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# MULTI-CRITERIA EVALUATION OF A POSSIBLE GEOPARK AT THE CONFLUENCE OF THE OKA AND VOLGA RIVERS

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# Presentation plan



1. General information about possible geopark including
  - i. The Puchezh-Katunki impact crater and red brechia dislocations
  - ii. The Prosek Upper Bathonian deposit
  - iii. The landscape at the confluence of the Oka and Volga rivers
2. General information about possible urbanizing project at the confluence as alternative to geopark project
3. Multi-Criteria evaluation of two alternative projects
4. Discussion and conclusion

# Why Geopark?

1. Geoparks are based on unique experience of nature use evolving habits, ways, literature, music and arts.
2. Geoparks are drivers of a low carbon economic development, involving the local population in it and creating markets for post-industrial goods and services based on network technologies.
3. Geopark is a site for multidisciplinary scientific research
4. Geopark has its special role in education including both Earth sciences and anthropological sciences based on culture, history and Geo heritage economy
5. Geoparks belong to the global network of educational and scientific tourism and local conventional economy to attract both residents and guests
6. Geoparks are inherently the prototype of the civilization of the future.







# General information about geological heritage of the region



1. The most famous Geo Heritage site of the region is the Puchezh-Katunki impact crater of an early Jurassic age. The Puchezh-Katunki dislocation belongs to top ten Earth objects of asteroid origin
2. The Bathonian-Calloviaian deposits of the Jurassic system near the settlement of Prosek on the banks of the Cheboksary reservoir is considered as «the golden nail» of the Jurassic stratigraphy
3. The landscape at the confluence of Oka and Volga rivers was created by water flows in the postglacial period. The landscape is considered as the most beautiful Russian landscape





# Geological sites at Nizhny Novgorod region







# Geopark at the confluence of the Oka and Volga Rivers Scenario 2





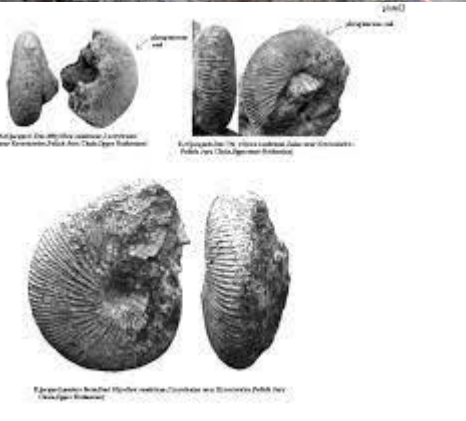
# permian dislocation (photo by Anton Ulyakhin)







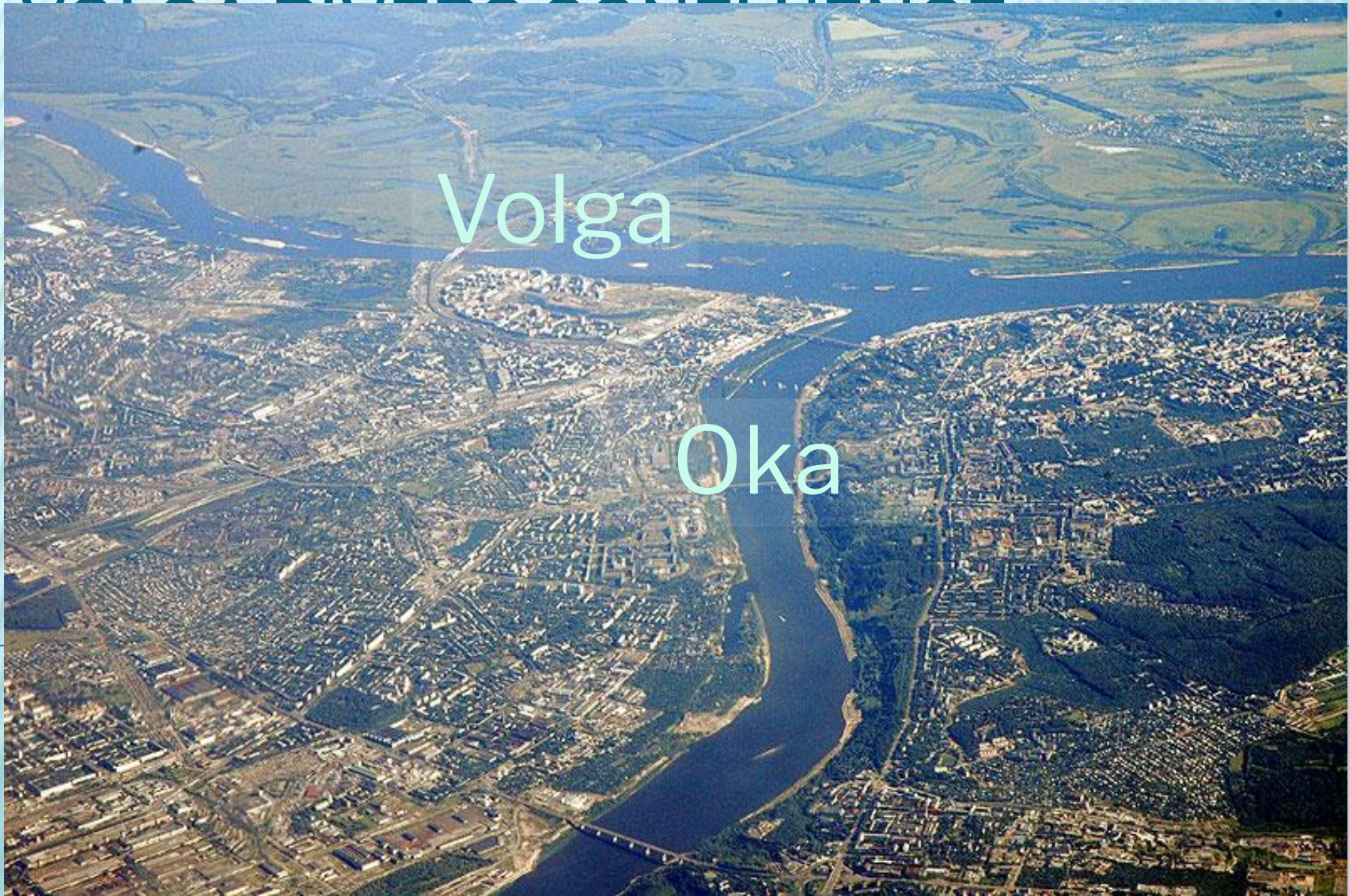
# The Prosek Upper Bathonian depo







# UNIQUE LANDSCAPE AT THE OKA AND



Volga

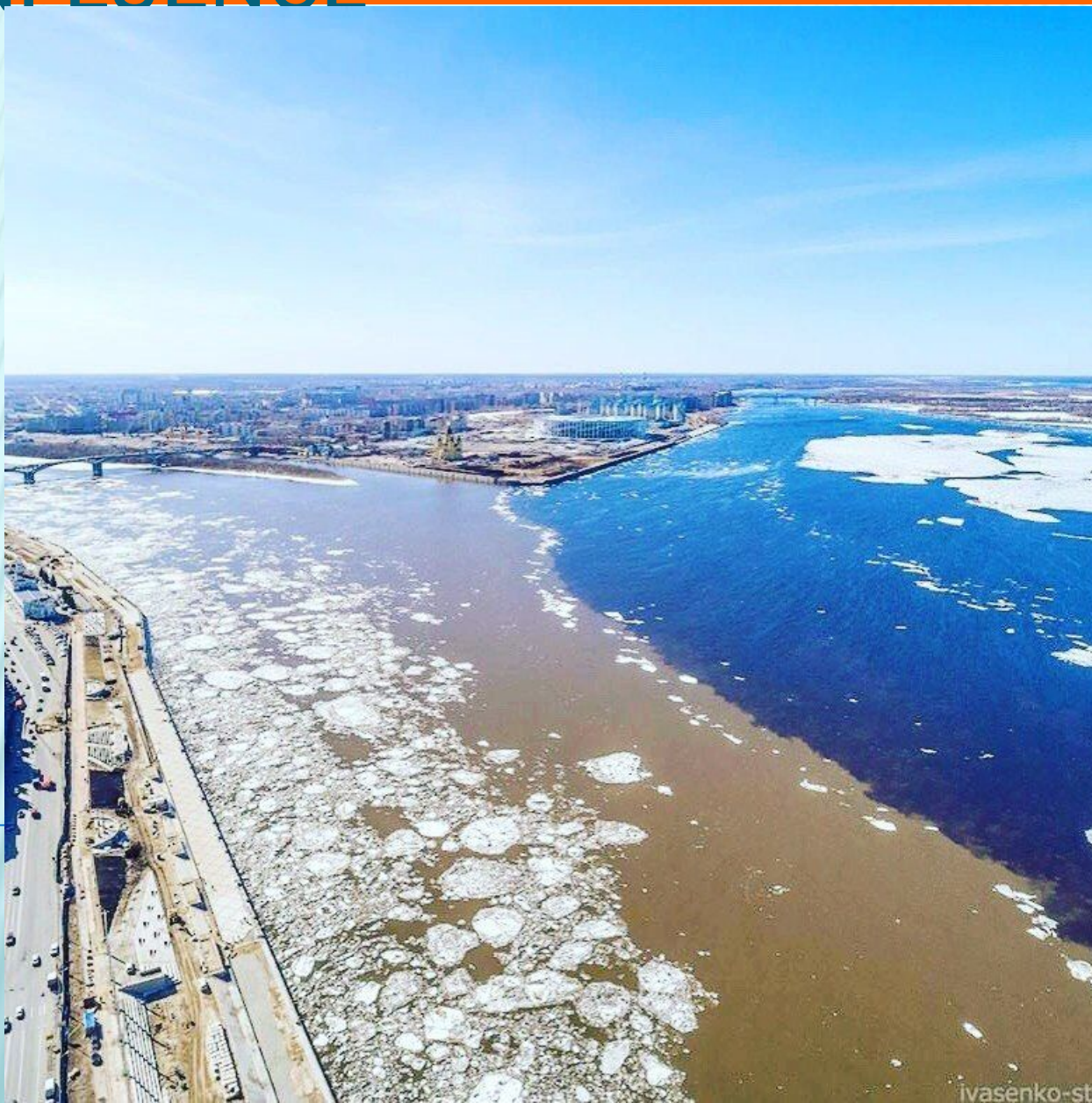
Oka







# SPRING ICE MELTING AT THE CONFLUENCE





# NIZHNY NOVGOROD AS A REGALLY POSED CITY



Volga



The height difference between the left floodplain and right steep banks is 150 m

The height difference was formed under the influence of melt water

after the melting of glaciers





# NIZHNY NOVGOROD AS A REGALLY POSED CITY



Volga

Oka







# URBANIZING PROJECTS AS ALTERNATIVE TO GEOPARK SCENARIO 1





# URBANIZING PROJECTS ON THE LEFT BANK OF THE VOLGA RIVER



Globe town with  
population  
400...500  
thousand  
(2009)

The project was  
postponed

No investors  
were found







# A NEW VERSION OF FLOODPLAIN URBANIZATION NAMED PARKOGRAD (2021)



The project  
of the  
biggest  
university  
campus  
and IT  
village  
(70 000  
students,  
30 000  
campus  
employers,  
40 000  
IT  
employers)





# PARKOGRAD (2021)





# PARKOGRAD (2021)



# MULTI-CRITERIA EVALUATION OF TWO ALTERNATIVE PROJECTS

Okazaki





# IMPACT MATRIX – SYSTEM STRUCTURAL ANALYSIS

**IMPACT MATRIX - SYSTEM STRUCTURAL ANALYSIS**

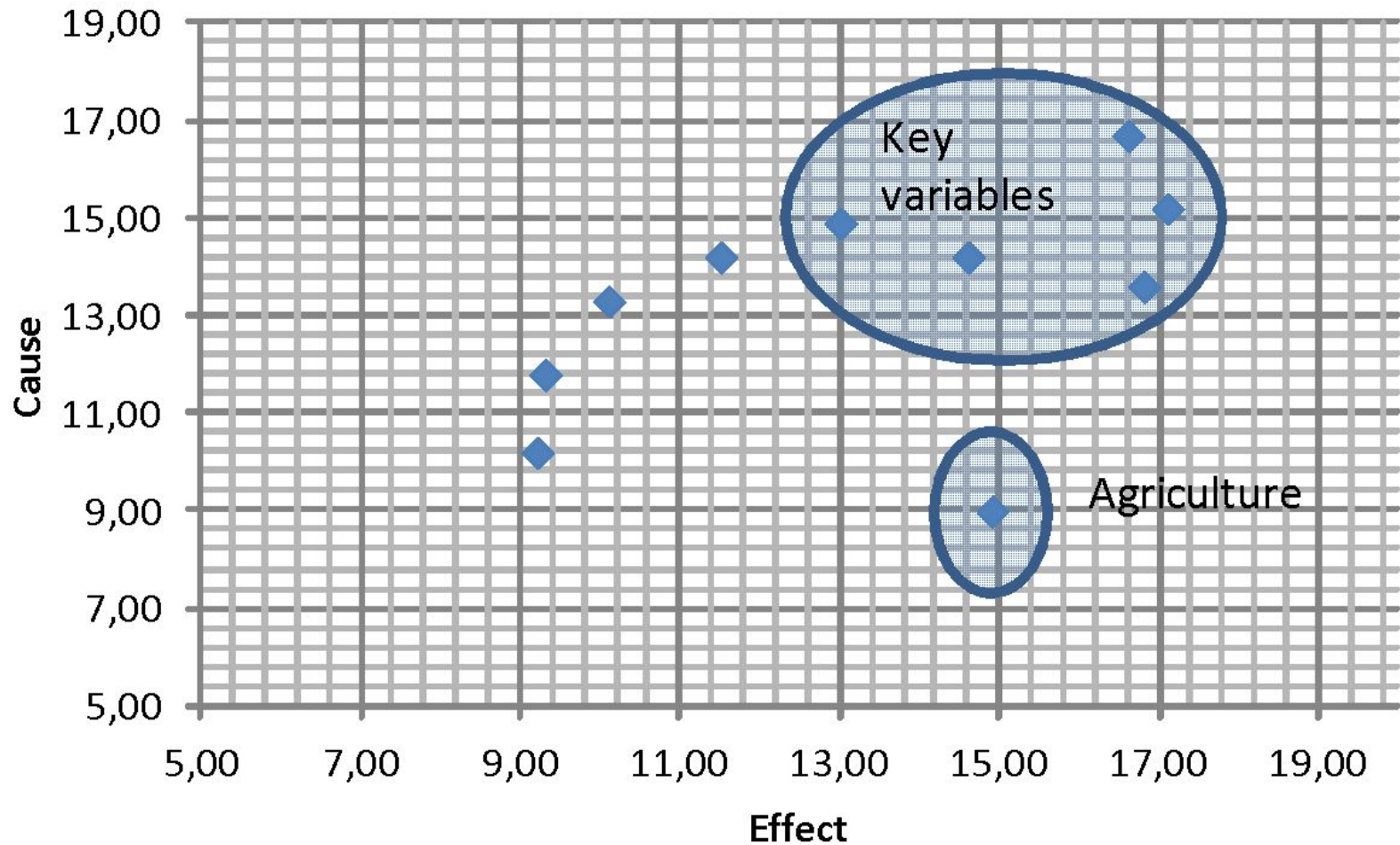
Variables	PR	SR	T	CH	GL	Gov	Ind	Ec	Ag	NH	SUM
Permanent residents PH		0,80	1,60	1,40	2,20	1,60	1,10	2,30	1,80	2,40	15,20
Seasonal residents SR	1,40		1,30	0,60	1,30	1,00	0,80	1,80	1,70	1,90	11,80
Tourism T	2,30	1,20		1,80	1,60	1,10	0,30	2,20	1,50	2,20	14,20
Cultural Heritage CH	1,80	1,20	2,20		0,80	0,80	0,10	2,00	0,50	0,80	10,20
Geol landscape GL	1,80	1,00	2,00	1,00		1,50	1,80	2,00	2,20	1,60	14,90
Governance G	1,70	0,60	1,70	1,10	1,50		2,30	1,60	1,30	2,40	14,20
industry Ind	2,40	0,70	0,30	0,60	1,90	1,90		1,30	2,20	2,00	13,30
Economy Ec	2,70	1,50	1,70	0,90	1,60	2,40	1,70		2,30	1,90	16,70
Agriculture Ag	1,20	0,70	1,00	0,40	1,00	0,30	1,10	1,70		1,60	9,00
Natural Heritage NH	1,80	1,60	2,80	1,40	1,10	0,90	0,90	1,70	1,40		13,60
<b>SUM</b>	17,10	9,30	14,60	9,20	13,00	11,50	10,10	16,60	14,90	16,80	133,10

Ten variables were selected by the team of the Platform project  
 Strong links between **residents, economy, tourism, landscape and natural heritage** were indicated.





# CAUSE AND EFFECTS OF THE GEOPARK IMPACT







# WEIGHTING MATRIX FOR MCE GEOPARK NIZHNY NOVGOROD

Variables	PR	SR	T	CH	GL	Gov	Ind	Ec	Ag	NH	SUM
Permanent residents PH		2,00	1,16	3,50	2,00	0,80	0,47	0,63	2,00	5,00	<b>17,6</b>
Seasonal residents SR	0,80		1,00	1,33	1,33	0,67	0,33	0,60	2,00	0,47	<b>8,5</b>
Tourism T	1,83	1,00		0,27	0,27	0,30	1,50	4,50	1,50	0,28	<b>11,5</b>
Cultural Heritage CH	0,30	1,33	4,00		0,80	0,47	0,67	3,33	1,50	0,47	<b>12,9</b>
Geol landscape GL	0,67	1,33	4,00	2,00		0,62	0,83	2,80	0,63	2,50	<b>15,4</b>
Governance G	2,00	2,00	3,00	3,00	3,00		5,00	3,50	2,50	4,00	<b>28,0</b>
industry Ind	3,00	3,00	0,83	2,00	1,50	0,22		0,83	1,50	3,33	<b>16,2</b>
Economy Ec	2,50	3,00	0,40	0,93	1,60	0,30	1,50		2,00	1,43	<b>13,7</b>
Agriculture Ag	0,67	0,67	0,83	0,83	2,50	0,63	0,83	0,80		0,83	<b>8,6</b>
Natural Heritage NH	0,22	3,00	4,00	3,00	0,63	0,27	0,93	3,30	1,50		<b>16,9</b>

## SCALE

- 9 extremely strongly more important
- 7 very strongly more important
- 5 strongly more important
- 3 moderately more important

- 1 equally important
- 1/3 moderately less important
- 1/5 strongly less important
- 1/7 very strongly less important
- 1/9 extremely strongly less important



# COMPARISON OF TWO SCENARIOS BASED ON TOTAL “UTILITY”

Variables	Weights	Utility 1	W*U_1	Utility 2	W*U_2
Permanent residents PH	17,6	0,5	8,8	0,7	12,3
Seasonal residents SR	8,5	0,3	2,6	0,5	4,3
Tourism T	11,5	0,6	6,9	0,9	10,3
Cultural Heritage CH	12,9	0,7	9,0	0,7	9,0
Geol landscape GL	15,4	0,5	7,7	0,9	13,8
Governance G	28,0	0,7	19,6	0,7	19,6
industry Ind	16,2	0,5	8,1	0,3	4,9
Economy Ec	13,7	0,8	10,9	0,4	5,5
Agriculture Ag	8,6	0,3	2,6	0,2	1,7
Natural Heritage NH	16,9	0,6	10,1	0,9	15,2
<b>Sum</b>			86,2		96,5





# CONCLUSION (1)

- The use of the MCE and the Brunswik's approach made possible to form a deeper and critical insight of processes in the Nizhny Novgorod agglomeration.
  - In particular, the key role of tourism, natural heritage and landscape was indicated.
  - The shrinking role of local agriculture and industry is important for low carbon transformation.
  - Our experts ranked natural heritage higher than cultural heritage. May be because they were focused on geological and natural heritage conservation. It looks amazing for the agglomeration with more than one hundred cultural monuments and sites. A new value is being formed in the public consciousness This is cultural landscape integrating natural landscape of high value and human creations.





## CONCLUSION (2)

- The weighting matrix analysis showed that there is some support in society for a more utilitarian projects based on modern construction technologies in difficult hydrological conditions.
- This approach creates huge urban areas on floodplains in the vicinity of the river. The unique natural landscape will be lost.
- The MCE performed in presentation suggests that for the selected variables and team of experts the option of creating a Geopark looks more preferable. For more reliable conclusions, further research is required.







# CONCLUSION (3)

- According to the results obtained scenario 2 looks more attractive for the population and for the regional economy.
- At the same time, a number of uncertainties in the assessment remain.
  - How can the result change with the expansion of expert team?
  - How does new variables change the final evaluation?
  - How does utility1 and utility2 refining change the final evaluation?

The authors hope to pursue these questions in discussions at  
SGEM workshop on 17-18<sup>th</sup> August

You are welcome!

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**THANK YOU FOR YOUR KIND  
ATTENTION!**

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