NEW RATING OF SHELTER ON ARCHEOLOGICAL SITE MEDIANA NEAR NIS AFTER STRUCTURAL CHANGES

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Historical monuments and protective structures

The idea is more than 100 years old

1897. Skull Tower (Serbian: Ćele kula) is a stone structure embedded with human skulls located in Niš (F.Kanic), 1909. celebration of the centenary of the first Serbian uprising

1936. Medijana Niš - Museum building
There are 189 archaeological sites in Serbia that have been declared as immovable cultural property.

- Cultural goods of exceptional importance (19),
- Cultural goods of great character (25)

Closed protection structures were built in only five sites in the last ten years.
Villa with a peristyle – Mediana near Niš

- Cultural good of exceptional importance.
- Ancient settlement near Nis was first mentioned in the 4th century A.D.
- The most important object on the Mediana site is Villa with a peristyle (area of about 6000m2)
First Mediana Shelter 1935.

- look

additional graphic perspective
New Mediana Shelters

look

Excavations for foundations 2013.
New Mediana Shelters in construction

- The construction of the timber frame was done in September and October 2014.
New Mediana Shelters in construction

and the covering was done in April 2015.
New Mediana Shelters

- At the end of 2018 and beginning of 2019, works were completed on the assembly and covering of the missing front sides of the Mediana shelter.
Shelters in practice - complex, multidisciplinary conditions and tasks

Protection of archaeological sites aims

- preventing devastation of monuments (earthen, stone, wall painted, mosaics ...),
- creating conditions for work on conservation of monuments and
- presentation - a unique museum "in situ"

The trend of the presentation is intensively developing in the 90s of the last century

At the beginning of the new millennium, strategies for the protection of archaeological sites are intensively developed applying shelters
The methodology that has been developed implies "RAPID ASSESMENT" of the mosaic state and the impact of the construction on mosaics through continuous monitoring.

Survey of the site state was established as a standard questionnaire.

First time in Serbia, Standard survey questionnaire of the site state was used for the assessing the efficiency of protective structures in Serbia.

THE GOALS OF THE WORK ARE SHELTER MONITORING AND EVALUATION OF THE ANALITICAL METHOD USED FOR THE SHELTER EFFICIENCY ASSESMENT.
Necessary data for the evaluation of protective structures

- Data is obtained from Shelter Survey
- Questions are divided into 3 groups
- Identification of the protective structure and its subsystems and assemblies
- State of the excavation below the protective structure
- Natural characteristics of the site
**Mediana-Identification Card of Site and Shelter**

The set of arranged data derived from the answers on the questions from the Survey on the locality is called the **IDENTIFICATION CARD**

<table>
<thead>
<tr>
<th>Arheološki lokalitet</th>
<th>Medijana kod Niša, Srbija</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Karakteristike lokaliteta</strong></td>
<td>Antičko naselje podignuto u blizini Niša prvi put se pominje u IV veku n.e. progašeno je za nepokretno kulturno dobro izuzetnog značaja. Najveći procenat doživela je u vreme imperatora Konstantina Velikog. Naselje je poznato po rezidencijalnim objektima, a u sklopu kompleksa su i terme, kao i prateći objekti sa garnizonom, poslugom…</td>
</tr>
</tbody>
</table>

**ARHEOLOŠKI OSTACI**

<table>
<thead>
<tr>
<th>Identifikacija arheoloških ostataka</th>
<th>Najznačajniji objekat na lokalitetu Medijana je Vila sa peristilom, koja je u toku 2014.godine većim delom pokrivena zaštitnom konstrukcijom.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Period</strong></td>
<td>Kraj III i IV vek n.e.</td>
</tr>
</tbody>
</table>


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*Table 1. Identity card*
Evaluation of Shelters Effects on Monuments

**RAPID METHOD** *(today in use)* is empirical model and expert judgment. It represent the basis for analyses in the decision-making phase.

This method provides a rough assessment of the shelter effect.

Cannot be considered as absolutely valid data.
New Approach to Evaluate Shelters Effects on Remains - *Shelter management system*

New method have been developed by authors of this paper for the reason of precise information of state of the ruins under shelter.

It is used to quantify the effects of protective structures and the evaluation of their influence on the archaeological remains.
Identification and Sorting Data

Factors Causing (from Identification Card)

are graduate with numerical marks as:

1. Very Slight Damage
2. Slight Damage
3. Moderate Damage
4. Severe Damage
5. Very Severe Damage
Stochastic Method Used to Predict the State of the Shelter and Ruins

- Tables 1, 2 and 3 are Data-Base of periodical Inspection Reviews
- Inspections are performed every 2 years
- The prognosis of the deterioration of the state is calculated within probability theory with the help of Markov chains
- One of the most popular stochastic techniques obtained from operational studies is the **Markov process** of decision making, which is today successfully being implemented in the system of managing bridge structures
Markov Chains Probability Method

- Definition of a state (Shelter elements/Ruins) and the determination of the probability of the transition from current to some future state (worse)

- The transition from one state into another is represented in matrix form (n x n) which is also known as the transition probability matrix $P$

- $P_{ij} = P[X_t=i, X_{t+1}=j]$

- Some more EQ are taken in paper
Markov Chains Probability Method - Results

Evaluation of the influences of the Shelters and the Evaluation of the improvement of the conditions for preserving the archaeological remains

**Summary Health Index (SHI) for sites under shelters**
(undimensional number - larger number poor performance status)

<table>
<thead>
<tr>
<th>Year</th>
<th>Location - Shelter</th>
<th>Construction HI</th>
<th>Ruins HI</th>
<th>SHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Medijana – Villa with peristyle</td>
<td>78</td>
<td>77</td>
<td>155</td>
</tr>
<tr>
<td>2017</td>
<td>Medijana – Villa with peristyle</td>
<td>80</td>
<td>77</td>
<td>157</td>
</tr>
<tr>
<td>2019</td>
<td>Medijana – Villa with peristyle</td>
<td>92*</td>
<td>77</td>
<td>169</td>
</tr>
</tbody>
</table>

*deterioration of the condition of the laminated wood main beams and degradation of the roof cover membrane received worse grades, which led to an increase in Medijana Health Index.*
Conclusions

1. Precise database is formed
2. Further monitoring of the effects on the monuments
3. Prognosis of their future states by applying Markov chains stochastic method
4. Formation and development of the Shelter management system
If someone have questions?

Thank you for your attention