DOPRINOS GEOTERMALNE ENERGIJE URBANOJ TRANSFORMACIJI GRADA UTIKE U SAD, SA ASPEKTA URBANISTIČKOG PLANIRANJA

CONTRIBUTION OF GEOTHERMAL ENERGY TO THE URBAN TRANSFORMATION OF THE CITY OF UTICA IN THE USA, WITH REGARDS TO URBAN PLANNING

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Korišćenjem Case study metode jednog Američkog grada na istočnoj obali u državi Njujork, ispitavane su predispozicije za oživljavanje centara gradova kroz integraciju pejzažne arhitekture tamo gde ona fali, afirmaciju upotrebe obnovljivih izvora (naročito geotermalne u vidu toplotnih pumpi i daljinskog grejanja) i uvođenje energetske sertifikacije i pešačkog i biciklističkog saobraćaja.

Radom je ustanovljeno da je moguće intergrisati obnovljive izvore u koncept urbanističke revitalizacije starih Američkih gradova i da ovo ima veliki socijalni značaj za zajednice i delove gradova kojima je potrebna afirmacija. Preporuka za dalja istraživanja je u sveobuhvatnom, gotovo pejzažnom odnosu prema gradu u celini, gde će se upotreba geotermalne energije od individualnih rešenja za objekte pretvoriti u koncept umrežavanja različitih izvora obnovljive energije. Glavni problem, koji se pokazao kroz istraživanje kao prisutan je mišljenje društva, koje još uvek ne prepoznaje i ne povezuje toplotnu energiju sa planiranjem grada u dugoročnom smislu. Na konceptima njene afirmacije treba raditi uključivanjem društvenih nauka i primenom koncepta medijskog i komunikacijskog menadžmenta, na primer.

Ključne reči: gradovi, SAD, post-industrijsko nasleđe, urbanizam, razvoj, geotermalna energija

Cities in the U.S. are characterized by very rich architectural and urban planning heritage, which can be regarded as valuable, but also as a drop-back. In

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comparison to European cities, the U.S. cities are known to be greater carriers of motor vehicle transportation infrastructures and, therefore, are more prone to urban sprawling. The segregation of the inner core from the rest of the city (suburbs or preferable places to live in) has helped deteriorate the role of the city cores in the urban development and their healthy morphologies. The inhabitants of city cores are turning away from the centre and deteriorated buildings of the post-industrial age. How can this be put to end – is the question in the research presented.

The case study of an East Coast city of Utica in the U.S. was presented. Especially, possibilities of landscape architecture, urban networks, and renewable energy (geothermal) were examined as an incubator for urban re-development. The outcomes show that this can be achieved as a long-term goal. The greatest obstacle to further implementation of energy planning (especially in terms of geothermal heat pumps and district heating) is the public belief that urban planning and energy planning are separate entities. Some instruments of media campaigns and educational strategies are to be recommended for achieving greater chance of geothermal to be considered a long-term option for a local resource-energy secure-city planning, despite the globalist city methodology set in planning of Utica so far.

Key words: cities, USA, post-industrial heritage, urbanism, development, geothermal energy

1. Introduction – on Utica

Utica in New York State (*NYS in further text) is an old post-industrial city which lies in the Mohawk region of Central New York and is known for its former advanced industries, especially that of the late 19th century and the first half of the 20th century. The growth of the city happened during this era of industrialization, when Utica set itself to be at the forefront of the so-called “Erie Canal”, connecting the Eastern Atlantic shore of the U.S. with the Midwest. By constructing this channel, Mohawk and Hudson Rivers were joined together by Lake Erie, forming an advanced trajectory of commercial supply of material and other goods, whose flow was enabled throughout the U.S. This led to the expansion of the whole region, its cities and, finally, to the expansion of the U.S. to the unoccupied territories in the Far West. The significance of this canal for the region and the development of NYS and Utica is indubitable. Moreover, the local accumulation of goods, materials and railway intersections has led to much of its existing architecture being built. Unfortunately, after World War II (WW2) and shortly prior to it, Utica saw a major decline in its population. An increasing number of people were losing their jobs due to the withdrawal of American factories from the area and the trend of de-industrialization that followed WW2. Being built for the population of some 100,000 people, Utica saw a major decline in numbers, coming down to around 60,000 people in 2014 (10). Additionally, people lost their jobs in the industrial sector and turned to other cities and areas, where the promise of the need for a basic-skilled workforce persisted. Leaving the city budget emptier than ever, Uticans saw a major decline in public infrastructure funding. This also meant hardly any new
investments, a rise in crime rates and Utica, with its deteriorating neighborhoods. soon became a dangerous place to live in.

Figure 1. Map showing New York State and rivers Hudson and Mohawk, along which the Erie canal was built and which allowed Utica to prosper, south on the map is NYC and to the upper left Lake Erie, source: de.wikipedia.org, assessed on 23.08.2017; Fig. 2 The Old Main of the NYS Lunatic Asylum, a historic landmark of Utica, source: https://asylumnotes.files.wordpress.com/2011/04/img_6792.jpg, assessed on 04.11.2017

On the other hand, Utica had plenty to offer in terms of its rich architectural and planning heritage. (1) The sanatorium building campus, the old railway station, one of the last of its kind in NYS, and many others were among many other buildings that suffered and have been left to decay. Utica’s park system was designed by the Olmsted brothers, famous landscape architects, known for their design of the Stanford campus and many NYS parks. The purpose of this paper is, among other things, to draw attention to the problem of architectural heritage in post-industrial cities, specifically on the example of Utica, and to show how geothermal energy could be integrated into the planning of neighborhoods.

Figures 2 and 3: Vacant parking lots in downtown Utica. These are the places where geothermal energy could be employed, within the process of urban regeneration. Cities in the U.S. are heavily dependent on car culture. Consequently, many empty parking lots appear in Utica, which could be put to better use. (sources: bing.com/maps), assessed 23.08.2017
Special emphasis is put on the role that urban planning can have in this process in the future. Utica is merely one of the key case studies on urban transformation in NYS that may set an example on how to deal with deteriorating cities and turn them into an advantage by using local resources such as geothermal, wind, solar and others. For the analysis, an expert interview sample has been selected, and will be described in the following chapters.

![Figure 4: Part of the One-world garden project for Utica’s downtown refurbishments of parking lots, courtesy of R2G, Cornell University, 2016 (11)](image)

2. Methodology and flow of the analysis

2.1. Expert Interview Sample

The total number of acquired interviews in NYS is 12 (some of which are listed in references [3–9]. One additional workshop result transcription on geothermal energy (lessons from Iceland) has been analyzed along with the expert interview sample, see reference [2]. Most of the interviewees are from NYS or US-based geothermal companies and their representatives with long-standing experience with geothermal energy (at least ten years). Two members of the sample are tenured professors from academic institutions at Cornell University*, in the fields of geothermal energy and urban planning. One is an engineer from a facility dealing with energy distribution. Four interviews have been made with the engineers from the City Hall of Utica. Two interviews were made with the representatives of the companies that have installed geothermal systems in their building retrofitting projects in Utica. One interviewee came from the neighboring city of Rome and spoke of the economic development of the region. The sample is rather diverse so as to try to answer as many as possible of the questions on the utilization of geothermal energy in Utica’s neighborhoods and to relate it to its diverse architecture and its sustainability as goals of urban planning. The analysis was performed with the MaXQDA software.

The interviewees were faced with the same questions in a semi-structured interview form. However, certain questions were left out whenever an expert was showing interest in other aspects of GE or architecture, related to his or her own professional expertise. The first interview occurred in October 2016 and thereafter each of the interviews occurred with the recommendation of the previous interviewees, on who could be further interviewed within the sample. This seemed
necessary because, at the beginning of the research, the already suggested methods such as Delphi could not provide results on the full scope of research questions pertaining to the way that geothermal energy and engineering technology connect to architecture and, more specifically, urban planning.

Table 1: Expert interview sample

<table>
<thead>
<tr>
<th>Expert interview type</th>
<th>Architecture &amp; urban planning</th>
<th>Geothermal energy (engineering)</th>
<th>Economic development</th>
<th>Public administration</th>
<th>Private companies</th>
<th>Special workshop on geothermal utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of interviewees</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Location</td>
<td>Cornell University</td>
<td>NYS, U.S., Cornell</td>
<td>City of Rome, NY</td>
<td>City of Utica</td>
<td>City of Utica</td>
<td>Cornell University</td>
</tr>
</tbody>
</table>

3. Analysis of the results and discussion

As seen from table 1, most of the interviewees in the interview set came from the geothermal sector. Most of them have been directly involved with geothermal installations and have seen the challenges that exist in GE utilization. Most of the interviewees coming from this sector had experience predominantly with low enthalpy geothermal resources. A member of the academia had experience with deep geothermal resources as well. A sample was interpolated with One specific workshop result (2), with an expert who was coming from one of the largest district heating companies in the world.

Members of the engineering sector described challenges with low enthalpy geothermal systems (GS). The biggest issue would be how to convince the society to invest into geothermal installations more profoundly. Another issue is the financial plausibility of using geothermal energy at an urban planning level: the interviewees agreed that building a district heating system (DHS) makes no sense for certain city areas or suburbs, where using individual heating systems could save more money. Furthermore, in the U.S. district heating was developing completely on its own, meaning that it has less of a communal character than is the case in Europe. Surprisingly, the U.S. was the first country in the world to use geothermal district heating, in Boise, Idaho. There has been very little change in almost one hundred years in the advancements of geothermal DHS, according to interviewee from the expert interview it_1 [3].
A large percentage of interviewees pointed to the changing situation with “green technologies. “The new generations are more willing to accept changes in the way that they perceive their environment. This would help boost more geothermal utilizations in cities. Interviewees from companies based in Utica that have used geothermal energy in their buildings said that geothermal energy had been beneficial for their refurbishment projects, offering an opportunity and setting an example for other home owners in Utica in the future. They also pointed out to the obstacles, referring to people not believing in something they could not see with their own eyes. This means that having one initial building project utilizing geothermal energy helps to achieve a domino effect, causing the building next door to be transformed as well, with the same or other renewable technologies and their combinations.

Table 2, List of the coded segments used for the analysis in MaXQDA, Urban Planning in the USA appeared 34 times within all the interviews, with one interviewer referring to the solutions for the future. Geothermal energy being new for most of the City Hall and Utica’s population and administration, it is no wonder that only one interviewee declared interest in suggesting practical solutions for using geothermal energy in the future in planning.

The City of Utica was, for a long time, a city where renewable energy was not employed and was not considered for the future. Companies like Hage Law, Matt Brewery and NGOs like RCIL and Center for Independent Living in Utica, have been local pioneers for geothermal installations. More on these companies that have installed geothermal heat pumps in Utica, can be found in the paper under reference (1). While interviewing the City Hall, the interviewees pointed out to an interesting problem in planning in Utica. They referred to the process as mostly reactive rather than proactive (4). Mostly solving the arising issues is what is being done most of the time in City Hall departments. The proactive approach ceases to exist with the lack of resources (time, money and skilled professionals) needed for
advocating large-scale urban transformations. This urban regenerative proactivity is what the City of Utica needs in the long run. One of the issues would be to deal with geothermal projects, integrating them into each and every city block and its scheduled renovations.

This would help Utica become a green city and a more vibrant community with a better infrastructure and greener technologies implemented for the future. It may also assist Utica in its urban planning issues, including connecting different city areas, such as parks, in one big whole, for example. To bring new life to older city parts and to try to secure a stable energy supply and local energy resource, instead of just using the fossil fuel-based heaters and hardly any centralized heating system in the city, except for the sanatorium or hospitals in Utica.

The interviewee coming from the economic and regional development sector pointed out the problem of setting a good example for the city’s surrounding area area. For example, the City of Rome had green initiatives that served the purpose of advocating other cities like Utica acquiring green projects afterwards. The interviewee was especially referring to the benefits for the city, the dwellers of projects set to have renewable energy utilization implemented at an early design stage (5). This view is very optimistic nowadays, judging by the fact that most of the buildings built in the world today have little or no regard for local resources for heating, cooling or for any passive house techniques.

The most interesting answer came from interviewee from the sector of urban planning, interview it_1 [6]. To get to the point where geothermal energy would be employed by the communities, there have to be cultural circumstances that need to be taken into account in the U.S. as well as in other countries. The interviewee pointed out a global picture of energy consumption and progress, which many Asian and Latin American countries pursue and the very fine details in how the way a culture perceives energy can influence the way a new energy (such as geothermal) can be introduced into the cities of certain areas. There are issues beyond the understanding of planners or building constructors and architects, that influence the implementation of GE in communities [7–9]. And these factors are in a large percentage of cases underestimated and given little weight in planning. The interviewee pointed out the problems of the stages of economic development a society is at, and stated that the level of understanding its citizens have for the technology is crucial for the success or failure of any new technology, including geothermal. There needs to be more focus on specific matters in planning such as how to deal with geothermal energy on a city level and to be proactive in these terms. Rather than attempting to address, even in fine detail, all of the existing regulations in planning of a city, where renewable energy integrations are usually set aside. A reference to geothermal energy being disregard in city planning is the Serbian city of Nis, where, for decades GE utilization awaits for the city government willing to pursue long-term goals in supplying even parts of the city with local geothermal resource.
4. Conclusion

There is an offset between integrating geothermal energy within an engineering approach to supplying energy to the city and its neighborhoods, and the planning methods applied nowadays, which try as much as possible to assimilate new technology and attach it to the existing practice, but often lack the understanding of it and what it could do for planning. The problem lies in the very practice, or rather its potential to acquire new methodologies. For example, the City of Utica has been growing and declining for the last 200 years. Access to energy was never in question. This gave way to the city’s reliance on fossil fuel, predominantly of external nature. The urban morphology of such a community was set to co-exist with external supplies and national grids which supplied the city. How would it be different, if the City of Utica had been planned, not only with external energy resources, but rather with geothermal heat pumps and other local resources as well? Would another energy crisis trigger the wave of “green thinking” in supplying the city with local energy? Would the architectural development of Utica have looked differently is yet to be answered. In the long run, energy needs to play a more significant role in urban planning. One of the ways to achieve this is through acquiring different approaches to harvesting local energy, retrofitting neighborhoods and making them more livable and above all, having long-term city planning goals, including local geothermal resource integration and cultural pattern analysis which could, with the aid of computer-based systems, help find ways for geothermal energy to get implemented and surpass the obstacles in the community and a fossil fuel-dependent culture of today's Utica.

In conclusion, the keys for a more profound geothermal utilization in Utica are:

– a change in the population structure (the millennials) can contribute to the perception of GE in the future
– a lot can be done in terms of cultural studies, studies of behavioral patterns and achieving a more proactive way of thinking among planners and engineers. Some of the social indicators contributing to urban renewal developed for many other cities in the U.S. , could be applied to Utica as well
– cultural circumstances in GE utilization seem to play a far greater role in planning energy applications than the very engineering or architectural expertise and practice tends to acknowledge.
– there is a large gap between an optimistic all-round GE utilization in planning and current mostly reactive practice that still sees buildings as separate entities, where plumbing or piping should just be inserted. This also, unfortunately, applies to the cities themselves and their planning.

Hopefully, Utica may live up to see the boost in its urban identity and sustainable and proactive planning in the years to come, including that with geothermal energy as an integrative part, quite opposite of how it is perceived today in the community, among its planners and in the City Hall. Luckily, majority of cities still have to learn how to comprehend renewable energy and local potentials, some of
which have these in abundance too. Finally, urban planning can actually assist Utica to become a major NYS post-industrial city dealing with its urban future in time.

**Nomenclature**

NYS – New York State  
GE – Geothermal Energy  
DHS – District Heating System

OIE – obnovljivi izvori energije  
RES – renewable energy sources

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5. References


[3] *** **Expert Interview it_1, Geothermal energy expert, Cornell University, NY, Interviewer: A. Jovanovic, 2016.**

[4] *** **Expert Interview ut_1, Engineering department expert, City hall of Utica, Interviewer: A. Jovanovic, 2016.**


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