# INDUSTRIAL PARKS, A POSSIBLE TOOL FOR RURAL DEVELOPMENT

Marius George POPA
PhD Student, Bucharest University of Economic Studies,
Email: mpopa74@yahoo.com

### Abstract

The development of rural communities is a very important objective of the European Union and attracting investments in that areas is a good way to achieve the goal of having a sustained improvement of the population's standards of living or welfare.

Is the industrial park, as a generic definition of delimited areas that provide the infrastructure and the necessary services for carrying out economic activities, a proper way to obtain rural development? Yes, the study reveals that, if ex ante rigorous planning is conducted and if proper tied with the rural context, that specialized environment to support economic activities could be a tool for achieve rural development. The industrial parks can become centres of growth and support for employment, with positive effects in the region and for the communities located in their proximity

In the case of Romania, the data show that a number of industrial parks was establish in the rural area. For boosting the creation and development of such systems, is necessary a closer cooperation between the public authorities and the entrepreneurs, under the objectives of smart business, a superior citizens' well-being status and a protected environment.

**Keywords:** rural development, industrial parks, growth, Romania.

**DOI:** 10.24818/CAFEE/2022/11/05

### Introduction

In the European Union, the development of rural communities is a very important objective. As a consequence, from 2000, the rural development was considered the second pillar of the common agricultural policy, part of the Agenda 2000 reform (European Commission, 2000). The rural development, in the vision of European Commission, target also the rural economy by expanding the range of activities in those areas, increasing the employment, sustaining the rural heritage but all of that within the obligation to protect the environment. United Nations consider as well that the development of rural areas is very important. United Nations adopted Agenda 21 (United Nations, 1992), which represents a comprehensive plan of action to establish a global partnership for sustainable development, to increase the quality of human life and protect the surrounding environment. Later, its objectives were taken over by the 2030 Agenda for Sustainable Development (United Nations, 2015), one of which is supporting rural development. For the scholars or national or international institutions, there is no final definition of rural development (Wubayehu, 2020) because the concept is in a continuous redefinition by modifying, changing and, in many cases, broadening his dimensions. The short version of the definition could be "the sustained improvement of the population's standards of living or welfare" (Wubayehu, 2020). (OECD, 2020) use the concept of citizens' well-being and, following the idea of having a specific place in mind when to propose a specific rural policy, (OECD, 2020) consider that rural well-being shifts from a one-dimensional to a multi-dimensional view of rural policies with three types of rural settlements – inside functional urban areas, close to cities and remote rural, three objectives - economic, social and environmental and three different stakeholders - the government, the private sector and the civil society.

Starting from these findings, we could consider that the concept of rural development involves, as main tasks, improving the quality of life in rural areas, protecting the rural heritage, improving the competitiveness of businesses and diversifying the rural economy. Stimulating such actions is a priority for many of the Member States of the European Union. Romania also has allocated substantial national and European resources in this regard, implementing programs dedicated to rural development in each of the programming periods, starting from the moment of accession to the European Union. The Romanian 2014-2020 Rural Development Program had a planned total public expenditure of EUR 9.5 billion, 27% being used for social inclusion & local development (European Network for Rural Development). Thus, actions to improve the competitiveness of businesses and to diversify the rural economy represent legitimate objectives of the local, national and European effort to achieve rural development.

The initiative to increase the competitiveness of businesses and the diversification of economic activities carried out in rural areas belongs equally to economic actors, who, in the context of the expansion of globalization, feel entitled to become more competitive in order to conquer new markets and expand their portfolio, but also to local and central authorities which, through adaptations of the regulatory framework in areas such as fiscal, social, authorization etc., by granting financial incentives or directly, by becoming economic actors, supports the efforts of entrepreneurs. By doing that, the government assumes the role of regulator and promoter or facilitator (Kim, 2015). Without being a surprising fact, civil society can also contribute to a more dynamic business environment (Parent, 2019), the status of customer or possible employee giving it a certain degree of power in determining entrepreneurs to consider the development or diversification of economic activities in rural areas. In this context, the creation of a specialized environment to support an economic activity makes sense, the most common formula being that of an industrial park with its various variants: agricultural (Pinna, S. 2016), scientific-technological, technological, business, logistic, innovation (SINTACT, 2013). In many countries, the authorities put in place special economic zones (Zakharov et al. 2021) with the same goal of fostering the private initiatives. The economic reality has also created innovative types of specialized spaces such as business structures, clusters or incubators (Maticiuc & Constantin, 2017). Industrial parks are delimited areas that provide the infrastructure (transport network, utilities etc.) and the necessary services (telecommunications, consultancy, financial services, training, technical guidance, information services and support services for businesses - hotel, conference rooms etc.) for carrying out economic activities (research and development, production, trade, storage etc.), capitalizing on the human, material and geopolitical potential of the area. (UNIDO, 2002) used the following general definition for an industrial park: "a tract of land developed and sub-divided into plots according to a comprehensive plan with the provision for roads, transport and public utilities, sometimes also with common facilities, for the use of a group of industrialists". Industrial parks are a useful tool for attracting investment, creating jobs and promoting innovation. Through them, start-ups can be supported, but an environment can also be created in which local and international companies can interact with mutually beneficial results. A major advantage of industrial parks / special economic zones is that they provide an institutional framework, services and infrastructure located in areas where skilled personnel can be attracted and which allow easy access to important transport routes (Nazarczuk & Cicha-Nazarczuk, 2021). Therefore, industrial parks can become centres of growth, with positive effects in the region, for the communities located in their vicinity. The present paper aim is to identify the possible positive effects that the creation and the development of industrial parks (as a generic definition of delimited areas that provide the infrastructure and the necessary services for carrying out economic activities) could be a tool for achieve rural development. In the case of Romania, will be analysed the data related with the creation and existence of the industrial parks.

## 1. Literature review

The idea of creating such facilities, called industrial parks or special economic zones, has been implemented in most areas of the world, regardless of political regime or level of development. In the United States of America (Bell, 2016) and (Lyapin, 2020), China (Crane et al, 2018), India (Topno, 2005), Europe (Nazarczuk & Cicha-Nazarczuk, 2021), South America (Taṣ, 2019) or Africa (Carrai, 2021), (Pakdeenurit et al, 2014) and (Ven 2018), the idea of strengthening local entrepreneurship or, above all, to attract foreign investment was implemented using this ready to plug in or ready to be used infrastructure formula.

Having a consolidated infrastructure for business is very important for the achievement of economic development. The conclusions of The International Conference on "Industrial Parks for Inclusive and Sustainable Industrial Development", organized under UNIDO coordination, after the discussion and exchanges of practical and theoretical experience in the field of industrial parks between 800 participants from 30 countries, sustain the fact that industrial parks "foster innovation and encourage the application and development of new technologies and innovative concepts, which can be of value for a country's economic growth" (UNIDO, 2019).

It is important to note that in order to achieve positive effects for development, the use of industrial parks have to be done in effectively and efficiently manner but having in mind the given country context (Memedovic, 2018). The specific way or organizing such a business structure differ. Could be a large special economic zone (Nazarczuk & Cicha-Nazarczuk, 2021) and (Pakdeenurit et al, 2014) or a coworking space (Knapp & Sawy, 2021) in smaller cities and rural areas or an interaction platform for rural entrepreneurs, sustain by State (Talbot, 2016). Regardless of their name or description, in generally, industrial parks stimulate the regional development by increasing the employment, participating in economic growth and diversification, particularly in relation with export growth (Azizov, 2014) and (Ven, 2018), improving productivity, creating scale economies, inducing positive spillovers (Memedovic, 2018). Industrial parks could also create a development network and disperse economic activities within the territory (Taş, 2019)

However, it is truth that the success of foreign firm's economic initiatives is proportional with the global connectivity of firm's settlement place (Rasel & Kalfadellis, 2021) and (Fink et al, 2012). This could be an answer for the disparities between the power of attracting foreign investors in the case of rural vs. urban industrial parks (Farole & Akinci, 2008). Also, such an initiative "must have a business case (markets, products, effective demand)" (Tas, 2019) in order to succeed. In some cases, that agglomeration economies, putted in place for mutual support, are more appropriate for urban areas and less fitted for rural zones (Atkinson, 2017). That's why the idea of established parks in rural areas in order to immediately create employment and economic opportunities do not always show positive effects (Farole & Akinci, 2008). But the successful know-how on industrial parks / special economic zone is exported in our days by countries like China in other territories, in Asia (Wang et al, 2021) and (Tritto & Camba, 2022), Africa (Carrai, 2021) and (Chen & Yunnan, 2020) or Europe (Miao, 2021). This type of concentrated economic area has positive effects on regional environment (Parente, 2019). In many cases, due to an ex ante rigorous planning, the establishment of industrial parks has positive effects on regional development and, if proper tied with the rural context, on rural development. For future undertakings in setting up of such functional spaces, there are three major aspects to analyse and to pursuit: the economic growth, the environmental preservation and the reduction of regional disparities (Falahatdoost & Wang, 2022). In the rural areas, the Rural enterprise hubs (Merrell et al, 2022), with workspaces for multiple tenant companies that share equipment, co-working spaces and business advice could be a feasible solution for supporting economic initiatives in rural zones and for achieving rural development.

## 2. Industrial Parks in Romania

In Romania, the State's support for such industrial parks is subordinated to the general objective of regional development, which is to be achieved through: a) accelerating the economic development of the regions where industrial parks are established; b) creation of new jobs; c) development and modernization of the economic infrastructure of the regions; d) increasing the economic cohesion of all the country regions; e) attracting domestic and foreign investments. The Romanian State started in 2000 the process of boosting the creation and development of such systems by adopting a specific legislation (SINTACT, 2000), (SINTACT, 2001), (SINTACT, 2002), (SINTACT, 2003, 2015) which also included dedicated package of tax incentives for the companies that administrate the industrial parks and for the companies operating in these locations, the main instruments being: (i) exemptions from paying local taxes (tax on buildings and land), (ii) exemptions from the payment of fees charged for changing the destination of the land related to the industrial park and (iii) exemptions from the payment of the fees charged for the removal from the agricultural circuit of the land related to the industrial park. This legislation is in force, and it applies both to existing parks and to the new similar initiatives.

According to the data updated at 10.10.2022 presented by the Ministry of Development, Public Works and Administration, in its capacity as a "specialized body of the central public administration in charged with the problematic of industrial parks" (SINTACT, 2013), a number of 104 industrial parks titles were issued in Romania until now (MDLPA, 2022). Obtaining the title is a mandatory condition to benefit from the dedicated tax facilities. Along with these, there are other business structures that operate in Romania, in general logistics parks, which were not the subject of this paper. Consequently, the data and information presented below will refer exclusively to the industrial parks that obtained the title according to the legislation mentioned above.

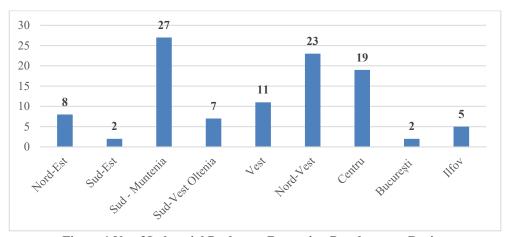


Figure 1 No of Industrial Parks per Romanian Development Region Source: MDLPA (2022), https://www.mdlpa.ro/pages/parcuriindustriale

The location of the industrial parks is not uniform at the level of the development regions, the Sud-Muntenia, Nord-Vest and Centru Regions accounting for 59% of their total. The distribution at county level ranks Prahova (Sud-Muntenia), with 16 parks, Cluj (Nord-Vest), with 11 parks, and Braşov (Centru), with 10 parks, in the first 3 places.

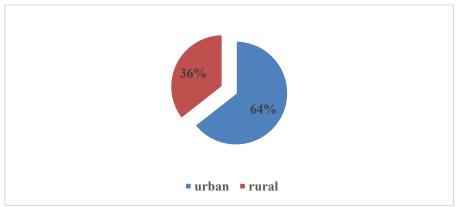


Figure 2 Location of the parks

Source: MDLPA (2022), https://www.mdlpa.ro/pages/parcuriindustriale

Even the majority of the industrial parks are located in the urban areas (67 of 104), the total surface of the parks is identical in the two types of area (urban and rural), 1700 hectares each. Having in mind the OECD types of rural settlements (inside functional urban areas, close to cities and remote rural), we noticed that the majority of the rural industrial parks are in the proximity of large city, that acts as a provider for the supplementary employees that the rural cannot deliver and facilitate the technological transfer needed for a good management of the business.

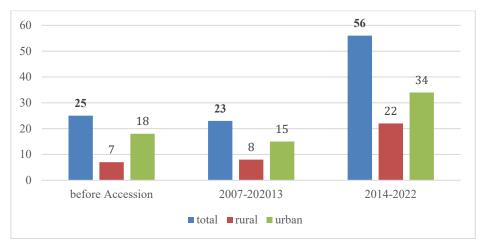


Figure 3 Moment in time of Setting up the parks

Source: MDLPA (2022), https://www.mdlpa.ro/pages/parcuriindustriale

Regarding the period of the industrial park establishment, more than half of them were set up in the last EU programming period, most of the rural parks having just few years of activity.



Figure 4 Operationalization stage

Source: MDLPA (2022), https://www.mdlpa.ro/pages/parcuriindustriale

In the urban area, 76% of the parks are fully operational (1500 ha) and 57% in the rural zone (1200 ha). 20 parks (in urban and rural areas) are still at greenfield stage, namely 120 ha in urban area and 477 ha in rural area. One explanation could be the fact that some of parks are opened in the last years, but for the others, probably the management of the park didn't have all the arguments in order to convince companies to become residents.

The existence of an industrial park on the territory of a rural community creates the possibility of an increasing revenue flow to the local budget, if the local administration knows how to attract and support entrepreneurs.

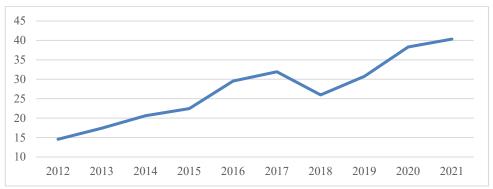


Figure 5 Ariceștii-Rahtivani budget revenues (EUR million)

Source: LCAR (2022)

Ariceștii-Rahtivani is a rural community, located between 2 large cites, Ploiești (20 km) and Târgoviște (40 km). The economic environment of the area was boosted by the creation, in 2009, of the first of 5 industrial parks. From 2012 to 2021, the revenues of the village with 8704 inhabitants (NIS, 2022) increase with 177%, to more than RON 40 million (LCAR (2022), a lot more than the 2021 revenues of Bușteni, RON 26,7 million (LCB, 2022), a city with 8894 inhabitants (NIS, 2022). The revenue of Ariceștii-Rahtivani is comparable with the revenue of a very important city, with a lot of economic activity, like Sinaia that, with

10410 inhabitants, accounts a RON 50 million revenue (LCS, 2022). This is an example on how industrial parks can influence the incomes of the community and lay the foundation of a rural development.

### 3. Conclusion

The rural development is an important component of the national development and most of the countries are looking for methods and instruments to achieve the goal of having a high level of well-being status of their citizens that are not living in the urbanized areas. The data shows that the development through smart industrialization could be a method to implement and the setting up industrial parks an instrument to use. The European Union (UE – Interreg Europe) is ready to conclude partnership with local and regional authorities interested in improving land planning regulations especially for rural areas, starting from the conclusion that "in rural areas, industrial parks can bring an economic added value and be a source of innovation, but they can also disfigure rural landscapes, hurt ecosystems and generate a great deal of pollution impacting the quality of life of local inhabitants. Economic development and protection of the environment and quality of life should can coexist with the proper regulatory framework."

In Romania, the image revels an effort from the State and private sector, sometimes combined, sometimes very individualized, in order to put in places business structure that, equipped with the necessary logistic and connections, could boost the economic initiatives. Starting from that image, I propose four main conclusions and proposals, for increasing the positive effects on rural development in Romania using industrial parks:

- 1. Existing institutional framework enables local authorities to attract investments;
- 2. However, the public support measures (State aid) dedicated to the residents of the parks have a minor level compared to other types of investment aid measures, thus companies lack one of the strong motivations to locate in industrial parks;
- 3. It is possible that some of the local authorities have minimal involvement in supporting industrial parks, the effect being the existence of some parks established for many years but still in the process of operationalization;
- 4. Perhaps it is necessary to carry out some analyses regarding the opportunity (i) to create a more complex network of support instruments dedicated to the residents of the rural industrial parks and (ii) to continue the administration of some industrial parks by public companies vs. the outsourcing of these services to private companies, with better results in the operation of such structures.

### References

- Atkinson, C.L. (2017). Rural Development In book: Global Encyclopedia of Public Administration, Public Policy, and Governance. DOI:10.1007/978-3-319-31816-5 1014-1
- 2. Azizov, M. (2014). The Importance of Industrial Parks in Economic Development. DOI:10.13140/RG.2.1.1476.9046.
- 3. Bell, T.W. (2016). Special Economic Zones in the United States: From Colonial Charters, to Foreign-Trade Zones, Toward USSEZs. Buffalo Law Review Vol. 64, No. 5 pp. 959-1007 (2016)
- 4. Carrai, M.A. (2021). Adaptive governance along Chinese-financed BRI railroad megaprojects in East Africa, World Development, Volume 141,105388. DOI.org/10.1016/j.worlddev.2020.105388.

- Chen & Yunnan (2020). "Africa's China": Chinese manufacturing investment in Nigeria in the post-oil boom era and channels for technology transfer, Working Paper, No. 2020/36, China Africa Research Initiative (CARI), School of Advanced International Studies (SAIS), Johns Hopkins University, Washington, DC.
- 6. Crane, B., Albrecht, C., McKay Duffin K. & Albrecht, C. (2018). China's special economic zones: an analysis of policy to reduce regional disparities, Regional Studies, Regional Science, 5:1, 98-107, DOI: 10.1080/21681376.2018.1430612.
- 7. European Commission (2000). Agenda 2000: for a stronger and wider Union. *Publications Office of the European Union*.
- 8. European Network for Rural Development https://enrd.ec.europa.eu/policy-in-action/rural-development-policy-figures/rdp-summaries en, accessed on 30.10.2022.
- 9. Falahatdoost, S. & Wang, X. (2022). Industrial Park Role as a Catalyst for Regional Development: Zooming on Middle East Countries. Land 2022, 11, 1357. https://doi.org/10.3390/land11081357.
- Farole, T. & Akinci, G. (2008). Special Economic Zones Progress, Emerging Challenges, and Future Directions. World Bank Open Knowledge Repository. DOI: 10.1596/978-0-8213-8763-4
- 11. Fink, M., Loidl, S., & Lang, R. (2012). Community-based Entrepreneurship and Rural Development: Creating Favourable Conditions for Small Businesses in Central Europe (1st ed.). Routledge. https://doi.org/10.4324/9780203108116.
- 12. LCAR (Local Council of Ariceștii-Rahtivani) (2022), https://comunaaricestiirahtivani.ro/hotarari/, https://www.arhiva.comunaaricestiirahtivani.ro, accessed on 10.11.2022.
- 13. LCB (Local Council of Buşteni) (2022), https://orasul-busteni.ro/transparenta-decizionala/documente-si-informatii-financiare/, accessed on 10.11.2022.
- 14. LCS (Local Council of Sinaia) (2022), https://www.primaria-sinaia.ro/category/hcl/, accessed on 10.11.2022.
- 15. Lyapin, A. (2020). Development of investment zones in the renewal model for a former industrial city: Case-Study of Chattanooga. IOP Conference Series: Materials Science and Engineering Open Access Volume 880, Issue 19 July 2020 Article number 012067 3rd International Scientific and Practical Conference on Investments. Construction. Real Estate: New Technologies and Targeted Development Priorities 2020, ICRE 2020 Irkutsk. DOI 10.1088/1757-899X/880/1/012067
- 16. Kim, J.I. (2015). Lessons for South Asia from the Industrial Cluster Development Experience of the Republic of Korea. Asian Development Bank.
- 17. Knapp, M. & Sawy, A. (2021). Coworking Spaces in Small Cities and Rural Areas: A Qualitative Study from an Operator and User Perspective. DOI:10.1007/978-3-030-62167-4\_7.
- 18. Maticiuc, M. & Constantin, A. (2017). Industrial Parks and Business Incubators as Clustering Incipient Forms. Quality Access to Success.
- 19. MDLPA (2022). https://www.mdlpa.ro/pages/parcuriindustriale, accessed on 30.10.2022.
- 20. Memedovic, O. (2018). LEVERAGING A NEW GENERATION OF INDUSTRIAL PARKS AND ZONES FOR INCLUSIVE AND SUSTAINABLE DEVELOPMENT. United Nations Industrial Development Organization, 2018. Strategic Framework for Leveraging a New Generation of Industrial Parks and Zones for Inclusive and Sustainable Development. Vienna.

- 21. Merrell, I., Phillipson, J., Gorton, M., & Cowie, P. (2022). Enterprise hubs as a mechanism for local economic development in rural areas. Journal of Rural Studies. 93. 81-91. DOI: 10.1016/j.jrurstud.2022.05.016.
- 22. Miao, J.T. (2021). Understanding the soft power of China's Belt and Road Initiative through a discourse analysis in Europe, Regional Studies, Regional Science, 8:1, 162-177, DOI: 10.1080/21681376.2021.1921612.
- Nazarczuk, J. & Cicha-Nazarczuk, M. (2021). What are the Key Location Factors for Firms in Special Economic Zones? Evidence from Poland. EUROPEAN RESEARCH STUDIES JOURNAL. XXIV. 147-160. 10.35808/ersi/1955.
- 24. OECD (2020), Rural Well-being: Geography of Opportunities, OECD Rural Studies, OECD Publishing, Paris. https://doi.org/10.1787/d25cef80-en
- 25. Pakdeenurit, P., Suthikarnnarunai, N. & Rattanawong, W. (2014). Special Economic Zone: Facts, roles, and opportunities of investment. Proceedings of the International MultiConference of Engineers and Computer Scientists 2014 Vol II, IMECS 2014, March 12 14, 2014, Hong Kong.
- 26. Parente, F. (2019). Inequality and social capital in the EU regions: a multidimensional analysis, Regional Studies, Regional Science, 6:1, 1-24, DOI: 10.1080/21681376.2018.1558105.
- Pinna, S. (2016). Alternative Food Networks, agro-biodiversity and landscape protection: lessons from two rural parks, Regional Studies, Regional Science, 3:1, 455-462, DOI: 10.1080/21681376.2016.1244488
- 28. Rasel, S. & Kalfadellis, P. (2021). Global and non-global city locations: the effect of clusters on the performance of foreign firms, Regional Studies, Regional Science, 8:1, 88-108, DOI: 10.1080/21681376.2021.1898461
- 29. SINTACT, (2000). Law no. 134 of July 21, 2000 regarding the regime of industrial parks
- 30. SINTACT, (2001). Government Ordinance no. 65 of August 30, 2001 regarding the establishment and operation of industrial parks.
- 31. SINTACT, (2002). Government Ordinance no. 14 of January 24, 2002 regarding the establishment of scientific and technological parks.
- 32. SINTACT, (2003). Government Emergency Ordinance no. 115 of October 24, 2003 regarding the privatization of the "Roman" Commercial Company S.A. Braşov and the establishment of the industrial park on the platform of Commercial Company "Roman" S.A.
- 33. SINTACT, (2003, 2015). Law no. 571/2003 regarding the Fiscal Code; Law no. 227/2015 regarding the Fiscal Code.
- 34. SINTACT, (2013). Law no 186/2013 regarding the establishment and operation of industrial parks.
- 35. Talbot, S. (2016). Creating a smart rural economy through smart specialisation: the micro-sphere model. Local Economy, 31(8), 892-919. https://doi.org/10.1177/0269094216678601
- 36. Taş, N. (2019). Note Presentation: Role and impact of Industrial Parks in national strategies and plans for sustainable development. International Conference UNIDO: "Industrial Parks for Inclusive and Sustainable Industrial Development", Lima, Peru, 11-12 June 2019.
- 37. Topno, A. (2005). What is Special Economic Zone? The Economic Times | News English Edition. INDIATIMES NEWS NETWORK

- 38. Tritto, A. & Camba, A. (2022). State-facilitated Industrial Parks in the Belt and Road Initiative: Towards a framework for understanding the localization of the Chinese development model, World Development Perspectives, Volume 28, 100465, DOI.org/10.1016/j.wdp.2022.100465.
- 39. UE Interreg Europe. https://www.interregeurope.eu/project-ideas/smart-sustainable-industrial-zones-in-rural-areas, accessed on 30.10.2022.
- 40. UNIDO (2002). Industrial Development Report 2002-2003. Vienna: UNIDO.
- 41. UNIDO (2019). International Conference: "Industrial Parks for Inclusive and Sustainable Industrial Development", Lima, Peru, 11-12 June 2019. https://www.unido.org/international-conference-industrial-parks-inclusive-and-sustainable-industrial-development
- 42. United Nations (1992). Agenda 21. United Nations Conference on Environment & Development Rio de Janeiro, Brazil, 3 to 14 June 1992. https://sdgs.un.org/sites/default/files/publications/Agenda21.pdf
- 43. United Nations (2015). Transforming our World: The 2030 Agenda for Sustainable Development. Seventieth session Resolution adopted by the General Assembly on 25 September 2015 United Nations.
- 44. Ven, S. (2018). Special Economic Zones as a Tool for Accelerating Economic Growth: A Literature Review. 22. 7-10.
- Wang, S., Meng, G., Zhou, J., Xiong, L., Yan, Y. & Yu, N. (2021). Analysis on geoeffects of China's overseas industrial parks: A case study of Cambodia Sihanoukville Special Economic Zone. Journal of Geographical Sciences. 31. 712-732. DOI:10.1007/s11442-021-1867-3
- 46. Wubayehu, T.Z. (2020). CONCEPTUALIZING RURAL DEVELOPMENT IN THE TWENTY-FIRST CENTURY. International Journal of Agricultural Extension and Rural Development Studies, Vol.7, No.4, pp.18-26, December 2020. Published by ECRTD-UK.
- 47. Zakharov, S., Ivanov, M., Rebrikova, A. & ShuiYao, X. (2021). Special economic zones and the role of construction industry enterprises in their creation. IOP Conference Series: Earth and Environmental Science. 751. 012187. 10.1088/1755-1315/751/1/012187.