

E-SMART Assessment for Rural Areas (Case Study of Veliko Tarnovo Region, Bulgaria)

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Abstract. *The research topic is motivated by the fact that rural areas in Bulgaria are lagging behind in their economic, social and territorial development compared to urban areas, despite European Union support policies for regional development and cohesion. Regardless of the fact that more and more the specialized literature investigating the development of rural areas emphasizes multifaceted factors, including environmental, social and technological aspects, there is a lack of a complex approach to analysis and assessment of their condition. Therefore, the authors set out to develop and demonstrate the application of a comprehensive E-SMART evaluation model based on a combination of 6 groups of factors with a significant impact on the socio-economic development of rural areas. The approbation of the toolkit was carried out in the seven rural municipalities in the Veliko Tarnovo region. The analysis of the results of the groups of factors – economic, social, manufacturing, agriculture, resources and technologies, as well as the complex indicator E-SMART-score, reveals the general and specific problems, as well as the competitive advantages of the rural areas included in the analysis. E-SMART model can be used as a reliable tool to increase the administrative capacity of municipalities when making strategic decisions for the development of the region.*

Keywords: rural areas, social and economic development, global challenges, innovation, and green transition.

Introduction

Rural areas are characterized by a potential that is often underestimated. This leads to deepening of their socio-economic problems and increasing disintegration between urbanized centres and

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rural areas. The motive for this study is that a large part of Bulgaria's territory falls within the definition of rural areas¹. 232 municipalities, which are 87.5% of the total number of Bulgarian municipalities are categorized as rural municipalities. They occupy 80.9% of the country's territory (Ilcheva, M. et.al. 2022). Most of them face specific challenges such as negative demographic processes, a low level of entrepreneurial activity, inefficient use of local resources, missed opportunities to create added value for the region, a lack of basic services for the population. The future development of rural areas in Bulgaria depends to a large extent on their ability to reverse the trend – retain the economically active population, attract investments in productive assets and infrastructure, effectively use local resources and specialize in traditional productions.

In this context the paper presents a tool for socio-economic analysis of rural areas, called E-SMART model. The structure of the model is based on a combination of groups of key indicators that have a significant impact on the socio-economic development of rural areas. The main objective of the E-SMART model is to assess the potential of municipalities by providing a snapshot of the state and opportunities for their development. The methodology adopted enables the identification of unused resources and assets that could achieve balanced territorial development and revitalize rural areas.

The main thesis considered in this research is that E-SMART tool can be used as a reference model for configuring a snapshot of the current development of the selected rural municipalities, their opportunities and unused potential for future development. However, the model can be used to elaborate a scenario for an integrated rural development following the dynamics of the six groups of indicators – economic and social factors, manufacturing, agriculture, resources and technologies. The six indicators can be classified as driving forces for productive and social capital, and assets of the region which can be turned into competitive advantages.

The paper is structured as follows: Section 2 provides a brief literature review of the composition of E-SMART tool. Section 3 presents the proposed conceptual E-SMART methodology and its application for the seven rural municipalities within Veliko Tarnovo region. Finally, the conclusion discusses the role of the model in assessing the rural areas, also providing limitations of the study and proposing further researches.

Literature review

Development of rural areas has been primarily associated with economic development in the past. Nowadays researchers pay more attention to the global effort to use economic development as a driver for social and community development with a focus on human capital and individual wellbeing. The OECD (2018) conceptualizes such development mainly in terms of efforts to reduce regional disparities by supporting economic activities within regions, particularly those relating to infrastructure projects, employment and stimulating investment conditions. Greater emphasis is placed on the broader aspects of regional and local development as well as on non-economic factors relating to health, quality of life and wellbeing (Gray et al, 2012).

However, while investigating the theoretical background of key frameworks of assessment of rural areas, we can apply the green growth concept and smart development concept. Green growth presents a new approach to economic growth and puts human well-being at the center of development, while ensuring that natural assets continue to provide the resources and environmental services to support sustainable development. Governments that put green growth at

¹ Rural areas are the municipalities (LAU) in which there is no settlement with a population of more than 30,000 people.

the heart of development can achieve sustainable economic growth and social stability, safeguard the environment and conserve resources for future generations (OECD, 2013).

The World Bank puts a strong emphasis on the rural infrastructure as a critical element of economic and social development. When there are adequate communication networks, roads, storage facilities and electricity supply, rural farmers and communities can be compatible at the food market (World Bank, 1999).

Smart development is another commonly used term as it has been applied extensively in the second decade of the new millennium, especially following the adoption of Europe 2020 growth strategy (Pelucha, Kasabov, 2020). According to McCann and Ortega-Argiles (2015) smart growth is closely related to embeddedness, relatedness and connectivity and assesses the level of innovation and knowledge economy.

The economic dimensions of rural development examine mainly the role of agriculture in rural economies, the main economic drivers as number of enterprises and level of foreign investment and the external resources that can be mobilized for local development. Social dimensions of rural development investigate issues related to education, healthcare, and social services in rural areas, explore the role of social capital and community participation and address demographics.

While developing a methodology for assessment of rural areas in Bulgaria the following theories were encompassed in E-SMART methodology:

- Theory for diffusion of innovations of Everett Rogers – Rogers' theory explores how new ideas, innovations, and technologies spread within a society. In rural development, this theory is often applied to understand the adoption and diffusion of agricultural practices, technologies, and development initiatives (Rogers, 1962).
- Participatory rural appraisal of Robert Chambers – Chambers is known for his work on participatory approaches in rural development. PRA emphasizes the importance of involving local communities in the planning and decision-making processes, recognizing their knowledge and perspectives (Chambers, 1994, 953-969).
- Theory of capability approach of Amartya Sen – capability approach focuses on enhancing people's capabilities to lead the kind of lives they value. In the context of rural development, this approach emphasizes the importance of providing opportunities and resources that empower individuals and communities (Sen, 1985).

Methodology

For the purposes of the study of the socio-economic condition of the municipalities, the E-SMART model is developed, which includes indicators from the following groups – *Economic, Social, Material, Agricultural, Resources and Technologies*.

The model is applied to the rural municipalities of the Veliko Tarnovo region, which are 7 out of 10 in total. As a foundation for constructing the final indicator of the E-SMART model, the logic of multidimensional models for assessing the financial condition of enterprises, combining several financial coefficients, is used. The foundation of such a model is the Z-score model of the father of the modern theory of predicting financial bankruptcy, E. Altman (2000, 9, 13), and the idea embedded in it is combined with the logic of enterprise ranking models (Kasarova, 2010; Kasarova, 2005, 30-31).

The complex assessment indicator for each municipality is called E-SMART-score, and it is calculated based on the scores for each group of indicators. The score for the relevant group of

indicators, in turn, is the sum of the values of the individual indicators. For example, for municipality X it is calculated using the formula:

$$(1) E - SMART_X = E_X + S_X + M_X + A_X + R_X + T_X = \\ = \sum_{i=1}^5 w_i E_i + \sum_{j=1}^4 w_j S_j + \sum_{k=1}^4 w_k M_k + \sum_{l=1}^4 w_l A_l + \sum_{m=1}^4 w_m R_m + \sum_{n=1}^4 w_n T_n$$

As can be seen from the formula, 5 significant ones were selected in the group of economic indicators, and 4 indicators in the remaining groups. The indicators are selected to meet the following conditions:

- To reflect reliably the relevant aspect of the state of the municipality;
- Information on the indicator to be collected periodically, i.e. annually, for all municipalities;
- If possible, not be affected by the scale of the municipality, such as area or population;
- Not to distort the final assessment of the state of the municipality.

Before applying the formulas for calculating the relevant aspect of the state of the municipality (for example, E, S, M, A, R, T) and for the complex assessment (E-SMART), the so-called normalization of the indicator is carried out. The purpose is to remove the influence of the different measurement units (numbers, BGN, sq. km, etc.) and to reflect the relative strength of the indicator for the specific municipality compared to other municipalities. This is done by dividing the value of the indicator by the average arithmetic value obtained on the basis of all rural municipalities in the region.

Another element of the algorithm, as seen in the formula, is the weighting of each of the indicators with a corresponding weight coefficient w . This coefficient has a value from 1 to 5 for indicators in the economic group and from 1 to 4 for indicators in all other groups, i.e. according to the number of indicators in the groups. The highest weight (5 or 4) is given to the indicator rated the highest by the experts, and the lowest (1) to the indicator rated the least important.

The experts assessing the importance of the indicators in the groups, respectively their weight, are employees in the administrations of the studied municipalities, selected by the method of random selection, i.e. a stratified random sample is formed. In this case, a total of 35 expert responses are received regarding the significance of each indicator in each of the groups.

After the evaluations characterizing the relevant aspects of the state and the complex evaluation indicator E-SMART are calculated for each of the municipalities, comparisons can be made by separate groups of indicators, i.e. aspects of socio-economic status as well as in general. The municipality with the best complex indicator E-SMART is the most successful rural municipality. Accordingly, reserves can be sought to increase the complex indicator of each municipality, as well as research can be done in a dynamic plan.

Results and discussions

MS Excel™ is used to enter, adjust, and transform the initial data, calculate the scores and present the results, with the information referring to 2022. The scores by individual groups are calculated and illustrated graphically without using weights for the individual indicators, after which the E-SMART complex indicator is calculated when weighted with the coefficients, according to the methodology. The sources of data are the official pages of the respective municipalities, the published profiles of the municipalities in Bulgaria by the Institute for Market Economy (IME, 2024) and the data of National Statistics.

Indicators from Group E

For the analysis of the economic situation (group E), considering the restrictive conditions, 5 indicators are selected using the weighting factors awarded, as follows: average salary in the municipality with a weight of 4; employment ratio with a weight of 5; expenditure on fixed tangible assets per capita with a weight of 1; share of own revenues in the municipal budget receipts with a weight of 3; coverage of costs for local activities with revenues with a weight of 2.

In the pilot study, the indicator "Foreign direct investments" was also included, but due to the lack of data for all municipalities, the delay in the effect of the investments, as well as the resulting unjustified distortion (overestimation) of the assessment for economically underdeveloped municipalities, the indicator is ignored.

Ultimately, the presented in Figure 1 results for group E demonstrate the complex leading place of the municipality of Lyaskovets, followed by the municipalities of Pavlikeni, Polski Trambesh, Strazhitsa, Elena, as well as last places for the municipality of Suhindol and the municipality of Zlataritsa. The position of the individual bars relative to 1 indicates whether the indicator for the specific municipality is significantly greater or less than the average for the investigated municipalities. In this regard, the municipalities of Lyaskovets and Pavlikeni again stand out, where only one of the indicators is slightly below the average for the whole – respectively the coverage of the costs of local activities with revenues (the municipality of Lyaskovets) and the share of own revenues in the total receipts (municipality Pavlikeni).

The indicators related to the municipal budgets included in this group illustrate the potential of the respective municipality to generate income and to be self-financed, as well as to receive subsidies from the central government and to utilize funds from the European Union funds for investment purposes. The municipalities of Lyaskovets, Pavlikeni and Polski Trambesh are the most effective in this case.

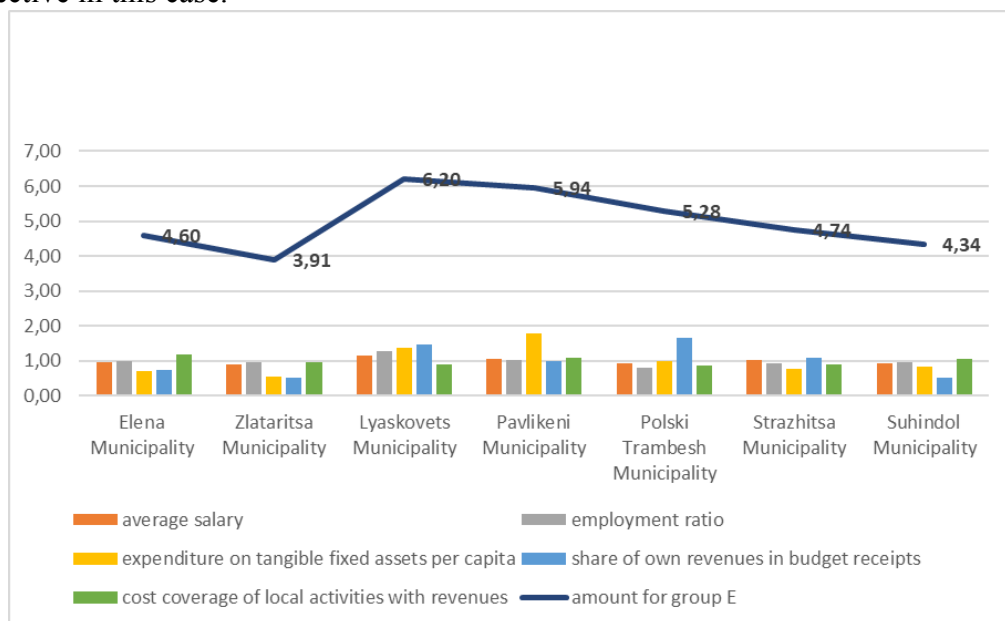


Figure 1. Economic indicators summary (group E)

Source: Authors' own research.

The use of weighting coefficients when calculating the final score for group E does not change the ranking of the included municipalities but shows to a greater extent the differentiation

between them by economic status (Table 1) with a dispersion rank between the first and last municipality equal to 6.19 points (18.68 for the municipality of Lyaskovets against 12.49 for the municipality of Zlataritsa).

Table 1. Final assessment of the economic state without and with the use of weighting coefficients and ranking of rural municipalities

	unweighted amount for group E	ranking position	weighted amount for group E	ranking position
Elena Municipality	4.60	5	14.15	5
Zlataritsa Municipality	3.91	7	12.49	7
Lyaskovets Municipality	6.20	1	18.68	1
Pavlikeni Municipality	5.94	2	16.30	2
Polski Trambesh Municipality	5.28	3	15.56	3
Strazhitsa Municipality	4.74	4	14.69	4
Suhindol Municipality	4.34	6	13.12	6

Source: Authors' own research.

Indicators from Group S

For the analyses of social indicators (group S) we have taken four summarized indicators that provide the basis for an objective comparison of the social development of the selected rural areas. These indicators include the number of NGOs per 10 000 inhabitants (with a weight of 1); proportion of population up to 65 years (with a weight of 4); number of students in mainstream schools (with a weight of 3) and social services (with a weight of 2). The unweighted values of the indicators are presented in Figure 2.

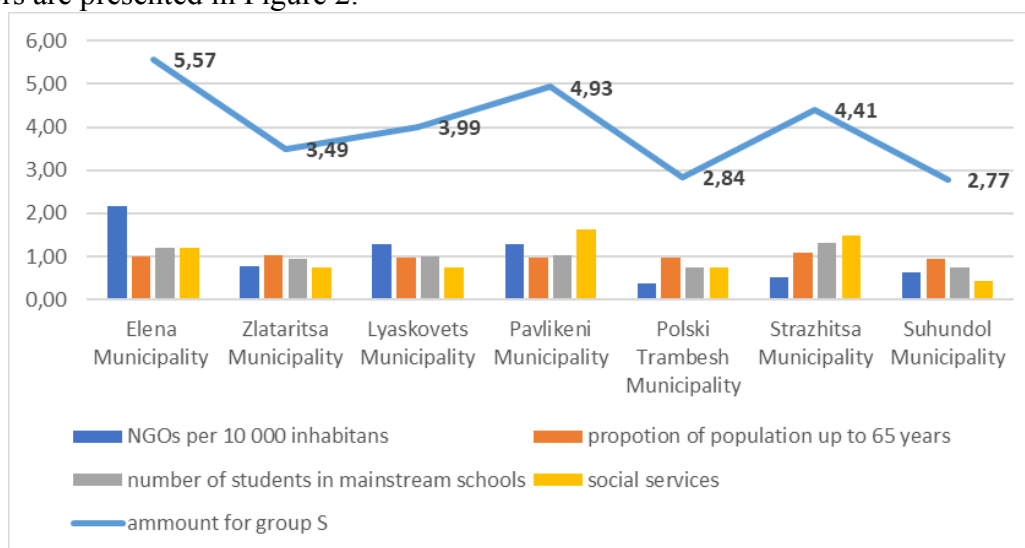


Figure 2. Social indicators summary (group S)

Source: Authors' own research.

Regarding the indicator "Number of NGOs per 10 000 inhabitants" Elena municipality has the highest unweight value (2.16), while Polski Trambesh municipality has the lowest value (0.58),

suggesting a below-average number of non-governmental organisations. This indicator shows the level of civil participation within the area through an organized form of non-governmental entities.

The second indicator for the proportion of population up to 65 years indicates the status of the active population as a key production asset for the economic viability of the area. The results show very close unweight values for three municipalities – Strazhitsa (1.09), Zlataritsa (1.03) and Elena (1.01), while the lowest rate is for Suhindol municipality – 0.94.

The third indicator is related to the number of students in mainstream schools and represents the expectations for the educational level of the population. The analysis of this indicator shows dramatic differences for rural areas with similar features starting from 1.33 for Strazhitsa and 1.20 for Elena municipality and going down to 0.74 for Polski Trambesh and Suhindol.

The last indicator for group S is related to the number of social services in the assessed rural areas demonstrating the availability and capacity of social infrastructure to meet the growing social needs of the population. The highest number of social services is in Pavlikeni municipality (11 social services) and Strazhitsa municipality (10 social services). While at the bottom is Suhindol municipality with 3 social services.

The sum of indicators from group S provides an overall assessment of social development and the level of social capital in each rural municipality. The highest value of social indicators is 5.57 for Elena, while 4 municipalities are with values below the average (Table 2). It should be noted that the municipalities with the highest score Elena, Pavlikeni and Strazhitsa represent rural areas with more vibrant social capital and active population which can be drivers for economic development.

Table 2. Final assessment of social indicators without and with the use of weighting coefficients and ranking of rural municipalities

	unweight amount for group S	ranking position	weighted amount for group S	ranking position
Elena Municipality	5.57	1	12.21	1
Zlataritsa Municipality	3.49	5	9.23	5
Lyaskovets Municipality	3.99	4	9.67	4
Pavlikeni Municipality	4.93	2	11.56	3
Polski Trambesh Municipality	2.84	6	7.98	6
Strazhitsa Municipality	4.41	3	11.81	2
Suhindol Municipality	2.77	7	7.53	7

Source: Authors' own research.

It should be noted that the use of weighted coefficients leads to a change of places in the ranking of the municipalities of Pavlikeni and Strazhitsa which are ranked 2 and 3. The reason for this assessment is the highest result for Pavlikeni in the criteria for availability of social services, while Strazhitsa keeps the leading position in the number of students in mainstream schools and the share of the population up to 65 years, which are the indicators assessed with the highest weight according to experts.

Indicators from Group M

The analysis of group M (manufacturing) is carried out using four indicators: the number of enterprises per 1,000 people with a weight of 1; the output per capita with a weight of 2; the added value per capita with a weight of 3; the enterprise turnover per capita with a weight of 4.

In this group, the complex leading place is for the municipality of Lyaskovets, which several times overtakes all other municipalities. The graphics shows the balanced development of the indicators in Lyaskovets municipality and all of their values are above the average. Furthermore, three of the indicators – the output per capita in thousands of BGN, the added value per capita in thousands of BGN, the enterprise turnover per capita in thousands of BGN, are two times above the average. Pavlikeni and Strazhitsa municipalities also show good performance with indicator values all above average. The least performing municipality in this group of indicators is Zlataritsa municipality, whose indicators are nearly a quarter of the average for the group. An exception is the indicator of the number of enterprises per 1000 people, which is two thirds of the average.

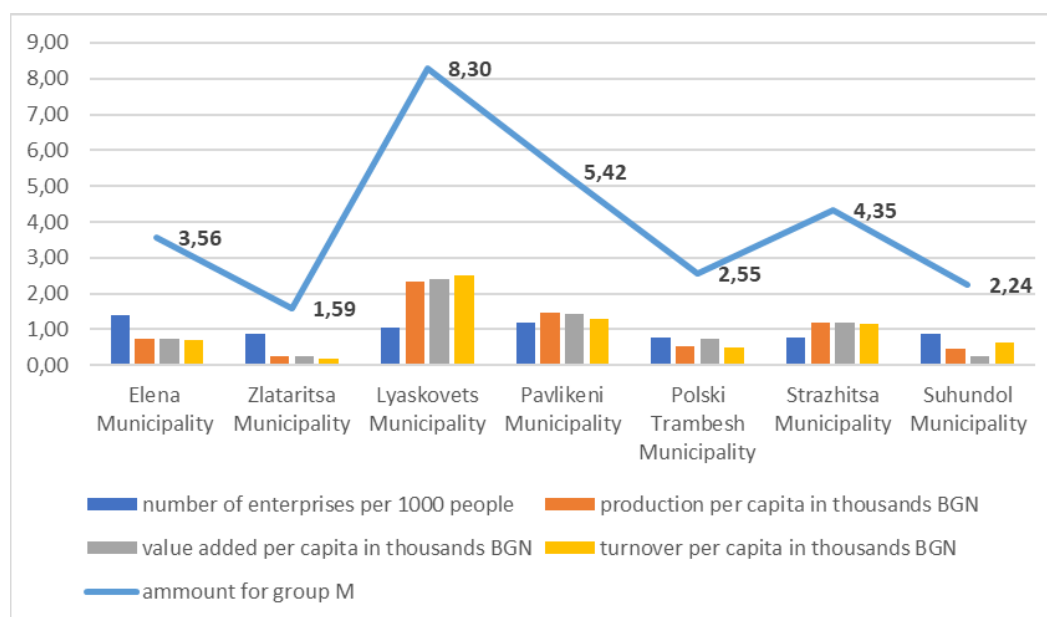


Figure 3. Manufacturing indicators summary (group M)

Source: Authors' own research.

The ranking of municipalities when using weighted coefficients remains unchanged compared to unweighted coefficients. However, it shows the bigger differentiation between municipalities by manufacturing status (Table 3) with a dispersion rank between the first and last municipality equal to 20.02 points (22.96 for the municipality of Lyaskovets against 2.94 for the municipality of Zlataritsa).

Table 3. Final assessment of the manufacturing component without and with the use of weighting coefficients and ranking of rural municipalities

	unweight amount for group M	ranking position	weighted amount for group M	ranking position
Elena Municipality	3.56	4	7.84	4
Zlitaritsa Municipality	1.59	7	2.94	7
Lyaskovets Municipality	8.30	1	22.96	1
Pavlikeni Municipality	5.42	2	13.68	2
Polski Trambesh Municipality	2.55	5	6.03	5
Strazhitsa Municipality	4.35	3	11.41	3
Suhindol Municipality	2.24	6	5.14	6

Source: Authors' own research.

Indicators from Group A

For the analysis of agriculture (group A), 4 indicators were selected using the weighting factors awarded as follows: number of farms per 1000 inhabitants with a weight of 4; share of agricultural land from the total area of the municipality with a weight of 2; share of occupied land from the total area of agricultural land with a weight of 1; animal units weighing 3.

The unweight values of the indicators are presented in Figure 4.

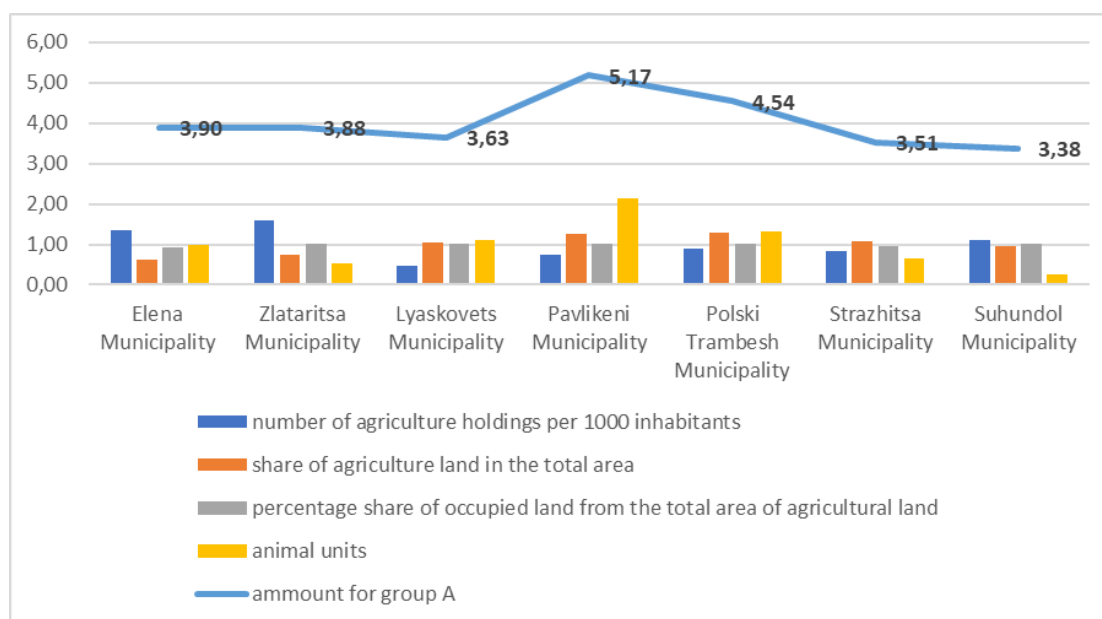


Figure 4. Agricultural indicators summary (group A)

Source: Authors' own research.

Regarding the indicator "Number of agricultural holdings per 1000 inhabitants" Zlitaritsa Municipality has the highest unweight value (1.59), indicating an above-average number of agricultural holdings in relation to its population. Lyaskovets has the lowest value (0.47), suggesting a below-average number of agricultural holdings concerning its population.

Larger values suggest that a significant portion of residents in the area are employed in agriculture. Higher values also imply smaller farms compared to areas with lower values, making

the region more accessible for agricultural activities. It can be considered that the barriers to entering industry are lower in the direction of the regions where agricultural holdings are grouped.

The largest share of agricultural areas from the total area is observed in the municipalities of Pavlikeni (1.26) and Polski Trambesh (1.29). This shows that agriculture plays a more significant role in the economy of these municipalities.

As for the percentage share of occupied land from the total area of agricultural land, all municipalities except Elena (0.91) and Strazhitsa (0.95) fall slightly above the average value of the indicator. The absence of significant discrepancies means that the municipalities are close and at the level of the potential of using the available agricultural land.

In terms of animal units, Pavlikeni Municipality has the highest value of the indicator - 2.15. This is significantly above the average resilience, indicating a much higher intensity of livestock production compared to all other communities, indicating a significant importance in this area of livestock production and related activities. Very high stocking densities, depending on how they are kept, can raise concerns about overgrazing and environmental degradation. The too high value of this municipality significantly raises the average value of the indicator. In Polski Trambesh, the reported value is also above the average level (1.32). At the other end of the scale is Suhindol with a value of 0.27. The significantly lower density of animals in the middle direction indicates a low dependence of the area on animal husbandry and contact with it for production activities.

The sum of indicators from group A provides an overall measure of agricultural activity and sustainability in each municipality. The average value is 4, helping to identify municipalities above or below the average (Table 3).

It should be noted that the municipalities with the highest score are Pavlikeni and Polski Trambesh. It is interesting that in them the value of the indicator "Number of agricultural holdings per 1000 inhabitants" is the lowest compared to all other regions. At the same time, the indicators for the occupied agricultural area and animal units are the highest.

Table 4. Final assessment of the agricultural state without and with the use of weighting coefficients and ranking of rural municipalities

	unweight amount for group A	ranking position	weighted amount for group A	ranking position
Elena Municipality	3.90	3	10.58	3
Zlataritsa Municipality	3.88	4	10.45	4
Lyaskovets Municipality	3.63	5	8.26	6
Pavlikeni Municipality	5.17	1	12.94	1
Polski Trambesh Municipality	4.54	2	11.17	2
Strazhitsa Municipality	3.51	6	8.34	5
Suhindol Municipality	3.38	7	8.25	7

Source: Authors' own research.

Although the indicator "Number of agricultural holdings per 1000 inhabitants" has the greatest weight among the four indicators, the municipalities of Pavlikeni and Polski Trambesh retain the first positions. The other weighted indicators make a significant contribution to their results and above all – the share of the agricultural area of the total area of the municipality and the livestock units. This shows an effect of consolidation of production on its economies of scale. In

order to establish this statement with greater accuracy, additional qualitative and quantitative assessments are unnecessary. However, such assessments could potentially provide more nuanced insights into the specific dynamics. The research evidence supports the idea that larger-scale agricultural units can be more economically viable.

The use of weighted coefficients leads to a change of places in the ranking of the municipalities of Strazhitsa and Lyaskovets. Weighting helps to balance action on the included indicators, some of which have higher values or greater variability than others, reflecting the perceived priorities of the subject being evaluated. In this case, Strazhitsa was replaced by Lyaskovets, respectively, in the unweight and weighted values, since the indicator with the greatest weight - "Number of agricultural holdings per 1000 people of the population" has almost twice the value in Strazhitsa. This shows the relatively easier access to agriculture in this municipality. There are no changes in the ranking of the other municipalities. The dispersion rank between the first and last municipalities, respectively Pavlikeni with 12.94 and Suhindol with 8.25, is 4.69.

Indicators from Group R

The assessment of the fifth component related with natural resources and assets of the rural areas comprises of four indicators (group R) as follows: number of accommodation establishments with a weight of 2; number of natural landmarks with a weight of 3; connectivity and good infrastructure with a weight of 4; number of cultural and historical sites with a weight of 3.

The composition of the indicator represents a summarized assessment of the natural resources of the municipalities, linked with their tourism potential and the status of the infrastructure in terms of transport and Internet connectivity. The unweighted values of the indicators are presented in Figure 5.

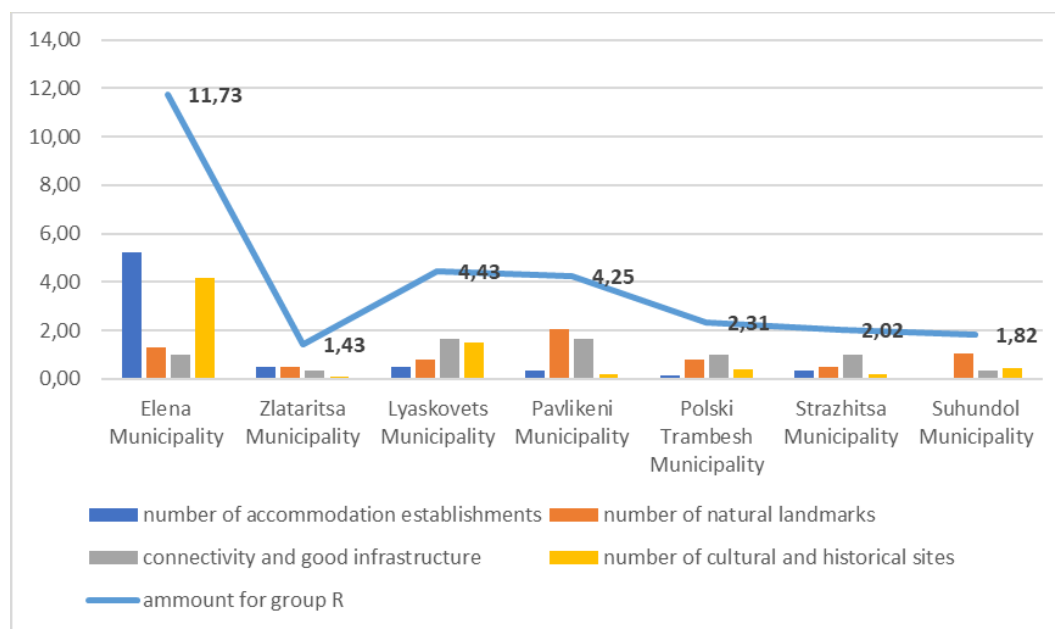


Figure 5. Resource indicators summary (group R)

Source: Authors' own research.

Regarding the indicator "Number of accommodation establishments" Elena Municipality has the highest unweight value (5.25) and 33 accommodation places, while all other municipalities

have results in the range of 0 to 0.48. This indicator demonstrates the very well-developed tourism of this area with a potential to be the driving force for the whole region.

The second indicator is related with the number of natural landmarks as a main source for the development of close to nature outdoor activities and tourism. Surprisingly Pavlikeni municipality has the highest score of 2.07, followed by Elena with 1.30. The two municipalities are with lowest score of 0.52 representing only two natural landmarks in the municipalizes of Zlataritsa and Strazhitsa.

The third indicator is assessing the transport and internet connectivity and the status of infrastructure as a main prerequisite for touristic development of the rural areas. In the ongoing digital transformation of all sectors in Bulgaria the basic Internet connectivity is becoming a critical factor for local development. The analysis of this indicator shows that the assessed rural areas can be divided into three main groups – with a very well-developed infrastructure and connectivity (Pavlikeni and Lyaskovets – score 1.67), areas with medium connectivity (Elena, Strazhitsa and Polski Trambesh – score 1), the most deprived areas in terms of connectivity and infrastructure - the municipalities of Suhindol and Zlataritsa – with a score of 0.33.

The last indicator for group R is related to the number of cultural and historical sites in the assessed rural areas demonstrating the capacity of cultural and historical heritage that can be turned into a competitive advantage of the rural areas. The highest number of cultural and historical sites is in Elena municipality (600 sites) and Lyaskovets municipality (217 sites). The lowest score of this indicator is for Zlataritsa with only 15 cultural and historical sites.

The sum of indicators from group R provides an overall assessment of local resources that can be used for tourism development and turn it into an income generation activity for people from rural communities. The highest value of resources indicators is 11.73 for Elena, while two municipalities – Zlataritsa and Suhindol are with an overall score below 2 (Table 5). It should be noted that the municipalities with the highest score Elena, Lyaskovets and Pavlikeni represent rural areas with a high potential for tourism development based on local traditions, folklore, cuisine, and cultural heritage.

Table 5. Final assessment of the resources without and with the use of weighting coefficients and ranking of rural municipalities

	unweight amount for group A	ranking position	weighted amount for group A	ranking position
Elena Municipality	11.73	1	30.94	1
Zlataritsa Municipality	1.43	7	4.16	7
Lyaskovets Municipality	4.43	2	14.49	2
Pavlikeni Municipality	4.25	3	14.11	3
Polski Trambesh Municipality	2.31	4	7.78	4
Strazhitsa Municipality	2.02	5	6.74	5
Suhindol Municipality	1.82	6	5.78	6

Source: Authors' own research

Indicators from Group T

The analysis of the Technological component is based on four indicators: share of capital expenditure in total expenditure of the municipality with a weight of 1; installed capacity of

renewable sources with a weight of 2; investments in energy efficiency with a weight of 4; free Wi-Fi hotspots with a weight of 3.

They were chosen to compare the progress achieved by the municipalities in implementing new technologies which is key to achieving sustainable rural development. By investing in new technologies and practices, municipalities can improve their energy efficiency, support more rational use of local resources, in particular the deployment of renewable energy sources. This is the way of reducing the reliance and dependence on outside supplies. Technologies can also help connect rural communities with the other world, providing online access to markets, information, and services that can improve quality of life for all involved.

The results show (Figure 6) the different approach adopted by each of the analyzed rural municipalities. The complex leading place is for Zlataritsa municipality (5.9 points), which is mainly due to the installed capacity of renewable energy indicator. Its values are four times greater than the average for the municipalities included. At the same time, Zlataritsa municipality ranks last in terms of investments in energy efficiency together with three other municipalities Elena, Strazhitsa and Polski Trambesh. On the contrary Lyaskovets municipality holds the first place in this indicator – over three times above the average. No such striking differences are observed in Pavlikeni municipality that takes second place in the overall ranking. In its case, the values of the four considered indicators are close to the average for the group which is evidence for more balanced implementation and use of technologies. It should be emphasized that all the municipalities under consideration have a close to average level of internet connectivity.

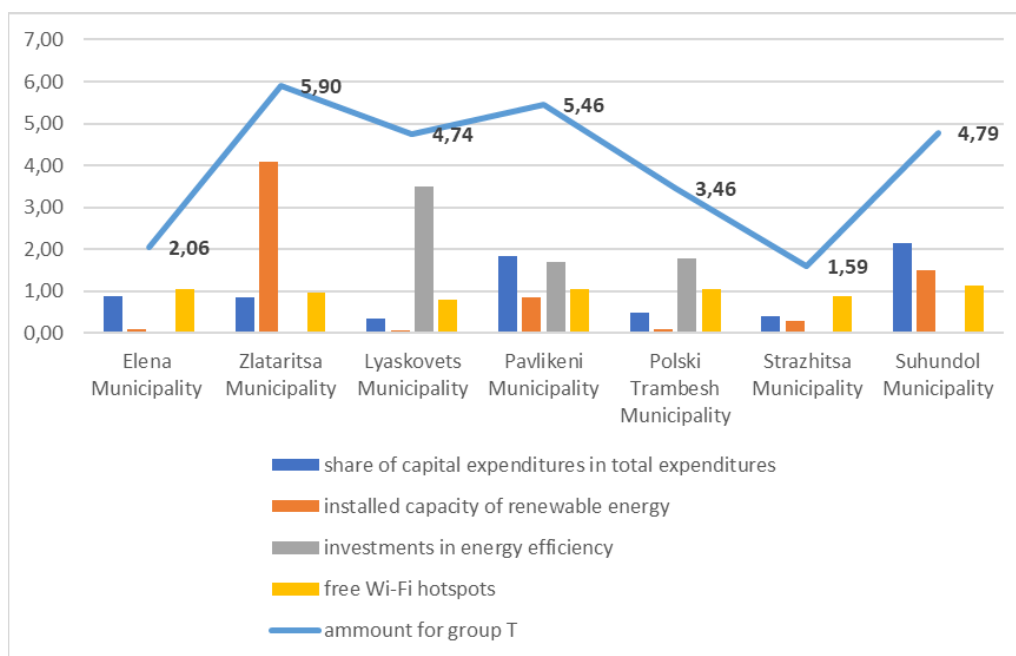


Figure 6. Technological indicators summary (group T)

Source: Authors' own research.

The use of weighted coefficients changes municipalities' places in the ranking (Table 6). Two municipalities move up – the municipality of Lyaskovets from fourth to first place and the municipality of Polski Trambesh from fifth to fourth place respectively. The reason for this is the weight that experts give to the energy efficiency indicator. Its values are the highest in Lyaskovets

municipality, followed by Polski Trambesh municipality. Accordingly, Zlataritsa drops two places from first to third place and Suhindol from third to fifth place since this indicator has zero values for them. Weighting coefficients not only change the ranking of the included municipalities but shows to a greater extent the differentiation between them (Table 6) with a dispersion rank between the first and the last municipality equal to 13.29 points (16.95 for Lyaskovets municipality against 3.66 for Strazhitsa municipality).

Table 6. Final assessment of the technological component without and with the use of weighting coefficients and ranking of rural municipalities

	unweight amount for group T	ranking position	weighted amount for group T	ranking position
Elena Municipality	2.06	6	4.29	6
Zlataritsa Municipality	5.90	1	11.93	3
Lyaskovets Municipality	4.74	4	16.95	1
Pavlikeni Municipality	5.46	2	13.53	2
Polski Trambesh Municipality	3.46	5	11.06	4
Strazhitsa Municipality	1.59	7	3.66	7
Suhindol Municipality	4.79	3	8.59	5

Source: Authors' own research.

E-SMART-score

The complex E-SMART assessment reveals similarities and differences among the rural municipalities involved in the analysis (Figures 7, 8). The leading three municipalities with the highest scores are Lyaskovets municipality (91.01), Pavlikeni municipality (82.12) and Elena municipality (80.01). It is noticed that these three municipalities form a leading group with scores that are significantly ahead compared with the rest four municipalities. The dispersion rank between the third municipality Elena and the fourth municipality Polski Trambesh is 20.42 points while the differentiation between the first and the last municipality Suhindol in the ranking is much greater – 42.60 points.

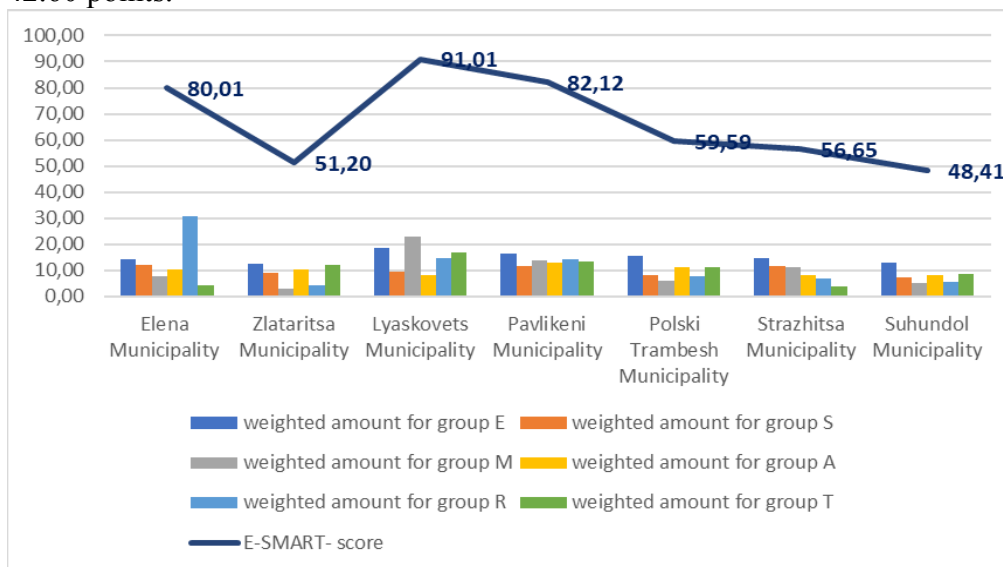


Figure 7. Summary group scores and complex E-SMART score

Source: Authors' own research.

The most successful rural municipality is Lyaskovets with 91.01 points. Indicators from group M (manufacturing factors) contribute significantly to this outcome. This is mainly due to the good results achieved by the enterprises operating within the municipality in particular, indicators for production, added value and turnover per capita. Undoubtedly, the increased business activity within the municipality is stimulated by its geographical proximity to the central city of the region – Veliko Tarnovo (10 kilometres away) as well as to another bigger town – Gorna Oryahovitsa. Respectively, Lyaskovets municipality performs better than the other municipalities in terms of the economic indicators in group E. Its values of the average salary, the employment rate, the expenditure on fixed assets per capita are above the average level for the studied municipalities. Lyaskovets municipality is also a leader in implemented projects for energy efficiency, which contribute to better socio-economic development. It should be noted that although the municipality of Lyaskovets is in first place with 91.01 points in the overall ranking, there is a big difference between the values of its groups of indicators. For example, group A has the lowest value of 8.26 points.

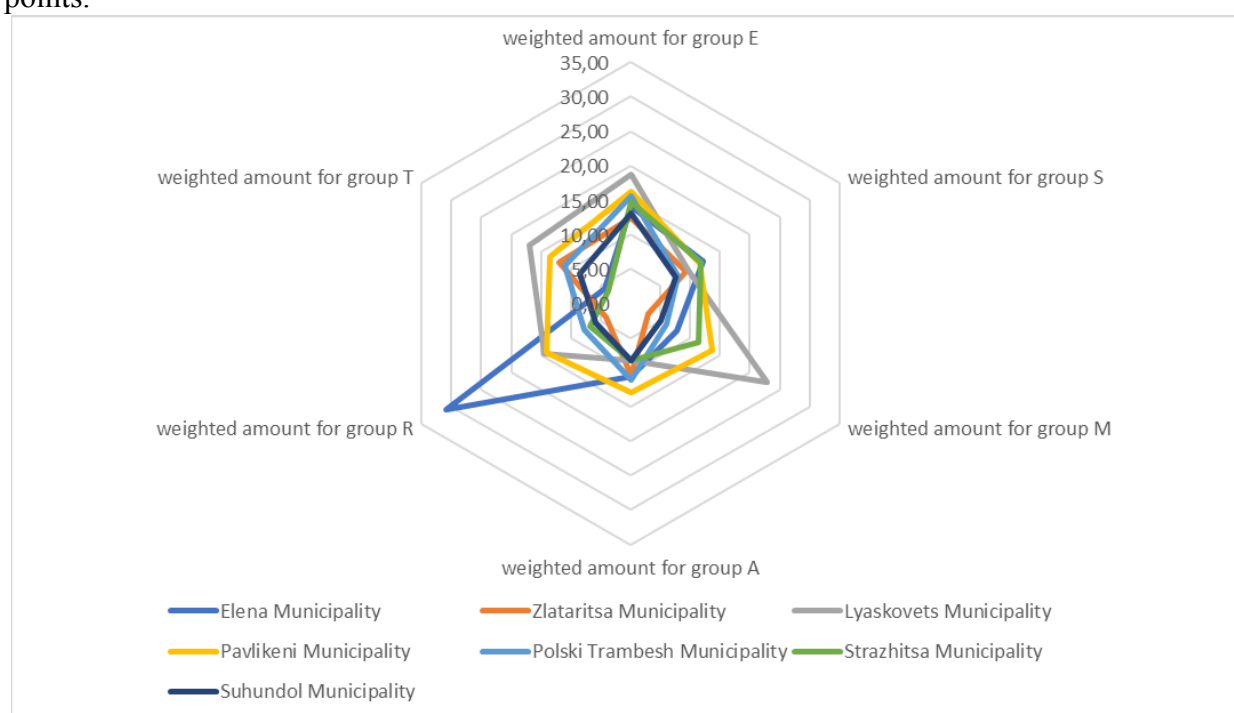


Figure 8. Radar diagram by groups of indicators and municipalities

Source: Authors' own research.

Although it is in second place, Pavlikeni municipality shows a relatively balanced development in all groups of indicators. The difference between the lowest and the highest value of the indicator groups in this municipality is only four points. This municipality has so far managed to make the most of its specific assets but nevertheless there is still much to be done in order to improve the socio-economic conditions in the municipality.

A specific feature of the third municipality in the ranking – Elena municipality, is its highest performance in group R. The municipality has managed to take advantage of its resources and become a tourist center for the region. It has a highly developed accommodation establishment as well as the highest number of cultural and historical sites among all other municipalities.

Conclusion

This paper has the aim of introducing E-SMART model as a tool to capture the dynamics of six indicators that are crucial for the social and economic development of rural areas. Three groups of the indicators have a productive power (economic factors, manufacturing and agriculture), one is related with human capital and two are focused on local assets and opportunities (resources and technology).

The E-SMART tool could be a good reference domain for modelling scenarios for future development of rural areas and can become a design pillar for their integrated development. It could also be considered a strategic tool for smart investment that can boost local development. However we should assume that the practical application of E-SMART model has been introduced as a snapshot of the socio-economic development of the seven rural municipalities of Veliko Tarnovo region. The results of the research demonstrated the main output that the six groups of indicators within E-SMART tool can be classified as driving forces for productive and social capital, and assets of the region, which can be turned, into competitive advantages.

The present research was carried out under the following limitations – the analysis of the seven rural municipalities in Veliko Tarnovo region which covers only one calendar year 2022. The included number of indicators are limited to the available official data. The research team has the ambition to expand the validation of E-SMART methodology by comparing rural municipalities from different regions of Bulgaria in order to obtain a more representative research picture of the development, strengths and weaknesses of rural municipalities. Another direction for future research could be to improve the E-SMART reference model in order to create a reliable mechanism to capture the development and dynamics of rural areas in the short term.

The application of the E-SMART methodology as a tool for complex assessment of the development of rural areas can support and increase the administrative capacity of municipalities in making strategic decisions for the future development of a given region. This could help each municipality reach its potential, and the region to improve its living standards and overall prosperity. Moreover, it can turn into an operation tool for smart rural communities taking the initiative to find practical solutions to challenges and make the most of new opportunities.

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