

planning.under.ground  
a concept and three dimensional visualization as part of the planning process  
of the underground city labin, croatia

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## 1 ABSTRACT

Urban agglomerations in the world metropolis demand new solutions to face the economical, social, ecological and physical problems. Many ideas concentrate mainly to above ground to either vertical and/or horizontal extension in the cities, with higher skyscrapers or even cities in the ocean.

But what about using underground space?

Fighting with the attributes of unpleasant surrounding, images of darkness, dampness and sickness, a lot of people don't feel sympathy for living underground. But the concept to live in depth, caves, catacombs or even cities below the surface is pretty old. Supported by literary and mystic traditions like travel to the underworld, a vision is initiated, to think more about these possibilities and a new direction of thinking for planners. The advantages of using the underground are obvious. In metropolitan cities in Netherlands, Israel or Japan, which have to face growing population, agricultural as well as open green spaces have to be protected. With the immense population growth, costs of land use increase and the climate in the cities deteriorates.

The transfer of the essential utilization below ground surface can help to reduce the visual impacts of big cities, as well as preserve and create open green spaces and change the image of modern cities.

Especially in Japan there is an increasing interest in going underground. The idea to build a whole city in an abandoned coalmine however is new.

In this specific case, the underground city is planned to be realized 200m below the surface in the abandoned tunnels of the former coalmine in Labin, Croatia. An underground city with all the amenities of a city above ground, but with a completely new character and atmosphere, which could be just artificially created above ground. Realized under the city of Labin, which has to fight against the highest unemployment rate in the whole region of Istria.

The visualization methods used in this project do not aim to communicate a detailed concept, but tend towards a virtual travel through a city in a mine, with its qualities, possibilities as well as limitations which will lead to a completely new direction of creating ideas for planning.

## THE IDEA OF GOING UNDERGROUND

The idea of an underground city has been initialized by Labin Art Express (LAE), a group of artists, founded in 1991, with the intention to preserve the heritage of the miners and their history. Lamparna, the place where miners stored and got their lamps, was transformed by the Austrian Architect Peter Rogl into a functional building and was opened as a cultural center in 1998.



Figure. 2-1, 2- 2: Lamparna once and today

The Underground city of Labin will have it's center below the newer part of Labin (Podlabin) and can be reached by an elevator shaft next to Lamparna (cultural center).



Figure 2-3, 2-4: Old center of Labin, Podlabin with elevator shaft to the mining area

One tunnel leads to Rasa, a mining settlement 2.6 km west of Labin, which will be used as a mining museum. Another tunnel ends at Plomin, an old city from the 15<sup>th</sup> to 16<sup>th</sup> century, almost abandoned today. It is the longest tunnel with about 6.5 km long and the idea to offer space for mushroom farming and other kinds of culinary production, like wine cellars, cheese storage and other suitable products. The most important connection to the underground city, is the tunnel to Rabac. Rabac, is a very attractive tourist area next to the sea. Within almost 3 km, tourists can experience the mine on their own and find out the character and challenge of being in underground space.

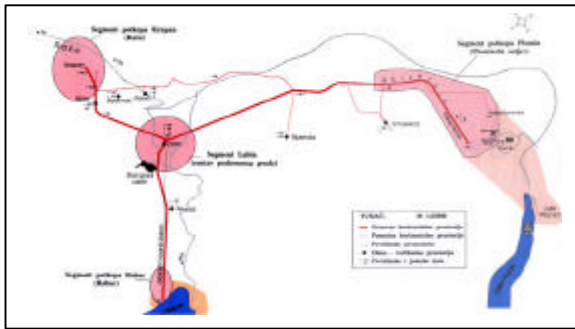


Figure. 2-5: Scheme of the underground city, the darker zones show the entrances, with the center in the middle

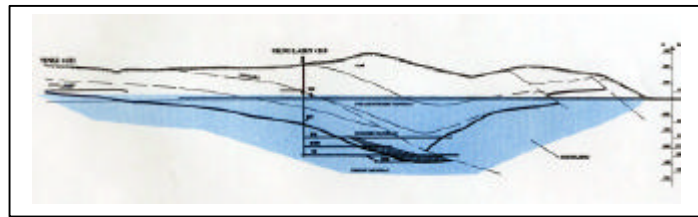


Figure.2-6: vertical cut through the tunnelsystem: all tunnels below minus 200m are under water and can't be used for the underground city

The Underground city has been initiated as an art project, which will affect social, as well as political and economical aspects. It aims for traditional as well as new kinds of tourists, like art and culture consumers. The touristical structure of Istria and Croatia will change, new jobs will be created and the standard of living of the population will be improved.

**PROS AND CONS FOR UNDERGROUND SPACE USAGE**

Although underground construction is two to three times more expensive than on the surface, the increasing land use costs like for example in Japan, make such project attractive nevertheless. Cities, with a reduced life quality because of traffic noise, desolated city centers and sterile office districts, a vertical urban design can be a solution. By transforming offices, shops and cultural structures, as well as traffic below ground, it is possible to compress urban space and reduce daily commuting. Cities can win back their real value: the integration of living, working, shopping and entertainment in a dense space.

pros	cons
<ul style="list-style-type: none"> <li>✂ can be build very close to existing settings, without negative influence</li> <li>✂ protection against natural disaster (special attention on exits, elevator shaft and other connections to the surface)</li> <li>✂ the stable temperature in depth can save energy</li> <li>✂ underground structures are free of the daily noise and vibration of the megacities, high frequency vibrations diminish faster with depth</li> <li>✂ limited exits facilitate control</li> <li>✂ reduces the visual impact</li> <li>✂ offers a natural and completely new interior feeling</li> </ul>	<ul style="list-style-type: none"> <li>✂ underground structures have a higher interaction with the existing local geology than most constructions above ground</li> <li>✂ requires a higher effort on construction techniques</li> <li>✂ isolation from the surface</li> <li>✂ depending on depth: no daylight, techniques using mirror reflections to utilize daylight</li> </ul>

Table 3-1: pros and cons of underground space usage

Light, efficient ventilation and spaciousness can reduce the negative images of darkness and fear. Light controlling is an essential component for human well being. Illumination can reveal spatial structures and emphasize surface structures.

**CONCEPTS FOR THE UNDERGROUND CITY IN LABIN**

The concept for an underground city is a more complex venture, than for urban spaces above ground. The location below ground surface offers a lot of restrictions like limited number of emergency exits, higher focus on air ventilation aspects as well as security in case of fire. All this aspects had been examined by Professor Jerko Nuic, from the Faculty of Mining, Geology and Oil at the University of Zagreb. The planners task is now, to pay attention to these technical aspects, as well as to adapt the sort of utilization. Underground city Labin, in the vision of LAE, will be a completely autonomic urban area. How far this will be possible is not the task of this work. But it's important to show what kind of utilization will be possible and useful. The depth of 200m below ground as well as restrictions for ventilation, exclude several utilizations as for example permanent living.

The city will be free accessible for experience, meaning that just a few organized routes have to be created where necessary and where people have to be informed, like in the mining museum. This will need a higher effort in controlling and security precautions.

It has to be taken into account, that this region of Istria is one of the most beautiful parts. As the project aims on tourists to revalue this region of Istria, attractions, entertainment as well as informational parts are a necessity in the underground city. On one side for helping people to understand the importance and meaning of this project as well as to show planners, that it is possible to eliminate

the dark images associated with underground space and to consider additional space which can be used in a different way than above the surface.

The city does not only exist around its center, living also extends to the edges and periphery. For that reason the tunnels towards the center have to be included in the planning as well as the surrounding above. The dimensions of the tunnels can be extended wherever it is necessary and possible from static considerations.

## VISUALIZATION OF THE UNDERGROUND CITY

Starting from the existing catasterplan and schematic map of the tunnelsystem as the base of information, the center of the future Underground City had to be surveyed again and prepared for the visualization. This has been done by measuring cross sections of the tunnels which were further used to create a 3D model of the tunnel system. The digital terrain model has been generated from digitized contour lines using the program SCOP. The 3d visualization has been created with Cinema 4D and 3D Studio Max.

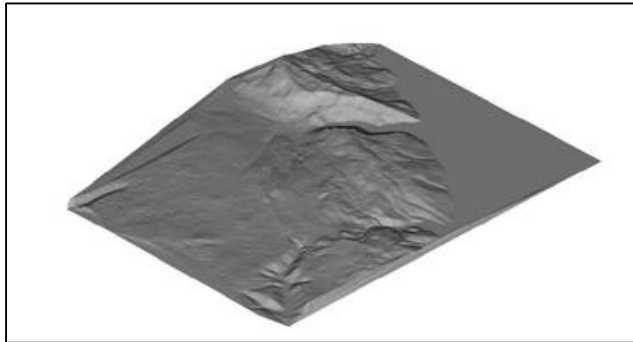


Figure. 5-1: surface model generated with SCOP

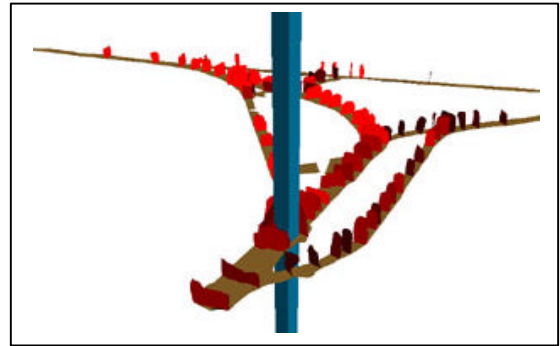


Figure. 5-2: survey data of the center of the underground city (the elevator shaft leads to the cultural center Lamparna), ArcVIEW

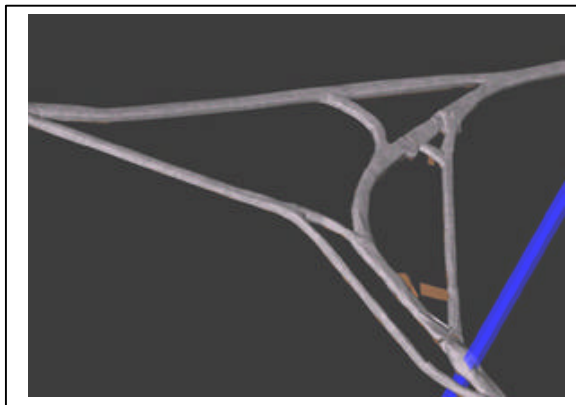


Figure. 5-3: overview of the former coal mine

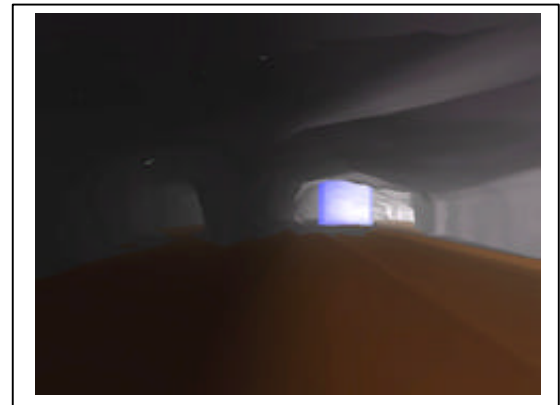


Figure 5-4: inside Rasa tunnel facing the elevator shaft

## CONCLUSION

The visualization has been created as a master thesis at the Vienna University of Technology. On one side it will be a presentation medium for future investors, for the population of the involved area to eliminate their fear of underground space usage and to make them interested in the project. On the other side to demonstrate how visualizations can be used in the planning process to illustrate a project in its conceptual phase.

As the creation of the underground city is a very complex task, it can be developed only in cooperation with an interdisciplinary team consisting of experts in mining, as well as planners, architects, artists and the population to define the needs and future utilization.

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