing practically in all developmental processes.

Certain indicators from the Global Competitiveness Report for 2019 point to the problem of the public functions management They are concentrated on the significance of the quality public sector management for the overall social and economic development of a country. In order to capture big picture regarding the significance of the public function management, it would be well advised to consult the exceptional book, recognized world-wide: D. Acemogly, J.A. Robinson, Why Nations Fail, Crown Business, New York, 2012. The authors describe excellently the example of Nogales, a city at the American-Mexican border, to show how political and legal system makes difference between success and failure in the economic development.

In order to analyze the position of Bosnia and Herzegovina, and to describe the influence of quality public management on economic growth, the following table was constructed. Table 2. shows the ranks the quality of individual management functions in Bosnia and Herzegovina, compared to Slovenia as the most developed transition country, not only among the countries formed after the breakdown of Yugoslavia, but in the whole transitional circle. The overall ranking within the framework of this report includes 141 countries, from all continents (World Economic Forum: Global Competitiveness Report 2019).

The above Table shows most vividly the falling behind of Bosnia and Herzegovina, caused by low efficiency of the government and not readiness of other public institutions All rankings in the above mentioned report on competitiveness put Bosnia and Herzegovina in the group of the countries at the bottom. Especially unfavorable are the indicators of the capacity of the managerial functions, i.e. the government, for foreseeing future developments and the adaptation of growth strategies to the changing circumstances. In this segment, the governmental bodies of Bosnia and Herzegovina have the lowest rating, at the bottom of the list. Only two countries are positioned lower than Bosnia and Herzegovina with regard to willingness to embrace changes, or efficiency of the public sector.

Such evaluations of the efficiency of the public services in Bosnia and Herzegovina are catastrophic, but do not come as a surprise to those who monitors the social and economic scene in the country. By the way, the constitutional system in Bosnia and Herzegovina is based on the Peace Agreement concluded in Dayton in 1995. The Dayton Agreement had, undoubtedly, contributed to the establishment of peace, but, as a constitutional and legal framework for the efficient functioning of the state, it is utterly unsuitable. Simply put, the hypertrophied political and legal infrastructure, based on 13 constitutions and the same number of legislative bodies, with 600 representatives, and hundreds of ministers, currently active in Bosnia and Herzegovina, cannot be neither

efficient nor productive. For this reason, the fundamental reform of the socio-political system of the country and its main institutions is one of the most important conditions for the normalization of the situation in the country and for the first steps towards execution of serious strategies for faster social and economic development.

TECHNOLOGICAL DEVELOPMENT – A VITAL PREREQUISITE FOR THE TRANSFORMATION OF THE ECONOMIC STRUCTURE

The world today experiences a stormy era of deep technological changes. The explosive development of new technologies is happening in all segments of human activity, and, as it seems, in economy most of all. The technological progress in the economic system has been based on new achievements in biotechnology, new materials, digitalization, energy transition, and many other changes.

Many estimates show that, based on new technologies, the global industrial structure and the models of its functioning will be significantly changed in the next ten years.

In the focus of this text are a short analysis of the present status of the Bosnian-Herzegovinian economy and an evaluation of the possibilities for its enhancement by the end of this decade.

As was already stated, Bosnia and Herzegovina significantly lags behind economically, compared to all the states that emerged from the former common state. That falling behind is especially pronounced in the industrial development, which is, in turn, as already said, the most important platform for technological advancement. The reasons for this lagging are well known; here are some of them:

- the devastating war, nontransparent privatization, and lack of reasonable development strategy destroyed the relatively developed (inherited) industrial basis. In the year before the last one, Elektroliza Mostar was closed, definitely the last modern industry in the field of non-ferrous metallurgy,
- for the same or similar reasons, the research and development institutes within economy practically disappeared, or were significantly reduced. Among others, the scientific and research institutes of Energoinvest were destroyed, and they were undoubtedly the most developed R&D group in the pre-war Bosnia and Herzegovina,
- biologically looking, by depopulation and lack of nonrenewal, a significant intellectual potential was lost in the research and development sector in economy
- investments in research and development coming from the state budget and the business sector were reduced to negligible levels.

All that was mentioned above has reduced the scientific and research basis, and hence the technological development in the economy of Bosnia and Herzegovina. Thus, the possibilities for the technological growth in the future are confined to a very modest framework. The extent to which the technological basis in Bosnia and Herzegovina today (not only in manufacturing) has been impoverished, almost neglected, is shown in next table (World Economic Forum: Global Competitiveness Report 2019).

The Table 3. enables the real estimation of the innovation capacity of Bosnia and Herzegovina. All the above BiH indicators are below those for Croatia, which, also, is not particularly active in the field of innovation. The comparison with Slovenia is almost inappropriate because the difference is too big. By way of illustration, the allocations from the GDP for financing scientific and research activities in Slovenia (2.0%) are ten times higher compared to Bosnia and Herzegovina (0.2%) with, at the same time, more than four times larger Slovenian GDP. It should be kept in mind that the stated percentage of allocations for R&D includes financing high education.

Although there seems to be no point in comparing allocations for R&D in Bosnia and Herzegovina with the leading European Union countries, because the differences are too big, some comparable data will still be mentioned. The average allocations for financing R&D in the European Union amounts to 2.03% of the GDP. According to this indicator, the European Union did not achieved the charted goal for the year 2020, namely, 3% of the BDP. The leading European countries, according to this criterion, are: Denmark with 3.8%, Finland, 3.1%, and Sweden, 3.16%. (European Commission: Key Figures 2018).

Regardless of that enormous gap, some substantial positive changes in the technological status of Bosnia and Herzegovina in the following years could not be realistically expected. A good start would be

	Criteria	B&H		Croatia		Slovenia	
		Score	Rank	Score	Rank	Score	Rank
1	Innovation capacity	28.4	117	37.8	73	58.2	28
2	R&D potential	20.2	106	35.7	49	56.8	27
3	R&D expenditure in GDP /%/	0.2	88	0.8	42	2.0	19
4	Patent application per million population	0,53	77	4.14	45	51.6	25
5	References of research institutions	1.1	88	3.3	64	5.6	54

Table 3
Indicators of the technological development level
Note: Score are position on O to 100 scale; 100 represents the optimal. Rank represents position on the ranking list between 141 countries.

for the state to adopt a realistic strategy for technological development and to start introducing changes according to the 14-priority Program. One should hope that the political and other responsible structures will, finally, commit themselves to the strategic turn in this sector.

HIGH ECOLOGICAL STANDARDS – A PREREQUISITE FOR SUSTAINABLE DEVELOPMENT

Future development will, certainly, depend on ecological challenges, and they are numerous in Bosnia and Herzegovina. Still, no serious development of economy, manufacturing industry in particular, could not be planned without recognizing the requirements of sustainability and green economy.

First, a few words about the current ecological situation in Bosnia and Herzegovina (See: Izvještaj Bosne i Hercegovine za UN Konferenciju o održivom razvoju, UN CSD, Sarajevo 2012). The real ecological situation in Bosnia and Herzegovina is not nearly satisfactory and comparable to the more developed transition countries. Partly because of the consequences of the war, but mostly because there is no any policy in the field of environmental conservation and protection, and because the sustainability requirements have not be respected, large areas and their natural potentials (land, water, air) are ecologically endangered. In this context, areas contaminated by land mines should be mentioned (about 1,092 square miles are still not cleared of mines), high levels of air contamination in Sarajevo and some other places, ecologically dangerous waste dumps (near mines or closed ferrous-metal factories and other metallurgical facilities), abandoned and not recovered large areas of former coal mining, and others. That is why Bosnia and Herzegovina has very low position on the international rankings measuring threats to the environment and sustainability. Among 188 countries in the list, Bosnia and Herzegovina is on the 93th place, while all the other surrounding countries have better positions: Croatia 42, North Macedonia 76, Serbia 77, Montenegro 92.

Instead of the deeper analysis of the actual ecological conditions, here are several guidelines important for the projection of the future growth. First of all, it is important to stress that the difficult ecological state, mentioned in short above, will have to be improved, and that will require large investments.

But, without it, it would be impossible to follow the chosen path towards the European Union., and to use more abundantly international resources to finance economic development. In other words, Bosnia and Herzegovina, in its developmental policy, will have to commit itself strategically to the postulates of the green economy and sustainability. That means that Bosnia and Herzegovina will have adopt European goals and criteria regarding decarbonization and green economy, determined by European Union as its strategic goals to be achieved by the year 2030 and 2050, respectively. Such a commitment will substantially influence the developmental policy of Bosnia and Herzegovina. Also, Bosnia and Herzegovina, in its developmental policy, will have to observe more actively the 17 sustainability goals, as determined by the United Nations in 2015 (The UN Agenda for sustainable development up to 2030, New York, 2015).

The above observations about ecological situations are meant to point to big challenges facing Bosnia and Herzegovina in order to solve the current state of ecology, but more so for making the concept of the strategy for the ecological development in the future. It should be kept in mind that Bosnia and Herzegovina, when it adopts ecological goals and policies, will have to adjust its strategies in the sector of energy, and maybe also some others. Namely, in the new European ecological framework, it would be difficult to maintain the orientation towards building the sources of energy based on fossil fuels, that is, burning coal and building thermo-electric power plants.

In addition, within the re-industrialization policy, it will be necessary to accept more determinedly the orientation towards the 4.0 industries, based on knowledge, digitalization, robotization, and industrial policies of the 21st century (Dani Rodik: Industrijska politika za 21. stoljeće – Globalizacija, institucije I gospodarski rast, HGK _ Privredni vjesnik, Zagreb). The most important for this orientation will be the intellectual capital, industrial knowledge, orientation toward foreign markets, etc. And something like that, again, requires high quality education, more investments in research, development, up-to-date technologies, modern equipment, and other things. In other words, everything said so far points to the imperative of serious turn in the developmental policy, attitude toward environment, and protection of the nature – forests, air, waters.

ENERGY TRANSITION - AN IMPORTANT ASPECT OF THE DEVELOPMENTAL POLICY

Generally speaking, energy transition is a process where the conventional power sector, based on fossil fuels, is being transformed into a new system based on renewable energy sources. The transition of the energy industry includes also a whole complex of new strategies and policies which make the power sector more efficient, as well as a number of measures meant to enable more rational consumption, lower distribution cost, and modernization of the storage system and management using digital networks. Now, that is really a revolutionary endeavor in an important segment of the industrial structure in every country. Hence, the energy transition is a key component of the Industry 4.0 and represents an entry into the new industrial era. The main goals of the power industry transition are, also, very far- reaching. They, in the first place, enable the **sustainability of energy system** – by using renewable energy sources: water, sun, wind, biomass; enhanced **efficiency** - by the use of renewable energy sources, rationalization of consumption, and by the modernization of management models. And, finally, the advanced technologies in distribution, storage, and consumption provide **safe** supply of electric power.

The transition of the energy industry is not only a technical and technological process, but also includes serious economic and social components. It changes the economic structure of a country, but also the organizational model of the economic and social life.

Bosnia and Herzegovina, having accepted the strategic commitment to take the European path, namely, to join the European Union, also accepted the energy transition as its strategic goal. It remains to be seen whether Bosnia and Herzegovina is fully prepared for this orientation.

Regarding the prerequisites for energy transition, first a few words about some basic indicators for the power sector. Although the facilities for the energy production in Bosnia and Herzegovina are relatively old, still the share of the renewable energy sources (RES) is comparatively high, at 40.8%; that is more than in Croatia with 33.1%, Slovenia 20.9%, and Serbia 21.2% (Global Competitiveness Report 2019). The high share of the RES in the structure of power sources in Bosnia and Herzegovina is the result of still functional significant hydropower capacities, built

before 1990 on the rivers Neretva, Rama, Drina, Vrbas, Trebišnjica. Since the 1990s, only two small hydropower stations were built: Mostarsko blato (2010) and Peć Mlini (2004). In addition, 113 mini power stations were built, which produced some 2.2% of the total electrical energy production in 2020. Among the renewable sources, solar power stations and wind farms should be also mentioned, all build after the war, but their production amounts to only less than two percent of the total energy production. Despite the significant opposition in the local communities, several hundreds of new mini power plants have been planned.

The main segment of the power sector in Bosnia and Herzegovina, however, are still thermo-power facilities, and all of them, except TE Stanari (capacity 300MW, put in production in 2016), were built and started producing energy before the 1990s. Obviously, the basic segment of the energy system are the objects that are using and burning coal as the fuel.

Although, according to the installed capacity, Bosnia and Herzegovina has over 40% of renewable power sources, the structure of the production gives somewhat different picture. Thus, in 2019, 71.9% of the total electric energy production came from the thermo-power capacities, 26.3% from hydro-power facilities, and 1.8% from wind farms and solar power plants.

The above data show that the energy sector structure in Bosnia and Herzegovina is mainly based on classical sources. That is why the country is faced with big challenges when it comes to the transition of power sources and power consumption.

As was already mentioned above, Bosnia and Herzegovina has chosen, generally, the European path, meaning that it will follow the European energy policy. And that "European" path in this field is the complete decarbonization of the European Union by the year 2050, and very specific goals which should be achieved by 2030.

Bosnia and Herzegovina, too, outlined some specific goals which should reduce the current concentrations of carbon dioxide near and around the classic energy sources and production; building several new hydro-power plants has been planned, as well as more solar plants and wind farms, also many mini hydro-power plants (despite the resistance in local communities). Still, the country plans to continue building thermo-power plants, for example, Tuzla 7, and others. It seems that the Federation of BiH is determined to build Tuzla 7, with 450 MW capacity, based on the Chinese technology and with Chinese investors, despite unfavorable reactions from the European Union. In addition to this project, longer-term plans include building more thermo-power plants, or enlarge the capacity of the existing ones. It seems that this pushing ahead with the building of classical energy sources is directly opposed to the commitment of the European Union.

These confusing signals from the long-term energy orientation of Bosnia and Herzegovina raise the question, what is the real energy policy of the country? It seems, unfortunately, that, as in other fields, there is no consent among the relevant factors not even about the choice of strategic goals and policies in the energy sector. Despite the fact that the development strategy in this sector should be clear and achievable, because it has been based on the European orientation (and resources), in this field, too, there exists a considerable confusion, and, thus, uncertainty. So, when energy strategy is concerned, disharmony is evident, as in other fields, among authorities and interests of state bodies and political groupings, revealing, again, the non-functioning of the state and public administration.

In this context, some other limitations facing the clear energy strategy should be mentioned, such as the inherited structure of the sector and mindset formed around it and which, by its nature, has difficulties with adopting new orientation and modernization (See: Mirza Kušljagić, Energetska tranzicija u Bosni I Hercegovini, Impresum, Tuzla 2019).

Undoubtedly, Bosnia and Herzegovina will have to follow the energy policy of the European Union if it wants to join it. And not only for that reason, but also because of general inclusion into the up-to-date energy processes, which enable sustainable, efficient, and secure production and consumption of electric energy. In this framework, the decarbonization by the year 2050 should, undoubtedly, be the ultimate goal, with interim goals that should be achieved by 2030.

It should be stressed once again that, taking into account the long-term strategy for energy sector, formulating strategic development goals is more urgent, but also more complex. It is more complex and difficult to shape a clear strategy in the politically complex state, with very wide administrative structure and intertwined authorities, but also the interests. More so, because the list of limitations facing a successful energy strategy is not exhausted by that.

Since not only the development and transition of the energy sector are in question, but also the development of manufacturing industry, financing, profitability, emission of greenhouse gases, development of human resource basis, and many other elements, Bosnia and Herzegovina should, despite all the difficulties, strongly confirm its orientation toward decarbonization with all of its components. In other words, it should shape, and accept by consensus, the state strategy for decarbonization for the period up to the year 2050. It has enough potential for such a strategy, which is the imperative of the time.

INSTEAD OF CONCLUSION

First of all, Bosnia and Herzegovina, undoubtedly, has been lagging considerably, according to all measures of economic successfulness, behind all comparable countries. Hence, it is in a very low starting position for launching serious developmental operations within the Industry 4.0, implementation of new technologies, decarbonization, and power sector transition. That is why it has to, unquestionably, undertake serious efforts to dynamize economic and overall social development, in order to fulfill the conditions for joining the European Union, as it is determined to do.

Especial efforts are needed in the segments of technological development, re-industrialization, implementation and obeying modern ecological standards, and energy sector transition.

Within the launching and affirmation of the strategic developmental turnaround, the exceptional responsibility is on the state in the wider sense. It should provide the political willingness, important so much for all strategy changes, and, in addition, the state is an exponent of the appropriate developmental strategies, it provides legal and regulative framework, and participates in providing funding.

Furthermore, the manufacturing sector has very significant role in developmental strategies; but today, in Bosnia and Herzegovina, this sector is considerably deteriorated, as is also the case with the energy segment. Still, this sector has been creating, advancing, and executing ideas for developing technologies from the program of the IV industrial revolution – the Industry 4.0, and so important energy sector transition.

The academic community must be an integral part of all the programs for the development and modernization of the economic and social structure. In order to achieve this, it is necessary to enlarge investments in the R&D, to qualify the research and development institutions, to raise the educational level, especial in the field of natural sciences, and motivate the renowned experts of the Bosnian and Herzegovinian origin to return to the country.

Despite a very low starting point, all of the mentioned programs can be started, if there is the political will, consensus of the interested institutions, the adequate level of knowledge and competences, as well as the strategic plan. Hence, within everything that was mentioned above, the significance of the planning and strategic thinking in general should not be neglected.

REFERENCES

1. D. Acemoglu, J.A. Robinson: Why Nations Fail, New York, 2012.
2. Dani Rodik: Industrijska politika za 21. stoljeće - Globalizacija, institucije I gospodarski rast, HGK, Zagreb, 2007.
3. E. Westkamper: Towards Re-industrialization of Europe, A Concept for Manufacturing 2030, Springer, London, 2014.
4. T. Flaherty, P. Nillesen, M. Caughin: Global Power Strategies, Strategy&, PWC.
5. European Round Table for Industry: European Competitiveness and Industry Report 2019.
6. World Economic Forum: Global Competitiveness Report 2019.
7. European Commission: Key Figures 2016.
8. WIIW: Handbook of Statistics 2019 - Central, East and Southeast Europe, Wien, 2019.
9. Dr Mirza Kušljagić: Energetska tranzicija u Bosni I Hercegovini, Impressum, Tuzla, 2019.
10. Report of Bosnia and Herzegovina for the UN Conference on sustainable development UN CSD, Sarajevo 2012.
11. Ž. Primorac – D. Ramljak: Inovacijski proces je ključni faktor dugoročnog razvoja Hrvatske, HDE, Opatija, 2010.

SAŽETAK

Bosna i Hercegovina se načelno opredijelila za priključivanje Europskoj uniji. Preliminarne odluke su već donesene, ali BiH treba, prije početka formalnih pregovora s EU-om, ispuniti neke standarde/kriterije koji su sadržani u 14 preporuka što ih je dala Europska komisija. Jedna od bitnih pretpostavki uspješnog puta prema EU-u jest da BiH ubrza privredni razvoj i modernizira ekonomsku strukturu u cjelini. U tom pogledu, posebno je važno da BiH unaprijedi tehnološki razvoj, poboljša svoju ekološku politiku i ubrza energetsku tranziciju. U tekstu je analiziran sadašnji razvojni nivo spomenutih područja i sugerirane su neke mjere koje bi trebale poboljšati sadašnje nezadovoljavajuće stanje u njima. Posebna pozornost posvećena je mjerama za povećanje inovacijskog kapaciteta, potrebi energičnijih zahvata u rješavanju ekoloških problema i energetskoj tranziciji kao preduvjetu za ulazak u Industriju 4.0, uvođenje zelene ekonomije I prihvaćanje dekarbonizacije kao dugoročnih politika. Naglašeno je da su to ultimativni ciljevi do 2050. godine, u suglasnosti s dugoročnom razvojnom orijentacijom Europske unije.

Key words: technological development, research and development, green economy, decarbonization, efficiency