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The Risks of Smart Cities and the Perspectives of Their Management Based on Corporate Social Responsibility in the Interests of Sustainable Development

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Abstract: Purpose: Bring to light the risks of smart cities and the perspectives of their management. It has been discovered that smart cities are created and developed under the impact of not only technological factors but also social factors. The connection between smart cities and quality of life is systemic (direct and reverse)—the quality of life also specifies the creation and development of smart cities. The impact of the COVID-19 pandemic on the development of smart cities is almost null (smart cities do not depend on the implementation of SDG 3). This paper's originality lies in the description of a new angle of studying smart cities—from the position of risks, and in the determination of the current level of these risks and the dynamics of their change during systematisation and description of the wide international experience of creation and development of smart cities. This paper's uniqueness lies in the development of a new approach to managing the creation and development of smart cities, which is based on corporate social responsibility, thus specifying and ensuring the involvement and important role of the subjects of entrepreneurship in this process. It is proved that the contribution of smart cities to the implementation of the SDGs is much wider and goes beyond the limits of SDG 9—it also extends to SDG 1 and SDGs 11–13.

Keywords: risks; smart cities; corporate social responsibility; sustainable development; SDGs; risk management

JEL Classification: D81; O14; O18; Q01; R51; M14

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1. Introduction

A smart city is a progressive model of the technocratic urban environment, a cyber-physical system at the city level. The transition from traditional cities to smart cities is a strategic initiative of the modern economic systems, which is joined by the growing number of cities around the world. For a national government, the creation of smart cities means support of the national strategy of the digital economy's development and the transition to Industry 4.0, as well as overcoming spatial disproportions (socio-economic inequality) and well-balanced development of territories within a country.

The creation of smart cities provides for their public authorities' better transparency of economic operations and better control, as well as increased control of the city's economy. The advantages include the overcoming of the shadow economy and prevention of violations of law, as well as the increase in the general level of predictability and safety of the city environment as a socio-economic system. The creation of smart cities leads to a significant increase in the competitiveness of territories—their attractiveness for doing business, placement of investments, living (residents do not leave the city and demographic problems are solved), and work (inflow of skilled personnel—labour migrants).

The key mission of smart cities consists in providing advantages for their residents, which ensure the increase in quality of life. There's a whole complex of advantages, from the simplified procedure of taxation and more targeted and effective fight against poverty to expanded opportunities of employment and guaranteed protection of labour rights in the online (more flexible and well-balanced) labour market in smart cities. As for the contribution of smart cities to the increase in quality of life, it is necessary to note their high environmental friendliness.

However, despite their described comprehensive advantages, the process of transition to smart cities is slow, and their number in the world is relatively small. These are mainly large cities (capitals) of the leading digital economies of the world. This phenomenon is not explained by the smart cities concept, according to which their creation is specified by technological factors. That is, according to this concept, if there is the sufficiently developed telecommunication infrastructure and the national programme of digital modernisation of the economy, smart cities should be created everywhere—but this does not take place. Therefore, there are other factors of the creation and development of smart cities (apart from technological) which are not taken into account in the existing concept.

In addition to the described uncertainty of the reasons (factors) for the creation of smart cities, the problem is that the international experience of the creation of the first smart cities shows the contradiction of their consequences. Not all urban communities are interested in the creation of a smart urban environment, and many of them oppose the government initiatives of smart city creation. The most general formulation of the drawback of smart cities is down to violation (erasure) of the limits of privacy and unprotectedness of personal data.

Living under the constant control of "machine vision", which is a usual thing in a smart city, is a serious challenge for culture, social institutes, and human psychology. This challenge requires serious social adaptation and it is unknown whether everyone would pass it and whether there are objective limits of social adoption and support for smart cities. Thus, together with advantages, there are risks of smart cities, without the consideration of which the smart cities concept is not complete and correct.

This leads to the following research question: What are the risks of smart cities and perspectives of risk management? To answer this question, using the existing works (Chiang 2021; Radziejowska and Sobotka 2021; Shimizu et al. 2021), which note that the creation of smart cities requires a certain social readiness and social support, this paper suggests the following hypothesis: quality of life is not just a function of smart cities but also the condition of their creation and development. That is, smart cities, in their turn, are a function of the quality of life—social factors, which determine the risks of the creation and development of smart cities.

The purpose of this paper was to specify the risks of smart cities and the perspectives of risk management. This paper's originality lies in the description of a new angle of studying smart cities—from the positions of risks, and in the determination of the current level of these risks and the dynamics of their change during systematisation and description of the wide international experience of creation and development of smart cities. This paper's uniqueness lies in the development of a new approach to managing the creation and development of smart cities, which is based on corporate social responsibility, thus specifying and ensuring the involvement and important role of the subjects of entrepreneurship in this process.

2. Literature Review

The smart city is a new model of the organisation of the urban economy, which corresponds to the digital technological mode and which emerged and is actively implemented around the world under the impact of the Fourth Industrial Revolution (Deja et al. 2021; García-Retuerta et al. 2022; Verma 2022). That is why smart cities are subject to technological risks, which include the risks of cyber security, risks of failures in the functioning of the telecommunication infrastructure (e.g., failures in the work of the Internet, the Internet of

Things), risks of anthropogenic disasters, etc. (Chen et al. 2022; Dolla et al. 2022; Galego and Pascoal 2022; Holla et al. 2016; Khan et al. 2022; Sarwesh and Mathew 2022).

Taking into account the above technological risks, the authors Ristvej et al. (2020) and Żywiołek and Schiavone (2021) recommend creating a smart city within the "Safety and Security First" concept. However, a smart city is a specific cyber–physical system, which is very different from the most widespread cyber–physical systems: smart companies, the transition to which implies the total automatisation and autonomy of digital devices (their ability to work without human participation) (Inac and Oztemel 2022; Vişan and Ioniţă 2022).

Though the creation of smart cities (as well as smart companies) envisages the increase in the level of economic processes' automatisation, humans are not replaced with machines, but remain in the smart city (Leite 2022; van der Wouden 2022). Due to this, the smart city is a complex socio-economic cyber–physical system (Ahmad et al. 2022; Duygan et al. 2022; Rajawat et al. 2022). When studying it, it is necessary to pay special attention to the social urban environment (Bokhari and Myeong 2022; Singh and Dwivedi 2022).

The "human factor" in the economy is the risk factor, so the smart city should be studied from the positions of risk (Cavada 2022; Miah et al. 2022; Zhang 2022). This paper uses the current concept of smart cities, which is demonstrated in Figure 1.

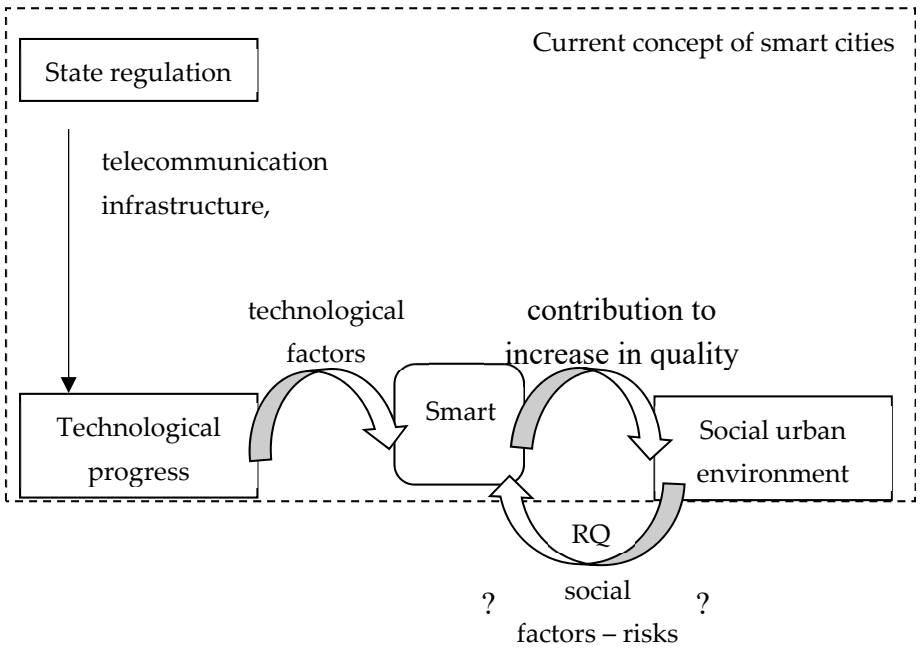

Figure 1. Causal connections of the creation and development of smart cities in their current concept. Source: authors.

As shown in Figure 1, the key provisions of the current concept of smart cities are as follows:

Smart cities are a result of technological progress and they are created and developed under the impact of technological factors (Anwar et al. 2021; Huang et al. 2021; Shahrour and Xie 2021);
The approach to managing the creation and development of smart cities is based on state regulation, aimed at the development of telecommunication infrastructure and regulatory support of smart cities (Peoples et al. 2021; Ptak 2021);
Smart cities improve the social urban environment, contributing to the increase in quality of life of urban dwellers (Keawsomnuk 2021; Rodríguez Bolívar 2021).

According to the current concept, smart cities are the manifestation, and the factors that specify them are concentrated within SDG 9 "Industry, innovation and infrastructure" (Bibri 2021; Ibrahim et al. 2021; Jackson 2021; Mach et al. 2021; Sharma et al. 2021; Trzeciak 2021).

According to the current concept, under the impact of the COVID-19 pandemic, the additional factor of creation and development of smart cities is healthcare, the high level of which provides opportunities for financing of smart cities (Czech and Puszer 2021; Zhang et al. 2021). However, a low level of healthcare and the ensuing serious problems (such as pandemics) slow down the development of smart cities and hinder the creation of new smart cities, causing the movement of resources from telecommunication infrastructure to healthcare and distracting state regulators from the regulatory support of smart cities (Inshakova et al. 2021; Ngo et al. 2021).

The practical experience contradicts the described current concept of smart cities, demonstrating their fragmentary character (incompleteness), insufficient precision, and insufficient correctness. In Russia, a smart city has been created only in Moscow (economic capital) and St. Petersburg (cultural capital). The decree of the Ministry of Construction, Housing and Utilities of the Russian Federation (2021) dated 25 December 2020, No. 866/pr "On adoption of the Concept for the project of digitisation of the city economy 'Smart city'" envisages the creation of smart cities all over the country.

According to the materials of the Institute for Statistical Studies and Economics of Knowledge of the National Research University "Higher School of Economics", the Ministry of Digital Development, Communications and Mass Media and Federal State Statistics Service (Rosstat) (2021), the number of broadband Internet users per 100 people of the population in the Yamalo-Nenets Autonomous Okrug (130.4), Krasnodar Krai (119.5), the Republic of Tatarstan (108.6), Nizhny Novgorod Oblast (118.1), and some other regions and cities is similar to Moscow (127.4) and St. Petersburg (128.0). Therefore, the impact of technological factors in the above regions and cities is favourable, but smart cities are not created in them, which is clearly caused by other factors, which are ignored by the current concept of smart cities.

This is confirmed by the international experience. Thus, the United Arab Emirates is ranked 4th in the ranking of the World Economic Forum (2021) by the indicator "Legal framework's adaptability to digital business models" (72.5 points in 2019), while the ranking of IMD (2021) contains only two cities of this country, which are not the ranking leaders: Abu Dhabi (28th) and Dubai (29th).

Similarly, Malaysia is ranked 5th in the ranking of the World Economic Forum (2021) by the indicator "Legal framework's adaptability to digital business models" (72.5 points in 2019), while the ranking of IMD (2021) contains only one city of this country, which is below the middle part of the ranking (closer to the end): Kuala Lumpur (74th). The examples of the UAE and Malaysia confirm Russia's experience and show that the presence of developed telecommunication infrastructure and regulatory support do not guarantee the creation and development of smart cities.

This is a sign of a gap in the literature—concerning the uncertainty of risks of creation and development of smart cities, as well as imperfection of the applied approach to the management of this process. Another gap exists because the current approach, which is based on state regulation, does not cover the risks of the creation and development of smart cities, the management of which requires a new approach.

The evidential base of the impact of the COVID-19 pandemic on the creation and development of smart cities is not formed, which is another gap in the literature. This paper fills these gaps through the study of the social factors' influence on the creation and development of smart cities, reconsideration of this influence from the positions of risk, determination of the specifics of risks of the creation and development of smart cities before (in 2019) and after (2020–2021) the start of the COVID-19 pandemic, and the search for the perspectives of risk management.

This literature review is followed by the Materials and Methods—with the research model and description of methods that are used to achieve the set research tasks. Then, the results of the achievement of each of the set research tasks are provided:

- Identification of the risks of the creation and development of smart cities through determining the social factors' impact on them (results of the achievement of the first task are provided);
- Determination of the current level of risk of smart cities (results of the achievement of the second task are provided);
- Study of the change of the risks of smart cities in the dynamics of recent years (2019–2021) (results of the achievement of the third task are provided);
- Determination of the perspectives and development of recommendations for managing the discovered risks of the creation and development of smart cities (results of the achievement of the fourth task are provided).

Then, the Discussion section contains a detailed consideration of the research results and the evaluation of conclusions from the position of the existing literature. The Conclusion, providing the key implications, limitations, and further research directions sums up the research.

3. Materials and Methods

The logical structure and tasks of this research are as follows. The first task is to identify the risk of the creation and development of smart cities (SmC) through specifying the influence of the social factors (sf) on them. Mathematical tools are used for this; the research model has the following form:

$$SmC = F(sf) \quad (1)$$

To specify the model, a method of regression analysis is used. The reasons for its use are as follows:

- Regression analysis allows one to find not only the general connection between the indicators but also the isolated contribution of each separate factor to the development of smart cities, thus identifying risks (positively influencing factors);
- Regression analysis allows specification of the research model (1) in each time period in isolation and determination of specific risks. This is especially useful under the conditions of the COVID-19 pandemic and crisis during the comparison of the pre-pandemic data of 2019 and the pandemic data of 2020–2021.

The indicator of the level of smart cities' development is their position in the corresponding ranking of IMD (2021): Smart City Rank (SmC). The social factors are the indicator of the quality of life from the materials of Numbeo (2021):

- Purchasing Power Index (sf_1);
- Safety Index (sf_2);
- Health Care Index (sf_3);
- Cost of Living Index (sf_4);
- Property Price to Income Ratio (sf_5);
- Traffic Commute Time Index (sf_6);
- Pollution Index (sf_7);
- Climate Index (sf_8).

Since the lower the values of sf_1, sf_4, sf_5, sf_6, sf_7, the better, for them to be considered the risks of smart cities their connection (regression coefficients) with the resulting variable must be negative. For the values of other factor variables (sf_2, sf_3, sf_8), the rule "the higher the better" applies; for them to be considered the risks of smart cities, their connection (regression coefficients) with the resulting variable must be positive. The reports of IMD (2021) are compared to 2019. That is why to study the dynamics of change of the selected indicators the statistics for 2019–2021 are used. In each period, the data on 84 smart cities are gathered. The research model (1) is compiled based on a continuous sample (for 2019–2021) of 252 observations (Table S1).

The second task is determining the current level of risk of smart cities. For this, their risk profile is compiled according to the methodology, which implies the following sequence of actions. In the first step, the indicator's values in the considered period are found. In this paper, this is the arithmetic mean of the indicators that characterise the risks of smart cities in 2021. In the second step, the qualitative treatment of the indicator's value is performed. For the indicators of quality of life, which characterise the risks of smart cities, the following scale is proposed (Table 1). It is compiled given the greatest possible (200 points) and factually achieved by the leaders of the ranking of Numbeo (2021) values of these indicators.

Table 1. The scale for the qualitative treatment of the value of the indicators of quality of life, which characterise the risks of smart cities.

Type of Indicator	Range of Values of the Indicator, which Corresponds to the Assessment, Score		
	Low Value	**Moderate Value**	**High Value**
The lower the indicator's value, the better (−)	above 75	50–75	below 50
The higher the indicator's value, the better (+)	below 50	50–75	above 75

Source: authors.

In the third step, the significance of the risk is specified. For this, the sum (in absolute value) of all the regression coefficients, which reflect the specified risks, is calculated. Then, the percentage ratio of each regression coefficient in isolation to this sum is calculated. If the percentage ratio is less than 0.20, the significance of the risk is low. If the percentage ratio is in the range from 0.20 to 0.50, the significance of the risk is medium. If the percentage ratio exceeds 0.50, the significance of the risk is high. In the last—fifth—step, the level of risk is found given the qualitative treatment of the values of the indicators of risks and the significance of risks. To specify the level of risk of smart cities on a scale from one to five, the following matrix is offered (Table 2).

Table 2. Matrix for specifying the level of risk of smart cities on a scale from one to five.

Significance of Risk	Value of the Indicator That Characterises the Risk		
	High Value	**Moderate Value**	**Low Value**
Low (below 0.20)	low risk (0)	acceptable risk (1)	moderate risk (2)
Medium (0.20–0.50)	acceptable risk (1)	high risk (3)	very high risk (4)
High (above 0.50)	moderate risk (2)	very high risk (4)	critical risk (5)

Source: authors.

According to Table 2, this paper uses a scale from one to five for the level of risk: the lower the value, the better.

The third task is studying the change of the risks of smart cities in the dynamics of recent years (2019–2021). For this, the arithmetic means of all indicators of quality of life are calculated, and their regressive connection with the Smart City Rank in isolation in each period is specified. The specifics of each period are determined. Additionally, the dynamics of the change of the risks of creation and development of smart cities in 2019–2021 are found with the help of the method of horizontal analysis (calculation of the indicators' growth). Special attention is paid to the factor of healthcare (Healthcare Index)—its role and significance as a risk of creating and developing smart cities before (in 2019) and after the start of the pandemic (in 2020–2021) are specified.

The fourth task is describing the perspectives and developing recommendations for managing the risks of the creation and development of smart cities.

4. Results

To achieve the first task of this research, based on the research model (1), the method of regression analysis is used to find the impact of social factors on smart cities. Thus, the model of linear regression with multiple regressors (2) is used:

$$SmC = 105.07 + 0.07 \times Sf_1 - 0.21 \times Sf_2 - 0.43 \times Sf_3 - 0.72 \times Sf_4 - 0.33 \times Sf_5 + 0.07 \times Sf_6 + 0.25 \times Sf_7 + 0.24 \times Sf_8 \quad (2)$$

The lookup values of regression coefficients are found with factor variables sf_4, sf_5, sf_8. According to the created model (2), the risks of creating and developing smart cities are as follows:

- Risk of increase in cost of living;
- Risk of increase in property price to income ratio;
- Risk of unfavourable change of the climate.

Thus, an increase in the cost of living by 1 point leads to a decrease in Smart City Rank by 0.72 positions. An increase in property price to income ratio by 1 point leads to a decrease in Smart City Rank by 0.33 positions. Aggravation of climate by 1 point leads to a decrease in Smart City Rank by 0.24 positions. The model is correct at the significance level of 0.01 (significance $F = 2.34 \times 10^{-26}$). The coefficient of multivariable correlation produced a rather high value, equalling 0.6589. Therefore, the creation and development of smart cities were 65.89% explained by the impact of social factors.

To achieve the second task of this research, based on Tables 1 and 2, a risk profile of smart cities in 2021 is compiled (Table 3).

Table 3. The risk profile of smart cities in 2021.

Element of the Risk Profile	Risks of Creation and Development of Smart Cities		
	Risk of Increase in Cost of Living	**Risk of Increase in Property Price to Income Ratio**	**Risk of Unfavourable Change of Climate**
Indicator of quality of life	Cost of Living Index	Property Price to Income Ratio	Climate Index
Type of indicator *	–	–	+
Arithmetic mean in 2021, score 1–200	63.95	14.34	80.09
Treatment of value	moderate	high	high
Significance of risk	0.56 (high)	0.26 (medium)	0.19 (low)
Level of risk	very high risk (4)	acceptable risk (1)	low risk (0)

* "–"—the lower the indicator's value, the better; "+"—the higher the indicator's value, the better. Source: calculated and compiled by the authors.

According to the risk profile in Table 3, the risk of an increase in the cost of living is very high in 2021 (assessed at 4 points from the scale from 1 to 5). The arithmetic mean of the Cost of Living Index in 2021 is 63.95 points (moderate value, according to Table 1: in the range from 50 to 75 points). The regression coefficient for this indicator in model (2) equals 0.72. The sum of all three regression coefficients for the selected indicators equals 1.29 (0.72 + 0.33 + 0.24). This is why the significance of the risk of increase in cost of living equals 0.72/1.29 = 0.56 (high: above 0.50). According to Table 2, a very high risk (4) occurs at the crossing point of the moderate value and high significance of the risk.

The risk of an increase in property price to income ratio is acceptable in 2021 (1 point according to the scale from 1 to 5). The arithmetic mean of the Property Price to Income Ratio in 2021 equals 14.34 points (high value, according to Table 1: below 50 points). The regression coefficient for this indicator in model (2) equals 0.33. The sum of all three regression coefficients for the selected indicators equals 1.29 (0.72 + 0.33 + 0.24). Thus, the significance of the risk of increase in cost of living equals 0.33/1.29 = 0.26 (medium: in the

range from 0.20 to 0.50). According to Table 2, acceptable risk (1) occurs at the crossing point of the high value and medium significance of the risk.

The risk of unfavourable change of the climate is low in 2021 (0 points according to the scale from 1 to 5). The arithmetic mean of the Climate Index in 2021 equals 80.09 points (high value, according to Table 1: above 75 points)). The regression coefficient at this indicator in model (2) equals 0.24. The sum of all three regression coefficients at the selected indicators equals 1.29 (0.72 + 0.33 + 0.24). That is why the significance of the risk of increase in cost of living equals 0.24/1.29 = 0.19 (low: below 0.20). According to Table 2, low risk (0) is at the crossing point of the high value and low significance of the risk.

To achieve the third task of this research, the change in risks of smart cities in the dynamics of recent years (2019–2021) is specified. For this, the arithmetic means of all indicators of quality of life (value) are calculated, and their regressive connection (significance) with the Smart City Rank is specified (according to the research model (1)) in isolation for each period. The results for each period are shown in Figures 2–4.

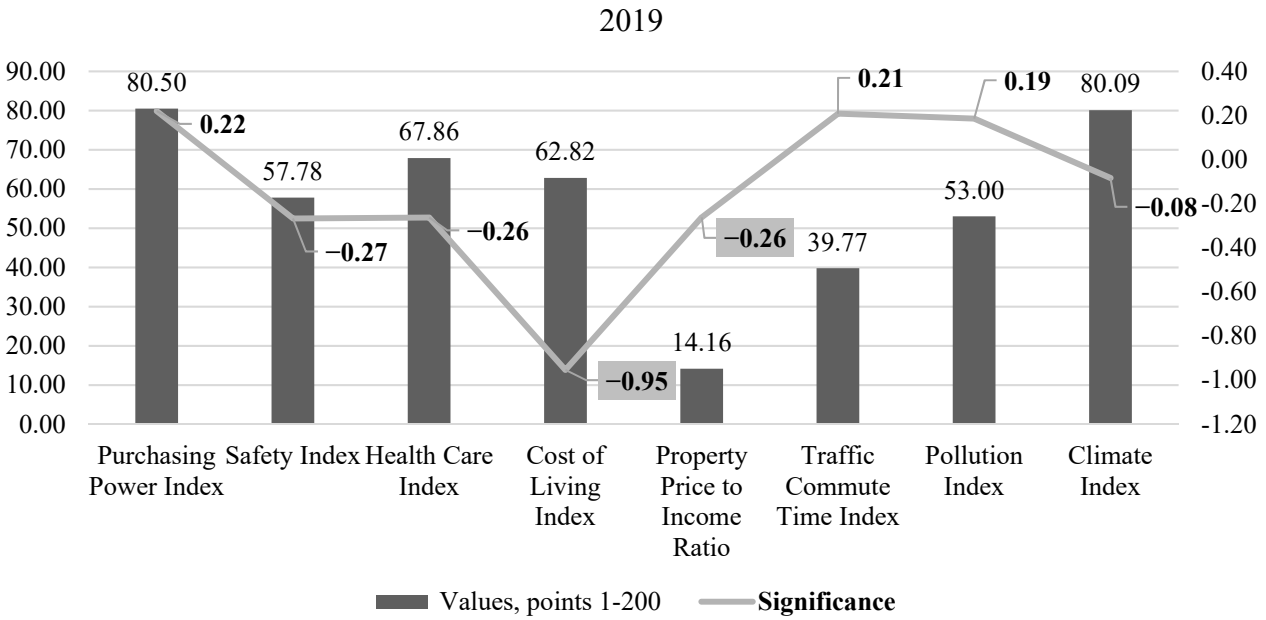

Figure 2. Arithmetic means of the indicators of quality of life and their regressive connection with smart cities in 2019. Source: calculated and built by the authors.

According to Figure 2, in 2019 (before the COVID-19 pandemic), there existed only two risks of creation and development of smart cities:

- Risk of increase in cost of living: the value of the Cost of Living Index in 2019 was 62.82 points (moderate, according to Table 1). The sum of regression coefficients: 0.95 + 0.26 = 1.21. Significance of the risk: 0.95/1.21 = 0.79 (high, according to Table 2). Level of risk: very high (4), according to Table 2;
- Risk of increase in property price to income ratio: the value of the Property Price to Income Ratio in 2019 was 14.16 points (high, according to Table 1). The sum of regression coefficients: 0.95 + 0.26 = 1.21. Significance of the risk: 0.26/1.21 = 0.21 (medium, according to Table 2). Level of risk: acceptable (1), according to Table 2.

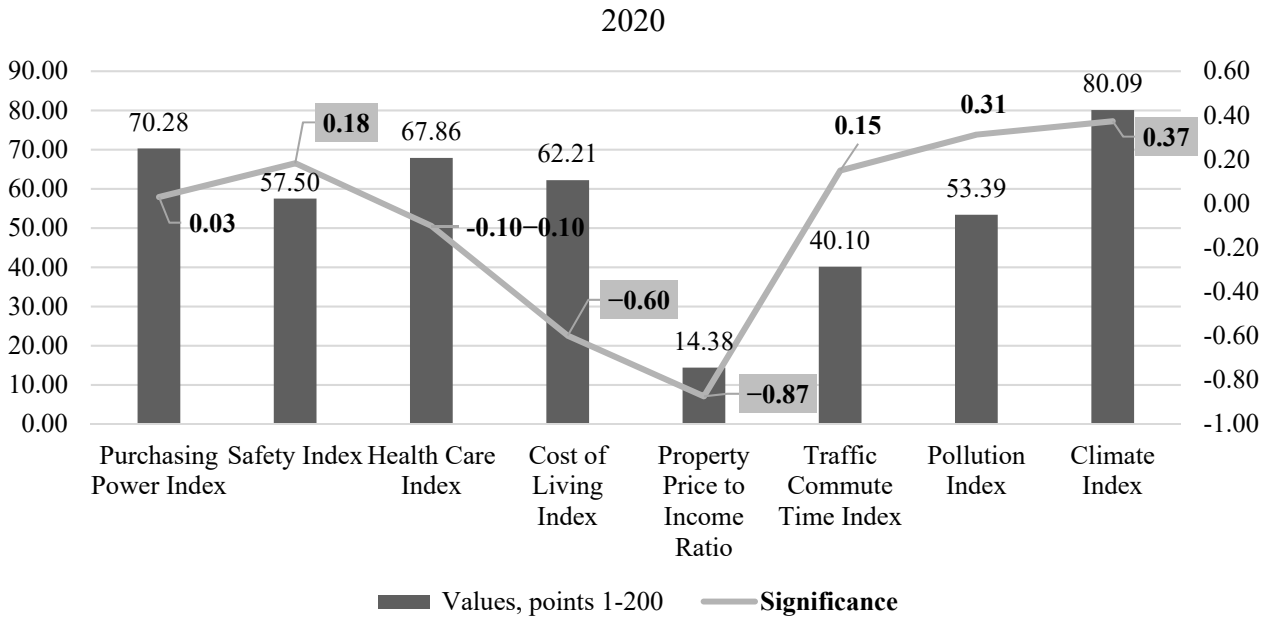

Figure 3. Arithmetic means of the indicators of quality of life and their regressive connection with smart cities in 2020. Source: calculated and built by the authors.

Based on Figure 3, in 2020 (amid the COVID-19 pandemic), there existed four risks of the creation and development of smart cities:

- Risk of safety: the value of the Safety Index in 2020 was 57.50 points (moderate, according to Table 1). The sum of regression coefficients: 0.18 + 0.60 + 0.87 + 0.37 = 2.02. Significance of the risk: 0.18/2.02 = 0.09 (low, according to Table 2). Level of risk: acceptable (1), according to Table 2;
- Risk of increase in cost of living: the value of the Cost of Living Index in 2020 was 62.12 points (moderate, according to Table 1). The sum of regression coefficients: 0.18 + 0.60 + 0.87 + 0.37 = 2.02. Significance of the risk: 0.60/2.02=0.30 (medium, according to Table 2). Level of risk: high (3), according to Table 2;
- Risk of increase in property price to income ratio: the value of the Property Price to Income Ratio in 2020 was 14.38 points (high, according to Table 1). The sum of regression coefficients: 0.18 + 0.60 + 0.87 + 0.37 = 2.02. Significance of the risk: 0.87/2.02=0.43 (medium, according to Table 2). Level of risk: acceptable (1), according to Table 2;
- Risk of unfavourable change of climate: the value of the Climate Index in 2020 was 80.09 points (high, according to Table 1). The sum of regression coefficients: 0.18 + 0.60 + 0.87 + 0.37 = 2.02. Significance of the risk: 0.37/2.02 = 0.18 (medium, according to Table 2). Level of risk: acceptable (1), according to Table 2.

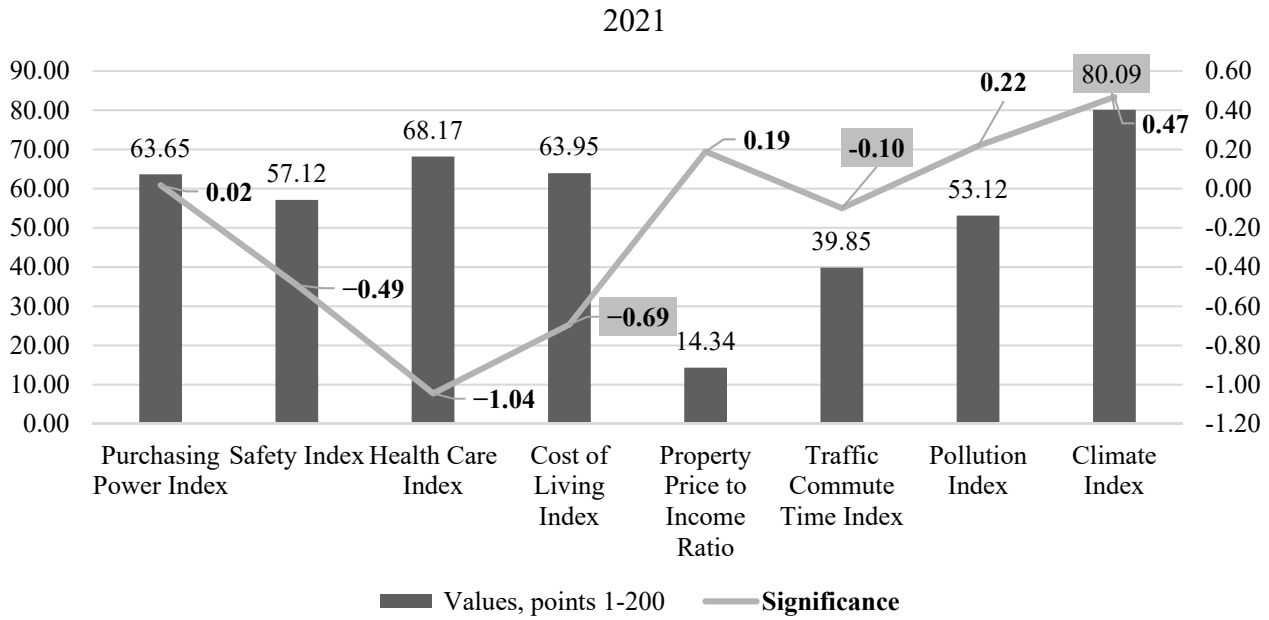

Figure 4. Arithmetic means of the indicators of quality of life and their regressive connection with smart cities in 2021. Source: calculated and built by the authors.

According to Figure 4, in 2021 (amid the COVID-19 pandemic), there existed three risks of the creation and development of smart cities:

- Risk of increase in commute: the value of the Traffic Commute Time Index in 2021 was 63.95 points (moderate, according to Table 1). The sum of regression coefficients: 0.69 + 0.10 + 0.47 = 1.26. Significance of the risk: 0.69/1.26 = 0.55 (high, according to Table 2). Level of risk: very high (4), according to Table 2;
- Risk of increase in cost of living: the value of the Cost of Living Index in 2021 was 63.95 points (moderate, according to Table 1). The sum of regression coefficients: 0.69 + 0.10 + 0.47 = 1.26. Significance of the risk: 0.10/1.26 = 0.08 (low, according to Table 2). Level of risk: acceptable (1), according to Table 2;
- Risk of unfavourable change of climate: the value of the Climate Index in 2021 was 80.09 points (high, according to Table 1). The sum of regression coefficients: 0.69 + 0.10 + 0.47 = 1.26. Significance of the risk: 0.47/1.26 = 0.37 (medium, according to Table 2). Level of risk: acceptable (1), according to Table 2.

Using model (2), the dynamics of change of the risks of creation and development of smart cities in 2019–2021 are specified (Table 4).

According to Table 4, the risk of increase in cost of living reduced in 2020 (compared to 2019) but grew in 2021 (compared to 2020). The risk of increase in property price to income ratio increased in 2020, but then reduced in 2021. The risk of unfavourable change of climate remained stable during the whole period, from 2019 to 2021.

To achieve the fourth task of this research, the perspectives are specified and recommendations are developed for managing the described risks of the creation and development of smart cities—they are based on corporate social responsibility. For managing the risk of an increase in the cost of living, it is recommended to refuse the increase in commodity prices by local companies. Unlike the measure of state regulation, which supposes the establishment of price limits, corporate social responsibility allows preservation of the effectiveness and natural character of the market mechanism, being more universal (applicable to all markets and market segments).

Table 4. Dynamics of change of the risks of creation and development of smart cities in 2019–2021.

Characteristics of the Risk		Risks of Creation and Development of Smart Cities		
		Risk of Increase in Cost of Living	**Risk Of Increase In Property Price To Income Ratio**	**Risk of Unfavourable Change of Climate**
Indicator of quality of life		Cost of Living Index	Property Price to Income Ratio	Climate Index
Type of indicator		−	-	+
Arithmetic mean, score 1–200	in 2019	62.82	14.16	80.09
	in 2020	62.21	14.38	80.06
	in 2021	63.95	14.34	80.09
Growth, %	in 2020 compared to 2019	−0.97	1.55	0.00
	in 2021 compared to 2020	2.80	−0.28	0.00
Treatment of growth from the positions of risk	in 2020 compared to 2019	Reduction of risk	Growth of risk	Risk did not change
	in 2021 compared to 2020	Growth of risk	Reduction of risk	Risk did not change

"−"—the lower the indicator's value, the better; "+"—the higher the indicator's value, the better. Source: calculated and compiled by the authors.

To manage the risk of an increase in property price to income ratio, it is recommended to provide employees with corporate real estate or easy accommodation rental plans. Unlike the measure of state regulation, which supposes the establishment of price limits, corporate social responsibility allows preservation of the effectiveness and natural character of the mechanism of competition in the real estate market and is more targeted—oriented towards residents of the city.

To manage the risk of unfavourable change of climate, it is recommended to implement the corporate programmes of the fight against climate change based on green investments. Unlike the measure of state regulation, which supposes environmental standardisation and norming, corporate social responsibility allows preservation of the flexibility of companies and is more effective, because it is aimed not at the formal observation of requirements but the specific result.

5. Discussion

This paper contributes to the literature by specifying the provisions of the concept of smart cities (Table 5). The method of regression analysis is used to create a model of multiple linear regression, which specifies the research model and quantitatively describes the social factors' impact on the creation and development of smart cities. The model allowed for precise identification of the risks of the creation and development of smart cities. A risk profile of smart cities in 2021 is compiled. It showed strong differences in the current level of various risks of smart cities and demonstrated the moderate general level of risk.

The change of the risks of smart cities in the dynamics of recent years is studied with the help of the calculated arithmetic means of the indicators of quality of life and their regression connections with smart cities in 2019–2021. The obtained results demonstrated relative stability of the risks of smart cities. Based on the systematisation of risks and their dynamics in recent years, the perspectives are determined and recommendations for managing the discovered risks of the creation and development of smart cities are developed.

Table 5. Comparative analysis of the existing provisions and specified (in this paper) provisions of the smart cities concept.

Criterion of Comparison	Existing Provisions	Specified Provisions
Factors of creation and development of smart cities	only technological (telecommunication infrastructure) factors	also social factors: cost of living, property price to income ratio, favourability of climate
Consequences of creation and development of smart cities	only advantages	also the following risks: risk of increase in cost of living; risk of increase in property price to income ratio; risk of unfavourable change of climate.
The connection between smart cities and quality of life	only direct connection: smart cities raise the quality of life	systemic (direct and reverse) connection—the quality of life also defines the creation and development of smart cities
Approach to managing the creation and development of smart cities	ignores risks and is based on state regulation	suggests risk management and is based on corporate social responsibility
Impact of the COVID-19 pandemic on the development of smart cities	clear and negative (smart cities depend on the implementation of SDG 3)	almost zero (smart cities do not depend on the achievement of SDG 3)
Contribution of smart cities to the implementation of the SDGs	only SDG 9	also SDG 1, SDG 11, SDG 12 and SDG 13

Source: authors.

According to Table 5, due to the above obtained results, this paper specifies all key provisions of the existing concept of smart cities:

- Unlike (Anwar et al. 2021; Huang et al. 2021; Shahrour and Xie 2021), the obtained results demonstrate that smart cities are created and developed according to the impact of not only technological factors but also social factors: cost of living, property price to income ratio, and favourability of climate;
- Unlike (Peoples et al. 2021; Ptak 2021), this paper proposes a new approach to managing the creation and development of smart cities, which offers risk management and is based on corporate social responsibility—it overcomes the limitations of the existing approach (which is based on state regulation);
- Unlike (Keawsomnuk 2021; Rodríguez Bolívar 2021), this paper showed that smart cities not only create advantages (improve the social urban environment) but also cause risks: risk of increase in cost of living; risk of increase in property price to income ratio; risk of unfavourable change of climate. The connection between smart cities and quality of life is not just direct (smart cities raise the quality of life) but also systemic (direct and reverse)—the quality of life also defines the creation and development of smart cities.

Unlike in previous works (Czech and Puszer 2021; Inshakova et al. 2021; Ngo et al. 2021; Zhang et al. 2021), it was discovered that the impact of the COVID-19 pandemic on the development of smart cities is almost zero (smart cities do not depend on the achievement of SDG 3). Unlike in previous studies (Bibri 2021; Ibrahim et al. 2021; Jackson 2021; Mach et al. 2021; Sharma et al. 2021; Trzeciak 2021), it was proved that the contribution of smart cities to the implementation of the SDGs is wider and goes beyond the limits of SDG 9 "Industry, innovation and infrastructure"—it also extends to SDG 1 (No poverty), SDG 11 (Sustainable cities and communities), SDG 12 (Responsible production and consumption), and SDG 13 (Climate action).

6. Conclusions

As a result of the performed study, it is possible to make the following conclusions. This paper answered the set research question and proved the proposed hypothesis. Three social risks of creation and development of smart cities were discovered: risk of increase in cost of living (high, assessed at 4 points in 2021); risk of increase in property price to income ratio (acceptable, assessed at 1 point in 2021); risk of unfavourable change of climate (low, assessed at 0 points in 2021).

This paper established the absence of the influence of the healthcare factor on smart cities before the COVID-19 pandemic (in 2019) and during the pandemic (in 2020–2021). Before the pandemic (2019), the risk of an increase in the cost of living was assessed as very high (4). In 2020, it dropped down to high (3); and in 2021, it became acceptable (1). Therefore, amid the COVID-19 pandemic, the risk of the creation and development of smart cities was reduced.

The perspectives of managing the risks of smart cities are connected to the support of the SDGs by local businesses. The proposed recommendations are based on corporate social responsibility in support of SDG 1, SDG 11, SDG 12, and SDG 13. Risks and risk management are of a financial nature: inflation, fight against poverty, and green investments.

The theoretical value of the results is as follows: specification of the factors of creation and development of smart cities, description of the risks of this process, and reconsideration of its essence from the positions of sustainable development. The practical value of the results is as follows: the new approach to managing the creation and development of smart cities is more flexible and effective—it allows the involvement of local companies in the management process through their corporate social responsibility. The new approach is not a replacement but an addition, which fills the gaps of the existing approach (which is based on state regulation).

Nevertheless, the obtained results are limited by the fact that they showed the variability of the spectre (list) of the risks of smart cities. Thus, two risks existed in 2019: the risk of increase in cost of living and risk of increase in property price to income ratio. In 2020, there existed four risks: risk of safety, risk of increase in cost of living, risk of increase in property price to income ratio, and risk of unfavourable change of climate. In 2021, there were three risks: risk of increase in commute time, risk of increase in cost of living, and risk of unfavourable change of climate.

The analysed international experience of 2019–2021 allows the expectation of a further change of the spectre of the risks of smart cities, which requires further research. The authors' recommendations on risk management need certain corrections in the course of the change of the spectre of risks in each future period. Future studies should be devoted to finding the spectre of smart cities' risks in future periods and, according to change in this spectre, to the correction of recommendations on smart cities risk management.

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