



FINANCIAL, ECONOMIC AND SUSTAINABLE DEVELOPMENT OF STATES WITHIN THE CONDITIONS OF INDUSTRY 4.0

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ABSTRACT

The article assesses the achievements of sustainable development by EU countries within the conditions of Industry 4.0. It has been determined that the concept of sustainable development achievement is integrated into the development of the technological sector. Achievements of sustainable development do not outpace the rapid development of Industry 4.0. More technologically advanced countries provide higher level of economic growth and prosperity. The growth rate of Greenhouse gas emissions (in CO₂ equivalent) in 1990 base year, is rising in advanced countries; herewith, such rate is slowing down in less developed countries. Employment growth in the high-tech and medium-tech sectors of EU countries corresponds to the worst environmental situation. Despite measures to overcome the problems of sustainable development in

the environmental sphere, in particular, concerning increase volume of financing for activities related to climate change, most EU countries do not ensure an increase in the share of renewable energy in final energy consumption. There are significant differences between countries in terms of environmental taxation: higher level of taxation corresponds to a higher level of expenditure on research and development in a number of countries; there is no such interconnection in the other countries.

Keywords: Sustainable development, Industry 4.0, Inequality, Ecosystem.

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1. INTRODUCTION

Industry 4.0 has led to a change in socio-economic and environmental systems. The role of a key factor in the new economy is based on human capital assets. This brings about aggravation of social and environmental problems in the absence of appropriate measures based on partnership and interaction of the state, business and society. The intensification of social, cultural, ethnic and other conflicts between countries takes place; it reinforces inequality. On the one hand, developing countries experience accelerated economic growth, on the other hand, the development of Industry 4.0 has led to an increase in the labour remuneration of the industrial and technological sectors, heightening inequality between social groups. The structure of the economy is transforming: there is an increase in the share of the creative economy, the knowledge-based economy, the share of services, while the share of agriculture has declined; an upward trend in the development of organic production is observed. Another problem of Industry 4.0 centers around massiveness of environmental problems on a global scale, climate change due to global warming, and chaotic environmental measures in the sphere of ecology. Different level of socio-economic development neither provides a solution to environmental problems nor aligns countries in terms of environmental development. At the same time, the state of the environment is better in the least developed countries to compare with advanced countries due to the lower level of industrialization. The specified problems determine the study relevance of the achievements of the sustainable development of states within the conditions of Industry 4.0.

The current basic task is to assess the achievements of the sustainable development policy, which should be based on the concepts of partnership management, digital management, intersectoral interaction of all participants of the socio-economic system, which affect the economic, social, environmental and management processes in countries. Assessment of sustainable development gains particular relevance.

2. LITERATURE REVIEW

The concept of sustainable development is integrated into the progress of the technological sector in the context of Industry 4.0. Sustainable development becomes an international principle of economic growth provision [6].

Sustainable development should be ensured through the implementation of social responsibility in industry, agricultural production, technological sectors of the economy, in all sectors of extensive use of Industry 4.0's results [4]. The concept of sustainable development consists in the trinity of man, the economy and nature in order to resolve the contradiction "increasing of human needs - reducing of natural resources" [2]

The paradigm includes economic, social and environmental components of responsibility, and economic growth is key aspect, because economic development provides an opportunity to finance activities for elimination of environmental and social problems [1].

In addition, sustainable development refers to the introduction of new legislation in EU, which is subsequently implemented by developing countries and integrated into world society. This reduces the gap between advanced countries and developing economies [6].

Sustainable development strategies were adapted in EU in 2001, 2006 and 2010. From thenceforth, there has been convergence towards their achievement, and governments are adapting national sustainable development strategies. This ensures institutional development and better coordination of sustainable development activities [7]. Thus, there has been certain gradual progress in sustainable development over the last ten years, but the indicators are below average in the majority of developed countries [5]. This is especially true of the countries that have recently become EU members. Despite a number of studies, focusing on the achievement of the sustainable development goals, there is a gap in the literature concerning investigation the link between sustainable development and the consequences of Industry 4.0 in terms of the high- tech and medium-tech sectors.

3. MATERIALS AND METHODS OF STUDY

Based on the analysis of indicators, characterizing the state of achievement of the sustainable development goals in the context of Industry 4.0 of EU countries for the period of 2001-2019, modern trends in the economic, social, environmental component of sustainable development have been determined under the influence of the development of high-tech and medium-tech sectors of the economy.

The secondary analysis of scientific researches for the period of 2009-2019 was conducted in order to identify priority issues for the development of high-tech and medium-tech sectors of the economy and sustainable development of EU countries. Based on the method of comparative analysis, the basic problems of sustainable development by goals have been identified. The analytical method has been applied to formulate generalized and detailed conclusions based on the research results, when comparing indicators for different EU countries.

4. THE RESULTS OF THE STUDY

Achievements of sustainable development do not outpace the rapid development of Industry 4.0: income inequality, quality of life is enhanced by technological development; countries are unable to quickly respond to existing challenges.

Financing of R & D by developed countries corresponds to the level of the population's purchasing capacity and quality of life: more technologically advanced countries provide higher levels of economic growth and prosperity. Herewith, the highest level of financing is observed in developed countries: South Korea 4,29 % of GDP, Sweden 3,32 % of GDP, Switzerland 3,29 % of GDP, Japan 3,2 % of GDP, Austria 3,17 % of GDP, Germany 3,13 % of GDP, Denmark 3,03 % of GDP, the United States 2,78 % of GDP, Belgium 2,76 % of GDP. R&D personnel by sector has been steadily increasing in developed countries: in 2005 the indicator was 0,9608% of the active population, in 2018 – 1,3591% of the active population.

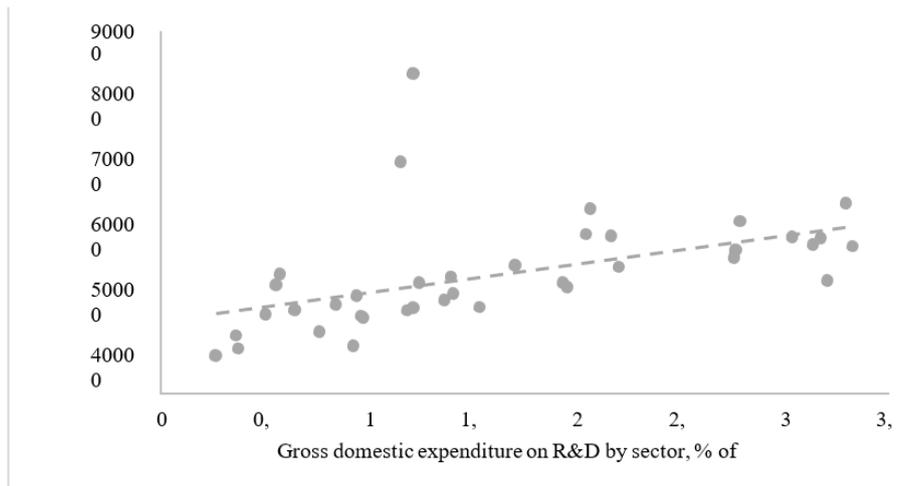


Figure 1 Gross domestic expenditure on R&D by sector (% of GDP) and Purchasing power adjusted GDP per capita (Real expenditure per capita) according to data of EU countries in 2018: Japan, the USA, Switzerland, Turkey

The growth rate of Greenhouse gas emissions (in CO₂ equivalent) of 1990 base year, has been increasing in advanced countries, herewith, such rate is slowing down in less developed countries. Employment in high- and medium-high technology manufacturing and knowledge-intensive services in EU countries accounted for 45, 8% of total employment in 2017, 46, 5% of total employment in 2019. Herewith, the highest values were observed in the following countries: Sweden - 58,2, Luxembourg - 56,2, Norway - 54,3, the United Kingdom - 54,2, Denmark - 53,3, Iceland - 53,2, Switzerland - 53, Belgium - 52,5, Germany – 51.

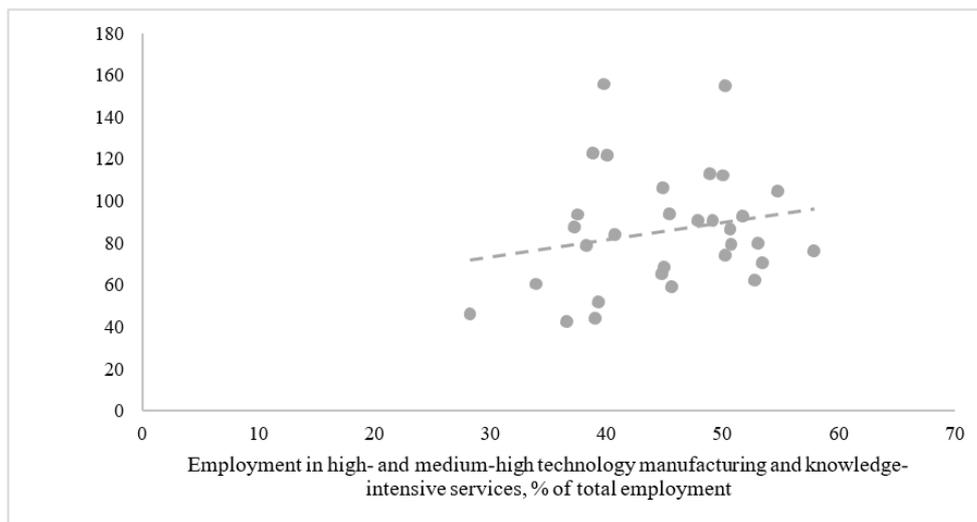


Figure 2 Employment in high- and medium-high technology manufacturing and knowledge-intensive services (% of total employment) and Greenhouse gas emissions (in CO₂ equivalent, of 1990 base year) according to EU data as of 2017

Employment growth in the high-tech and medium-tech sectors of EU countries corresponds to the worst environmental situation. The highest indicators of Greenhouse gas emissions in 2017 were in Turkey – 244,5, Cyprus – 155,7, Iceland - 154,8, Portugal -122,8, Spain - 121,8, Ireland - 112,9, Malta - 112,2, Austria - 106,2, Norway - 104,9.

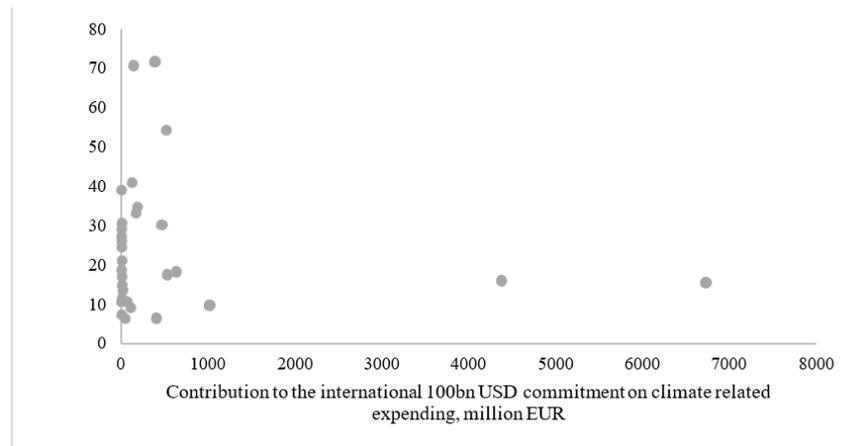


Figure 3 Contribution to the international 100bn USD commitment on climate related expending (million EUR)1 and Share of renewable energy in gross final energy consumption by sector, % in EU countries in 2017

Despite measures to overcome the problems of sustainable development in the environmental sphere, in particular, volume growth of funding for climate change related activities, the increase in the share of renewable energy sources in final energy consumption is not provided in most EU countries. It is worth noting the high share of the indicator in the following countries: Norway - 72,752, Iceland - 72,208, Sweden - 54,645, Finland - 41,162, Latvia - 40,292, Montenegro - 38,807, Denmark - 35,708, Albania - 34,865, Austria - 33,426, Portugal - 30,322, Estonia - 29,996 and Croatia - 28,024.

Climate related economic losses (EU aggregate) in 2017 amounted to 12052 million Euro, including from meteorological events - 4433 million Euros, from hydrological events - 1090 million Euro, climatological events - 6529 million Euro. Thus, the insured economic losses from climate change are characterized by periodic growth: the peak of losses was observed in 2007 - 17536 million Euro, in 2013 - 22976 million Euro.

The indicator of measuring national climate change measures is the share of environmental taxes in total tax revenues, which averaged 6,29% of all taxes in 2008-2018. The highest level of environmental taxation was observed in the following countries: Latvia - 10,88, Bulgaria - 9,82, Greece - 9,49, Slovenia - 9,35, Croatia - 9,31, the Netherlands - 8,62, Estonia - 8,31, Cyprus - 8,25, Malta - 8,2, Denmark - 8,13, Romania - 7,95, Italy - 7,84, Poland - 7,72, Portugal - 7,41.

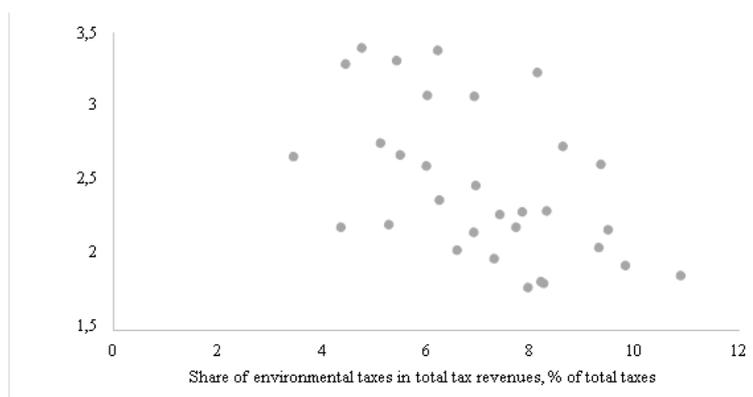


Figure 4 Share of environmental taxes in total tax revenues (% of total taxes) and Gross domestic expenditure on R&D (% of GDP) in EU in 2018

There are significant differences between countries in the level of environmental taxation: higher level of taxation corresponds to a higher level of expenditure on research and development in some countries; there is no such interconnection in the other countries. For example, there is a low level of environmental tax with a high level of funding for research and development in Latvia, Bulgaria, Cyprus, Malta. Herewith, there is a reverse tendency in high-income countries: the level of environmental taxes is approximately 2,5-3% with a simultaneous high level of funding for research and development.

- upward trend in poverty reduction among EU countries and achieving a level of stability of labour remuneration;
- upward but weak trend towards achieving sustainable development goals: 1) in terms of ensuring food security due to the backwardness of the economic development of the less developed countries of Eastern and Central Europe;
- concerning ensuring a high level of life quality and well-being, the Czech Republic, Estonia, Latvia, Hungary and Lithuania face certain difficulties in achieving a high level of life quality; 3) difficulties in providing a high level of education quality, in particular, problems crop up due to the dynamism of the technological sector, which requires employees to have a high level of technical skills;
- provision of gender equality remains a challenge for countries; Industry 4.0 reinforces inequality due to the predominance of men in the high-tech sector;
- economic growth rate has slowed over the past ten years, the liquidity crisis of financial markets and the financial solvency crisis exacerbate these trends, which has a negative impact on solution of environmental issues due to the need to finance the ramifications of the crisis, growing budget deficits instead of financing technologies that would solve the problems of climate change;
- notwithstanding the concept of business social responsibility, which is increasingly being integrated into the activities of the corporate sector, there is an acute problem of ensuring responsible production;
- the issue of provision of partnerships among business, government and communities remains a challenge for EU countries. As Filippova, V. D., Budnyk, V. A., Mykhailiv, H. V., Hryniv L. V. and Los, O. I. (2020) have noted that “there is an unsatisfactory dynamic both in terms of the number and quality of PPP agreements in the area of public-private partnerships” [3].

6. CONCLUSIONS

The assessment of the achievement of sustainable development by EU countries within the conditions of Industry 4.0 indicates the following basic trends. The concept of achievement of sustainable development is integrated into the development of the technological sector. Achievements of sustainable development do not outpace the rapid development of Industry 4.0. More technologically advanced countries provide higher levels of economic growth and prosperity. The growth rate of Greenhouse gas emissions has been increasing in advanced countries, herewith, such rate is slowing down in less developed countries. Employment growth in the high-tech and medium-tech sectors of EU countries corresponds to the worst environmental situation. Despite measures to overcome the problems of sustainable development in the environmental sphere, in particular, volume growth funding for climate change related activities, the share of renewable energy sources in final energy consumption is not ensured in most EU countries. There are significant differences between countries in the level of environmental taxation: higher level of taxation corresponds to a higher level of expenditure on research and development in some countries; there is no such interconnection

in the other countries. Achievement of sustainable development is a challenge for most EU countries because of slow economic growth, gender inequality, low levels of responsible production and consumption, partnerships between business entities, government and communities, food security, and the quality of education.

Structural transformation is the powerhouse of economic development. Countries will not be able to provide economic growth without strengthening their productive capacities and the flow of resources to more productive sectors. There have been many examples of structural transformations in the history, leading to higher productivity, employment and raise in wages, creating more equitable distribution of income. However, Industry 4.0., driven by advanced technologies such as artificial intelligence and robotics, may change the laws of the game for countries that are embarking on a path of industrialization. Within the conditions of labour force withdrawal out of sectors with low labour productivity, increased automation may narrow the ability of workers to find decent jobs and reduce pressure on sluggish growth and salary scales. This may be exacerbated by the increasing market concentration that becomes evident in the digital industries. As a result, the benefits of any increase in labour productivity may be enjoyed by the owners of a small number of companies, and the income distribution structure may be distorted to such an extent that is incompatible with social stability.

Employment rates in EU countries have remained high over the past decade, however, investment volumes in business are weak, as well as the growth in labour productivity and wages. These trends coincided with a period of rapid growth in corporate profits and macroeconomic conditions, which, theoretically, should be favorable for investment.

In EU countries an increase in inequality is observed instead of investment growth, which is evidence of a confidence crisis to capitalism. Productivity growth is impossible without investments. Therefore, such trends indicate a “market failure” and require governments to develop effective labor market policies. Under such conditions, governments resort to policies of economic growth and salary increase. This can provide businesses stimulation in order to create capital (invest in new technologies) for avoiding wage costs, but at the same time it may cause an increase in unemployment, consumption expenditures, reducing production output. However, it may also provide an increase in labour productivity. The argument in favor of such a policy is the high level of aggregate demand since 2015, which will smooth the increase of employees’ labour costs for business. Thus, the macroeconomic conditions of the last ten years have significantly affected technological development and the achievement of sustainable development goals. Within the conditions of productivity crisis, slow economic growth and weak investment, further growth of high-tech industries is ocured. Under such conditions, achievement of sustainable development will be restrained by the high growth rate of the technological sector, which does not invest in energy-efficient technologies.

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