ORIGINAL RESEARCH ARTICLE

The Urbanism and Geography in Green Regions of Europe

Efthymios Spyridon Georgiou

Department of Geoinformatics, University of Salzburg, 5020 Salzburg, Austria; efthymios.georgiou@stud.sbg.ac.at

ABSTRACT

This article refers to Hallstatt in Austria and Ioannina in Greece. The goals analyze the two locations that have similarities in geometric shape, digital elevation model (DEM), and geomorphology. Firstly, Hallsatt's advances were more technical than aesthetic. There is a general tendency towards extravagance and baroque and Greco-Oriental influences. Secondly, Ioannina is a mountainous city located around Lake Pamvotis. The geometry develops parallel to the lake. The city experiences many cultures. The ancient city had an urban planning that characterized the Ottoman Empire. In the old part, there is the castle, old stone streets, wooden houses, and the house of the Greek Muslim Ali Pasha. The author obtains numerous aerial photographs using Google Earth software. The photographs were received dynamically for all the perimeters of the regions. In short, the cartographer has between 15 and 20 photographs. The next step is to align the photographs in Zephyr photogrammetry software. Configuring resolutions, distance, camera locations, contrast, and brightness is essential. The final products are the 3D texture, 3D model, and orthophotos from Hallstatt and Ioannina. Digital products are suitable for measuring areas, circumferences, and heights. Furthermore, digital products represent a digital archiving practice: conservation and visualization are crucial factors today as they share, represent, promote, and document urban planning, historical memory, and the natural environment.

Keywords: maps; statistics; 3D aerial photos; 3D terrain; 3D model

1. Introduction

The current paper aims at a geography analysis of the European landscape. The purpose is to understand how the European landscape and urban constructs were built in the historical past. The work practically gives emphasis to the meaning of the digital products (maps, 3D terrain, statistics) and the spatial analysis of the cities. The work emphasizes the meaning of the digital products (maps, 3D terrain, and statistics) and the spatial analysis of the cities. Practically, it produces some digital products that help in the better knowledge of Hallstatt and Ioannina. The criteria are the geomorphology, the political decisions, the spatial situation, the cultural background, the environmental conditions, and the living standards of the inhabitants. The manuscript examines two cities, Hallstatt and Ioannina. The similarities between both cities are the mountainous location, the lakes, the natural beauty, the tourist attractions, and the rich history. The cities create geometry like a "typical bird motif".

Typical terms because of the geometry have axes: lines paralleling the lake, horizontal and vertical axes, and building blocks. A bird, because of its geometric shape, creates a bird. The head is in the historical center of the cities, and the plumage is the modern extension of the cities. Motif, because the central idea is the Greek-Roman philosophy. The architects in the centuries of the Renaissance

affected Greek–Roman culture and principles. The origin of this shape is from ancient, oriental culture. Many times, the environmental conditions are favorable for this construction.

For instance, the lake is a crucial factor. The road axis builds parallel and vertical in the lakes. The transformation of cities has been a diachronic phenomenon over the centuries. The cities lived through poverty, wars, economic development, and political decisions. European political decisions positively affect social, environmental, technological, economic, and sustainable development. The 21st century carries out previous years' history, tradition, and urbanism.

2. History and culture

2.1. One city many cultures

On 28 May 1979, the treaty of accession of Greece to the European community was signed at the Zappeion Megaron. Greece formally joined the European Communities on 1 January 1981 and became its tenth member[1]. The entrance of the E.U. gave an essential boost to democracy, liberalism, the opening of borders, and the development of small businesses (bakeries, boutiques, and grocery stores).

With this innovative, modern, and efficient tool, the Ioannina basin acquires excellent benefits because it is the largest administrative center in the southern-western Balkans. The role and importance are constantly in a strong position because of its historical and cultural background, education, business, and administrative services[2].

Table 1. The cities' stats.

Cities	Population	Density	Annual population change
Hallstatt	734	12.29/km^2	−0.76%
Ioannina	70.643	280/km^2	0.62%

Note: The data is from website worldpopulationreview[3] and website citypopulation[4].

Table 1 shows statistics from the cities. The population, the density, and the annual population change examine the demographic conditions in Hallstatt and Ioannina. The data must be assembled in an appropriate form in readiness for analysis. This stage will also entail a good deal of the initial preliminary statistical analysis to clean up the data and identify potentially meaningful relationships that need further examination[5].

2.2. Typical bird motif

The birds in society symbolize freedom, peace, hope, communication, and romance. Nowadays, many architects sometimes organize events relative to this geometry in the cities. For instance, in Brasilia, it lights up like a bird, according to Lucio Costa, a city planner. The idea was to build it like a cross, made by two axes: the "monumental axis," where the government buildings and palaces are located, and the "road and residential axis." Many times, the location of the city is the bird geometry. In both places, there are lakes. The central road axis is parallel to the lakes. Also, the buildings are constructed parallel to this line. The line planning of a city is common in many cities.

Moreover, the city planners will preserve this shape in the following years. The plans sometimes conserve the memories, the culture, the living standards, and the history of the inhabitants. For instance, the inhabitants of the region of Epirus went to Europe, the U.S.A., Canada, and Australia because they searched for a better future. In local history, the bird likes the freedom of a better life. The region passed through a lot of war and poverty. Moreover, the people love the city, the music, and the cuisine.

The Hallstatt High Valley (Austria) represents one of Europe's oldest cultural and industrial landscapes and forms the center of the UNESCO World Heritage region Hallstatt-Dachstein/Salzkammergut. For millennia, this Alpine valley was a vast region's demographic and economic center, with intricate links to

regional and trans-regional communities[6]. The Hallstatt salt mine comprises 21 levels and several smaller shafts ranging from 514 m above sea level (Erbstollen level) to an elevation of around 1267 m[7]. The "Salzberg valley" offers only a restricted area and is difficult to access as it is closely confined by steep mountains to the north, south, and west and by a steep slope in the east descending towards Lake Hallstatt[8].

3. Visualization and documentation

3.1. Digital products

Nowadays, digital products are intelligent and innovative solutions. The needs of the modern sciences are good data analysis and presentation. For instance, online maps offer the possibility of managing the data of many users. An online environment of spatial classification. The value of digital products is significant because of the rapid spread of information in every corner of the planet.

The digital products are:

Maps: The emergence of big data presents a call to action for cartographers. Making a map is, at its core, an act of generalization to make sense of an infinitely complex world[9]. Maps have three essential attributes: scale, projection, and symbolization. Each element is a source of distortion. They describe the essence of the map's possibilities and limitations as a group[10].

Graphs: Like all modern mathematical theories, the theory of graphs has its own shorthand notation, allowing considerable economy of thought and making it more effective and more accessible to manipulate[11]. The various graphs are supposed to have values for one "dependent" variable y and one "independent" (exogenous, predictor) variable x. The (x,y) points lie nearly in a straight line[12].

Online maps: One advantage of using an online map is that it is a digital store of information, and therefore, it can be consulted without actually visiting the river. Consequently, it enables the user to anticipate a future requirement[12].

Tables: The most efficient and robust statistical techniques are of little value unless the application is possible within the resources of the statistical worker. Since statistical data are highly perishable, the analysis can be accomplished in a minimum amount of time[13]. Tables for statisticians. The set of tables is concerned only with the commoner, more familiar, and more elementary of the many statistical functions[14].

Figures: Many research papers in imaging concern measurement. The number of observers is visualized with the various and varied figures. The power of figures in statistical analysis affects understanding in audience[15].

To summarize, humanity lives in the technological revolution nowadays. The Terra MB data, the progress of the applications, the global web, virtual reality (photos, videos, MP4), and the low-cost engineering machines (drones, lidar, satellites) have increased the indexes of sustainable development, human protection, and the make-decisions of policies. All people need to imagine a better future. The people need the planet, and the planet needs the people.

3.2. Digital times

The digital age is described by technologies that increase the speed and scale of knowledge renewal in business and society. The theory of evolution as an explanation of our system affirms that sustainability functions around the revival of knowledge[16]. One of the essential aspects of e-government is how it brings citizens and businesses closer to their governments[17]. More and more governments are using information and communication technologies, especially the Internet or web networks, to provide services between government agencies and citizens, businesses, employees, and other non-governmental organizations[15]. Knowledge turnover could be higher in parts of the system that are relatively stable, and new variations are rarely

maintained as they emerge. In other, less stable parts of the system, faster knowledge turnover is beneficial because new knowledge is produced more frequently, allowing adaptation to the changing environment[16].Waves of e-government are multiplying in organizations and public administrations around the world[17].

For example, in the second generation of the of the internet, the "Semantic Web," the functionality that understands meaning replaces the ability to find matching words without knowing it[16].

The benefits of the digital era are:

1) Quickly spread information;
2) Globally knowledge;
3) Various and varied texts, videos, tables;
4) Visualization of information. For instance, photographs and videos;
5) Historical storage;
6) Artificial intelligent;
7) Big authenticity. For instance, government websites.

The digital era changes the daily lives of people. Humanity is facing new challenges.

4. Digital products

4.1. 3D model

The methodology base on the **Figure 1**. The three pillars are the planning the Project, the Google Earth, and the Photogrammetric Project.
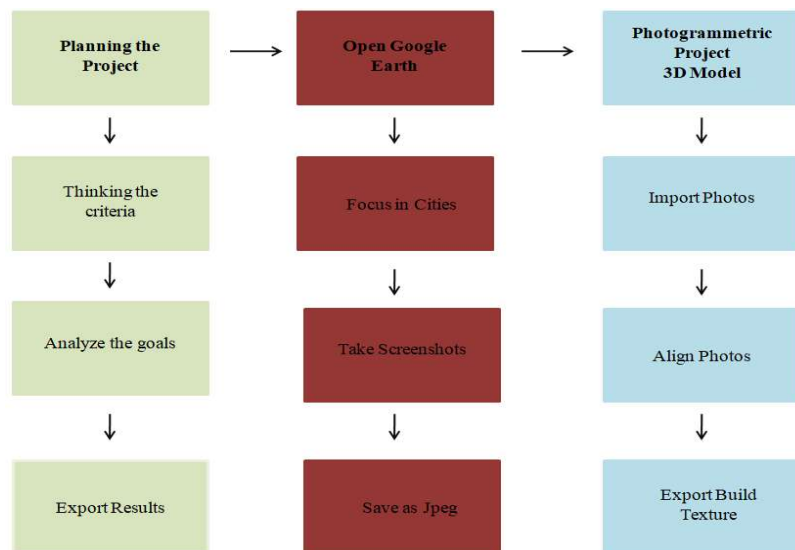

Figure 1. Data Modeling of the project.

Figures 2 and **3** show the Hallstatt. The Ioannina is presented as a 3D model. Also, **Figures 4** and **5** show Ioannina. In the models, the urbanism, the water land, the green areas, and the roads. The development profit of cartographers, G.I.S. analysts, and G.I.S. designers is essential in professional planning. That is why a strategy, a system of action, and professional development are needed[18]. The chance to derive 3D information from images aligns with the ability to pick out corresponding points in photos taken of the same object from different positions[19].

Images are processed using 3DF Zephyr photogrammetry software. The purpose approaches 2D photographs in the form of common characteristics of contrast, brightness, and pixel size. The point cloud is

rotated so that Hallstatt and Ioannina follow the vertical. It will allow exploiting the distribution of points along the X-axis and Y-axis in the next step[20].
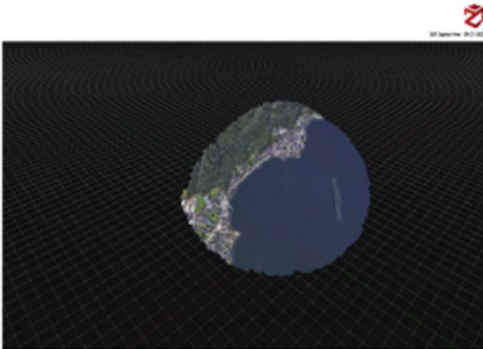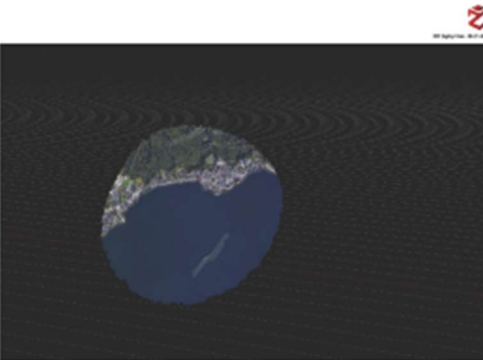

Figure 2. The Panoramic 3D view from Hallstatt.

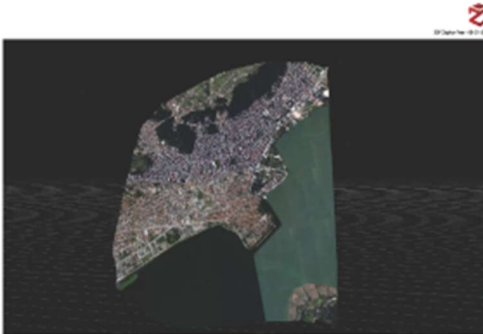**Figure 3.** The Panoramic 3D view from Hallstatt.

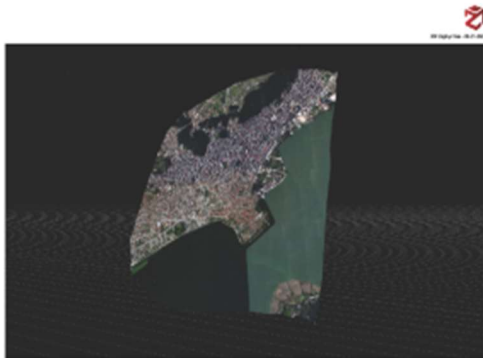**Figure 4.** The Panoramic 3D view from Ioannina.

Figure 5. The Panoramic 3D view from Ioannina.

4.2. DEM

The Digital Elevation Model (DEM) is a valuable and innovative digital product. **Figures 6** and **7** show the elevation from the vast region and the cities with white color. **Figure 6** shows Hallstatt and **Figure 7** shows Ioannina. The Digital Elevation Model presents the vector and raster datasets. The points of the cities and the wide of the elevation.
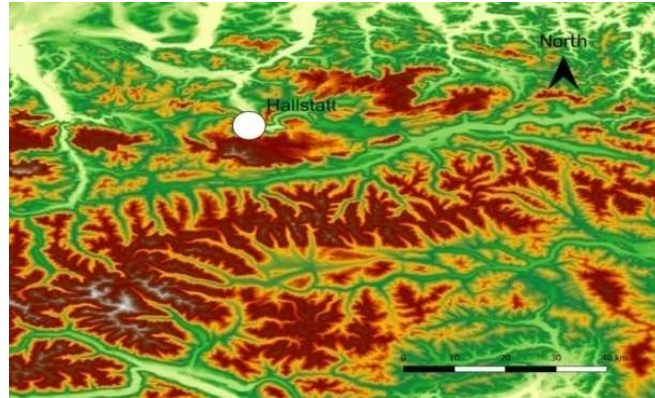

Figure 6. DEM from Hallstatt's region, Data from the official website Earthdata Nasa.gov[21].
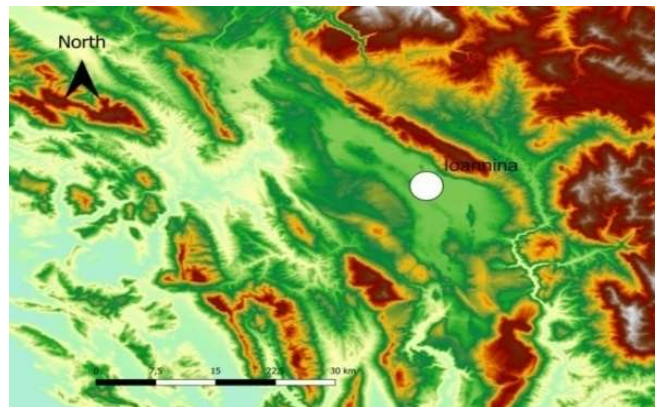

Figure 7. DEM from Ioannina's region, Data from the official website Earthdata.Nasa.gov[21].

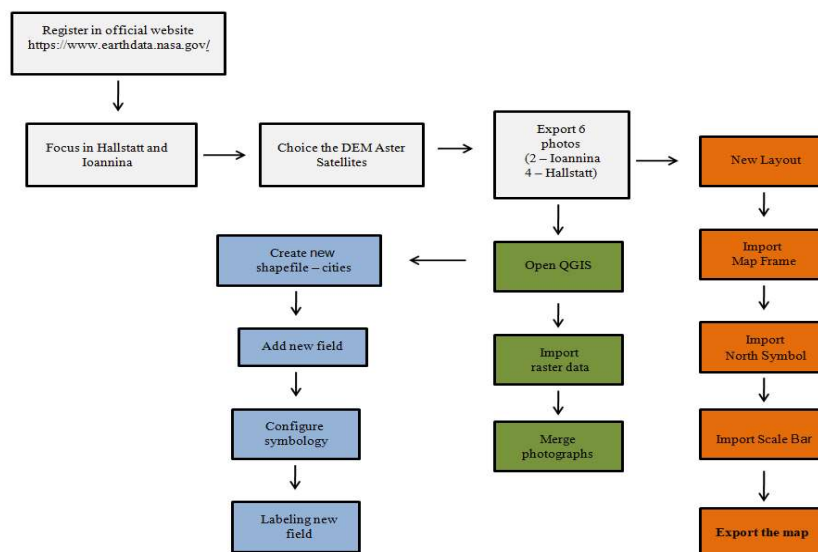Summarize, the methodology in **Figure 8** of the process has the following steps:

Figure 8. Data Modeling of the DEM construction.

The increased digitization of organizational processes and products poses new challenges to understanding product innovation. It also opens new horizons for information systems research[22]. Over the last ten years, the development and use of digital maps for teaching and learning in higher education have rapidly increased. There is also a political drive to encourage and foster best practices in this area. The use of digital maps for learning, outlining the features that make them powerful tools, before considering the more general literature on learners' use of maps, which suggests that although they have great potential, the use of digital maps by learners may not be straightforward[23].

The Geographic Information System and the related applications in QGIS, ArcGIS Pro, and ArcGIS Online are solutions to present digital geography. The vector and raster datasets included the data for the region. The spatial analysis configures criteria for the cities, villages, natural environment, and cultural sites. Maps are an innovative product for this purpose. **Figures 9–11** show the Hallstatt and Ioannina. The digital environment contains the scale bar, map frame, the symbol north, and the shapefile.

Figure 9. The location from Hallstatt, Austria.

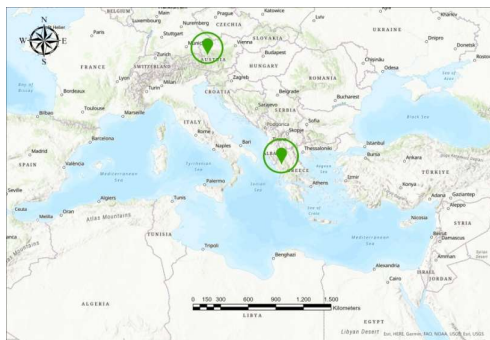**Figure 10.** The location from Ioannina, Greece.

Figure 11. The locations from Hallstatt and Ioannina in Europe.

4.3. Maps

The transition from analogical to digital maps has many benefits nowadays. For instance, it is a choice of storage, easy sharing, spread of information, and sound presentation. The maps make life simpler and more intelligent. The similarities in geomorphology are the mountainous areas, the lakes, and the nearest distance from the sea. Periphery Epirus is located in the Ionian Pelagos, and Hallstatt is nearest to the Adriatic Sea. Also, Hallstatt is located in the Austro-Bavarian Alps, and Ioannina is in the Pindos mountains.

Table 2 shows the similarities from the two cities.

Table 2. Similarities.

Cities	Geomorphology	Weather	Lakes	Elevation	Environment
Hallstatt	Mountainous Area Alps	Cold and Rain	Lake Hallstatt	Elevation 511 m	Nature Heritage
Ioannina	Mountainous Area Pindos	Rain and Humidity	Lake Pamvotis	Elevation 480 m	Natural Beauty

5. Results

The area of Ioannina is bigger than Hallstatt. Moreover, Hallstatt is an economic-environmental and cultural-tourist development pole. Both cities have lakes, and the cities are built on the west side of the lakes.

The geometry due to **Figures 12–15** is like a bird. The top of the city focuses on the main activities of the city. Also, the units of measurement are square meters, meters in area, and meters in perimeter. The following **Table 3** shows the area and perimeter of Hallstatt and Ioannina. The user ArcGIS Pro makes digitalization in urban areas.

Figure 12. The geometry shape of Hallstatt in region scale.
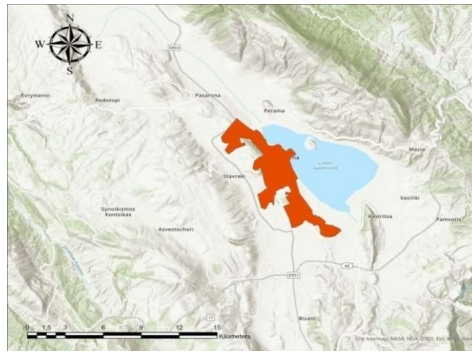

Figure 13. The geometry shape of Hallstatt.

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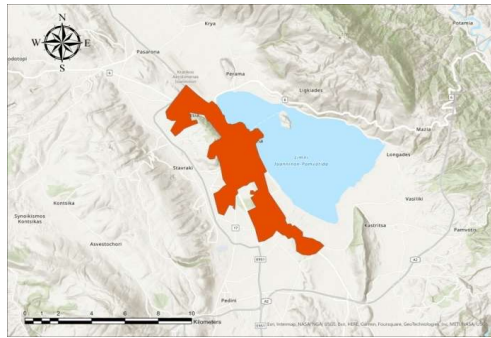**Figure 14.** The geometry shape from Ioannina in region scale.

Figure 15. The geometry shape from Ioannina city.

Table 3. The cities' measurement.

Cities	Area (Sq. Meters)	Perimeter(Meters)
Hallstatt	313,963	5577
Ioannina	14,583,276	36,374

The cities are located in mountainous areas. Sometimes, climate change affects the inhabitants' social lives and living standards. Especially in winter, the rains and winds are vital weather phenomena.

6. Discussion

The authors should discuss the results and how they can be interpreted from the perspective of previous studies and the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted. The full paper can develop discussion around specific themes. For instance, what are the new opportunities of the technological revolution? What is the software's significance, and how can our lives become easier?

How digital products are the new possibility of new cooperation, transparency, and accuracy in the measurements between organizations from every corner of the planet. Architects, urbanists, teachers, archeologists, biologists, sociologists, and environmental scientists must adapt and gain from the new digital times. The world will probably change in the following years. These changes need to win over all people because they all want a better, more sustainable future.

Digital measurements are smart and innovative tools. The measurements solve solutions from previous decades. For instance, the website epsg.io[24] offers enough accuracy. The coordinate system gives emphasis to each region.

Also, the culture, the arts, the geomorphology, the music, and the cuisine unite the people. For instance, the countries produce many agricultural products in the Mediterranean Sea. The Mediterranean cuisine and diet are the traditional way of life of the people. Nowadays, the land benefits the economy and international trade. North Europe has multi-national environments, especially in the vast cities and capitals. The business is

more developed because of the road networking systems, the technical approach in the business frame, and protection from the environment. In addition, there is the phenomenon of focusing the population in huge European cities because there are many jobs. For this reason, the little villages, the periphery of the central development poles live in poverty and have low-income jobs.

7. Conclusion

Digital products have powerful meaning today. The digital era is a reality. The audience can observe every corner of the earth. The process of technology is something new. The map society has the challenge of managing the modern situation. Geography, geomorphology, and city planning included similarities in European cities because the shared history and cultural background are very significant. This frame needs to be preserved. The sense of responsibility is at the level of governance and by each citizen. A responsible society and the exchange of ideas create a better future for the next generation.

Conflict of interest

The author declares no conflict of interest.

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