Business Intelligence Tools in the Interpretation of the Ranking of Smart Cities

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***Abstract* - Abstract - In the age of Big Data, it is necessary to use various tools to quickly identify data trends, i.e. to visualize large datasets in graphical form. This paper explains the steps of extracting, transforming and loading (ETL) data from various sources, i.e. the use of business intelligence tools in interpreting large datasets for a large number of cities. Three basic phases of collection, processing and visualization of 38 indicators by six dimensions of a smart city for 127 Croatian cities are presented. Data collections were made through web scraping, secondary searches on the official websites of public institutions and through official requests to authorized institutions and cities. The second phase involved structuring, normalization, formatting, data cleaning and the calculation of the Croatian Smart Cities Index, which is the average of all standardized indicator values for all six dimensions of a smart city. The third phase concerned the interpretation of the results, i.e. the visualization of all dimensions of smart cities in Power BI and Tableau.**

Keywords: Business Intelligence (BI), Smart Cities, Ranking, Power BI, Tableau, Big Data

I. INTRODUCTION

The most important key to a successful BI system is the consolidation of data from many different operational systems into a data warehouse [1]. BI is most often based on data warehouse arrangements (DWH - Data Warehouses) [2]. Since it is a complex study involving a large number of entities, i.e. 127 cities of the Republic of Croatia, the 38 indicators described in ISO standard 37120 - Indicators for urban services and quality of life and ISO standard 37122 - Sustainable cities and communities [3], [4]. The ranking of smart cities has become an important empirical basis for the discovery of comparative advantages and the sharpening of specific profiles and thus for the definition of goals and strategies for future development [5]. Visualization with the Tableau program and the Microsoft Power BI program enabled a clear presentation of the research results, in which one can easily compare the various data according to different criteria. Considering the volumes of data, this program assists planners and decision-makers with a system that combines data acquisition, data storage and knowledge management with analysis tools for presenting complex internal and competitively relevant information [6]. In this paper, the data storage and processing part of Power BI is referred to as ETL, while Tableau uses the Tableau Prep program.

In these interfaces, the loading of data from different sources began, i.e. the second phase involved normalizing, formatting and cleaning the raw data to create indicators and then calculating the index for each city [7]. Based on the index value, a ranking of the best and worst cities for all six dimensions of a smart city was created and then the overall ranking according to the index of smart Croatian cities. Before loading into Power Bi, all values are standardized (z-value), in the value range of -1.98 to 1.98, while all dimensions of Smart Cities are marked with colors to facilitate the interpretation and visualization of the research results. [7].

When exploring data visualization with the Tableau program, Figure 1 offers a great overview, portraying the interpretation for Croatia as a whole, showing each county, city, and index. The visualization was based on color coding system that was already defined in the first part of the empirical study when classifying the cities.

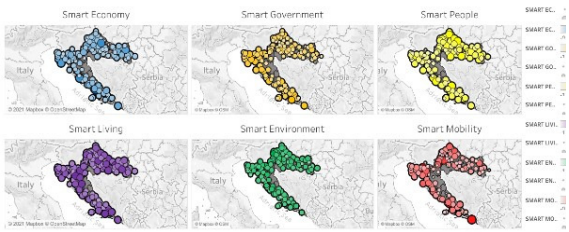

Figure 1. Dimensions of smart cities in the Tableau program

The systematic approach of the mentioned programs is presented, enabling quick manipulation during the data preparation process, so that with just a few clicks, we can format the data and set the criteria for how we want to display the datasets before the actual data visualization occurs.

II. PREVIOUS RESEARCH

Big data analytics has become an indispensable component in the age of digital transformation, resulting from the creation of vast amounts of data generated by digital processes. Data management and data literacy have become a highly sought-after skill in organizations as the importance of data-driven decision making continues to grow. Therefore, many authors emphasize the introduction of data literacy curricula as one of the strategic priorities at universities [8], [9], [10], [11], [12].

The importance of using BI in public administration to support city leaders is emphasized. A group of authors from New South Wales (Australia) developed a planning and policy support tool for local management of infrastructure services Smart Infrastructure Dashboard (SID) that combines BI tools and geospatial data [9], while others developed informational dashboards the success of the city's sustainability, taking into account several indicators identified as key indicators of urban sustainability [13].

The application of BI was also used to verify the implementation of the smart city strategy in accordance with the established objectives and action plan in Portugal. Urban Tableau was developed by Bord, which combines quantitative and qualitative indicators with a specific smart city strategy. The tool explores the steps that need to be taken to implement this framework, the selection of the most appropriate indicators and the use of urban statistics [14], [19]. BI has become an indispensable tool for quality monitoring in universities [15], [16].

The importance of the application of BI in the business world is emphasized, especially as a support for corporate management, to evaluate competitive advantages [17], to optimize resources and improve corporate strategy [18], to improve business efficiency [20]. Previous research has shown that advanced technologies (BI, big data analytics, etc.) increase the success of companies and improve the quality of the presentation of big data. Similarly, Power BI and Tableau enable better visualization and analysis of data when presenting the ranking of smart cities, resulting in a more accurate and better ranking.

III. DEFINITIONS

BI is a term that encompasses a wide range of analytics software and solutions for collecting, consolidating, analyzing, and delivering information in a way that is intended to enable business users to make better business decisions [21], [22] to present complex internal and competitive information to internal planners and decision makers [23], to improve business performance [24], and to highlight macroeconomic trends and contribute to building the so-called collective intelligence organization. BI has two meanings. The first meaning refers to a type of data analysis that aims to understand organizational activities and capabilities, and the second meaning refers to a set of technologies that support this type of data analysis. As an evolution of decision support tools, BI tools enable querying, data mining, statistical analysis, reporting, scenario modeling, data visualization, and the like [25]. In this work, the BI programs Tableau and Power BI Desktop were used, which provide a practical application solution for visual monitoring of progress and can be published on the city's website. With these tools, data can be extracted and combined, searched and displayed interactively. In addition, it is also possible to create dashboards that combine different visual representations with different data related to a specific city or dimension. Visualization with the help of BI programs has become an indispensable tool, as the functionality of any system that works with databases or warehouses relies on a large amount of data [7].

Tableau is an analytical program that was introduced at Stanford in 2003 with the goal of improving the flow of analysis and making data more accessible through visualization. With Tableau, large amounts of data can be easily transformed into reports, visualizations and dashboards ten times faster than with traditional BI systems. Data visualization brings together machine learning, statistics, natural language and intelligent data preparation to deliver robust and reliable results.

Power BI was conceived in 2010 by authors Ru-ler and Dhers Netz, who were part of a team at Microsoft that provided support services for SQL Server, while the interface itself was designed by West Chadic George in 2010. Microsoft Power BI was officially launched in 2014. Power BI can be divided into different tools, such as Power BI Service, Power BI Desktop, Power BI Mobile and Power BI Developer. Power BI Desktop is a free data analysis and reporting tool that is installed on a computer via Windows. It can be connected to a variety of local and cloud data sources to transform information into an interactive visual representation. Power BI Services is a cloud service that hosts all visualizations created and allows viewing, editing and sharing of visualizations with potential users. Power BI Mobi-le refers to a set of responsive mobile software applications for iOS, Android and even Windows 10 devices. Power BI Developer requires complete knowledge of the Power BI system in order to access the development and management of other BI tools and applications with this tool [26].

The benefits of using these tools are certainly the elimination of guesswork within the organization, better communication between the departments of a given organization and quick interventions in terms of business results. That is, high quality and continuous monitoring of information, that is an important asset of any organization, to speed up the process of timely and quality decision making.

IV. PROCEDURE

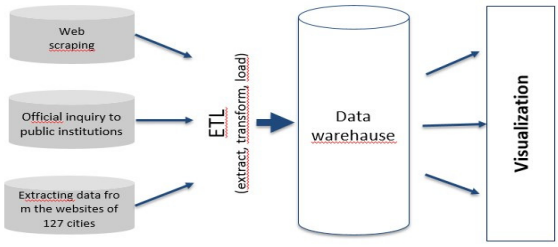

Figure 2. Conceptual model of reserch

The raw data in this study have been retrieved from different sources, of varying quality, using inconsistent representations, codes and formats that need to be

harmonized. Therefore, problems of integration, cleansing and formatting are already solved during loading and conversion.

Figure 2 shows the conceptual model of the present study. The data have been collected from publicly accessible bodies, such as the State Statistical Office, the State Election Commission, the Ministry of Economy and Sustainable Development, the Ministry of Regional Development and EU Funds, A1 Croatia, Hrvatski telekom d.d. Parts of the data were collected through official requests to public institutions, i.e. the Institute of Public Finance, the Croatian Institute of Health Insurance, the National and University Libraries in Zagreb, Elen HEP electric filling stations, Croatian Waters, the Croatian Electrical Industry, the Croatian Regulatory Authority for Network Activities, the puni.hr portal, then through a detailed search and analysis of the websites of all 127 Croatian cities and with measurements on the Google map, an indicator of the road distance of all cities to the nearest airport was calculated [7].

TABLE I. TABLE I. ISO INDICATORS INCLUDED IN THE CREATION OF THE SMART CITY INDEX

MART ECONOMY	Number of overnight stays by tourists Share of tax revenue Number of companies Number of trades Road connection to the nearest airport Direct debt per capita Share of ICT companies and trades Proportion of employees in the ICT sector Share of employees in education, research and development Share of budget expenditure on research and development
SMART GOVERNMENT	Share of the electorate in the last local elections Budget expenditure per inhabitant Budget transparency Digital communication channels List of municipal companies Citizen participation in the preparation of the budget Digital forms for citizens
SMART PEOPLE	Proportion of the population enrolled in primary education Ratio of students to teachers in elementary school Proportion of budget expenditure on sport and culture Proportion of active library users per inhabitant Ratio of library materials per inhabitant Proportion of citizens with a university degree per 1,000 inhabitants
SMART LIVING	Proportion of smart electricity metres out of the total number of metering points Ratio of primary care physicians per resident Live cameras
SMART ENVIORMENT	Share of electricity consumption per inhabitant Electricity consumption in public street lighting Greenhouse gas emissions in tonnes per inhabitant Concentration of solid particles (PM10) Total amount of municipal waste per inhabitant Proportion of the urban population connected to the water supply system Proportion of household expenditure on environmental protection
SMART MOBILITY	Percentage of internet connections per household Wi-Fi Pay for parking online GIS Number of e-charging stations

Table I shows all ISO indicators from which the index of smart Croatian cities was compiled using the equal weighting method.

To create the city index of all six dimensions, 38 indicators from different sources for 127 Croatian cities were uploaded. The indexes for each cities and six dimension are listed in Appendix I.

In the next step of the ETL process, data transformations were tackled. This process ensures that all datasets are cleansed and formatted correctly for the target system and its database structure. To make it compatible with the target system or database, the data transformation process ensures the removal of duplicates or anomalies, the standardization of data formats, data aggregation and the application of specific calculations. Data transformation ensures that the data have been consistent, accurate and error-free before it is loaded into the target database [27].

Once the data was collected, the first step of the ETL process was initiated, which is data extraction, i.e. uploading the raw data from various data sources previously mentioned. The majority of the data were retrieved from MS Excel tables and .csv files.

In the final step of the ETL process, data loading is performed. Efficient data loading is essential for BI. This is where the transformed data is loaded into the target system or database. The systems can include a data warehouse, a data lake or even a simple Excel spreadsheet. During the data loading process, the data is structured in a format that facilitates access, querying and analysis. The target database is optimized for the different types of data to be stored and for the end use cases in which the data will be used. This may involve creating a specific data model, partitioning the data or creating an index.

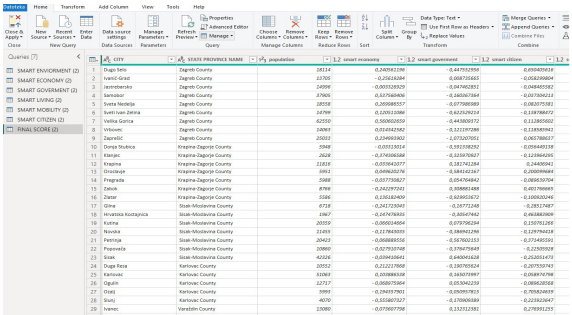

Figure 3. Power BI interface for data transformation

Figure 3 shows the interface where the data is transformed accordg to the requirements of the research.

After the detailed preparation of the data, we started to create a report in the form of charts, graphs and cutters. Power BI dashboards provide a consolidated presentation of key statistics, measurement data and visualizations, i.e.

interfaces that enable easy report creation. We can drag and drop data fields onto the report canvas, choose from a and tables, and customize their formatting and appearance.wide range of custom visualizations such as charts, maps

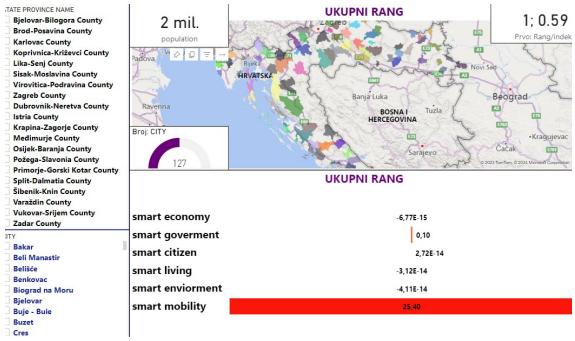

Figure 4. Example of a report for all Croatian cities in Power BI

Figure 4 shows an example of a collective report for all cities in the Republic of Croatia. A Choropleth map was applied to the report to display all cities in different colors, cutters were applied to all districts, and a list of all cities in the respective district was created. In addition, the Gauge visual was used to show the number of inhabitants and the position in the ranking as well as the corresponding index. The bar chart shows the average values of all dimensions of a smart city.

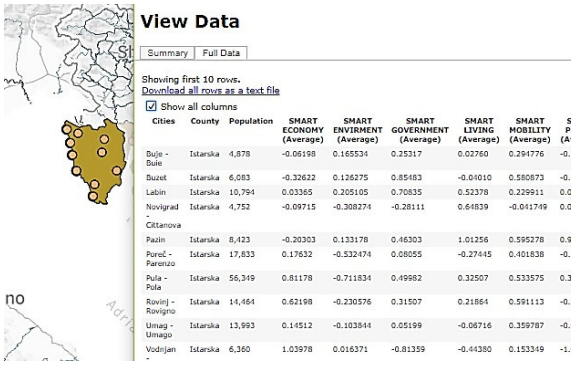

Figure 5. Grouped data for the County of Istria in Tableau

In addition to the visualization for all dimensions, a preview for each individual dimension is also available, and if you move the mouse pointer over a specific county and city, the results are displayed at that moment. If one wants to see the grouped data of a single county or individual dimensions, one can activate the display of the data by clicking on a single county or dimension and selecting the Full data option, which provides an overview of all indicators, as can be seen in Figure 5.

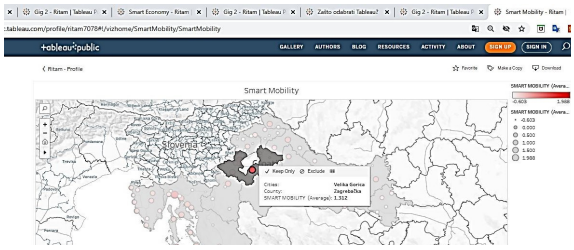

Figure 6. Display for one city and one dimension in the Taleau program

If you want to see the data for an individual city, e.g. in the overall ranking, it is sufficient to select the city in the list of an individual county to display all relevant data, as shown in Figure 6.

V. CONCLUSION

The BI program Tableau and Power BI Desktop represent an application solution that can be used in practice for visual monitoring of progress and placed on city websites. With this tool, data can be extracted and combined, searched and displayed interactively. In addition, it is possible to create dashboards that combine different visual representations with different data related to a specific city or dimension. Visualization with the help of a BI program has become an indispensable tool, as the functionality of any system that works with databases or data warehouses is necessary, as has been done in this work with regard to big data.

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Appendix I. Index of smart Croatian cities for 6 dimensions of a smart city

County	Cities	Smart Economy	Smart Governmnet	Smart Citizens	Smart Living	Smart Enviorment	Smart Mobility
Zagreb	Dugo Selo	**0.19**	**-0.45**	**0.70**	**-0.33**	**0.26**	**-0.12**
Zagreb	Ivanić-Grad	**-0.34**	**0.01**	**0.08**	**-0.27**	**-0.11**	**-0.27**
Zagreb	Jastrebarsko	**-0.03**	**-0.05**	**-0.11**	**-0.22**	**0.03**	**0.77**
Zagreb	Samobor	**0.36**	**-0.16**	**0.00**	**0.05**	**-0.15**	**0.29**
Zagreb	Sveta Nedelja	**0.14**	**-0.08**	**-0.17**	**-1.69**	**0.31**	**0.53**
Zagreb	Sveti Ivan Zelina	**0.08**	**-0.62**	**-0.22**	**-0.47**	**0.29**	**-0.30**
Zagreb	Velika Gorica	**0.42**	**-0.44**	**0.11**	**-0.52**	**-0.32**	**1.31**
Zagreb	Vrbovec	**-0.03**	**-0.12**	**0.02**	**-0.14**	**-0.28**	**-0.44**
Zagreb	Zaprešić	**0.10**	**-1.07**	**0.42**	**0.13**	**0.16**	**1.02**
Krapina-Zagorje	Donja Stubica	**-0.07**	**-0.59**	**0.10**	**0.03**	**0.17**	**-0.39**
Krapina-Zagorje	Klanjec	**-0.41**	**-0.33**	**0.32**	**0.63**	**1.29**	**-0.37**
Krapina-Zagorje	Krapina	**-0.10**	**0.18**	**0.39**	**-0.06**	**0.23**	**0.09**
Krapina-Zagorje	Oroslavje	**0.01**	**-0.58**	**0.19**	**-1.01**	**0.37**	**-0.12**
Krapina-Zagorje	Pregrada	**-0.09**	**0.05**	**0.08**	**0.28**	**0.71**	**-0.36**
Krapina-Zagorje	Zabok	**-0.32**	**0.31**	**0.47**	**1.05**	**0.34**	**0.58**
Krapina-Zagorje	Zlatar	**0.15**	**-0.93**	**0.22**	**-0.35**	**0.24**	**-0.44**
Sisak-Moslavina	Glina	**-0.19**	**-0.17**	**-0.52**	**-0.16**	**-0.28**	**-0.60**
Sisak-Moslavina	Hrvatska Kostajnica	**0.09**	**-0.31**	**0.92**	**0.24**	**0.11**	**-0.56**
Sisak-Moslavina	Kutina	**-0.22**	**0.08**	**0.13**	**-0.40**	**-1.98**	**0.55**
Sisak-Moslavina	Novska	**-0.15**	**-0.39**	**-0.21**	**0.18**	**0.15**	**0.26**
Sisak-Moslavina	Petrinja	**-0.11**	**-0.57**	**-0.48**	**-0.61**	**0.02**	**-0.45**
Sisak-Moslavina	Popovača	**-0.04**	**-0.38**	**-0.25**	**-0.48**	**0.37**	**-0.42**

Sisak-Moslavina	Sisak	**-0.11**	**0.64**	**-0.22**	**-0.07**	**-0.32**	**0.23**
Karlovac	Duga Resa	**0.29**	**-0.19**	**-0.31**	**0.29**	**0.22**	**-0.28**
Karlovac	Karlovac	**0.00**	**0.17**	**0.03**	**0.77**	**-0.26**	**0.97**
Karlovac	Ogulin	**-0.13**	**0.05**	**-0.05**	**1.08**	**-0.13**	**0.02**
Karlovac	Ozalj	**-0.19**	**-0.05**	**-0.77**	**-0.43**	**0.83**	**-0.51**
Karlovac	Slunj	**-0.46**	**-0.17**	**-0.38**	**0.14**	**0.01**	**-0.16**
Varaždin	Ivanec	**-0.05**	**0.13**	**0.28**	**-0.48**	**0.24**	**0.50**
Varaždin	Ludbreg	**-0.11**	**0.07**	**0.26**	**-0.36**	**0.41**	**-0.15**
Varaždin	Lepoglava	**-0.23**	**0.25**	**0.96**	**0.20**	**-0.24**	**0.03**
Varaždin	Novi Marof	**0.19**	**-0.26**	**-0.04**	**-0.28**	**0.06**	**-0.34**
Varaždin	Varaždin	**0.21**	**0.28**	**0.94**	**-0.28**	**-0.16**	**0.31**
Varaždin	Varaždinske Toplice	**-0.02**	**0.25**	**-0.99**	**-0.66**	**0.79**	**-0.37**
Koprivnica-Križevci	Đurđevac	**-0.65**	**-0.28**	**1.24**	**0.40**	**0.37**	**0.13**
Koprivnica-Križevci	Koprivnica	**-0.30**	**-0.23**	**1.01**	**0.61**	**0.05**	**0.97**
Koprivnica-Križevci	Križevci	**0.06**	**-0.49**	**0.31**	**-0.28**	**-0.15**	**0.55**
Bjelovar-Bilogora	Bjelovar	**1.08**	**-0.39**	**0.40**	**-0.12**	**-0.71**	**0.62**
Bjelovar-Bilogora	Čazma	**-0.06**	**-0.26**	**-0.21**	**0.97**	**0.26**	**-0.04**
Bjelovar-Bilogora	Daruvar	**-0.25**	**-0.20**	**0.26**	**0.79**	**0.26**	**0.00**
Bjelovar-Bilogora	Garešnica	**-0.22**	**0.03**	**-0.62**	**-0.24**	**-0.13**	**-0.10**
Bjelovar-Bilogora	Grubišno Polje	**-0.26**	**0.32**	**0.12**	**-0.55**	**-0.40**	**-0.50**
Primorje-Gorski Kotar	Bakar	**0.36**	**0.20**	**-0.64**	**-1.50**	**0.10**	**0.21**
Primorje-Gorski Kotar	Cres	**-0.28**	**0.67**	**-0.31**	**-0.63**	**0.11**	**0.71**
Primorje-Gorski Kotar	Crikvenica	**0.10**	**0.36**	**-0.18**	**-0.59**	**-0.31**	**1.02**
Primorje-Gorski Kotar	Čabar	**-0.23**	**0.21**	**-1.13**	**-0.19**	**0.24**	**-0.34**
Primorje-Gorski Kotar	Delnice	**-0.39**	**0.37**	**-0.56**	**0.05**	**0.52**	**-0.20**
Primorje-Gorski Kotar	Kastav	**0.06**	**0.01**	**-0.30**	**-1.41**	**-0.02**	**-0.10**
Primorje-Gorski Kotar	Kraljevica	**0.01**	**0.13**	**0.19**	**-0.57**	**-0.20**	**0.84**
Primorje-Gorski Kotar	Krk	**0.09**	**-0.20**	**0.04**	**-0.23**	**-0.34**	**0.95**
Primorje-Gorski Kotar	Mali Lošinj	**-0.07**	**0.53**	**0.35**	**-0.35**	**0.29**	**0.97**
Primorje-Gorski Kotar	Novi Vinodolski	**-0.08**	**0.38**	**-0.50**	**-0.12**	**-0.22**	**0.63**
Primorje-Gorski Kotar	Opatija	**-0.08**	**0.52**	**0.38**	**0.24**	**0.23**	**0.42**
Primorje-Gorski Kotar	Rab	**-0.08**	**0.28**	**-0.24**	**-0.30**	**-0.44**	**0.57**
Primorje-Gorski Kotar	Rijeka	**0.88**	**0.55**	**0.25**	**0.55**	**-0.73**	**1.98**
Primorje-Gorski Kotar	Vrbovsko	**-0.01**	**0.50**	**-1.07**	**-0.27**	**0.74**	**-0.50**
Lika-Senj	Gospić	**-0.32**	**0.21**	**0.02**	**1.07**	**0.12**	**0.20**
Lika-Senj	Novalja	**-0.18**	**0.60**	**-0.35**	**0.53**	**0.01**	**0.82**
Lika-Senj	Otočac	**0.02**	**-0.36**	**-0.65**	**0.84**	**0.56**	**-0.38**
Lika-Senj	Senj	**-0.33**	**-0.15**	**-0.61**	**1.24**	**-0.15**	**-0.27**
Virovitica-Podravina	Orahovica	**-0.21**	**-0.53**	**0.23**	**1.04**	**0.26**	**-0.03**
Virovitica-Podravina	Slatina	**-0.12**	**-0.13**	**0.23**	**0.11**	**0.14**	**0.09**
Virovitica-Podravina	Virovitica	**-0.66**	**0.09**	**0.16**	**0.91**	**0.02**	**0.20**
Požega-Slavonia	Kutjevo	**-0.22**	**-0.32**	**-0.35**	**-0.15**	**0.24**	**0.00**
Požega-Slavonia	Lipik	**-0.81**	**-0.39**	**-0.79**	**0.41**	**0.00**	**-0.07**
Požega-Slavonia	Pakrac	**-0.22**	**-0.21**	**0.31**	**0.21**	**0.51**	**-0.07**
Požega-Slavonia	Pleternica	**0.07**	**0.15**	**-0.03**	**-0.91**	**-0.01**	**-0.44**
Požega-Slavonia	Požega	**-0.28**	**-0.17**	**0.35**	**0.61**	**-0.12**	**0.54**
Brod-Posavina	Nova Gradiška	**-0.24**	**0.17**	**1.09**	**0.94**	**-0.01**	**0.08**
Brod-Posavina	Slavonski Brod	**0.14**	**-0.33**	**0.25**	**-0.13**	**-0.10**	**0.33**
Zadar	Benkovac	**-0.01**	**-0.24**	**-0.22**	**-0.13**	**0.21**	**-0.21**
Zadar	Biograd na Moru	**-0.45**	**0.80**	**1.01**	**0.04**	**-0.26**	**0.41**
Zadar	Nin	**-0.35**	**0.02**	**-0.74**	**0.50**	**0.65**	**0.42**
Zadar	Obrovac	**-0.06**	**-0.29**	**-0.90**	**-0.42**	**0.39**	**-0.16**
Zadar	Pag	**0.16**	**0.63**	**-0.11**	**0.22**	**-0.28**	**0.51**
Zadar	Zadar	**1.04**	**0.03**	**0.90**	**-0.20**	**-0.63**	**0.85**
Osijek-Baranja	Beli Manastir	**-0.25**	**0.07**	**-0.16**	**0.29**	**0.34**	**-0.46**
Osijek-Baranja	Belišće	**-0.71**	**-0.38**	**-0.13**	**-0.27**	**0.13**	**-0.21**
Osijek-Baranja	Donji Miholjac	**0.09**	**-0.78**	**-0.28**	**-0.03**	**0.29**	**0.08**
Osijek-Baranja	Đakovo	**0.19**	**-0.27**	**0.30**	**0.92**	**0.14**	**0.03**
Osijek-Baranja	Našice	**0.42**	**0.04**	**0.56**	**0.20**	**-0.84**	**0.16**
Osijek-Baranja	Osijek	**0.72**	**0.50**	**0.24**	**-0.38**	**-0.89**	**0.85**
Osijek-Baranja	Valpovo	**0.21**	**-0.41**	**-0.02**	**0.61**	**0.15**	**0.19**
Šibenik-Knin	Drniš	**0.05**	**-0.28**	**-0.26**	**-0.13**	**0.09**	**-0.49**
Šibenik-Knin	Knin	**-0.11**	**-0.17**	**0.15**	**-0.42**	**0.07**	**-0.49**
Šibenik-Knin	Skradin	**-0.01**	**-0.50**	**-1.33**	**-0.59**	**0.23**	**-0.55**
Šibenik-Knin	Šibenik	**0.30**	**0.13**	**0.28**	**0.21**	**-0.20**	**0.56**
Šibenik-Knin	Vodice	**0.14**	**-0.32**	**-0.36**	**-0.59**	**0.04**	**0.49**
Vukovar-Srijem	Ilok	**-0.11**	**-0.59**	**-0.24**	**-0.22**	**0.27**	**-0.44**
Vukovar-Srijem	Otok	**-0.19**	**-0.21**	**-0.35**	**0.11**	**0.14**	**-0.15**
Vukovar-Srijem	Vinkovci	**0.04**	**-0.23**	**0.64**	**0.18**	**-0.73**	**0.22**
Vukovar-Srijem	Vukovar	**0.09**	**0.16**	**-0.12**	**-0.31**	**0.02**	**0.24**
Vukovar-Srijem	Županja	**-0.20**	**-0.33**	**0.45**	**0.13**	**-0.05**	**0.05**

Split-Dalmatia	Hvar	**-0.03**	**0.35**	**0.41**	**0.41**	**-0.55**	**0.68**
Split-Dalmatia	Imotski	**0.34**	**0.22**	**-0.07**	**-0.11**	**0.23**	**0.67**
Split-Dalmatia	Kaštela	**0.42**	**-0.17**	**0.13**	**-0.57**	**-0.61**	**0.85**
Split-Dalmatia	Komiža	**-0.23**	**-0.28**	**-0.90**	**-0.13**	**-0.49**	**-0.12**
Split-Dalmatia	Makarska	**0.12**	**0.20**	**-0.30**	**-0.38**	**-0.32**	**0.56**
Split-Dalmatia	Omiš	**0.08**	**0.09**	**-0.27**	**0.14**	**-0.04**	**0.32**
Split-Dalmatia	Sinj	**0.28**	**-0.01**	**1.22**	**-0.66**	**-0.18**	**0.54**
Split-Dalmatia	Solin	**0.11**	**-0.06**	**0.40**	**-0.81**	**-0.86**	**1.08**
Split-Dalmatia	Split	**1.84**	**0.18**	**0.12**	**-0.45**	**-0.79**	**1.79**
Split-Dalmatia	Stari Grad	**-0.28**	**-0.04**	**-0.24**	**-0.67**	**-0.15**	**0.32**
Split-Dalmatia	Supetar	**0.00**	**0.15**	**0.62**	**-0.07**	**0.42**	**0.38**
Split-Dalmatia	Trilj	**0.10**	**-0.42**	**-0.64**	**-0.63**	**0.14**	**-0.42**
Split-Dalmatia	Trogir	**0.07**	**0.32**	**-0.28**	**0.03**	**-0.38**	**0.33**
Split-Dalmatia	Vis	**0.07**	**0.47**	**0.42**	**-0.33**	**-0.16**	**-0.02**
Split-Dalmatia	Vrgorac	**-0.23**	**0.56**	**-0.08**	**0.66**	**0.27**	**-0.46**
Split-Dalmatia	Vrlika	**-0.60**	**0.57**	**-0.92**	**-0.17**	**0.17**	**-0.03**
Istria	Buje - Buie	**-0.06**	**0.25**	**-0.74**	**0.03**	**0.15**	**0.30**
Istria	Buzet	**-0.31**	**0.85**	**-0.11**	**-0.04**	**0.45**	**0.58**
Istria	Labin	**0.02**	**0.71**	**0.04**	**0.52**	**0.04**	**0.23**
Istria	Novigrad - Cittanova	**-0.11**	**-0.28**	**0.05**	**0.65**	**-0.27**	**-0.05**
Istria	Pazin	**-0.21**	**0.46**	**0.94**	**1.01**	**0.30**	**0.59**
Istria	Poreč - Parenzo	**0.16**	**0.08**	**-0.23**	**-0.27**	**-0.54**	**0.40**
Istria	Pula - Pola	**0.83**	**0.50**	**0.37**	**0.33**	**-0.59**	**0.53**
Istria	Rovinj - Rovigno	**0.62**	**0.32**	**-0.55**	**0.22**	**-0.44**	**0.60**
Istria	Umag - Umago	**0.15**	**0.05**	**-0.62**	**-0.07**	**-0.15**	**0.36**
Istria	Vodnjan - Dignano	**1.04**	**-0.81**	**-1.01**	**-0.44**	**0.09**	**0.15**
Dubrovnik-Neretva	Dubrovnik	**0.55**	**0.74**	**0.28**	**0.49**	**-0.27**	**1.73**
Dubrovnik-Neretva	Korčula	**-0.06**	**1.04**	**0.39**	**1.07**	**-0.24**	**0.47**
Dubrovnik-Neretva	Metković	**0.02**	**-0.51**	**0.42**	**0.80**	**0.14**	**0.03**
Dubrovnik-Neretva	Opuzen	**0.14**	**0.04**	**0.80**	**0.43**	**0.27**	**-0.15**
Dubrovnik-Neretva	Ploče	**-0.28**	**0.53**	**-0.50**	**0.78**	**0.24**	**0.12**
Međimurje	Čakovec	**-0.03**	**-0.07**	**1.09**	**0.44**	**0.12**	**0.93**
Međimurje	Mursko Središće	**-0.20**	**-0.06**	**0.05**	**-0.06**	**0.28**	**-0.41**
Međimurje	Prelog	**-0.56**	**0.39**	**-0.17**	**-0.59**	**0.05**	**0.03**