ISSN 2067-4082
e-ISSN 2068-9969
L-ISSN 2067-4082

Journal of Urban and Regional Analysis

Volume 14 — Issue 1 — February, 2022

University of Bucharest
Professional Association of Romanian Geographers
www.jurareview.ro

EDITOR

Ioan IANOŞ, *University of Bucharest*

Managing Editors:

Cristian TĂLÂNGĂ, *University of Bucharest*

Mirela PARASCHIV, *"Ovidius" University of Constanța*

Alexandru GAVRIŞ, *Bucharest University of Economic Studies*

EDITORIAL BOARD

Jerzy BANSKY
Polish Academy of Sciences, Poland

Gerhard BRAUN
Free University of Berlin, Germany

Wilfried HELLER
University of Potsdam, Germany

Markus HESSE
University of Luxembourg, Luxemburg

Roy JONES
Curtin University, Bentley, Australia

Peter JORDAN
University of Vienna, Austria

Audrey KOBAYASHI
Queen's University, Kingston, Canada

Ruben Camilo Lois GONZÁLEZ
University of Santiago de Compostela, Spain

Hualou LONG
Chinese Academy of Sciences, China

George POMEROY
University of Shippensburg, USA

Denise PUMAIN
Paris University 1, France

Luca SALVATI
University of Rome 'La Sapienza', Italy

Michael SOFER
Bar-Ilan University, Israel

Anthony SORENSEN
University of New England, Armidale, Australia

Alexandru UNGUREANU
"Al..I. Cuza" University of Iași, Romania

Jan WENDT
University of Gdansk, Poland

INTERNATIONAL EDITORIAL ADVISORY BOARD

Jozsef BENEDEK
"Babeş-Bolyai" University, Romania

Constantinos CHOROMIDES
Glasgow Caledonian University, United Kingdom

David BOLE
Anton Melik Geographical Institute, Slovenia

Cristian BRAGHINĂ
University of Bucharest, Romania

Milan BUFON
University of Primorska, Slovenia

Hans-Joachim BŰRKNER
Leibniz Institute for Regional Development and Structural Planning, Erkner, Germany

Pompei COCEAN
"Babeş-Bolyai" University, Romania

Remus CREŢAN
West University of Timișoara, Romania

Joaquin FARINOS DASI
University of Valencia, Spain

Hermanus S. GEYER
Stellenbosch University, South Africa

Daniel GÖLER
University of Bamberg, Germany

Octavian GROZA
"Al. I. Cuza" University of Iași, Romania

TamásHARDI
Hungarian Academy of Sciences, Hungary

LisaHARRINGTON
Kansas State University, USA

Alexandru ILIEŞ
University of Oradea, Romania

Margarita ILIEVA
Kazimierz Wielki University, Poland

Piotr LITYŃSKI
Cracow University of Economics, Poland

Irena MOCANU
Institute of Geography, Romanian Academy, Romania

Ionel MUNTELE
"Al. I. Cuza" University of Iași, Romania

Gabriel PASCARIU
"Ion Mincu" University of Architecture and Urbanism, Romania

Valerià PAÜL
University of Santiago de Compostela, Spain

Alexandru-Ionuț PETRIȘOR
"Ion Mincu" University of Architecture and Urbanism, Romania

Victor PLATON
Institute of National Economy, Romania

Petr RUMPEL
University of Ostrava, Czech Republic

Alexandru SANDU
"Ion Mincu" University of Architecture and Urbanism, Romania

Dumitru SANDU
University of Bucharest, Romania

Cătălin SÂRBU
"Ion Mincu" University of Architecture and Urbanism, Romania

Andrei SCHVAB
"Ovidius" University of Constanța, Romania

Igor SÎRODOEV
Moldavian Academy of Sciences, Republic of Moldova

Izhak SCHNELL
Tel Aviv University, Israel

Vasile SURD
"Babeş-Bolyai" University, Romania

Antoni Francesc TULLA
Universitat Autònoma de Barcelona, Spain

Rafael VIRUELA
University of Valencia, Spain

George WHITE
South Dakota State University, USA

Ulf WIBERG
Umeå University, Sweden

Daniela ZAMFIR
University of Bucharest, Romania

The manuscripts and any correspondence will be sent to the Editorial Office:
University of Bucharest - Interdisciplinary Centre for Advanced Research on Territorial Dynamics (CICADIT), 030018 , 4-12, Regina Elisabeta Blv., Bucharest, Romania
Tel/fax: 0040 213 138 410, e-mail: office@cicadit.ro , http://www.jurareview.ro

Journal of Urban and Regional Analysis

Volume 14 – Issue 1 – February, 2022

Journal indexed in:

CLARIVATE ANALYTICS – Emerging Sources Citation Index
SCOPUS
ERIH PLUS
EBSCO Central & Eastern European Academic Source Database Coverage List
ProQuest
Ulrichsweb
Directory of Open Access Journals (DOAJ)
Knowledge Base Social Sciences Eastern Europe (GESIS)
Index Copernicus International
CEEOL - Central and Eastern European Online Library

University of Bucharest - Interdisciplinary Centre for Advanced Research on Territorial Dynamics (CICADIT)

Professional Association of Romanian Geographers (APGR)

TECHNICAL BOARD

Andreea-Loreta CERCLEUX
Irina FLOREA-SAGHIN
Cosmina Andreea MANEA
Florentina-Cristina MERCIU
George SECĂREANU
Ilinca-Valentina STOICA
Maria-Nataşa TĂTUI-VĂIDIANU
Daniela ZAMFIR

The review is issued under the aegis and the support of the

University of Bucharest - Interdisciplinary Centre for Advanced Research on Territorial Dynamics (CICADIT)

Professional Association of Romanian Geographers (APGR)

Journal of Urban and Regional Analysis, vol. 14, 1, 2022

www.jurareview.ro

Ricardo CRESPO, Abbas RAJABIFARD

Inverse Model Using Land and Property Sub-Systems for Planning Future Cities: A General Framework 5

Kianoosh ZAKERHAGHIGHI, Zahra AKBARIAN, Maryam KHANIAN, Mojtaba KHANIA

Grade Separation: Its Effect on the Public Perception of the Urban Landscape. Case Study: Hamean, Iran 23

Igor SÎRODOEV

Reliability of Spatially-Referenced Secondary Economic Data: Validation, Issues, and Solutions 37

Alisara MENAKANIT, Vudipong DAVIVONGS, Prapassara NAKA, Nath PICHAKUM

Bangkok's Urban Sprawl: Land Fragmentation and Changes of Peri-Urban Vegetable Production Areas in Thawi Watthana District 59

Karolina JÓZEFOWICZ

Small-Town Depopulation in the Wielkopolskie Voivodeship, Poland 79

Jamileh TAVAKOLINIA, Mohammad Kazem SHAMS POUYA

The Role of Social Capital of Tourist Host Communities in Local Development 101

Onur SUNGUR, Merve KILINÇ YILMAZ

Defining and Developing a Rurality Index for Turkey 129

Journal of Urban and Regional Analysis 14–1 (2022): 5–22, https://doi.org/10.37043/JURA.2022.14.1.1

INVERSE MODEL USING LAND AND PROPERTY SUB-SYSTEMS FOR PLANNING FUTURE CITIES: A GENERAL FRAMEWORK

Ricardo Crespo[a], **Abbas Rajabifard**[b]

[a] Universidad de Santiago de Chile, Santiago, Chile,
[b] University of Melbourne, Melbourne, Australia

Abstract: This paper suggests the use of the inverse model coupled with land and property systems to support urban decision-making. The inverse model is to be used for planning decisions today to achieve the desired tomorrow. This approach has been used previously in urban planning with a property system. The use of a property system alone is insufficient in dealing with the complexity of urban systems. Complex systems are made up of sub-systems that interact with each other; the integration of two sub-systems offers a first and simple alternative to address the complexity of urban systems. We suggest the use of two parametric approaches, logistic regression and house price, to model land and property sub-systems, respectively. Finally, we stress that further studies are needed to integrate the inverse model with other statistical techniques that also deal with complexity, such as cellular automata (CA) or agent-based models.

Keywords:

inverse model;
land and property system;
urban complexity

Email: ricardo.crespo@usach.cl

Initial submission: 14.10.2020; Revised submission: 01.07.2021; Final acceptance: 09.12.2021

Introduction

Most scholars seem to agree that the urbanisation rate is growing very rapidly worldwide. According to the United Nations (2019), today, 55% of the world's population lives in urban areas, a proportion that is expected to increase to 68% by 2050. Although urbanisation is a natural process with positive effects on society, it is also well known that high rural-urban migration rates may produce undesired effects such as urban sprawls, unemployment, pollution and increased crime rates, amongst other problems (Ahmed and Islam 2014, Zhang 2016, Bhat et al. 2017). Looking at these facts, several practical questions arise when it comes to devising future sustainable cities. For instance, will cities in the future be prepared to absorb massive rural-urban migration in a sustainable way? What are governments doing today to address the approaching changes in urban and rural societies? Are the governments working towards the right direction? United Nations (2019) warn that the preparation for this growth all depends on the decisions made now. Hence, it becomes essential to assist governments with appropriate policies and actions to be taken today in the attempt to secure sustainable future cities.

To deal with these undesired uncertainties in the planning process, policymakers and researchers often turn to statistical methods and models to forecast future urban patterns. One popular technique is cellular automata (CA), a rule-based method capable of simulating future states of urban patterns represented by a grid cell arrangement over space. Moreover, the rules determine whether a cell is to be urbanised or not in the future. To this end, the rules must be defined in relation to the drivers that promote urbanisation, such as urban regulations, population movement, population growth, land price, planned actions and geographical conditions, to mention just a few. Various scholars have stressed the importance of CA in urban modelling. One of them, Batty (2005) argued in favour of understanding cities by the means of complexity science techniques, such as CA, agent-based models and fractals. Other scholars, including Liu and Phinn (2003), Fuglsang et al. (2013) and Gonçalves et al. (2019), conducted more applied studies where CA is used to forecast city growth in Sidney, Copenhagen and Cape Verde, respectively.

Other remarkable methodological contributions to urban planning come from econometrics and spatial econometrics. For example, logistic regression is a popular method for modelling rural-urban land use change (Allen and Lu 2003, Hu and Lo 2007, Khajeh Borj Sefidi and Ghalehnoee 2016, Gangopadhyay et al. 2020, Kantakumar et al. 2020). The method seeks the probability of land use change in terms of a set of explanatory variables associated with urbanisation drivers, such as climate, population density or accessibility, to mention a few. To deal with a potential spatial autocorrelation in the data, some scholars have proposed the spatial autologistic regression model (SALR). Similar to the spatial autoregressive model (SAR) introduced

by Anselin (1988), SALR incorporates a spatially lagged term to account for the probability of the neighbouring cells of the grid. Although Dormann (2007) has questioned the statistical validity of SALR, the model has been used in land use change studies by Millington et al. (2007), Tayyebi et al. (2010), Wu et al. (2010) and Jiang et al. (2015).

Some scholars have improved the accuracy of future urban pattern predictions by integrating several of these methods. This is the case of Siddiqui et al. (2018) and Wang et al. (2019) who combined logistic regression, CA and a Markov model to simulate future urban patterns. Both studies conclude that the integration facilitates the simulation process and increases the accuracy of the results compared with logistic regression alone. Nevertheless, the authors highlight the need to include socio-economic driving forces to further enhance accuracy. Another interesting study was conducted by Kantakumar et al. (2019), who combined remote sensing data with scenario-based analysis to improve the role of urban planning on studying rapid urbanisation in Indian cities. The authors developed a scenario-based urban growth simulation model (SUSM) that uses logistic regression model and stochastic constrained CA for the spatial simulation of urban growth. In terms of modelling, SUSM treats cities as complex adaptive systems and therefore attempts to cope with the inherent dynamics and complex non-linear behaviour present in urban systems. Another integrative approach of urban modelling and scenario-based analysis was conducted by Dorning et al. (2015). The authors integrate a modified and more suitable CA method for urban growth, land suitability mapping and landscape pattern analysis to explore urban sustainability under different growth circumstances.

Despite most of these models and methods having been very important in promoting the awareness of urban processes, they approach the problem mostly from a today perspective. In other words, they use current data to forecast the future states of cities. In this regards, Grêt-Regamey and Crespo (2011) claim that this can lead to a dead end if the drivers of current problems become the main drivers of the planning process, thus transferring our problems to the future. To deal with this inconvenience, the same authors have proposed a novel approach, denoted as planning from a future vision: an inverse model in spatial planning.

As opposed to traditional planning processes, the point of departure of this novel approach is a desired future defined by the stakeholders. From this point on, a top-down quantitative analysis is performed, giving rise to actions to be taken by planners today to achieve such a desired future. As the forward model, Grêt-Regamey and Crespo (2011) regressed house prices on a linear combination of house price drivers. Next, the model is inverted to find an economic compensation scheme for the residents affected by noise emitted from nearby highways and the airport. The set of possible solutions is given by a linear combination of values for house drivers so that economic

compensation is achieved. However, the indicated cities are considered complex urban systems made up of highly heterogeneous sub-systems connected by complex interactions (Batty 2009, Baynes 2009). As documented by Liu (2009), the examples of urban sub-systems that interact with each other are population, land, employment, transport, property and infrastructure, to mention a few. The linear hedonic house price model used by Grêt-Regamey and Crespo (2011) concentrates on the analysis of one single sub-system: property. It thereby ignores any interaction between the property sub-system under study and the rest of the urban sub-systems. This may steer the whole urban system into an undesired future state since all sub-systems are far from remaining unchanged over time. Thus, along with being analogous to the butterfly effect example widely illustrated in the study of complex systems (Lorenz 1963), a wrong planning decision today may cause severe conflicts in the urban development in the future.

Accordingly, we think that the whole planning process should combine a system-oriented forward model to be inverted with a participative definition of the future city defined by the stakeholders. Clearly, cities can be described and defined following a myriad of concepts, approaches, or viewpoints. For instance, Ortegon-Sanchez and Tyler (2016) conceptualise a desirable future city state in terms of a set of five fundamental urban principles: active and inclusive city, courteous city, city as a public space, evolving and healthy city. The authors argue that these principles are the initial message to start a dialogue between the people and the city's agents to engage, commit and promote transformative actions. From an architecture perspective, Schmitt (2013) focuses on the role of spatial dimension and geometry to characterise cities. Following a more systemic approach, cities can be characterised by a set of measurable indicators that describe each of the above-mentioned interacting components defined by Liu (2009).

This paper aims to suggest the use of the inverse modelling approach to support urban planners and stakeholders to deal with urban complexities in the planning process based on literature review. To this end, we follow Liu (2009)'s vision of a city and focus our attention on describing cities according to two sub-systems that interact with each other: land and property. We suggest a set of measurable indicators that describe both systems and that are associated with: land use; land use change; climate; geography; public transport network; urbanisation of commercial, industrial and residential zones; types of dwellings preferred by the residents; and amenities, amongst others.

We recommend the use of a logistic land use change modelling to understand urban growth dynamics for the former sub-system, whilst we recommend hedonic house price modelling to capture the residents' preferences for the latter. Arguably, land use change modelling provides information on where cities will grow, whilst the hedonic modelling provides information on what type of properties the residents prefer.

Methodology

The inverse problem can be briefly defined as a mathematical procedure by which a set of model parameters characterising a physical system is derived from observed data (output of the physical system). This is particularly useful in cases when the inherent complexity of some physical systems makes it difficult for scientists to grasp the dynamics governing the system under study merely from the theory. As its name suggests, the inverse problem operates oppositely to the forward problem. The latter produces new data based on a set of given or previously estimated parameters characterising the system. Both mathematical approaches are represented in Figure 1, following the sketch provided by Scales and Snieder (2000), where G is a linear or non-linear mathematical operator linking the model's parameters (m) with a vector of data (d). Thus, prior knowledge of the mathematical operator G becomes fundamental to solve both the forward and inverse problems.

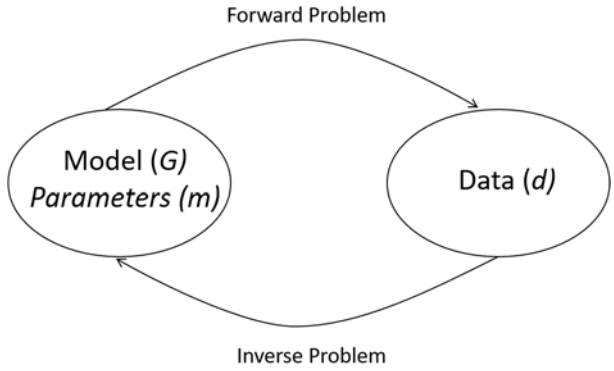

Figure 1. Representation of the forward and inverse problems. Source: Scales and Snieder (2000)

Further, based on Aster et al. (2013), a mathematical formulation of the inverse problem is represented as follows:

$$d = \mathrm{G}(m) \tag{1}$$

The solution of the inverse model is given by the set of estimated parameters $\hat{m}$ so that $G(\hat{m})$ becomes close to d. According to Engl et al. (2000), there are two possible interpretations of the solution. First, the estimated parameters represent past states or parameters of a physical system. In other words, the solution represents the initial conditions of the system under study. Second, the solution provides guidance on how to influence a system via its present state or parameters to steer it to a different state in the future. For this reason, the solution of the inverse approach has found applications in fields such as exploration geophysics (Parker 1994, Scales and Tenorio 2001, Tarduno et al. 2009, Menke 2018), environmental modelling (Kaminski and Heimann 2001,

Giudici 2002, Henze et al. 2009), medical imaging (Louis 1997, Arridge 1999) and engineering applications (Soemarwoto et al. 2000, Martinez-Luaces 2009, Schneider et al. 2009).

However, in many cases, the solution of the inverse problem may not be unique. More than one set of estimated parameters $\hat{m}$ solve Equation 1. This is referred to in the literature as the ill-posed problem (Tarantola 2005, Aster et al. 2013). In addition, the ill-posed problem is associated with solutions that are mathematically unstable. The inconvenience of unstable solutions is that small changes in observations may correspond to big changes in the phenomenon under study (Rabino and Laghi 2002). Non-uniqueness and/or unstable solutions make the inverse problem difficult to solve; thereby, sophisticated mathematical methods are often necessary to cope with the ill-posed problem. Louis (1996) provides a comprehensive review of various mathematical algorithms and approaches to deal with the problem. Additionally, Rabino and Laghi (2002) suggest the use of prior information to delimit the space of solution and to contribute to reducing the instability of solutions.

Results

The inverse approach in spatial planning

The ability of the inverse modelling approach to support urban planning has been examined in three recent studies. In the first, Grêt-Regamey and Crespo (2011) use the results from an inverse model analysis to quantify how much a public or private investor might have to compensate the residents for future planned noise-emitting factories in a metropolitan area in Switzerland. To this end, the authors use a hedonic house price model to quantify the negative relationship between the high level of noise and property values. To find the desired economic compensation scheme, a trade-off analysis between key house pricing drivers was performed. Typical house pricing drivers are selected from locational, structural, and environmental house price determinants. In other words, the trade-off analysis offers planners a wide set of possible combinations between the selected key drivers from which the residents are to be economically compensated because of a higher level of noise in the proximity.

The trade-off analysis plays a fundamental role in the use of the inverse model in urban planning because it tackles the problem of unfeasible solutions due to economic restrictions or conflicts between public and private parties. It is worth noting that the ill-posed problem is not actually a problem in urban planning; rather, it is a favourable condition for the trade-off analysis. In the second study, Crespo and Grêt-Regamey (2012) provide the theoretical framework for the inverse model in spatial planning and present a new case study to illustrate how to cope with the increasing population density in the metropolitan area of Zurich by the housing market. Additionally, Crespo

et al. (2016) suggest the use of an inverse model coupled with a land use change model to examine urbanisation in a city in southern Chile.

The inverse model for planning future cities

As its name suggests, future city planning is concerned with making strategic decisions today to ensure sustainability and well-being in cities in the future. As discussed above, the proposed inverse model becomes a sound top-down mathematical technique to support planners in the decision-making process. However, in the field of urban planning, strategic decisions involving the future of cities should rely not only on the output of mathematical models but also on the knowledge of relevant experts in the matter. In the context of the inverse model, the knowledge of experts can be used to reduce the space of possible solutions by leaving out political, practical, and economic unfeasible solutions. In this regard, Scales and Snieder (2000) state that, in practical inverse models, decisions are usually not based exclusively on the estimated model but involve the integration of other data and human expertise. Based on a figure provided in the above-mentioned work of Scales and Snieder (2000), we extend Figure 1 and present a new figure (Figure 2) that sketches the framework of the inverse model for planning future cities that we propose in this study.

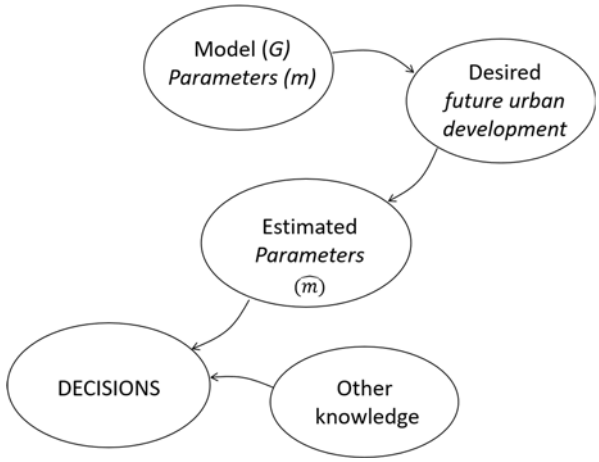

Figure 2. Representation of the forward and inverse models for planning future cities. Source: own elaboration and Scales and Snieder (2000)

In this case, the set of the model's parameters denoted by m represents a group of key drivers of urban processes over time. Typical examples of urban processes are urban growth (often measured by the rate of rural-urban land use conversion) and residential-commercial or residential-industrial land use conversion. Likewise, examples for the drivers of urban processes are agriculture subsidies, migration rate, industrialisation, and increased population density. Consequently, the selection of the

proper mathematical model (G) for the urban process under study becomes of great importance in planning future cities and therefore the identification of the key drivers (m) that control the process. As indicated in the introduction, typical mathematical models used in urban planning are CA, hedonic house price models, logistic regression, and the Markov processes, amongst others.

It should be noted that the definition of the desired future urban development becomes the most important step in the planning process. Defining a future planning scenario involves the participation of various stakeholders: residents, public and private institutions, and local and regional authorities, amongst others. It is expected that the actors of the process may have a completely different understanding at the moment of defining a future urban development in a given geographical area. It is therefore crucial for the sake of the planning process that all participants not only to agree with a future urban development but also to have a close understanding of the shape, attributes, and design of the future urban development scenario. In other words, all actors of the planning process must speak the same language when devising a future urban development.

The concept of urban development is highly dependent on the level of aggregation of the analysis. If the analysis is performed at a district or municipality level, the concept of urban development may be more closely associated to the urban design of small areas, whilst the concept of urban development is more likely to be associated to infrastructure and the demographic or socio-economic characteristics of the city or region if the analysis is performed at a city or regional level. It is also worth pointing out that both the forward and inverse models deal with mathematical modelling; therefore, the concept of urban development should be quantifiable by a set of indicators such as city size, dwelling type, population density, public transport network, central business district location, and commercial, industrial, or residential zones, amongst others.

Once the urban process to be studied and its drivers, and the desired future urban development defined by the stakeholders are selected, the next step is to solve the inverse model for the key parameters (drivers). This set of estimated parameters ($\hat{m}$) are then used as guidelines over time to make key decisions today to achieve the desired future urban development. The item 'other knowledge' summarises the expert opinion and human expertise supporting a final decision in the planning process. They become fundamental to reduce the space of solutions by leaving out the impracticable solutions that may be technically infeasible or not recommended politically. The whole planning process is finally completed with the decisions to be made today to achieve the desired future. The decisions are derived from the solutions of the inverse model and they should clearly provide stakeholders with the guidelines to gradually achieve the desired future.

A general framework of the integration of the inverse model to land and property sub-systems

Next, it becomes necessary to define a general framework for a participatory urban planning approach. To this end, we propose an integrated land and property system model to deal with urban complexities. The drivers of the land system may be also the drivers of the property system. In fact, understanding land use changes over time is, in some ways, similar to understanding how urbanisation evolves. Both processes are clearly interconnected, as rapid urban population growth occurs as a result of increasing demand for urban lands, particularly for housing (Thuo 2013).

We propose the integrated framework depicted in Figure 3. As it can be observed, the main actors are the stakeholders, modellers, and planners. Whilst stakeholders deal with the definition of the desired future urban development, modellers deal with system identification. As pointed out by Tarantola (2005), the latter task includes the parameterisation of the system for both forward and inverse modelling approaches. The output of the modeller's stage corresponds to a set of recommended actions to be taken by planners; thus, the appropriate system identification becomes crucial to solve the inverse problem and thus to provide reliable recommendations.

Therefore, it is now necessary to define the type of model G from which the key parameters are to be derived to perform the inverse analysis. In this study, we suggest the use of a logistic land use change and hedonic house price models to deal with land and property systems.

Land use change models have been of great importance in forecasting future land patterns and therefore finding out where a next urbanisation process is more likely to occur. The dynamics of land use change comes as a result of the complex interactions between the human and the physical environment (Verburg et al. 2004). To deal with these complexities, various statistical approaches have been proposed as documented by Koomen and Stillwell (2007). One of these statistical approaches most often found in the literature is the logistic regression approach, by which the observed land use change (usually at parcel level) between two or more time periods is regressed on a set of drivers associated to terrain, climate, accessibility, economic and socio-economic attributes, amongst others. Typical drivers associated to terrain attributes are slope and soil degradation. In addition, the typical drivers associated to climate are sunshine exposure, average temperature, and rainfall. In the case of accessibility, variables such as the distance to roads and highways or the proximity to bus or train stations are frequently used. Finally, variables associated to agricultural subsidies, tax levels or land ownership conflicts are often selected as economic and socio-economic drivers. Logistic regressions deal with probabilities, which in this case corresponds to the probability that a given land use change (e.g. in the case of rural-urban) occurs during two time periods. Such probabilities are strongly correlated to the parameter estimates

obtained from the regression and associated to each variable (driver). The order of magnitude of the parameter estimates and their statistical significance provide planners with useful and relevant information to identify the drivers that are more strongly (positively or negatively) correlated with the urbanisation process analysis.

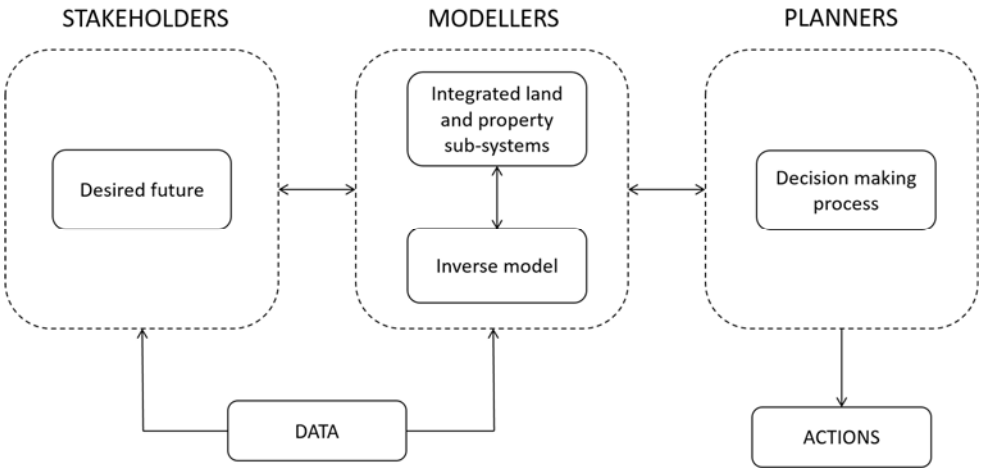

Figure 3. Framework of the integrated land and property sub-systems

Similarly, the urbanisation trends may also be explored by studying the housing market. As with the land use analysis, urbanisation and the housing market are closely related. Very often, urbanisation causes the demand for dwellings to increase more rapidly than the supply. Therefore, house prices tend to exhibit an upward trend overtime. In addition to any temporal trend, house prices frequently exhibit spatial variability, mostly caused by the heterogeneous residents' preferences for dwelling attributes (Fotheringham et al. 2002, Bitter et al. 2007, Helbich et al. 2014). It is reasonable to expect that the residents' preferences for house attributes vary not only over space but also over time. This is because cities, as complex adaptive systems, are constantly evolving and adapting themselves to external shocks. For instance, a demand shock for housing is likely to have, at least in the short term, a negative impact on the urban attributes such as mobility, accessibility to workplace, crime rate, unemployment rate and pollution levels, amongst others. It is also expected that households tend to compensate this loss of well-being by moving out to neighbourhoods with better accessibility or dwellings with higher standards.

One of the most popular statistical techniques to explore the relationship between the house prices and the households' preferences is the hedonic house price modelling. This technique is intended to model the price of properties in terms of quantitative and measurable attributes related to those properties. Typical attributes included in the model are associated to the structural, locational and neighbourhood characteristics of properties. Structural attributes refer to the physical characteristics of properties, such

as number of rooms and bedrooms, number of bathrooms, floor area, building age and the existence of basement, garage, balcony, and heating system, amongst others. In turn, locational attributes refer mostly to accessibility to central business districts and proximity to schools, shopping centres, bus stops, railway, train stations, airports and amenities, amongst others (Chin and Chau 2003). Finally, the neighbourhood attributes refer to the socio-economic characteristics of the surrounding neighbourhood, such as the social class of the area, the unemployment rate, the crime rate, the racial diversity, and the occupations of the inhabitants. Hedonic house price models are frequently fitted by ordinary least square or spatial autoregressive regression to account for spatial autocorrelation. The outcomes from a logistic land use change model provide useful insights on where city expansions are more likely to occur; and which drivers are more strongly associated to such expansion. Likewise, the outcomes from the hedonic house price model provide useful information on the resident's preferences in a spatially explicit manner and contribute to answering the question: what type of property or neighbourhood will the future residents prefer?

Clearly, the dynamics of land and property systems should not be studied separately from one another. Both systems have common drivers associated to locational, socio-economic and environmental or infrastructure attributes, i.e. accessibility to road networks, level of population density around, proximity to amenities and infrastructure development. For this reason, the use of these drivers in urban planning should be done with care as it may steer systems to undesired future states. For example, improved accessibility is likely to foster rural-urban land use change as most people, mostly commuters, tend to live near road networks. However, it is not always clear whether the values of the surrounding existing properties will drop or rise because of better accessibility as some may prefer to reside in more remote and quiet places. Similarly, promoting industrial zones will likely foster rural-urban land use change because of new employment alternatives; however, house values are likely to drop as the residents tend to associate industrial zones with air and noise pollution, as well as with disturbing freight traffic coming in and out. Thus, when studying land and property systems for spatial planning, we can generally distinguish two types of drivers: system-specific drivers, i.e. those that only affect the output of each system, and common drivers, i.e. drivers that simultaneously trigger changes in both systems.

Identifying both types of drivers and understanding the extent to which they influence the output of systems shed important light on performing trade-off analysis in spatial planning. By doing so, the undesired effects on a system caused by the new values for drivers of the other system can be compensated by finding an appropriated set of values from the system-specific drivers. Again, because of the complexity of modelling both systems together, the inverse model analysis at this point should be done with caution. It may happen that some combinations of either system-specific or common drivers from both systems lead the whole process to a desired future state; however, it

may also happen that a certain combination of drivers from both systems leads the whole process to an absolute undesired future urban development. When dealing with public policy, the latter case may imply an important and irreversible waste of time and money. One easy example to illustrate how a public policy may produce undesired effects on a system corresponds to the construction of highways near rural areas. According to land use change modelling, highways across rural areas are likely to foster urbanisation, i.e. to induce rural-urban land use conversion. Commuters benefit from the construction of highways nearby; however, highways are also associated to high traffic, noise, and vehicular congestion. Some residents may demand compensation for this loss in their quality of life, such as improved amenities or public transport infrastructure.

Discussion

As stated above, urban systems are made of various sub-systems with very complex interactions. In this study, with the purpose of facilitating the introduction of the proposed integrated inverse approach, particularly the trade-off analysis, we selected only two of these sub-systems: land and property systems. Thus, future research should concentrate on integrating other urban sub-systems. We suggest the transport system because of its evident influence on city development. Clearly, an efficient transport system yields superior labour mobility, industrial and commercial development, land and property values and tourism activities, amongst others. Transport systems play a fundamental role in shaping future cities and promoting urbanisation. However, it should also be noted that the more city sub-systems are included in the analysis, the higher the complexity of the mathematical modelling necessary to solve the inverse model. In this sense, further research should also address the complexity of urban systems in space and time more thoroughly. In complex systems, most relationships between explanatory and exploratory variables may exhibit non-linearities; urban systems are not the exception to the rule.

In relation to the methods used to model land and property systems, we selected two parametric approaches: logistic regression and hedonic house price. In both cases, independent variables are associated with a linear parameter that represents the extent to which changes in the variables affect the response variable. The advantage of these methods over nonparametric approaches, such as CA, is that the information contained in the parameter estimates can be passed onto planners in a more straightforward manner. Planners can identify more easily the measures (each of them associated with an independent variable) that are more influential, feasible and urgent for carrying out actions.

In addition, the results can be displayed in a spatially explicit manner using local spatial techniques such as geographically weighted regression (GWR). This technique,

developed by Fotheringham et al. (2002), allows estimates to vary across space estimating as many parameters estimates as the number of points in the sample. As done by Grêt-Regamey and Crespo (2011) and Crespo and Grêt-Regamey (2012), local estimates can be clustered over space to define different planning actions at small area levels. The applications of GWR in land use change and hedonic house price models can be found in Helbich et al. (2014) and Zhao et al. (2020), respectively. Although CA is not a parametric technique, very close attention should be placed on the recent work conducted by Feng and Tong (2018), who integrated GWR and CA to produce non-stationary rules over space. With the parametric approach, the inverse model is solved for the independent variables; therefore, a trade-off analysis between key house pricing and land use drivers is possible. In the case of the integrated GWR-CA, this trade-off analysis is not straightforward. We think that further work remains needed to integrate this approach with the inverse model. This integration can be a promising step forward as techniques such as CA or agent-based models are probably more robust to deal with urban complexity.

Conclusions

To bring the proposed methodology into actions, there remain some other challenges to deal with, e.g. the conversion of abstract concepts in urban planning into quantitative data to fit the models. A desired future defined by stakeholders cannot always be derived from quantifiable concepts such as the percentage of land use conversion, desired rate of urbanisation or type and size of property. Frequently, stakeholders tend to discuss general concepts on the types of future urban development scenarios, such as business-as-usual land use, mostly tourism landscape or business-oriented city development. Obviously, several urban structures may be associated to each one of these types of urban development, making the definition of the desired future a complex decision. To deal with this inconvenience, we suggest future studies to integrate 3D visualisation techniques as a way to visualise the output of mathematical models.

Another relevant challenge in urban planning is concerned with the sustainability of cities. Experts worldwide seem to agree that the rapid urbanisation rate is becoming a serious threat to urban sustainability. Rapid urban growth at the expense of future food or ecosystem service provision is not precisely a desired future. Thus, the achievement of a not only desired but also sustainable future urban development is another interesting application of the inverse model approach. To this end, for further research, we propose the elaboration of a general function accounting for the welfare of society in a way that the solution of the inverse model provides the actions to be made today to achieve the desired future development in a sustainable manner. Broadly speaking, such a well-being function should include social, environmental

and economic variables to secure in the long-term food, ecosystem service and energy provision, as well as an environment free of pollution.

In summary, despite the above-mentioned challenges, we think that this study addresses an interesting way to move ahead to extend the novel work of Grêt-Regamey and Crespo (2011) and Crespo and Grêt-Regamey (2012), who proposed the use of the inverse model in urban planning. The process of forecasting possesses an intrinsic risk of missing the target, even when using complex mathematical modelling. Therefore, it becomes important to first define a desired future defined by the stakeholders and an appropriate model or combination of models to deal with urban complexity. By doing so, the risk of missing the target may be reduced significantly. A solution with zero risk is not possible because of the inherent uncertainty of statistical models and data. Finally, it is worth mentioning that we also expect this methodology to be fully integrated on a friendly user web-based platform available for planners from either the industry or the public sectors at different geographical levels, such as municipality, city, or regional levels. It is also important to bring more abstract mathematical concepts to real application for users not familiar with such concepts.

References

AHMED M. F., ISLAM M. S. (2014) Urbanization and Environmental Problem: An Empirical Study in Sylhet City, Bangladesh, Research on Humanities and Social Sciences 4 (3), 161-172.

ALLEN J., LU K. (2003) Modeling and Prediction of Future Urban Growth in the Charleston Region of South Carolina: a GIS-based Integrated Approach, Conservation Ecology 8 (2), 2.

ANSELIN L. (1988) Spatial Econometrics: Methods and Models, Kluwer Academics, Dordrecht.

ARRIDGE S. R. (1999) Optical tomography in medical imaging, Inverse Problems 15 (2), R41.

ASTER R. C., BORCHERS B., THURBER C. H. (2013) Parameter Estimation and Inverse Problems, Elsevier, New York.

BATTY M. (2005) Cities and Complexity: Understanding Cities with Cellular Automata, Agent-Based Models, and Fractals, The MIT Press, Cambridge, MA.

BATTY M. (2009) Cities as Complex Systems: Scaling, Interaction, Networks, Dynamics and Urban Morphologies, in: Meyers R. A. (ed.) Encyclopedia of Complexity and Systems Science, Springer, New York, pp. 1041-1071.

BAYNES T. M. (2009) Complexity in Urban Development and Management: Historical Overview and Opportunities, Journal of Industrial Ecology 13 (2), 214-227.

BHAT P. A., UL SHAFIQ M., MIR A. A., AHMED P. (2017) Urban sprawl and its impact on landuse/land cover dynamics of Dehradun City, India, International Journal of Sustainable Built Environment 6 (2), 513-521.

BITTER C., MULLIGAN G. F., DALL'ERBA S. (2007) Incorporating spatial variation in housing attribute prices: A comparison of geographically weighted regression and the spatial expansion method, Journal of Geographical Systems 9, 7-27.

CHIN T. L., CHAU K. W. (2003) A critical review of literature on the hedonic pricing model and its application to the housing market in Penang, International Journal for Housing Science and Its Applications 27 (2), 145-165.

CRESPO R., GRÊT-REGAMEY A. (2012) Spatially explicit inverse modeling for urban planning, Applied Geography 34, 47-56.

CRESPO R., MANUSCHEVICH D., CRESPO F., CONCHA G., RAJABIFARD A. (2016) Participatory planning process for controlling urbanization: an inverse model approach, ICEGOV '15-16: Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance, 378-379.

DORMANN C. F. (2007) Assessing the validity of autologistic regression, Ecological Modelling 207 (2-4), 234-242.

DORNING M. A., KOCH J., SHOEMAKER D. A., MEENTEMEYER R. K. (2015) Simulating urbanization scenarios reveals tradeoffs between conservation planning strategies, Landscape and Urban Planning 136, 28-39.

ENGL H. W., HANKE M., NEUBAUER A. (2000) Regularization of Inverse Problems, Kluwer Academic Publishers, Dordrecht.

FENG Y., TONG X. (2018) Dynamic land use change simulation using cellular automata with spatially nonstationary transition rules, GIScience & Remote Sensing 55 (5), 678-698.

FOTHERINGHAM A. S., BRUNSDON C., CHARLTON M. (2002) Geographically Weighted Regression: the analysis of spatially varying relationships, Wiley, Chichester.

FUGLSANG M., MÜNIER B., HANSEN H. S. (2013) Modelling land-use effects of future urbanization using cellular automata: An Eastern Danish case, Environmental Modelling & Software 50, 1-11.

GANGOPADHYAY P., JAIN S., SUWANDARU A. (2020) What Drives Urbanisation in Modern Cambodia? Some Counter-Intuitive Findings, Sustainability 12 (24), 10253.

GIUDICI M. (2002) Some problems for the application of inverse techniques to environmental modeling, Contemporary Mathematics 333, 89-97.

GONÇALVES T. M., ZHONG X., ZIGGAH Y. Y., DWAMENA B. Y. (2019) Simulating Urban Growth Using Cellular Automata Approach (SLEUTH)-A Case Study of Praia City, Cabo Verde, IEEE Accesss 7, 156430-156442.

GRÊT-REGAMEY A., CRESPO R. (2011) Planning from a future vision: Inverse modeling in spatial planning, Environment and Planning B: Planning and Design 38 (6), 979-994.

HELBICH M., BRUNAUER W., VAZ E., NIJKAMP P. (2014) Spatial Heterogeneity in Hedonic House Price Models: The Case of Austria, Urban Studies 51 (2), 390-411.

HENZE D. K., SEINFELD J. H., SHINDELL D. T. (2009) Inverse modeling and mapping US air quality influences of inorganic PM2.5 precursor emissions using the adjoint of GEOS-Chem, Atmospheric Chemistry and Physics 9 (16), 5877-5903.

HU Z., LO C.P. (2007) Modeling urban growth in Atlanta using logistic regression, Computers, Environment and Urban Systems 31 (6), 667-688.

JIANG W., CHEN Z., LEI X., JIA K., WU Y. (2015) Simulating urban land use change by incorporating an autologistic regression model into a CLUE-S model, Journal of Geographical Sciences 25 (7), 836-850.

KANTAKUMAR L. N., KUMAR S., SCHNEIDER K. (2020) What Drives Urban Growth in Pune? A Logistic Regression and Relative Importance Analysis Perspective, Sustainable Cities and Society 60, 102269.

KHAJEH BORJ SEFIDI A., GHALEHNOEE M. (2016) Analysis of urban growth pattern using logistic regression modeling, spatial autocorrelation and fractal analysis. Case study: Ahvaz city, International Journal of Architectural Engineering & Urban Planning 26 (2), 183-194.

KAMINSKI T., HEIMANN M. (2001) Inverse modeling of atmospheric carbon dioxide fluxes, Science 294 (5541), 259.

KANTAKUMAR L. N., KUMAR S., SCHNEIDER K. (2019) SUSM: a scenario-based urban growth simulation model using remote sensing data, European Journal of Remote Sensing 52 (S2), 26-41.

KOOMEN E., STILLWELL J. (2007) Modeling Land Use Change: Theories and Methods, in: Koomen E., Stillwell J., Bakema A., Scholten H. J. (eds.) Modelling land-use change: Progress and applications, Springer, Dordrecht, pp. 1-21.

LIU Y. (2009) Modelling Urban Development with Geographical Information Systems and Cellular Automata, CRC Press, Boca Raton.

LIU Y., PHINN S. R. (2003) Modeling urban development with cellular automata incorporating fuzzy-set approaches, Computers, Environment and Urban Systems 27 (6), 637-658.

LORENZ E. N. (1963) Deterministic nonperiodic flow, Journal of the Atmospheric Sciences 20 (2), 130-141.

LOUIS A. K. (1997) Application of the approximate inverse to 3D X-ray CT and ultrasound tomography, in: Engl H. W., Louis A. K., Rundell W. (eds.) Inverse Problems in Medical Imaging and Nondestructive Testing, Springer, Vienna, pp. 120-133.

MARTINEZ-LUACES V. (2009) Modelling and inverse-modelling: experiences with O.D.E. linear systems in engineering courses, International Journal of Mathematical Education in Science and Technology 40 (2), 259-268.

MENKE W. (2018) Geophysical Data Analysis: Discrete Inverse Theory, Elsevier, London.

MILLINGTON J. D. A., PERRY G. L. W., ROMERO-CALCERRADA R. (2007) Regression techniques for examining land use/cover change: A case study of a Mediterranean landscape, Ecosystems 10, 562-578.

ORTEGON-SANCHEZ A., TYLER N. (2016) Constructing a Vision for an 'Ideal' Future City: A Conceptual Model for Transformative Urban Planning, Transportation Research Procedia 13, 6-17.

PARKER R. L. (1994) Geophysical Inverse Theory, Princeton University Press, Princeton.

RABINO G. A., LAGHI A. (2002) Urban Cellular Automata: The Inverse Problem, in: Bandini S., Chopard B., Tomassini M. (eds.) Cellular Automata. ACRI 2002. Lecture Notes in Computer Science 2493, Springer, Berlin, pp. 349-356.

SCALES J., SNIEDER R. (2000) The Anatomy of inverse problems, Geophysics 65 (6), 1708-1710.

SCALES J. A., TENORIO L. (2001) Prior information and uncertainty in inverse problems, Geophysics 66 (2), 389-397.

SCHMITT G. (2013) Spatial modeling issues in future smart cities, Geo-Spatial Information Science 16 (1), 7-12.

SCHNEIDER P. S., MOSSI A. C., FRANÇA F. H. R., DE SOUSA F. L., DA SILVA NETO A. J. (2009) Application of inverse analysis to illumination design, Inverse Problems în Science and Engineering 17 (6), 737-753.

SIDDIQUI A., SIDDIQUI A., MAITHANI S., JHA A. K., KUMAR P., SRIVASTAV S. K. (2018) Urban growth dynamics of an Indian metropolitan using CA Markov and Logistic Regression, The Egyptian Journal of Remote Sensing and Space Science 21 (3), 229-236.

SOEMARWOTO B. I., LABRUJÈRE T. E., LABAN M., YANSYAH H. (2000) Inverse aerodynamic shape design for improved wing buffet-onset performance, in: Tanaka M., Dulikravich G. S. (eds.) Inverse Problems în Engineering Mechanics II, Elsevier, Nagano, pp. 419-428.

TARANTOLA A. (2005) Inverse Problem Theory and Methods for Model Parameter Estimation, Inverse Problem Theory and Methods for Model Parameter Estimation, SIAM: Society for Industrial and Applied Mathematics, Philadelphia.

TARDUNO J., BUNGE H.-P., SLEEP N., HANSEN U. (2009) The Bent Hawaiian-Emperor Hotspot Track: inheriting the mantle wind, Science 324 (5923), 50-53.

TAYYEBI A., DELAVAR M. R., YAZDANPANAH M. J., PIJANOWSKI B. C., SAEEDI S., TAYYEBI A. H. (2010) A spatial logistic regression model for simulating land use patterns: A case study of the Shiraz Metropolitan Area of Iran, in: Chuvieco E., Li J., Yang X. (eds.) Advances in Earth Observation of Global Change, Springer, Dordrecht, pp. 27-42.

THUO A. D. M. (2013) Impacts of urbanization on land use planning, livelihood and environment in the Nairobi rural-urban fringe, Kenya, International Journal of Scientific & Technology Research 2 (7), 70-79.

UNITED NATIONS (2019) World Urbanization Prospects: The 2018 Revision, United Nations, New York.

VERBURG P. H., VAN ECK J. R. R., DE NIJS T. C. M., DIJST M. J., SCHOT P. (2004) Determinants of land-use change patterns in the Netherlands, Environment and Planning B: Planning and Design 31 (1), 125-150.

WANG M., CAI L., XU H., ZHAO S. (2019) Predicting land use changes in northern China using logistic regression, cellular automata, and a Markov model, Arabian Journal of Geosciences 12, 790.

WU G., ZENG Y., XIAO P., FENG X., HU X. (2010) Using autologistic spatial models to simulate the distribution of land-use patterns in Zhangjiajie, Hunan Province, Journal of Geographical Sciences 20 (2), 310-320.

ZHANG X. Q. (2016) The trends, promises and challenges of urbanisation in the world, Habitat Internațional 54 (3), 241-252.

ZHAO C., JENSEN J. L. R., WEAVER R. (2020) Global and local modeling of land use change in the border cities of Laredo, Texas, USA and Nuevo Laredo, Tamaulipas, Mexico: A comparative analysis, Land 9 (10), 347.

Journal of Urban and Regional Analysis 14–1 (2022): 23–36, https://doi.org/10.37043/JURA.2022.14.1.2

GRADE SEPARATION: ITS EFFECT ON THE PUBLIC PERCEPTION OF URBAN LANDSCAPE. CASE STUDY: HAMEDAN, IRAN

Kianoosh Zakerhaghighi[a], **Zahra Akbarian**[a], **Maryam Khanian**[a], **Mojtaba Khanian**[b]

[a] Hamedan Branch, Islamic Azad University, Hamedan, Iran

[b] University of Lodz, Lodz, Poland

Abstract: Urbanization has brought about dramatic changes in the quality of the landscape in Hamedan, which is located in a mountainous area in the west of Iran. Not only these changes affect the people's well-being, but also how they perceive the new landscape. This paper analyses the effects of newly built grade separations on the public perception of the urban landscape. In keeping with this aim, the survey was a suitable method to collect the people's opinions on the quality of the urban landscape. Unity, complexity, order, and aesthetics are the main factors that affect the quality of the urban landscape and its perception. The structural equation model of the research showed that unity through aesthetics is the critical path that affects the people's image of the city and their landscape preference. The results confirm that the public perception of the landscape quality, which is essential to planners, is affected by different kinds of intersection. Additionally, it specifies that the unique structure of Hamedan and its development in the last decades has a significant role in the people's landscape preferences and on their perception of it.

Keywords:

urban landscape; intersection; public perception; preference

Email: k.zakerhaghighi@gmail.com

Initial submission: 05.12.2019; Revised submission: 14.04.2020; Final acceptance: 10.06.2020

Introduction

Urbanization is the most dynamic process that shapes the landscapes at a global level, therefore urban landscapes are home for more than 50% of the world population. In the opinion of Palermo (2008), landscape is the place of individuality to which the habitants belong. Azara (2008) noted in his study that landscape is not something to exist in itself, as it is just a mental construct. According to Konkoly-Gyuró (2018), transformation is one of its characteristics. Rędzińska and Szulczewska (2019) mentioned that the change of landscape is an unavoidable process. Zhang et al. (2019) described the urban landscape as experiencing rapid growth all over the world. Also, it is something that is regarded to be of exceedingly fragmented habitats (Malkinson et al. 2018).

Urban landscapes are the result of social development and environmental transitions (Wu et al. 2019). Also, many researchers have investigated the importance of cognitive and identity approaches in landscape research (Silbernagel et al. 2006, Tieskens et al. 2018, Suppakittpaisarn et al. 2019). For instance, Memlük (2012) believes that it is not completely independent from the circumferential buildings and structures. Altogether, they shape the character and identity of a city. Urban landscape contributes to the view of a city in connection with the visual quality (Memlük 2012). As mentioned by Nijhuis et al. (2011), the visual aspects are themselves characters of the landscape, including: unity (the landscape as an entire, its individuality and clarity of character and boundaries); spaciousness (the spatial figure or spatial organization, the spatial layout); and appearance (the thorough set of sensory impressions, especially 'seeing').

Antrop and Van Eetvelde (2017) described "visual perception" as the information that we sense. Gavrilidis et al. (2016) stated that landscape quality assessments are usually based on visual perception. Additionally, landscape perceptions refer to the visual aspects and the use-value of the environment (Soini et al. 2012). Chen et al. (2009) mentioned in their study that the personality of the observer, the location of observation, the socioeconomic profile of the observer, the scene composition, and the complexity of the landscape affect its perception. According to Hedblom et al. (2020), "visual quality" is something linked to scenic beauty, aesthetic quality, and visual preference.

Mathew and Krishna Rao (2007) described intersections as areas shared by two or more roads. Qiu and Peng (2015) divided them into three types: at-grade intersections, grade separations, and interchanges. Grade separation is classified into two types: overpass and underpass (Mathew and Krishna Rao 2007, Qiu and Peng 2015, Modi 2017). An overpass is a road that crosses over another road, and an underpass is an underground passage (Mathew and Krishna Rao 2007, Modi 2017).

The characteristics of the landscape in grade separations have a significant impact on

the quality of the urban landscape and its perception (Figure 1). Here we address questions such as: how does the urban landscape alters where the kind of intersection is changed? How does it affect the public perception of the urban landscape? What are the reasons for it? What are the factors that affect people's preferences in any grade separation?

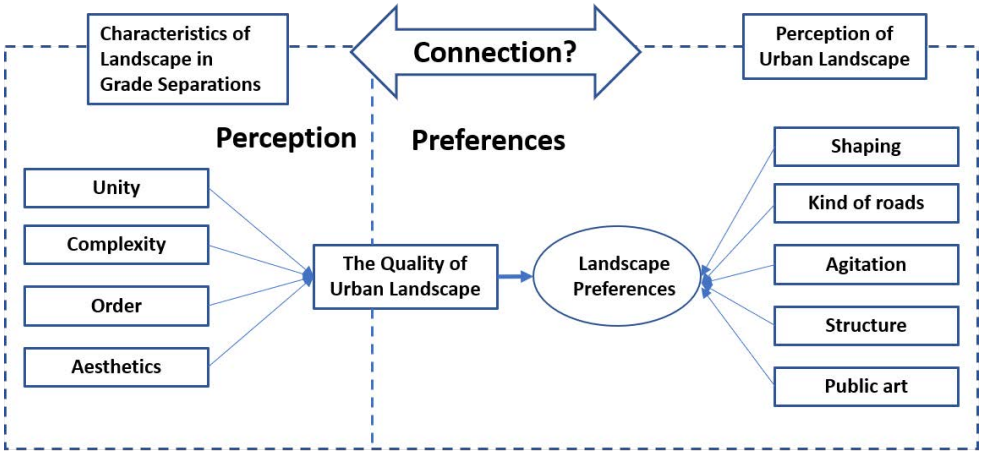

Figure 1. The characteristics of the landscape in grade separations

In this paper, regarding the rapid change in the quality of the landscape, the characteristics of the landscape in grade separations are investigated. The focus is on discovering the relationship between these changes and their impact on the people's perception in Hamedan City in the West of Iran. Hamedan is chosen for this study because its landscape, as a scenic city located in the hillsides of Alvand, which is a subrange of the Zagros Mountains in western Iran, is changing rapidly over the past decade on the account of various reasons, such as urbanization (Solgi et al. 2016).

The primary purpose of this study is to discuss the effect of grade separations on the quality of the landscape and its perception in cities such as Hamedan. As regards the characteristics of the landscape in grade separations, the results have positive and negative interests on the people's perception of the urban landscape. For example, as a negative interest, overpasses have blocked the pedestrian's view, but a positive one is that they have caused different sequences of pleasant vision for drivers.

Methodology

The area selected for this study was Hamedan municipality, located in a mountainous region in the west of Iran (Figure 2), and the capital city of Hamedan province. Hamedan City is one of the oldest cities in Iran. As stated by Kanō (1978), it had been touched by the wave of urban modernization in the days of Reza Shah. That time, in 1931, the German engineers had planned six radial roads for Hamedan. Then, the

second wave of urban modernization in the 1970's was introduced in the city. Also, it has developed somewhat in recent years; for instance, nine grade separations were constructed in the different places of the city (Figure 3). Based on the latest census of 2016, the population of Hamedan is of 554 406 people. In Hamedan, winters are usually cold and snowy, and summers are mild.

Figure 2. The location of Hamedan in Iran

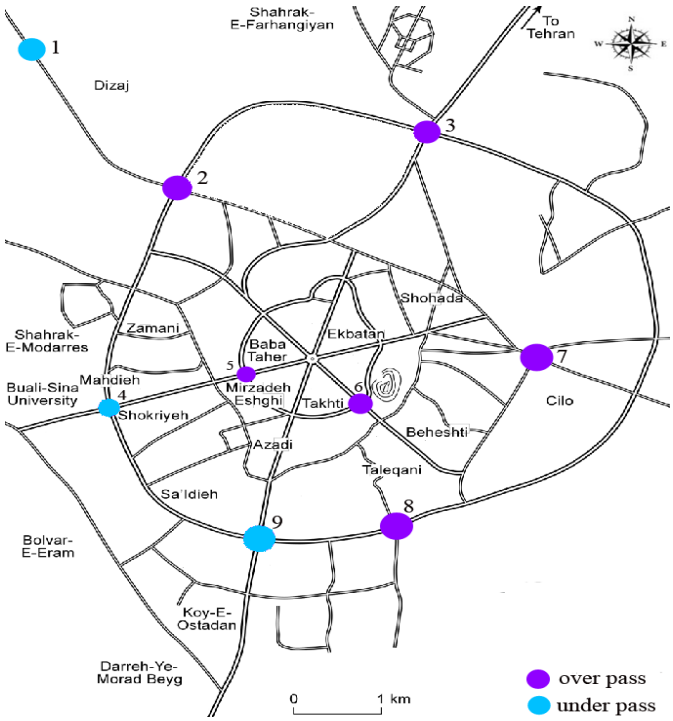

Figure 3. Plan view of the streets of Hamedan and the location of its grade separations

Study population and sampling

Following the aim of the research, the people who reside in Hamedan were involved in the study. The sample was above ten years old. At the 2016 census, the number of people who are ten plus years old and reside in Hamedan was 475,054. The methods of sampling and calculating the sample size were random and empirical. Referring to this method, the sample size involved 0.023% of the target population (110 people).

The dependent variable in this study is the landscape preference, which refers to the perception of it (Figure 4). Preference is described as an interaction between thought and effect (Van Der Heide and Heijman 2013). The independent variables are unity, complexity, and order. These variables are chosen based upon prior studies illustrating their association with the perception of the urban landscape and the relevance of each variable concerning a particular concept (preference).

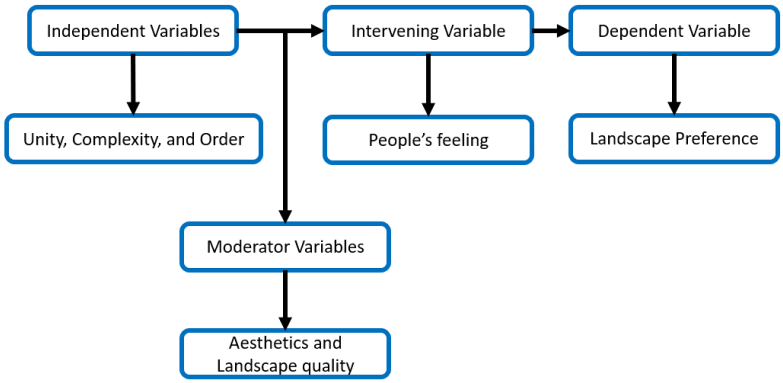

Figure 4. Research variables

Data collection

For data collection, the questionnaire was used to gather the necessary information about the effects of the different kind of intersections on the quality of the landscape and its perception. Also, it was used to find the connection between unity, complexity, and order as independent variables, and landscape preference as a dependent variable. The field application of the questionnaire used as a data collection tool in the research was carried out in October 2018. Before completing the questionnaire, the researchers gave detailed information about the study to the participants. Questions were multiple choice closed-ended ones. Two types of questions were used; the first type was designed to know about the participants like their age, gender, etc. The second type of questions was designed to the analysis of the landscape quality effects on the participants' perception and their preferences, following the variables of the research and the Likert scale (Joshi et al. 2015). A five-point scale was used to know how much the people agree or disagree with a particular status. The responses ranged from

strongly agree (5 points) to strongly disagree (1 point). The questionnaires were distributed on paper and social networking.

Method and tool of statistical analysis

The structural equation modeling was used for analyzing the structural model of the research. Civelek (2018) described this method as a statistical method used to test the connections between the observed and latent variables. The observed variables are the measured variables in the data collection process and the latent variables are the variables measured by connecting to the observed variables because they cannot directly be measured. Structural Equation Modeling consists of two primary components as the structural model and measurement model. SmartPLS was employed to analyze the data in this research. Wong (2013) described it as one of the prominent software applications for Partial Least Squares Structural Equation Modeling (PLS-SEM).

Results

Factor loading, validity, and reliability

To study the model, the factor loading of research questions were investigated. The values that are upper than 0.4 are valuable, and the ones that are lower than 0.4 should be removed. According to this, the questions with a factor loading lower than 0.4 were removed. Content Validity and Convergent Validity were also used for validating the validity of the measurement tool (questionnaire). Content Val was achieved by ensuring the consistency between the measurement indexes and the existent literature; this validity was gotten by the opinion of experts. Convergent Val is based on the medial correlation coefficient between the indexes of any construction. The Average Variance Extracted (AVE) should be greater than 0.5, which makes it possible to assess Convergent Val (Fornell and Larcker 1981). The composite reliability coefficient was used for ascertaining the reliability of the tool. According to Ali et al. (2018), Composite Reliability (CR) should be higher than 0.7.

The results revealed that the model and the tool have suitable reliability and validity (Table 1). It seemed that there is a significant connection between these variables:

1. unity, aesthetics, and landscape preference
2. complexity, aesthetics, and landscape preference
3. order, aesthetics, and landscape preference
4. unity, aesthetics, landscape quality and landscape preference
5. complexity, aesthetics, landscape quality and landscape preference
6. order, aesthetics, landscape quality and landscape preference

Table 1. The values of ascertaining the reliability and the validity of the tool

Variable	AVE	CR
Unity	0.638	0.776
Complexity	0.517	0.705
Order	0.580	0.805
Aesthetics	0.511	0.712
Landscape quality	0.580	0.723
Landscape preference	0.668	0.801

Hypotheses testing

T-value was used for testing these hypotheses and the connection between the variables in the structural model. In SmartPls, that is noticed by bootstrapping. T-statistic shows the effect of variables on each other. The values of more than 1.96 show that there is a significant connection between the variables. Also, path coefficients should be used for testing the intensity of this connection. If the path coefficients are more than 0.6, the variables are in a strong connection; the values between 0.3 and 0.6 and under 0.3 show moderate and weak connection, respectively (Figure 5, Figure 6). The t-test value for unity and aesthetics was 3.309; the results showed a significant connection between these variables, and the path coefficient value for them was 0.389. Besides, there was a significant connection between aesthetics, landscape quality, and landscape preference variables because the t-test value for them was 3.540, which is reliable (Table 2).

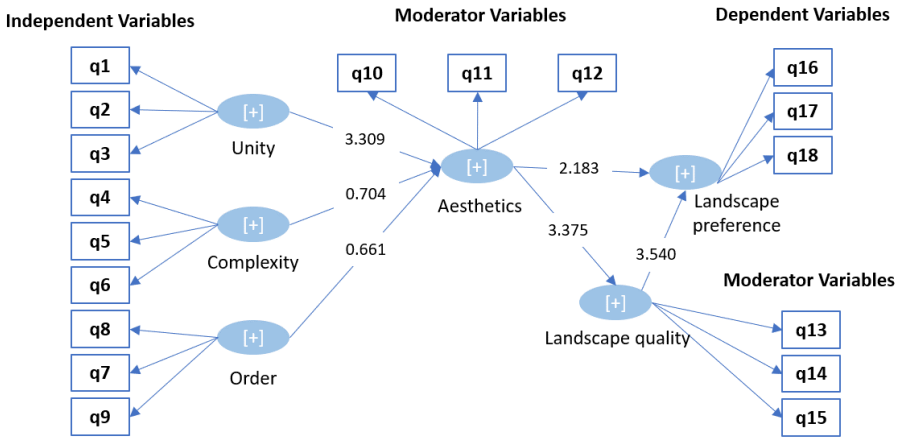

Figure 5. The results of the t-statistic

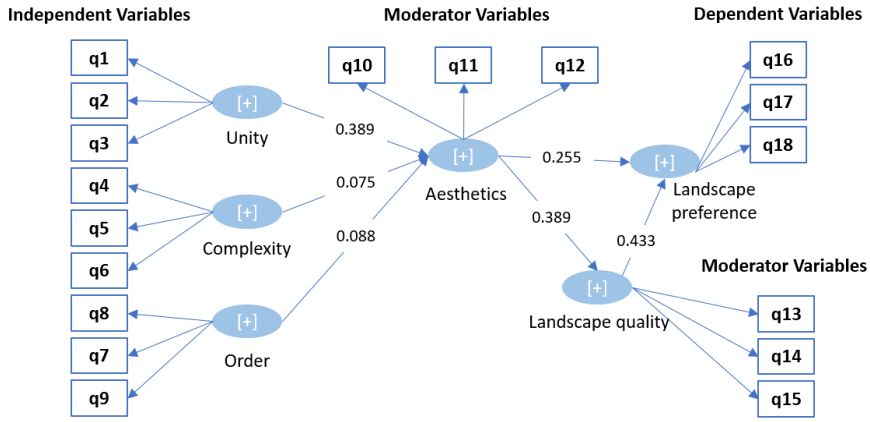

Figure 6. The results of the structural coefficients

Table 2. The reliable paths

Path	Path coefficient	Condition
unity > aesthetics > landscape preference	0.099	✓
unity > aesthetics > landscape quality > landscape preference	0.168	✓

Model Fitness

The Coefficient of Determination (R^2) was used to evaluate the fitness of the structural model. Chin (1998) defined the R^2 value as 0.19, 0.33, and 0.67 for weak, moderate, and strong in the Partial Least Squares (PLS) path modeling method. The average value of R^2 in this research is 0.338, which shows the power of the structural model for describing the structure. Finally, the results show that the produced model has a suitable fitness.

Discussion

In this research, the hypothesis of the study states that there is a significant connection between the characteristics of the landscape in grade separations and the quality of the urban landscape and its perception. Using the example of Hamedan, the results indicate that not only grade separations have significant effects on the quality of the urban landscape, but also, they have effects on the people's perception and their landscape preferences. These include the variation in the quality of the urban landscape because of the characteristics of the landscape in grade separations. Additionally, the correlation between unity and aesthetics indicates the typical qualities of these two factors that lead to the landscape preference.

There are several ideas and theories of the landscape perception and preference that confirm the results of the study. Kaplan and Kaplan (1989) described coherence as the degree to which different elements relate to each other and facilitate insight and create order. Based on their description and the results of the study, the unity between the elements of grade separations is such an essential factor that should be considered.

Nohl (2001) believes that landscape is seen as an aesthetic object and characterized by its appearance so that aesthetics is something that affects people's perception and their landscape preference in grade separations.

As mentioned above, unity through aesthetics is the critical path that affects the people's image of the city and their landscape preference. The findings of this issue in Hamedan show the fact that creating the image of unity in grade separations has an impact on the people's understanding of their landscape preference and on their perception of aesthetics.

According to the results of the interviews, it seems that the location of Hamedan (in a mountainous area that provides a beautiful landscape) affects the people's preferences and it causes them to prefer the landscapes that are parallel and compatible with this special feature. Although most of the grade separations located in Hamedan are non-aligned with these landscapes, which can be an annoying thing for the people and it affects their perception, the grade separations located in the second ring of the city cause a sense of coherence in this area and they have a positive impact on the unity of this structure and then its feature of aesthetics.

Additionally, it seems that the next reason about the effect of unity on the landscape quality and landscape preference, which impacts on the people's perception of the landscape, is to consider the previous local identity of Hamedan. This claim is confirmed by reviewing the history of urban development in the city, which included 6 radical roads in 1931 (Zakerhaghighi et al. 2014). This urban modernization has changed the special structure of the city and it caused the people's image of the urban spaces to change (separated spaces without any special connection).

According to the history of urban development in the city and the results of the research, the grade separations are the urban spaces that have affected the special structure of the city. Also, they have caused the people's perception of the urban landscape which is gradually changing. This is important to mention that only two of the grade separations are located in the first ring of the city.

As stated in many environmental psychology studies (Lalli 1988, Radstrom 2014), the physical and environmental characters of a city affect the shaping of people's local identity. All in all, the people of Hamedan know the grade separations as spatial connections between the different spaces of the city, and unity as one of the characters

of grade separations that affect the quality of the urban landscape, their preferences, and their perception.

Although all the data in this paper are from only one city, the methods of analysis of the landscape quality on people's perception may be applied to cities worldwide. This suggestion is supported by preliminary results from European cities like London, Paris, Rotterdam, and Frankfurt am Main, all of which focus on the evolution of landscape and its impact on the public opinion (Nijhuis et al. 2011).

Conclusions

The analysis of the connection between the characteristics of the landscape in grade separations and the quality of the urban landscape and the people's perception shows that the affective factors in grade separation, which affect the quality of the urban landscape and its perception, are those that cause unity and aesthetics to be perceived as well as with considering of the visible landscapes of the city. Also, it is specified that changing the special structure of Hamedan in 1931 has caused the people of the city to perceive the grade separations as connecting factors that connect the physics of the city. The same characters of the grade separations are the things that have caused unity as a factor to affect the quality of the urban landscape and the people's perception of it.

The main limitation of this study was related to the sample size and the sample area selection, as well as the potentially high level of providing biased results. It is recommended that the research to be done in the future with particular emphasis on the connection between age, gender, occupation, and landscape preference in grade separations because people from different ages, genders, and occupations have different opinions about their environment.

References

ALI F., RASOOLIMANESH S. M., SARSTEDT M., RINGLE C. M., RYU K. (2018) An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research, International Journal of Contemporary Hospitality Management 30 (1), 514-538.

ANTROP M., VAN EETVELDE V. (2017) Landscape Perspectives: The Holistic Nature of Landscape, Springer, Dordrecht.

AZARA P. (2008) Landscape, Live Nature: Towards the Construction of the Image of the Landscape in the West, in: Maciocco G. (ed.), Urban Landscape Perspectives, Springer, Berlin, Heidelberg, pp. 43-60.

CHEN B., ADIMO O. A., BAO Z. (2009) Assessment of aesthetic quality and multiple functions of urban green space from the users' perspective: The case of Hangzhou Flower Garden, China, Landscape and Urban Planning 93 (1), 76-82.

CHIN W. W. (1998) Issues and opinion on structural equation modeling, MIS Quarterly 22 (1), 7-16.

CIVELEK M. E. (2018) Essentials of Structural Equation Modeling, UNL Libraries, Lincoln.

FORNELL C., LARCKER D. F. (1981) Evaluating structural equation models with unobservable variables and measurement error, Journal of Marketing Research 18 (1), 39-50.

GAVRILIDIS A. A., CIOCĂNEA C. M., NIȚĂ M. R., ONOSE D. A., NĂSTASE I. I. (2016) Urban Landscape Quality Index – Planning tool for evaluating urban landscapes and improving the quality of life, Procedia Environmental Sciences 32, 155-167.

HEDBLOM M., HEDENÅS H., BLICHARSKA M., ADLER S., KNEZ I., MIKUSIŃSKI G., SVENSSON J., SANDSTRÖM S., SANDSTRÖM P., WARDLE D. A. (2020) Landscape perception: linking physical monitoring data to perceived landscape properties, Landscape Research 45 (2), 179-192.

JOSHI A., KALE S., CHANDEL S., PAL D. K. (2015) Likert Scale: Explored and Explained, British Journal of Applied Science & Technology 7 (4), 396-403.

KANŌ H. (1978) City Development and Occupational Change in Iran: A case study of Hamadan, The Developing Economies 16 (3), 298-328.

KAPLAN R., KAPLAN S. (1989) The experience of nature: A psychological perspective, Cambridge University Press, Cambridge.

KONKOLY-GYURÓ É. (2018) Conceptualisation and perception of the landscape and its changes in a transboundary area. A case study of the Southern German-French borderland, Land Use Policy 79, 556-574.

LALLI M. (1988) Urban Identity, in: Canter D., Jesuino J. C., Soczka L., Stephenson G. M. (eds.), Environmental Social Psychology, Kluwer Academic Publishers, Dordrecht, pp. 303-311.

MALKINSON D., KOPEL D., WITTENBERG L. (2018) From rural-urban gradients to patch – matrix frameworks: Plant diversity patterns in urban landscapes, Landscape and Urban Planning 169, 260-268.

MATHEW T. V., KRISHNA RAO K. V. (2007) Introduction to Transportation Engineering, NPTEL, Retrieved from: www.nptel.ac.in.

MEMLÜK M. Z. (2012) Urban Landscape Design, in: Ozyavuz M. (ed.), Landscape Planning, InTech, Rijeka, pp. 277-298.

MODI N. (2017) Design Consideration of Underpass type of Bridge Structure as per Indian Standard, International Journal of Technical Innovation in Modern Engineering & Science 3 (6), 33-36.

NIJHUIS S., VAN LAMMEREN R. J. A., VAN DER HOEVEN F. (2011) Exploring the Visual Landscape: advances in physiognomic landscape research in the Netherlands, IOS Press, Amsterdam.

NOHL W. (2001) Sustainable landscape use and aesthetic perception–preliminary reflections on future landscape aesthetics, Landscape and Urban Planning 54 (1-4), 223-237.

PALERMO P. C. (2008) Thinking Over Urban Landscapes: Interpretations and Courses of Action, Urban and Landscape Perspectives, in: Maciocco G. (ed.), Urban Landscape Perspectives, Springer, Berlin, Heidelberg, pp. 27-41.

QIU Z., PENG X. (2015) Investigating the impact of urban grade-separation on pedestrian PM2.5 exposure, Clean Technologies and Environmental Policy 17, 1917-1927.

RADSTROM S. (2014) A Place-Sustaining framework for local urban identity: an introduction and history of Cittaslow, Italian Journal of Planning Practice 1 (1), 90-113.

RĘDZIŃSKA K., SZULCZEWSKA B. (2019) Landscape in change as perceived by its residents: A case study of Wilanow West in Warsaw, Land Use Policy 85, 259-270.

SILBERNAGEL J., CHEN J., NOORMETS A., SONG B. (2006) Conducting sound ecological studies at the landscape scale: research challenges, in: Chen J., Saunders S. C., Brosofske K. D., Crow T. R. (eds.), Ecology of Hierarchical Landscapes: From Theory to Application, Nova Science Publishers, Inc., New York, pp. 281-295.

SOINI K., VAARALA H., POUTA E. (2012) Residents' sense of place and landscape perceptions at the rural–urban interface, Landscape and Urban Planning 104 (1), 124-134.

SOLGI E., ROOHI N., KOUROSHI-GHOLAMPOUR M. (2016) A comparative study of metals in roadside soils and urban parks from Hamedan metropolis, Iran, Environmental Nanotechnology, Monitoring & Management 6, 169-175.

SUPPAKITTPAISARN P., JIANG B., SLAVENAS M., SULLIVAN W. C. (2019) Does density of green infrastructure predict preference? Urban Forestry & Urban Greening 40, 236-244.

TIESKENS K. F., VAN ZANTEN B. T., SCHULP C. J. E., VERBURG P. H. (2018) Aesthetic appreciation of the cultural landscape through social media: An analysis of revealed preference in the Dutch river landscape, Landscape and Urban planning 177, 128-137.

VAN DER HEIDE C. M., HEIJMAN W. J. M. (eds.) (2013) The economic value of landscapes, Routledge, London.

WONG K. K.-K. (2013) Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS, Marketing Bulletin 24, Technical Note 1, 1-32.

WU J., WANG S., ZHANG Y., ZHANG A., XIA C. (2019) Urban landscape as a spatial representation of land rent: A quantitative analysis, Computers, Environment and Urban Systems 74, 62-73.

ZAKERHAGHIGHI K., GHEITARANI N., KHANIAN M., TAGHADOSI R. (2014) Examination of effects of urban street configuration on the amount of

commercial buildings establishment (according to natural movement theory), Case study: Hamedan, European Online Journal of Natural and Social Sciences 3 (1), 20-27.

ZHANG D., HUANG Q., HE C., YIN D., LIU Z. (2019), Planning urban landscape to maintain key ecosystem services in a rapidly urbanizing area: A scenario analysis in the Beijing-Tianjin-Hebei urban agglomeration, China, Ecological Indicators 96 (Part 1), 559-571.

Journal of Urban and Regional Analysis 14–1 (2022): 37–58, https://doi.org/10.37043/JURA.2022.14.1.3

RELIABILITY OF SPATIALLY-REFERENCED SECONDARY ECONOMIC DATA: VALIDATION, ISSUES, AND SOLUTIONS

Igor Sîrodoev[a,b]

[a] Ovidius University of Constanța, Constanța, Romania
[b] University of Bucharest, Bucharest, Romania

Abstract: In the era of ever-increasing data supply, range and diversity, there is a strong need to compare and assess the reliability of the data coming from various sources. For secondary economic data, such sources are usually grouped into two big categories: surveys carried on and statistical records kept by governmental bodies (statistical agencies etc.); and commercial data, collected by private companies from various public (or confidential) sources. The article discusses the benefits and pitfalls of these data categories on the example of the two data providers in Romania, whose data are widely used in economic research and for the development of public policies: National Institute of Statistics (NIS) and Borg Design S.R.L. (BD). The quality control of the data provided by NIS is more transparent and it is rigorously based on the international standards applied in the field of official statistical surveys; however, the spatial resolution of these data is quite coarse, usually at the level of counties. In turn, data provided by BD have a much finer spatial resolution (down to the level of villages), but their quality control is less transparent. In conclusion, the analysed data are complementary and can be used for analytical purposes, considering their limitations.

Keywords:

data quality assessment;
European Classification of Economic Activities (NACE);
territorial development and planning;
Romania

Email: igor.sirodoev@univ-ovidius.ro

Initial submission: 15.10.2020; Revised submission: 07.05.2021; Final acceptance: 26.06.2021

Introduction

The amount of data available for scientific research and development planning has been skyrocketing in the past two decades (National Science Foundation 2019, Kitchin 2021). This explosion brings new opportunities but it also creates infinite uncertainties in the previously well-established procedures, research methods and territorial planning approaches (Glaeser et al. 2021). Considerable attention is directed towards managing such uncertainties as data representativeness, validity, and reliability (Kitchin 2014). The latter can be described in several ways, among which, synchronic reliability will retain our attention: it refers to the fact that observations recorded within the same interval of time should be similar (Golledge and Stimson 1997). Reliable data enjoy more confidence and a wider implementation. In the field of territorial planning, smart data management, sustainable city policy, dynamic planning, accomplishing sustainable development goals, and the implementation of more place-specific sustainable development models (Bănică et al. 2020) depend on accurate, confident, and reliable data. The concept of smart city, which describes the new paradigm in urban planning, originates from the data revolution we are witnessing (Kourtit et al. 2020).

Secondary economic data are widely used in economic, geographical, and sociological research. They are usually collected for a well-established purpose, but they can be used whenever appropriate for a great variety of tasks (Kitchin 2014). The difficulty of assessing the synchronic reliability of secondary economic data comes from the availability of alternative sources: when just one data provider exists on the market, the accuracy and reliability assessment of the data becomes a time-consuming and painful task, frequently made using ad-hoc procedures and confusing methodologies (Di Zio et al. 2016). Moreover, if there is just one dataset available with no alternative, such an assessment makes little sense because there are just two ways out of this dichotomic problem: to use or not to use. That is why researchers and planners usually choose the most obvious one: they use the data to get their task done. In recent years, the multitude of alternative data sources made available for academic and planning communities transformed the issue of data reliability assessment from a lofty goal to a routine task, being standardised across the data providers (Di Zio et al. 2016) and introduced in the workflow of the national statistical authorities (Van der Loo and De Jonge 2021).

Although there is a partial overlap of the terms used to describe the location of a certain object on the Earth's surface, we would like to provide some explanations and to make some distinctions between concepts according to the most common uses. "Geo-referencing" refers to matching the two coordinate systems: the internal system of a digital object (map, satellite scene) and the ground system of geographical coordinates (United States Geological Survey 2021). "Geocoding" is the transformation of a description of an object to the location of the Earth's surface (ESRI 2021). In other words, georeferencing is a narrow procedure of geocoding, when just geographical

coordinates, which describe an object, are used for its correct positioning in space. Although geocoding has quite a broad cover, it most frequently marks the process of using postal addresses for finding the objects' precise position in space. In the context of this article, we will talk about the spatial referencing of the objects, which means that for their location in space the associated names of the administrative-territorial units, whose position is known, are used as hints for spatial location.

Taking into consideration that data validation means that one decides whether a data set is suitable for a certain well-established purpose or not (Van der Loo and De Jonge 2020), in this article we propose a methodology for assessing the reliability of spatially-referenced economic data and to assess the reliability of the datasets largely used in the national scientific research and economic development planning. We focus on entrepreneurship and the available data which characterise the economic activity of enterprises, as it is one of the main factors to influence the competitiveness at the regional and local level and it is frequently used in geographical, economic, sociological research and to solve planning tasks (Sîrodoev 2009, Dziekański 2021). Two data providers from Romania, which correspond to the imposed criteria, are selected for this purpose: The National Institute of Statistics (NIS) and Borg Design S.R.L. (BD).

BD data are highly used in Romanian scientific research publications and economic development planning activities. Among the topics in which the use of these data was explicitly reported, we should mention: numerous development strategies and territorial planning documents at county and local level; sociological studies of the national economy (Petrovici 2013); analyses of small towns' local economies (Bănică and Camară 2011, Sîrodoev et al. 2015), of coastal (Burtea et al. 2012) and mountain (Drăgan 2013) areas; forest-related economic activities (Ciobotaru 2018); tourism activities (Herman et al. 2021); cultural economics (Drăghici et al. 2015, Lupchian and Saghin 2020); entrepreneurial initiatives (Iurea 2011, Schvab et al. 2014, Vădăstreanu et al. 2015, Mogos 2017); sustainable growth (Mogos et al. 2021); emergent economic activities (Peptenatu et al. 2012); sports economics (Péter 2017); IT & C industries (Popescu and Gavriș 2012); foreign capital investments (Pop et al. 2017); business ethics (Pup 2013); creative industries (Pintilii et al. 2015, Sava and Bădulescu 2018, Sava and Meșter 2019) and cities (Sava and Bădulescu 2019); mobile marketing (Zifceac and Mlesnita 2011), and many more, where the source of the data was not properly acknowledged.

NIS data containing economic variables broken down by NACE codes are usually met in similar types of studies. Moreover, it is an official data source to be used in governmental activities and to be reported to various European institutions. Explicitly acknowledging the source, when using these data, has not been a common practice in documents and studies, especially in the past, because for many years the National

Institute of Statistics was the single data provider. Today, since the number of private data providers has increased, the source of the data directly used or in a processed and transformed form should be precisely mentioned because there might be differences in the outputs.

The aim of this paper is to assess the reliability of spatially-referenced economic data largely used by the academia and planning communities in Romania, as well as to propose a methodology for such an assessment. In what follows, we present the main features and issues of the two datasets selected for comparison and we describe the methodological steps of data processing and analysis. There are also detailed the most important results related to each spatial scale of the analysis, from NUTS level 1 to the Local Administrative Units (LAU). We discuss the main strengths and weaknesses related to the proposed methodology as well as the issues in the findings. Finally, conclusions on the method of data reliability assessment and on the appropriateness of using the analysed datasets in academic research and the planning practice are made.

Methodology

Data description

The official governmental data are produced by the National Institute of Statistics of Romania (NIS) through the web portal TEMPO online (statistici.insse.ro:8077/tempo-online). The purpose of the governmental data collection is to support the national authorities in their effort to develop and elaborate public policies and strategies, to make economic forecasting, and to monitor the market economy in Romania according to the international standards. Statistical surveys and data collecting are realised periodically according to an approved plan, and they cover a wide range of social, economic, environmental, infrastructural and other data types. The data used in this analysis come from three statistical subfields: culture (3 tables: ART121A, ART122A, and ART123A), workforce (4 tables: FOM104D, FOM103D, FOM104F, and FOM105F), and statistics of enterprises (7 tables: INT101O, INT101R, INT101S, INT101T, INT101U, INT102D, and INT104D).

The data contained in the culture tables are spatially presented by communes/towns/-municipalities (LAU) and counties (NUTS Level 3), and they do not have associated NACE codes. The same applies to table FOM104D. The data in the rest of the tables are broken down by NACE codes, from sections to classes (depending on the table); however, counties are the lowest spatial level of these data, to which development regions (NUTS Level 2) and macroregions (NUTS Level 1) are added.

Concerning the NACE classification, the tables have three types of organisation: (1) the culture tables have no classification codes: they can be deduced from the table names (museums – class 9102, theatres – division 90, and libraries – class 9101, as well as the

total number of employees, in the case of FOM104D); (2) the two F-tables from the workforce subfield include sections and divisions that are blended in one table; (3) for all the enterprises' tables, the NACE levels from sections to classes are broken down by the tables in such a way that each table contains only one NACE level. At the same time, the form in which the data are provided does not respect the strict separation by individual NACE codes to avoid confidentiality issues. Thus, the workforce F-tables have some divisions grouped together (02-03, 38-39, 59-60, and 62-63). Even more complicated situations can be found in the case of the enterprises' D-tables: sections L, M, and N, as well as R and S, are grouped, while the A section is divided into three divisions (01, 02, and 03); the A section includes divisions which are not provided for the county level, just for the upper two ones (NUTS 2 and NUTS 1). There are three types of measurement units used in these tables: the number of persons (employees or occupied population), the number of enterprises/companies (active units or local active units), and the national currency (the enterprises' turnover).

Besides the presented features of the analysed tables, some other characteristics had limited comparability because of the lack of correspondence between the NIS and BD data: the workforce tables with NACE codes are broken down by sexes, while the data in the enterprises' tables are grouped by four size classes, equivalent to micro-, small- and medium-sized enterprises, as well as large ones.

The BD data are provided by Borg Design S.R.L. through the web portal Romanian companies (www.listafirme.ro) or they can be purchased directly from the provider in the database format. The purpose of the commercial data collection is to facilitate the search on the web of a company of interest, including its name, contact details, financial data, lawsuits, and other information necessary for doing an informed business and maintaining a transparent and stable market economy. As such, Borg Design (BD) collects more data than it is usually required in spatially-referenced economic research.

Dor scientific research purposes, Borg Design also provide anonymized data aggregated by Local Administrative Units (LAU), or their subdivisions for which the Romanian National Classification Codes for Settlements (SIRUTA) exist. The BD data are broken down by NACE classes (4 digits) for each SIRUTA code and they frequently contain the number of companies, the turnover, profit, losses, and the number of employees. At the same time, data not attributed to any NACE code exist in the database: they add up to the totals, but the activity field of these enterprises remains undisclosed.

Both data providers declare the quality of their products as a supreme guiding principle; however, it is interpreted differently, depending on the purpose of data collection. The governmental data strictly respect the international standards for data collection, processing, handling, storage, and dissemination, while the commercial data provider is guided by the principles of the precise reflection of the national economic

environment and the free competition within the market economy. Both data providers have the National Trade Register Office (NTRO) (www.onrc.ro) as the primary source of information about the existing active companies. They further process and enhance these data by adding supplementary information following their specific purposes related to data quality and provision. At the same time, we can see that in both data sources, the total number of active companies differ from that of their primary source, the National Trade Register Office (Table 1).

Table 1. The total number of active companies in Romania

Year	National Trade Register Office (NTRO)			Companies in NIS data	Companies in BD data
	Legal entities	*Individual enterprises and authorized persons*	*Companies*		
2013	719258	348159	371099	498768	648843
2014	747699	392104	355595	521381	657598
2015	773781	396535	377246	528040	668876
2016	808878	382860	426018	541663	679027
2017	870408	388128	482280	568589	729022
2018	927373	392548	534825	591500	752206
2019	984909	378742	606167	606390	781846
2020	1036594	393586	643008	640104	774218

Source: NTRO, NIS, BD

Data processing

The data required a series of processing steps to be accomplished before being properly compared. Since BD data have a finer resolution in both space scale and NACE codes, the processing includes BD data aggregation to match the NIS data resolution. There were also made some prior assumptions to increase the range of comparable data: (1) the occupied population (FOM103D) was assumed to be equivalent to the number of employees; (2) the NIS data reported either as yearly averages or at the end of the year were considered equivalent to the yearly BD data.

In 2008, the NACE codes underwent a significant revision from version 1 to version 2, which, according to NIS, makes the direct data comparison between the two versions incompatible. That is why our analysis focuses on the recent 13 years, from 2008 to 2020. According to NIS order no. 337/20.04.2007, the Classification of Activities in National Economy includes 21 sections (from A to U), 88 divisions (from 01 to 99), 272 groups (from 011 to 990), and 615 classes (from 0111 to 9900), which is essentially the

same as the European classification (Eurostat 2008). However, not all the codes can be found in statistical reports. Thus, NIS provides data for just 18 sections, excluding O – Public administration and defence; compulsory social security, T – Activities of households as employers, and U – Activities of extraterritorial organisations and bodies with associated subdivisions (4 divisions, 7 groups, and 13 classes), which are missing from the spatially-referenced statistical data. There are also missing classes in the existing sections. That is why, out of 615 classes included in NACE, there have been reported just 588 unique class codes, varying between the minimum yearly value of 580 (in 2008) and the maximum of 587 (registered in half of the analysed years).

The NIS data processing resumed to unmixing tables with blended NACE codes. Then the data in LAU tables were aggregated to complete the missing superior spatial scales (NUTS 2 and NUTS 1). The NACE patterns (as there are some differences in reporting as mentioned above) have been determined and extracted for each table. The BD data were aggregated according to the pattern specific for each NIS table and spatial scale. Finally, the data from these two sources were merged into one database with 747079 entries, and the percent deviation of BD data from the NIS data was computed. For the analysis, there were removed 44601 entries having 0 or no data in either of the analysed variables and 55619 entries whose deviation exceeded 100%. The resulting database with 646859 samples served for further analysis.

Data analysis

The reciprocal reliability of the two datasets was assessed by the strength of the relationship between the analysed variables at a certain spatial scale. However, before the calculation of the correlation coefficients, the data should have passed through several filters as they are implemented in R (The R Foundation 2021). When comparing two variables, the first assumption to be met is whether they come from the same distribution, preferably normal, but not necessarily. The Kolmogorov-Smirnov test was employed to filter out the inappropriate cases of variables coming from different distributions (Conover 1999). When the test confirms that the data come from the same distribution, further tests were applied. In the other case, the data were normalised and tested again. If the answer remained negative, these data were excluded from further analysis.

In the second phase, we determined the sample size. Depending on the scale for the NIS table and NACE codes involved in the analysis, the sample size could differ from more than 5000 samples to 13 (minimal sample size for one spatial unit, one NACE code, and values registered in all analysed years). To include incomplete sets of observations to a limited extent, we considered the threshold value of 9: samples smaller than this threshold were excluded. An additional sample-size filter was used to separate the small distributions with less than 30 samples from the large ones which exceeded this value.

The normality test was carried out using two different tests, which were applied depending on the sample size. The small distributions were tested using the t-test (Student 1908, Spector 2021), while for large distributions the Shapiro-Wilk's W test was involved (Royston 1982). Using these two tests in parallel for the distributions, which differ in size, was important as Shapiro-Wilk's test produced quite a large number of false-positive results in small distributions.

Finally, correlation coefficients were computed for the variables. For the normally distributed variables, the Pearson correlation coefficient was computed because it requires that both analysed variables come from the normal distribution (Pearson 1895). For the variables which did not pass the normality test, the Kendall rank correlation coefficient was computed because it accepts that both variables come from the same distribution, which should not necessarily be normal (Kendall 1938). The significance of the computed coefficients was assessed using the associated p-value. It is obvious that not all the results had significant correlation coefficients. Below we will present and comment on the issues in the results, covering the strengths and weaknesses of the proposed methodology.

Results

National level

The raw data in the entire dataset has a significant right skewness, which cannot be corrected even after a log-normal transformation. However, when we look at the percent deviations, we can see a slight left skewness with two outstanding cases, which happen at 0 and 100% deviations (Figure 1). It should not be a surprise as the BD database contains more companies than the NIS one; this difference varies from 14% to 37% depending on the year. The outstanding case of the deviations close to 0 is remarkable because it points towards an important amount of data in which the variables do not significantly differ from each other. Another outlier formed close to the 100% deviation highlights quite a large presence of the cases with small values registered in the variables, in which a change in 1-2 measurement units (number of companies) means a double difference.

When breaking down our dataset in spatial scales (Figure 2), one can observe that the NUTS 3 scale (counties) is the one in which the differences close to 0 are mainly accumulated. This situation can be observed on the upper levels as well, but its prominence progressively decreases in such a way that it is no longer observed at the national level. We should also highlight the similarity of the distributions, whose kurtosis increases progressively from NUTS 3 to the national level. At the same time, all the above LAU levels are left-skewed; the medians on the plots highlight the thresholds, which separate the samples into two halves.

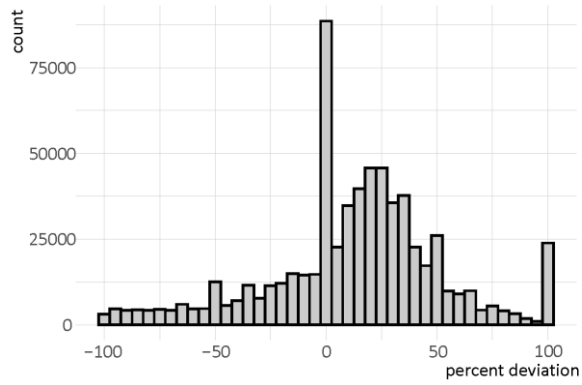

Figure 1. The percent deviation of BD data from NIS data.
Source: computed by the author from NIS and BD data

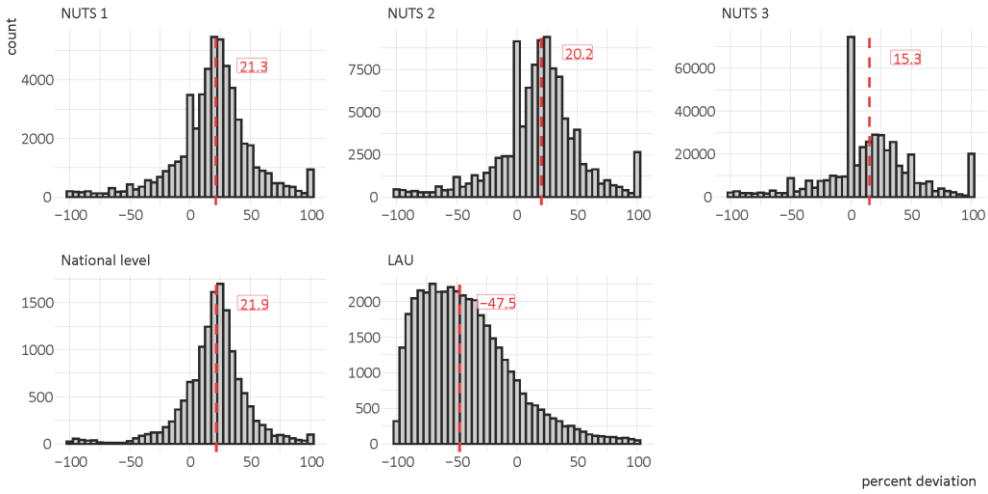

Figure 2. The percent deviation of BD data from NIS data by spatial scales. Note: the median value is shown in red.
Source: computed by the author from NIS and BD data

The values in the LAU level have a completely different distribution: it is right-skewed, while in half of the spatial units BD data are smaller than the NIS ones by 47.5% or more. This finding is especially important because our need for economic activity data is the strongest at this level, with no alternatives.

NUTS level 1

The NUTS level 1 has just four spatial units: macroregions. Because of the reduced number of units, not all the variables and data tables could surpass the minimum size threshold, and whose correlation coefficient could be obtained. Here we present our

results on the example of the NIS's INT102D table, which contains the number of employees in local active units by NACE sections (Figure 3).

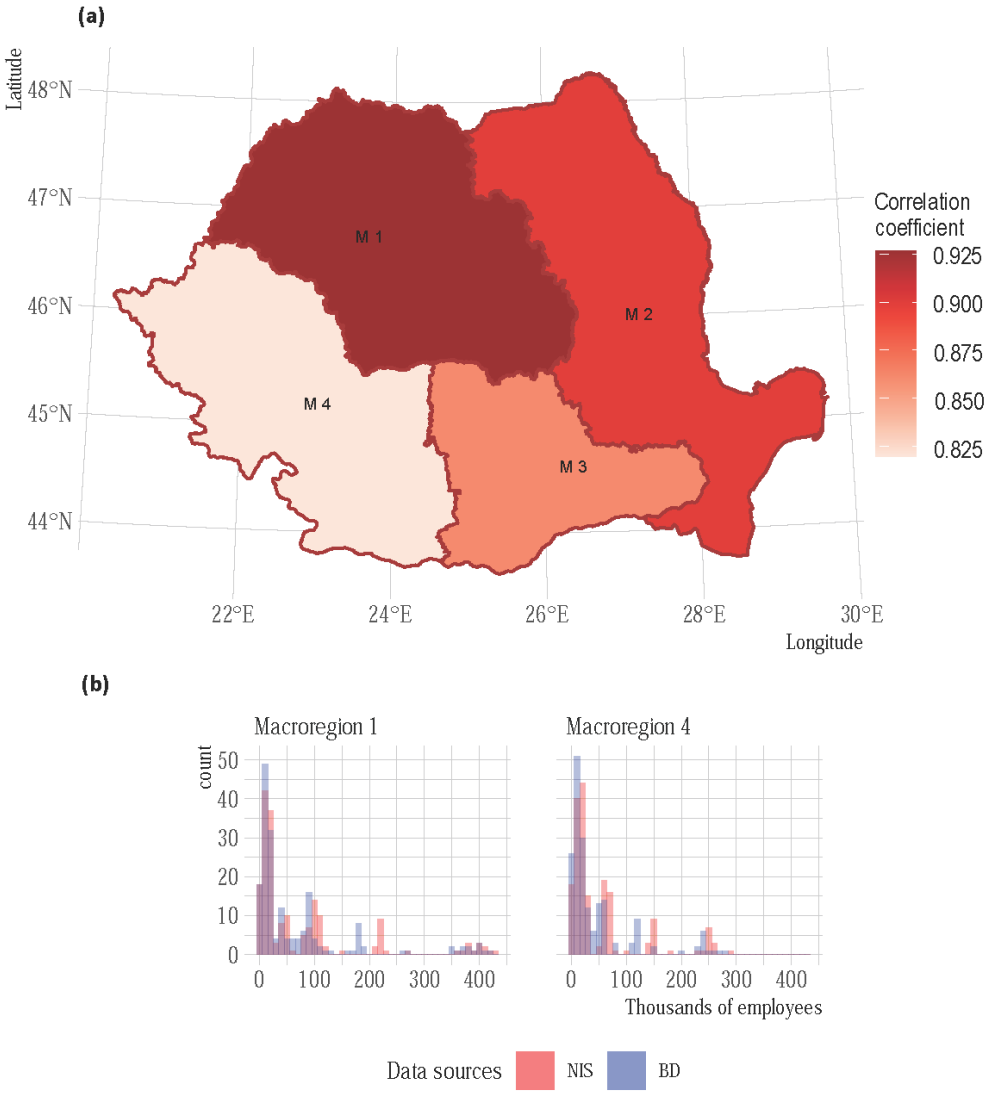

Figure 3. The correlation coefficients (a) and (b) the BD vs. NIS data relationship by NUTS 1: variable – employed in local active units; NACE level – sections; measurement units – number of employees (NIS table: INT102D). Source: computed by the author from NIS and BD data

Macroregion 1 has the highest correlation coefficient of 0.925, and even Macroregion 4's lowest value of 0.825 is higher than 0.8, which points towards a significant and very strong correlation between BD and NIS data. The data have a significant asymmetry, which should not be a surprise in economic data. Macroregion 1 has also five clusters

of NACE codes, which are grouped by the employed persons, and the largest cluster (the cluster with the highest number of employees per NACE code) is grouped around 400 thou. employees. In Macroregion 4, the presence of the four clusters follows a somewhat similar pattern, but at diminished size ranges: the two smallest clusters are almost joined together, while the largest one is formed around the average size of 250 thou. employees.

The difference between the macroregions is not significant as the correlation coefficients of all units remain in the very strong domain. That is why we can conclude that both data sources can be used at the NUTS 1 level interchangeably to a certain extent.

NUTS level 2

The NUTS level 2 has a double number of spatial units: regions of development. However, even this number is below the adopted threshold, which contributed to excluding many cases smaller than it. Our results are illustrated using the same NIS table, and the observed trends are pretty the same (Figure 4). Thus, the North-West Development Region (part of Macroregion 1) has the highest correlation coefficient of 0.94, while the West Development Region (part of Macroregion 4) has the lowest one. Even the lowest coefficient lies within the range of a very strong relationship between the analysed data. The histograms also highlight a clustering pattern similar to that in the macroregions but at even smaller sizes.

The spatial pattern of the correlation coefficients' distribution is different from that of macroregions. Here we see that the southern half of the country has no statistically significant correlations between the BD and NIS datasets at this spatial scale. It means that there is no relationship between the BD and NIS datasets in the case of employed persons in these regions of development.

NUTS level 3

The NUTS level 3 has 42 spatial units: 41 counties and the Municipality of Bucharest. This number is large enough to be eligible for the Shapiro-Wilk's normality test and only the rarity of the activities or the incomplete observations can represent a threat to accomplishing the normality condition. Our results are shown using the INT101O table as an example. This table represents the number of active enterprises by NACE sections (Figure 5). Unlike the NUTS 2 example, all the counties have statistically significant and very strong correlations between BD and NIS data. The histograms of the two counties with the highest and lowest correlation coefficients, Ilfov and Tulcea, accordingly, show the distribution of companies by NACE codes. In both cases, we can see the high asymmetry of the distribution and that the BD data overestimate the number of companies in the larger NACE codes when compared to the NIS data. At the same time, Ilfov county has much more NACE codes with a large number of

companies (that can exceed 10 000 in certain economic activities), while in Tulcea the largest activity does not exceed 3000 companies.

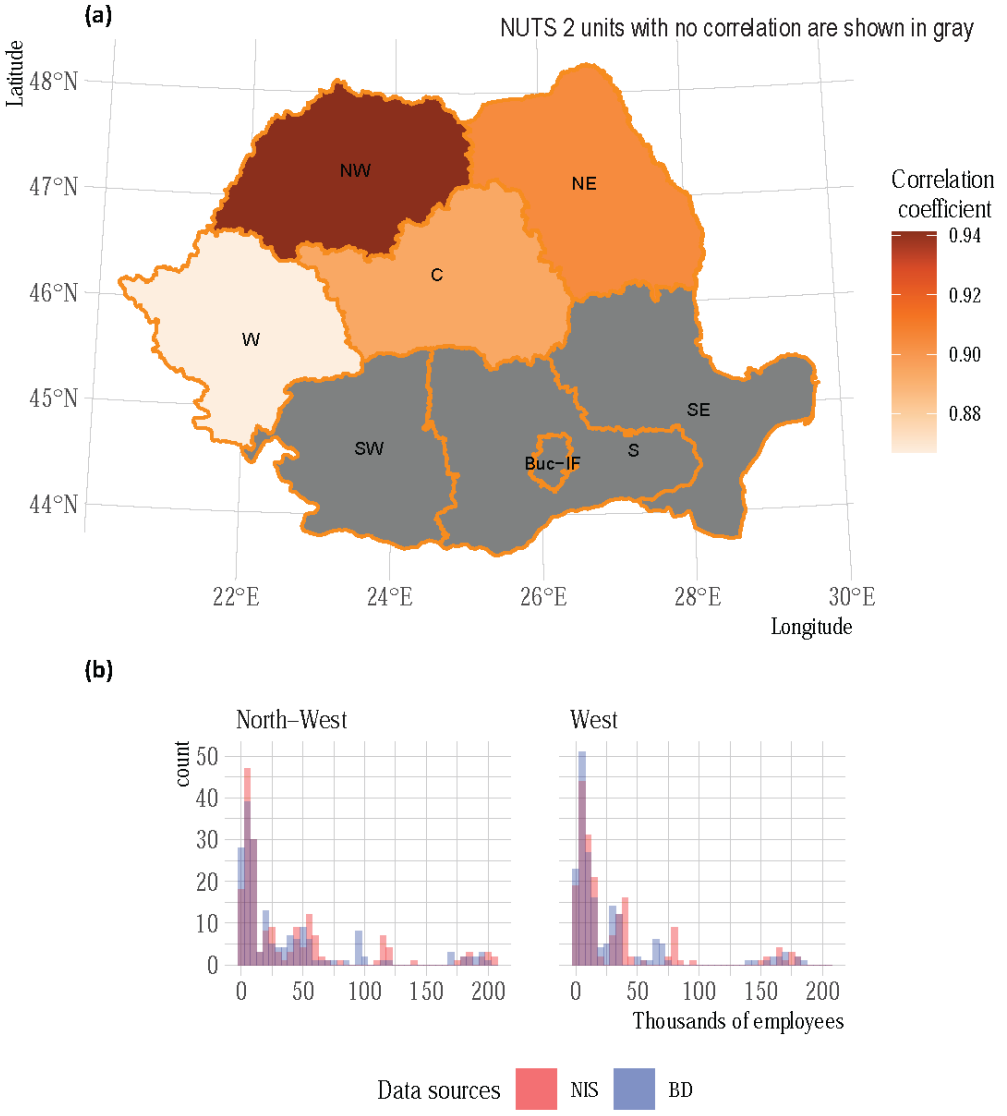

Figure 4. The correlation coefficients (a) and (b) the BD vs. NIS data relationship by NUTS 2: variable – employed in local active units; NACE level – sections; measurement units – number of employees (NIS table: INT102D). Source: computed by the author from NIS and BD data

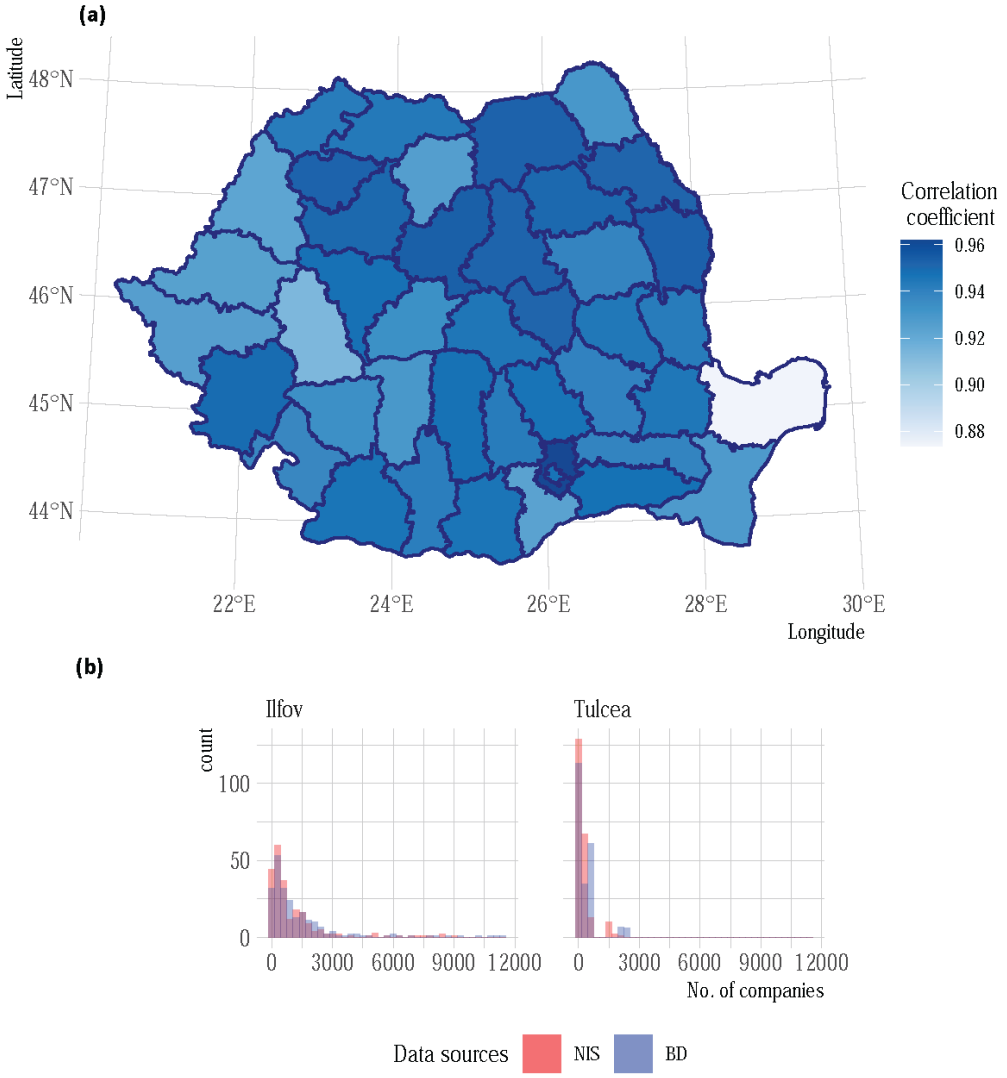

Figure 5. The correlation coefficients (a) and (b) the BD vs. NIS data relationship by NUTS 3: variable – active enterprises; NACE level – sections; measurement units – number of companies (NIS table: INT101O). Source: computed by the author from NIS and BD data

There is no clear spatial pattern in the correlation coefficient distribution in the case of counties. However, one feature should be highlighted: the counties with a slightly higher correlation coefficients are grouped in the northern half of the country. It reflects the same trend observed with different data at the upper spatial scales. Ilfov county, serving as a suburbanization playground for the capital city, is the most dynamically developing county in the past decade in Romania, while Tulcea county is remarkable

for its remoteness and limitations (both physical and legal) to attracting new economic activities. These specific features could have played a significant role in shifting these counties to the opposite extremes of the correlation coefficients distribution.

LAU

As it has been already mentioned, the case of the local administrative units is the most important. On the one hand, there are few datasets and variables to compare with at this level. On the other hand, lacking a single important enterprise from the database can significantly change the picture of the local economy.

If we break down the LAU percent deviations by four administrative types existing in Romania (rural communes, small towns, larger municipalities, and the county seats), we will observe three different patterns (Figure 6). First, the rural communes, which form the majority of the spatial units, are right-skewed with the median value very close to -50%, i.e. in half of the units, the BD data are half times smaller than the NIS data. Second, towns form an almost bell-shaped distribution with the right tale; here, the median value is -34.5%, meaning that deviations are not so massive and so large compared to the previous situation. Third, the data distribution in the municipalities and county seats forms two distinguished clusters: (1) a distribution, whose shape is close to a normal one but with a quite long right tail: (2) a prominent cluster located in the range from about -75% to -100%. The difference between the two-unit types is given by the reciprocal relationship of these clusters: municipalities form a small cluster of the second type, which barely influences the entire distribution, while in the county seats, this cluster is strong enough to significantly shift the median values close to its right margin (which means that it includes the half of the units in the sample). Broadly speaking, each of the distributions is similar to its neighbours, such as the municipalities distribution, which has common features with both towns and county seats. However, county seats are the most different from the rest. In any of the analysed cases, such a big difference between the two analysed datasets questions their reliability at the local level.

When looking at the individual tables, we have not much to choose from: there are only four tables with data available at this spatial scale, and there is only one (FOM104D) whose analysis resulted in statistically significant correlations. This data table contains the yearly average number of employees by LAU.

An overview of the results highlights interesting features. First, just less than half of the LAU (about 39%) report statistically significant correlations (Figure 7). Second, there is a big difference in the distribution types: the great majority of the units (1191) have the non-normal relationship, whose strength is measured by the Kendall rank correlation coefficient, while only 40 units show a normal distribution of their variables, whose correlation strength is measured by the Pearson coefficient.

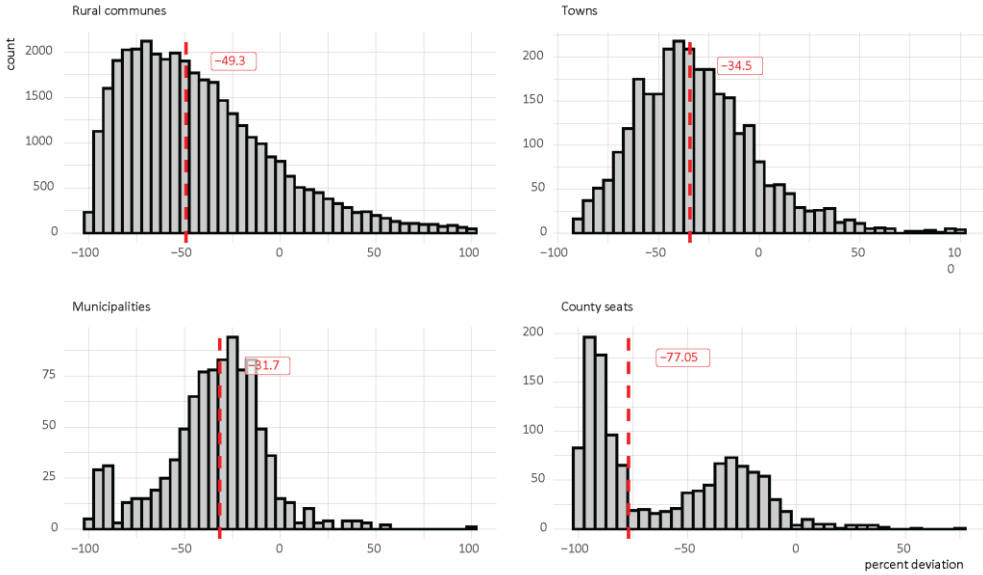

Figure 6. The percent deviation of BD data from NIS data by the types of LAU. Note: the median value is shown in red. Source: computed by the author from NIS and BD data

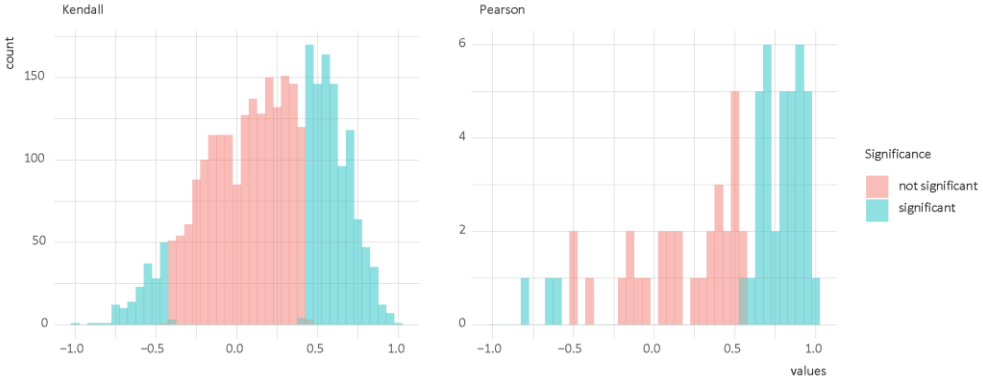

Figure 7. The correlation coefficients for BD vs. NIS data relationships by LAU: variable – the average number of employees; measurement units – thousands of employees (NIS table: FOM104D). Source: computed by the author from NIS and BD data

Third, there is a curious case of statistically significant negative correlations in both Kendall and Pearson groups, some of them being strong. In a natural situation, the statistically significant correlation should be positive given the nature of the analysed data and their primary origin (which is the same). However, provided the spatial clustering trend of the LAU with a negative correlation, there should be a locally specific factor to explain this abnormality. The largest clusters are located in Vâlcea

and, especially, Dolj counties, north and south of Craiova; the mountain area of Hunedoara county, west of Sibiu; and Ialomița county, north-east of Bucharest (Figure 8a). Sample distributions of strong negative (Moțăței, Dolj) and positive (Găneasa, Ilfov) correlations are given in Figure 8b; in both cases, the strength of the relationship is assessed using the Kendall rank correlation coefficient.

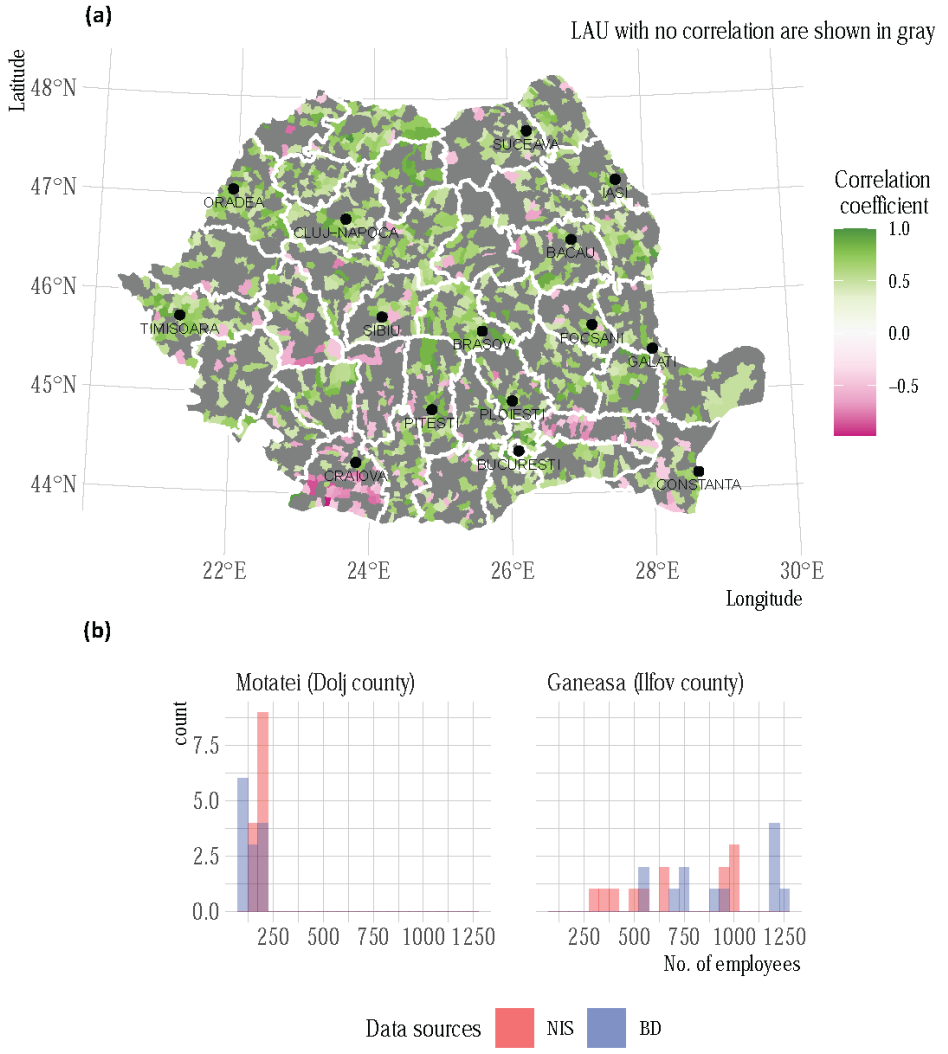

Figure 8. The correlation coefficients (a) and (b) the BD vs. NIS data relationship by LAU: variable – the average number of employees; measurement units – employees (NIS table: FOM104D). Source: computed by the author from NIS and BD data

The LAU with positive correlations do not create explicit spatial clusters, however, one might observe a bit larger concentration of these units with higher correlations in the

central and north-western parts of the county. This trend has its correspondence on the upper levels: the area is included in Macroregion 1 and the North-West Region of Development (which had the strongest correlations at the corresponding spatial scale).

Discussion

Our analysis has revealed several problems to be discussed. First, we can hardly consider either of the datasets as a reference: both of them differ from the primary source. Under these circumstances, the single criterium of reliability should serve the correlation coefficient: the higher the correlation, the more reliable the data. Indeed, it is less likely that highly correlated BD and NIS data will be significantly different from those provided by NTRO.

Second, our bulk analysis revealed significant similarities between the data and strong, even, very strong correlations, especially at the higher spatial scales and with blended codes or in totals. However, when we get into a higher resolution either of NACE codes or spatial scale, it becomes harder to find reliable codes and spatial units, in which correlations will remain at a statistically significant level. We tested this situation for all types of data (employed population, turnover and number of firms) and two opposite cases represented by the NACE codes: (1) the most massively present in Romania, such as sections C – Processing industry, G – Trade, and F – Construction, and classes 4711 – Retail sale in non-specialised stores with food, beverages or tobacco predominating; 4120 – Construction of residential and non-residential buildings; and 7022 – Business and other management consultancy activities, and (2) the most rarely present codes but with few large enterprises (hardly to be missed out by any statistical survey), such as 0721 – Mining of uranium and thorium ores; 2446 – Processing of nuclear fuel; 3040 – Manufacture of military fighting vehicles; 3211 – Striking of coins; 5310 – Postal activities under universal service obligation. To which cultural data at the LAU scale were added, as the corresponding NIS tables could be made equivalent to the appropriate NACE codes. None of the analysed cases resulted in statistically significant correlations. The results of our bulk analysis suggest that there must be such correlations at a finer spatial scale or NACE code level as well; however, testing each possible situation and its outliers exceeds the scope of this article.

Third, the proposed methodology involves simple statistical tests to make quick assumptions about the bulky data. It has its weaknesses, such as not involving comprehensive analysis or being blind to the problem of outliers. Analysing the outliers is a time-consuming procedure, which is not appropriate for such a general assessment. It also requires a deep understanding of the processes and causes that made those outstanding cases possible. In some situations, the outliers should not be excluded from the analysis, because they can be even more important than the rest of the sample. A classical economic outlier of this kind is the national capital, Bucharest,

which concentrates more than 10% of the total population and an even higher share of the workforce; its contribution to the national Gross Domestic Product has been 27.6% before the pandemics, and it concentrates, with its suburbs, about half of the foreign direct investments attracted by Romania (Sîrodoev et al. 2017). The county seats, thanks to the intense urbanisation occurred in the last decades (Petrișor et al. 2020), play a similar role on the LAU scale analysis: there were just a few cases with normal distribution at this level, while the great majority of significant correlations were computed using the Kendall rank correlation coefficient. At the same time, we saw that the distribution of the data in 42 county seats is significantly different from the rest of the 3109 LAU units. The outlier problem can serve as a possible explanation of weaker correlations in the southern half of the country, where the hypertrophy of the urban system is more prominent (Ianoș and Tălângă 1994).

That is why we would recommend that every narrow study makes statistical significance analysis to assess the reliability of its results. Even if the output's reliability is low, it will not mean that the results should not be trusted, but rather they point towards a hidden potential yet to be discovered. At the same time, a more detailed and narrow analysis requires more sophisticated methods. Some guidelines towards a thorough statistical data validation can be found in the recently published materials and realised using the cutting-edge infrastructure (Di Zio et al. 2016, Van der Loo and De Jonge 2018).

Conclusions

The article proposed a simple and relatively quick method to assess the reliability of bulk spatially-referenced secondary economic data. The method is based on a series of simple statistical tests and sample size differentiation. It was employed in testing two datasets that are the most largely used in Romanian geographical, economic, and sociological research, and economic development planning. It was tested at each administrative spatial scale existing in Romania: from NUTS 1 to LAU. The models' output has proved the usefulness of the method and it revealed that the analysed data are correlated, and they can be used for the reliability assessment. However, it also highlighted some weaknesses and quality issues in the structure and content of the datasets.

Our findings show that there are significant and very strong statistical relationships between the BD and NIS datasets at each spatial scale. The spatial pattern identified in the analysed data reveals the opposition between the northern and southern parts of the county: more spatial units with stronger relationships were identified in the north, especially within Macroregion 1. There is no single explanation of this case, however, the location of the capital city, the strongest outlier in the national economic system, in the southern part of the country has certainly contributed to this inequality.

There are also numerous cases, in which the strength of the relationship could not be assessed using this quick approach to analyse the bulky data. A more comprehensive investigation should be applied in detailed studies involving individual NACE codes or at small spatial scales. At least two problems deserve special attention: the issue of outliers and the curious case of spatially clustered strong and very strong negative correlations between the BD and NIS data. The explanation of their existence is rather relevant at the local scale of the analysis. The discussed weaknesses and shortcomings of the method and the results do not undermine the importance of our findings. They neither recommend the exclusion of any of the analysed data sources from scientific research, as they are not fully and reciprocally compatible, but point towards the importance and necessity of the accuracy assessment of narrow and detailed studies involving spatial breakdown of economic data including the codes of Statistical Classification of Economic Activities.

Acknowledgements

The current work was realised using the data acquired in the frames of the following projects: PN-III-P1-1.2-PCCDI-2017-0686, PN-II-RU-TE-2014-4-1481, CNFIS-FDI-2021-0447, CNFIS-FDI-2020-0523, with the financial assistance of the Romanian government.

References

BĂNICĂ A., CAMARĂ G. (2011) Accessibility and tourist function development of the Romanian small towns, GeoJournal of Tourism and Geosites 7 (1), 122-133.

BĂNICĂ A., ISTRATE M., MUNTELE I. (2020) Towards green resilient cities in Eastern European Union countries, Journal of Urban and Regional Analysis 12 (1), 53-72.

BURTEA C., CHICOŞ A., PELEANU I. (2012) Analysis of economic activities in Black Sea coastal area, Urbanism. Architecture. Constructions 3 (3), 3-16.

CIOBOTARU A.-M. (2018) Impact of deforestation on structural dynamics of the local economies in Suceava County, University of Bucharest, Bucharest.

CONOVER W. J. (1999) Practical nonparametric statistics, John Wiley & Sons, New York.

DI ZIO M., FURSOVA N., GELSEMA T., GIEßING S., GUARNERA U., PETRAUSKIENĖ J., QUENSEL-VON KALBEN L., SCANU M., TEN BOSCH K. O., VAN DER LOO M., WALSDORFER K. (2016) Methodology for data validation 1.0, Essnet Validat Foundation, Retrieved from: www.ec.europa.eu.

DRĂGAN M. (2013) The Reorganization of Economic Activities in the Apuseni Mountains, Revue Roumaine de Géographie 57 (1), 55-62.

DRĂGHICI C., PAPUC R. M., IORDACHE S., DOBREA C. R., PINTILII R.-D., TEODORESCU C., PEPTENATU D., DIACONU D., SIMION A. (2015) The role of European Capital of Culture status in structuring economic profile of Sibiu, Romania, Procedia Economics and Finance 26, 785-791.

DZIEKAŃSKI P. (2021) Entrepreneurship and competitiveness in the terms of endogenization of regional economy processes on the example of Eastern Poland poviats in 2007-2018, Journal of Urban and Regional Analysis 13 (2), 343-358.

EUROSTAT (2008) NACE Rev.2: Statistical classification of economic activities in the European Community, Office for Official Publications of the European Communities, Luxembourg.

ESRI (2021) What is geocoding? ArcGIS Desktop, Retrieved from: desktop.arcgis.com.

GLAESER E., KOURTIT K., NIJKAMP P. (eds.) (2021) Urban empires: Cities as global rulers in the new urban world, Routledge, New York, London.

GOLLEDGE R. G., STIMSON R. J. (1997) Spatial behavior: a geographic perspective, The Guilford Press, New York, London.

HERMAN G. V., GRAMA V., BUHAȘ S., GARAI L. D., CACIORA T., GRECU A., GRUIA A. K., HUDEA O. S., PEPTENATU D. (2021) The Analysis of the Ski Slopes and the Degree of Economic Dependence Induced by Winter Sports Tourism. The Case of Romania, Sustainability 13 (24), 13698.

IANOȘ I., TĂLÂNGĂ C. (1994) Oraşul şi sistemul urban românesc în condiţiile economiei de piaţă (The city and the Romanian urban system within the context of the market economy), The Romanian Academy, Bucharest.

IUREA D. (2011) Entrepreneurial initiatives in Iasi County and their role in social and economic development, The Annals of Valahia University of Târgovişte, Geographical Series 11, 119-127.

KENDALL M. G. (1938) A new measure of rank correlation, Biometrika 30 (1-2), 81-93.

KITCHIN R. (2014) The data revolution: Big data, open data, data infrastructures & their consequences, Sage, London.

KITCHIN R. (2021) Data lives: How data are made and shape our world, Bristol University Press, Bristol.

KOURTIT K., ELMLUND P., NIJKAMP P. (2020) The urban data deluge: challenges for smart urban planning in the third data revolution, International Journal of Urban Sciences 24 (4), 445-461.

LUPCHIAN M.-M., SAGHIN D. (2020) The cultural vitality of cities - a premise of tourism development? Georeview 30 (1), 1-9.

MOGOS S. I. (2017) High Growth Entrepreneurship: A Multi-Level Perspective on Firm Growth and Growth Policy, Carnegie Mellon University, Pittsburgh.

MOGOS S., DAVIS A., BAPTISTA R. (2021) High and sustainable growth: persistence, volatility, and survival of high growth firms, Eurasian Business Review 11, 135-161.

NATIONAL SCIENCE FOUNDATION (2019) Harnessing the data revolution, Retrieved from: www.nsf.gov.

PEARSON K. (1895) Note on Regression and Inheritance in the Case of Two Parents, Proceedings of the Royal Society of London 58, 240-242.

PEPTENATU D., DRĂGHICI C., MERCIU C. (2012) Characteristics of entrepreneurial profile in some emergent territorial structures in Romania, Actual Problems of Economics 138 (12), 448-458.

PÉTER L. (2017) Romania: Private Sport Sector at the Crossroads of Past Socialism and Present Capitalism, in: Laine A., Vehmas H. (eds.), The Private Sport Sector in Europe: A Cross-National Comparative Perspective, Springer, Cham, pp. 287-308.

PETRIȘOR A.-I., SÎRODOEV I., IANOȘ I. (2020) Trends in the national and regional transitional dynamics of land cover and use changes in Romania, Remote Sensing 12 (2), 230.

PETROVICI N. (2013) Neoliberal proletarization along the urban-rural divide in postsocialist Romania, Studia UBB Sociologia 58 (2), 23-54.

PINTILII R.-D., PEPTENATU D., DRĂGHICI C., SAGHIN I., STOIAN D.-R. (2015) Structural changes in the entrepreneurial profile of the creative industries in Romania, Procedia Economics and Finance 23, 1147-1151.

POPESCU C., GAVRIȘ A. (2012) The impact of the economic crisis in the IT&C Industry – Evidence from Bucharest, Journal of Urban and Regional Analysis 4 (1), 35-49.

POP C. A., HORGA I., BOCOI M. (2017) The evolution of foreign capital in Western Romania (1991-2017). Case study – Bihor County, Annals of the University of Oradea. International Relations and European Studies (RISE) 9, 149-168.

PUP A. (2013) Developing business ethics as an academic field in Romania, Procedia – Social and Behavioral Sciences 93, 2048-2052.

ROYSTON J. P. (1982) An Extension of Shapiro and Wilk's W Test for Normality to Large Samples, Journal of the Royal Statistical Society. Series C (Applied Statistics) 31 (2), 115-124.

SAVA D.-C., BĂDULESCU A. (2018) Dimensions and Performances of the Creative Economy in Romania, Proceedings of the 12th International Management Conference 12, 223-232.

SAVA D.-C., BĂDULESCU A. (2019) How creative are Romanian Cities?, Proceedings of the 13th International Management Conference 13, 65-76.

SAVA D.-C., MEȘTER I. (2019) The Catalysts of the Creative Economy in Romania: An Empirical Analysis, Proceedings of the 13th International Management Conference 13, 50-64.

SCHVAB A., PEPTENATU D., PINTILII R. (2014) Entrepreneurial sector dynamics in emerging territorial systems: The case study of Baia Mare City, Romania, Actual Problems of Economics 152 (2), 294-304.

SÎRODOEV I. G. (2009) Small and medium-sized enterprises in Republic of Moldova, Journal of Urban and Regional Analysis 1 (1), 67-84.

SÎRODOEV I., IANOȘ I., WHITE G., VÎRDOL D. (2017) Foreign direct investment as a factor of diminishing or/and increasing regional inequalities? ISR-Forschungsbericht 42, 269-285.

SÎRODOEV I., SCHVAB A. C., IANOȘ I.-L., ION F. (2015) Rural towns in Romania: A reality asking for specific sustainable development policies, Carpathian Journal of Earth and Environmental Sciences 10 (3), 147-156.

SPECTOR P. (2021) Using t-tests in R, Berkeley Statistics, Retrieved from: statistics.berkeley.edu.

STUDENT (1908) The probable error of a mean, Biometrika 6 (1), 1-25.

THE R FOUNDATION (2021) The R Project for Statistical Computing, Retrieved from: www.r-project.org.

VĂDĂSTREANU A., BRAD S., BOT A. (2015) The Structure and the Resources of Entrepreneurial Network - Essential Factors to Survival and Performance. The Case of Study Romania, International Journal of Managerial Studies and Research 3 (7), 31-40.

UNITED STATES GEOLOGICAL SURVEY (2021) What does "georeferenced" mean?, USGS, Retrieved from: www.usgs.gov.

VAN DER LOO M., DE JONGE E. (2018) Statistical data cleaning with applications in R, Wiley, Hoboken.

VAN DER LOO M. P. J., DE JONGE E. (2020) Data validation, in: Balakrishnan N., Colton T., Everitt B., Piegorsch W., Ruggeri F., Teugels J. L., Wiley StatsRef: Statistics Reference Online, Wiley, Hoboken, pp. 1-11.

VAN DER LOO M. P. J., DE JONGE E. (2021) Data Validation Infrastructure for R, Journal of Statistical Software 97 (10), 1-31.

ZIFCEAC A., MLESNITA R.-A. (2011) Mobile Marketing for Mobile Business (mMK-4-mBIZ), 10th International Conference on Mobile Business, 144-151.

Journal of Urban and Regional Analysis 14–1 (2022): 59–78, https://doi.org/10.37043/JURA.2022.14.1.4

BANGKOK'S URBAN SPRAWL: LAND FRAGMENTATION AND CHANGES OF PERI-URBAN VEGETABLE PRODUCTION AREAS IN THAWI WATTHANA DISTRICT

Alisara Menakanit, Vudipong Davivongs, Prapassara Naka, Nath Pichakum
Kasetsart University, Bangkok, Thailand

Abstract: Agricultural lands are heavily affected by urban sprawl. Urbanization therefore plays a significant role in changing megacities' agricultural fringes such as in Bangkok's peri-urban vegetable production areas. This study focuses on the prime vegetable production areas in Bangkok and aims to: 1) understand and determine the land use changes to these areas, 2) clarify the landscape configurations of these areas to assess landscape fragmentation, 3) discuss and recommend land use planning policies and measures to conserve the existing peri-urban agricultural landscape. We use a geographic information system (GIS) database and three thematic map layers (land use, waterways, and roads) to analyze and clarify land use proportions, changes in the vegetable production areas, and the land configurations during different periods from 1976 to 2015. The fragmentation of the vegetable production matrix increased due to the immediate effect of the expanded road network construction and due to a later consequence of the contiguous roadside urban development. The remaining vegetable production areas were mostly away from the primary road leading to the Bangkok centre city. The monitoring system on the fragmentation of agricultural lands is essential as a database to find suitable measures to control urban sprawl in various cities.

Keywords:

peri-urban agriculture;
land use changes;
urban sprawl;
vegetable production areas;
Bangkok

Email: archvpd@ku.ac.th

Initial submission: 04.07.2019; Revised submission: 28.06.2020; Final acceptance: 13.07.2020

Introduction

Urban sprawl is a global phenomenon that has widely occurred in a large number of cities around the world. This kind of urbanization has transformed the surrounding agricultural lands over the fringe of megacities. Agricultural lands are usually located around most of the cities because they are essential as the primary economic organ that brought about agriculture (Jacobs 1970). Von Thünen (1998) has identified the locations of several types of surrounded agricultural lands through their ability to transport products to the city. As a kind of market gardening products in the model, vegetables were usually cultivated close to towns. However, these agricultural lands were lately fragmented and changed by urban sprawl, which is characterized as scattered, leapfrog, unlimited, and unplanned urban expansion toward surrounding agricultural areas (Ocampo 1995, Gillham 2002, Burchell et al. 2005). Accordingly, several theories have been introduced as tools to limit and control urban sprawl with the idea to separate the urban from rural areas, i.e., greenbelt, smart growth, and zoning (Gillham 2002).

Bangkok, one of the fast-growing megacities in Southeast Asia, has been expanding beyond control (Kaothien 1995, McGee 1995, Robinson 1995, Vagneron 2007, McKinsey Global Institute 2018). Encroachment due to urban sprawl into prime agricultural land located around cities is a global phenomenon that also occurred in Bangkok (Mekvichai et al. 1990, Hara et al. 2005, Murakami et al. 2005, Hara et al. 2008, Hirsch 2009). Since the 1980s, the rapid economic growth and population increase in Bangkok has influenced urbanization, which has spread into the high-quality surrounding peri-urban agricultural land (Jones 1997, Yokohari et al. 2000). Peri-urban agricultural land conditions have deteriorated, and the available area has been reduced, and these factors have affected both the quality and quantity of production usually consumed by urban people (Hung and Yasuoka 2000, Sajor and Ongsakul 2007).

Vegetable production is an important integral part of Bangkok's peri-urban agriculture, which includes the other three significant crops: rice, fruits, and ornamental plants (Bangkok Agriculture Office 2018). Thawi Watthana district, located in west Bangkok (Figure 1), has been the largest vegetable production area in Bangkok (Bangkok Agriculture Office 2018). It comprises two sub-districts: Sala Thammasop and Thawi Watthana (Figure 2). People who reside in this area are a combination of the local farmers and new urban residents. The local farmers mostly live and work on the vegetable production areas while the new urban residents primarily live in the housing estates in the form of gated communities and work in the center city of Bangkok. Currently, there are 55,554 registered residents in the Sala Thammasop sub-district and 23,098 in Thawi Watthana sub-district (Thawiwatthana District Office 2020). The agricultural census in 2017 revealed that more than half of the vegetable production areas in Bangkok were in the whole Thawi Watthana district

(Bangkok Agriculture Office 2018). Therefore, the district's vegetable production areas play an essential role in providing large amounts of fresh vegetables to Bangkok urban consumers. The proximity to the city offers the advantages of short and rapid delivery, resulting in fresh and "low-miles" food products (Giradet 2005, Paxton 2005, Lovell 2010, Tsuchiya et al. 2015). However, these vegetable production areas are also vulnerable due to the influences of urbanization (Mekvichai et al. 1990).

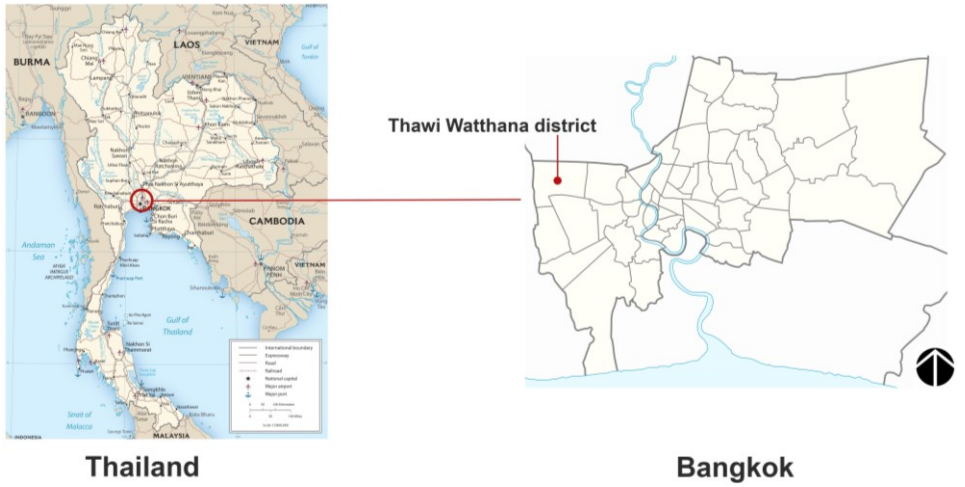

Figure 1. Location of Thawi Watthana District, Bangkok, Thailand. Source: adapted from Wikimedia Commons

Figure 2. Aerial Photograph of Thawi Watthana district. Source: The Royal Thai Survey Department

The decline in peri-urban agriculture has persisted even though there have been land use plans to conserve the agricultural lands in Bangkok. For example, the 2nd

Bangkok's Development Plan (1982-1986) designated agriculture land use, and the Bangkok's Comprehensive Plan (1992–2013) also designated rural and agricultural land use for this district (Bangkok Metropolitan Administration 2014).

Several researchers studied Bangkok's peri-urban agricultural land changes, indicating the ineffectiveness and lack of implementation of land use control (Ross and Poungsomlee 1995, Bello et al. 1998, Yokohari et al. 2000, Askew 2002). Therefore, it is crucial that other factors influencing land use change mechanisms to be investigated. Most of the research focused on rice paddy fields and orchard areas since both of these land uses are a major part of Bangkok's peri-urban agriculture and have particular transformation mechanisms (Hara et al. 2008, Suwanarit 2010, Davivongs et al. 2012, Thongdara et al. 2013). The impact from different factors—such as road, land price, irrigation—are intertwined and vary with specific crops and cultivation methods. Vegetable production areas have been considered as a minor part; therefore, there has been little study on them.

Many previous studies indicated the influence of road construction as a significant cause of the reduction of Bangkok's agricultural area in general (Suttipong 1993, Jongkroy 2009, Suwanarit 2010, Choochuysuwan and Chirapiwat 2013, Jongkroy and Thongbai 2014). However, there has been no thorough study on vegetable production areas in Thawi Watthana district to understand land use changes and landscape fragmentation as influenced by road construction. Located in the low-lying area of the Chaophraya River delta where a continuous ditches-and-dike irrigation system is, these vegetable production areas have shaped a unique landscape. How the road construction caused fragmentation to the vast continuous vegetable production areas affected and the declining process of the vegetable production areas should be investigated.

The working hypothesis of this research was that vegetable production areas in Thawi Watthana district are fragmented by road construction influences, and this has resulted in a decrease in vegetable production areas. Therefore, this research aimed to: 1) understand and determine land use changes to these areas; 2) clarify the landscape configurations of these areas to assess landscape fragmentation; and 3) discuss and recommend land use planning policies and measures to conserve the existing peri-urban agricultural landscape.

Methodology

Vegetable production areas were studied using aerial photographs and satellite images from 1976 to 2015. Previous studies showed that road construction was the main reason for the reduction in agricultural areas (Suttipong 1993, Jongkroy 2009, Suwanarit 2010, Choochuysuwan and Chirapiwat 2013, Jongkroy and Thongbai 2014). Consequently, the starting year (1976) was chosen as this was when the first road construction

commenced in this district. The time interval between aerial photographs or satellite images was approximately ten years with some variation due to the availability of images. Aerial photography from 1976, 1995, and 2002 from the Royal Thai Survey Department, and satellite imagery from 2015 from the Google Earth Pro software (Version 7.1; Google Llc.; Mountain View, CA, USA) were used. A site survey confirmed on-ground position with identified characteristics on the photographs and images such as land use, waterways, and roads. A handheld GPS was used to verify the survey locations.

The aerial photographs and satellite images were digitized and stored in a geographic information system (GIS) database. The data consisted of three thematic map layers: land use, waterways, and roads. Land use comprised: a) the vegetable production area (Figure 3); b) the built-up area; and c) others, which included other types of agricultural lands such as paddy fields and fruit orchards.

(a) *(b)*

Figure 3. Clarification of vegetable production areas on (a) satellite images (Google Earth Pro) and (b) on-site, to create the GIS land use thematic map

This GIS database helped to clarify land use proportions, changes in vegetable production areas and land configurations during different periods from 1976 to 2015. The steps followed procedures available in the Spatial Analyst toolbox of the ArcGIS software (Version 10.3; ESRI Inc.; Redlands, CA, USA):

1) *Land use proportion analysis* determined the amounts (in hectares) of land in vegetable production areas, urbanized areas, and roads. Then, the percentage area of these three types of land use was calculated by comparing them.
2) *Vegetable production area analysis* focused on the land conversion rate. The rates of vegetable production land conversion (hectares per year) were determined and compared with the urbanized area and road area.

3) *Landscape configuration analysis* addressed landscape fragmentation in terms of patch number (PN), patch density (PD), and mean patch size (Area_MN) (Leitão et al. 2006).

PN is an index to count the total number of land patches in the study area. These vegetable production land patches are separated by other types of land use. A high PN value indicates land fragmentation, while a low PN value indicates low fragmentation.

PD is the number of land patches in 1 ha. A high PD indicates high land fragmentation. In contrast, a low PD shows low fragmentation. PD was calculated using Equation 1:

$$PD = \frac{PN}{A} * 100, \quad (1)$$

Where A is the area in hectares, and PN is the patch number.

Area_MN is the average size of all vegetable production land patches. A high Area_MN indicates low fragmentation. In contrast, a low Area_MN shows high fragmentation (Qiu et al. 2015). The calculation of Area_MN can be using Equation 2:

$$Area\_MN = Total\ Area/PN, \quad (2)$$

Where Area_MN is the total study area in ha, and PN is the patch number.

Results

Spatial analysis of vegetable production areas in Thawi Watthana (1976 to 2015)

In 1976 (Figure 4), the vegetable production area was 1,342.97 ha (5.8%), followed by built-up area 62.30 ha (1.2%), roads 11.13 ha (0.2%), water 106.15 ha (2%), and others 3,679.64 ha (70.7%). Vegetable production areas were mostly in the northeast of the district, in the Sala Thammasop sub-district, along the Mai, Pho, Bang Tan, and Kwai canals. Small adjacent plots in combination made large, irregular-shaped plots. Other large plots were scattered along both sides of the Thawi Watthana canal, especially to the south, along Bang Phrom and Bang Noi canals, and on the eastern side of Phutthamonthon Sai 2 road. Roads that appeared in 1976 were Sala Thammasop in the north, Phutthamonthon Sai 2 road in the east, and Thawi Watthana road in the west.

In 1995 (Figure 5), vegetable production areas totalled 1,534.75 ha (29.5%), followed by roads 267.93 ha (5.2%), built-up areas 248.53 ha (4.8%), water 161.25 ha (3.1%), and others 2,989.72 ha (57.5%). During 1976-1995 vegetable production areas increased by 191.79 ha at 10.09 ha/year notably in the south along Bang Phrom canal, Bang Noi canal,

and Thawi Watthana-Kanchanaphisek road down to Bang Choek Nang canal on the southern border and also on the southwestern side of Thawi Watthana road (Figure 6).

Figure 4. Distribution of vegetable production areas, built-up areas, water, roads, and others in 1976

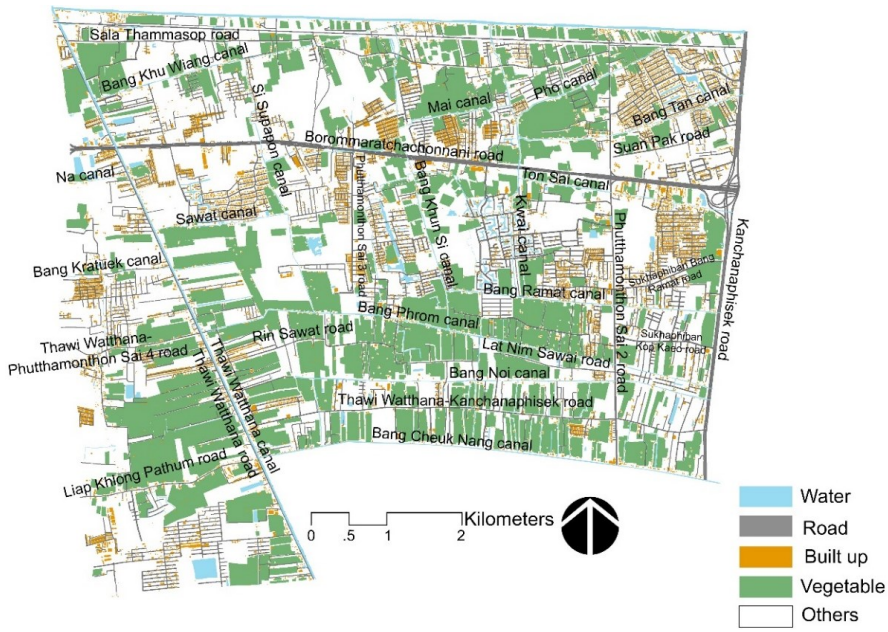

Figure 5. Vegetable production areas, built-up areas, water, roads, and others in 1995

Figure 6. Location of gained vegetable production area during 1976-1995, in Sala Thammasop and Thawi Watthana sub-districts

It was also surprising that vegetable production areas increased along Thawi Watthana-Kanchanapisek road, which was improved from a walking lane into an asphalt road in 1982. This fact contrasts with previous research, which found that road construction was the primary cause of decreasing agricultural areas.

Several places recorded a decrease in the vegetable production area, particularly between Kanchanaphisek road (north-south direction) and Phutthamonthon Sai 2 road. Kanchanaphisek road expanded from 1978-2000, while there was no data on the start of Phutthamonthon Sai 2 road, except that its expansion into a 6-lane road finished in 1982.

In 2002 (Figure 7), land use comprised of vegetable production areas 1,106.87 ha (21.3%), built-up areas 495.94 ha (9.5%), roads 393.98 ha (7.6%), water 177.52 ha (3.4%), and others 3,027.86 ha (58.2%). Vegetable production areas decreased by 427.88 ha. In the same period, a short section of Utthayan road construction and the expansion of Kanchanapisek road in the east were completed in 1999, respectively in 2000. However, the loss of vegetable production areas appears quite scattered. Extensive disappearance was between Sala Thammasop and Borommratchachonnani roads in the north and those to the west of Thawi Watthana road. Utthayan and Kanchanaphisek road had only a minor impact on the decrease in vegetable production areas in this period, probably because Kanchanaphisek road was in use earlier.

Figure 7. Vegetable production areas, built-up areas, water, roads, and others in 2002

In 2015 (Figure 8), land use comprised vegetable production areas 630.37 ha (12.1%), built-up areas 655.64 ha (12.6%), roads 562.37 ha (10.8%), water 230.19 ha (4.4%), and others 3,123.62 ha (60%).

Figure 8. Vegetable production areas, built-up areas, water, roads, and others in 2015

The vegetable production area decreased by 476.50 ha. The most distinct losses were along both sides of Thawi Watthana road.

Sub-district level

The number of vegetable production areas in both sub-districts was in a decreasing trend (Table 1). However, during 1976-1995, the vegetable production area in Thawi Watthana sub-district doubled from 383.76 ha to 758.12 ha. This result was different from the Sala Thamasop sub-district, where the vegetable production area always decreased (Figure 9).

Table 1. Vegetable production area at sub-district level

Year	Sala Thamasop sub-district (ha)	Change rate (%)	Thawi Watthana sub-district (ha)	Change rate (%)	Total (ha)
1976	959.15		383.76		1,342.91
1995	758.12	-20.96	776.27	+102.28	1,534.39
2002	491.70	-35.14	614.90	-20.79	1,106.60
2015	250.82	-48.99	379.43	-38.29	630.24

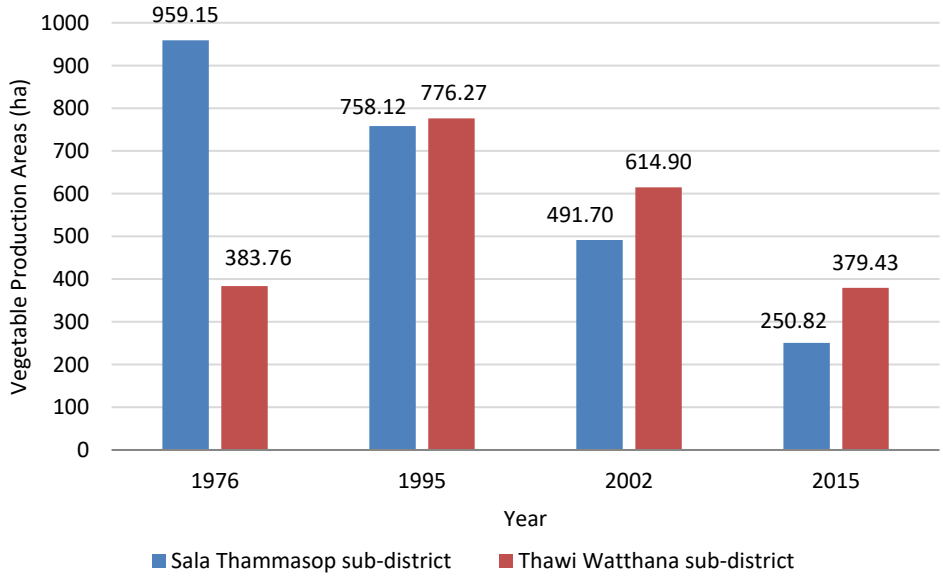

Figure 9. Amount of vegetable production area in Sala Thamasop and Thawi Watthana sub-districts

Thawi Watthana district vegetable production area analysis (1976 to 2015)

Vegetable production areas in Thawi Watthana district decreased in general (). However, the change differed in each period. From 1976 to 1995, the area increased with 10.09 ha/year, and after that, it kept decreasing. The highest rate of decrease was during 1995-2002 (61.13 ha/year), while during 2002-2015 it recorded 36.65 ha/year (Figure 11).

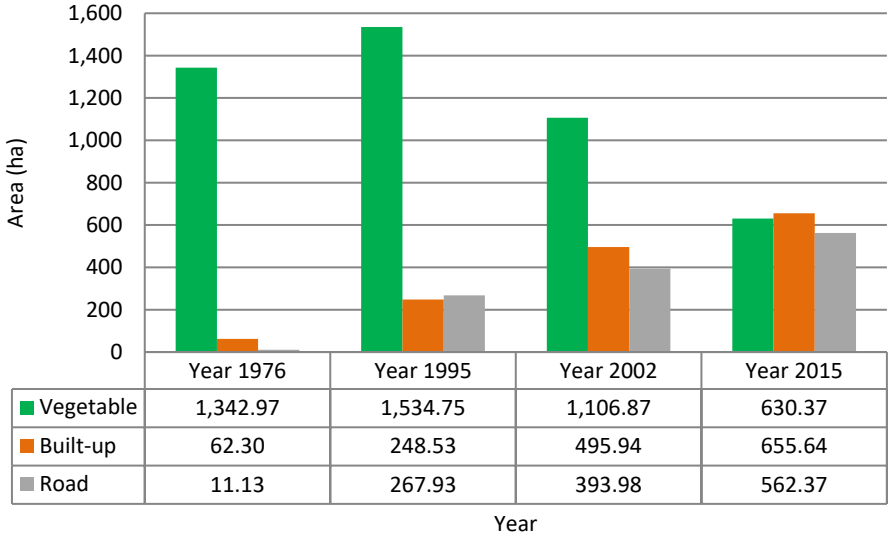

Figure 10. Area comparison of vegetable production, built-up, and road (1976-2015)

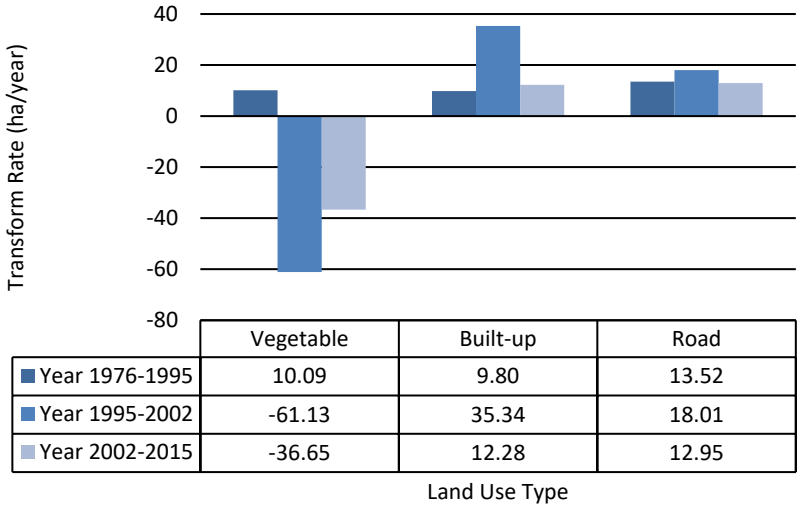

Figure 11. Transformation rates of vegetable production area, built-up area, and road area

The lost areas were to the north in the Sala Thammasop sub-district. In 2015, the vegetable production areas only existed in the southern part of the Thawi Watthana sub-district. In contrast, built-up areas and road areas continuously increased at different rates, which corresponded to the decrease in vegetable areas.

Landscape configuration analysis on vegetable production areas in Thawi Watthana district from 1976 to 2015

Vegetable production areas in Thawi Wattthana district were analyzed to clarify land fragmentation from 1976 to 2015, using landscape configuration indices: patch number (PN), patch density (PD), and mean patch size (Area_MN). The results (Figure 12) revealed that the PN of vegetable production areas had been continuously increasing from 1976 until 2002 and started declining from 2002 until 2015 (PN 1976 = 193, PN 1995 = 545, PN 2002 = 652, and PN 2015 = 351).

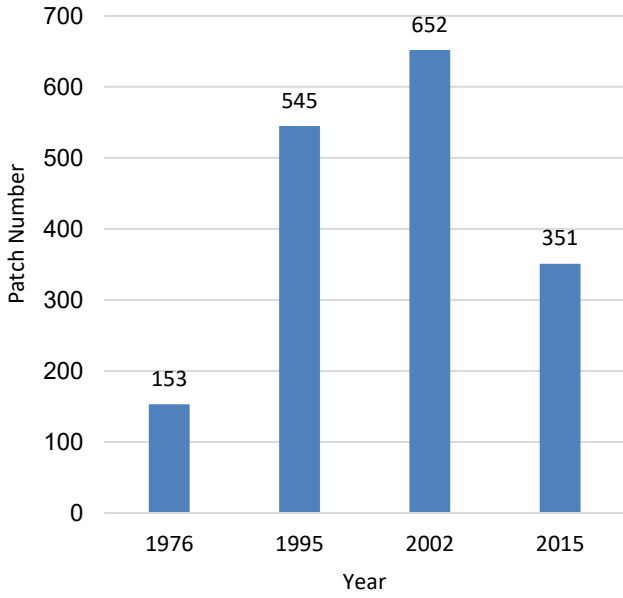

Figure 12. Patch number in 1976, 1995, 2002, and 2015

The patch density analysis results showed a similar pattern to that of the patch number (Figure 13). From 1976 until 2002, the PD had been continuously increasing; it decreased from 2002 to 2015 (PD 1976 = 11.39 patches/100 ha, PD 1995 = 35.51 patches/100 ha, PD 2002 = 58.90 patches/100 ha, and PD 2015 = 55.68 patches/100 ha).

The mean patch size analysis results revealed that the highest Area_MN of 8.78 ha was in 1976. Later, the Area_MN in 1995, 2002, and 2015 was 2.82 ha, 1.70 ha, and 1.80 ha, respectively (Figure 14).

The landscape configuration analysis of vegetable production areas revealed continuously increasing land fragmentation from 1976 until 2002. In the early years, vegetable production patches were large, but they were subsequently divided and became smaller in later years. However, vegetable production areas' fragmentation was lower in 2015, compared with 2002.

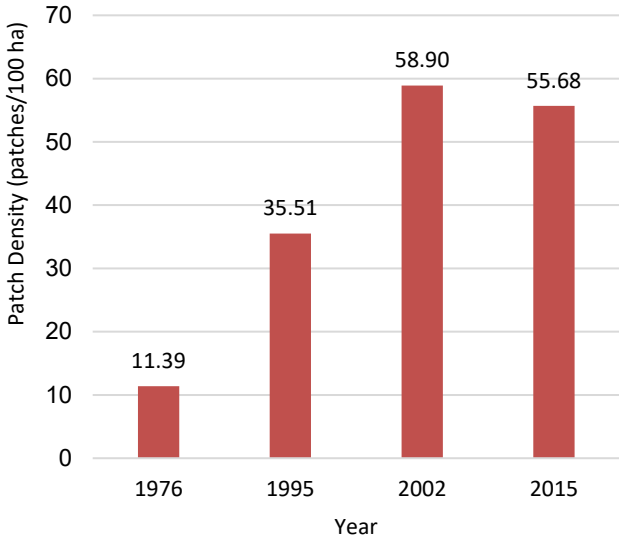

Figure 13. Patch density in 1976, 1995, 2002, and 2015

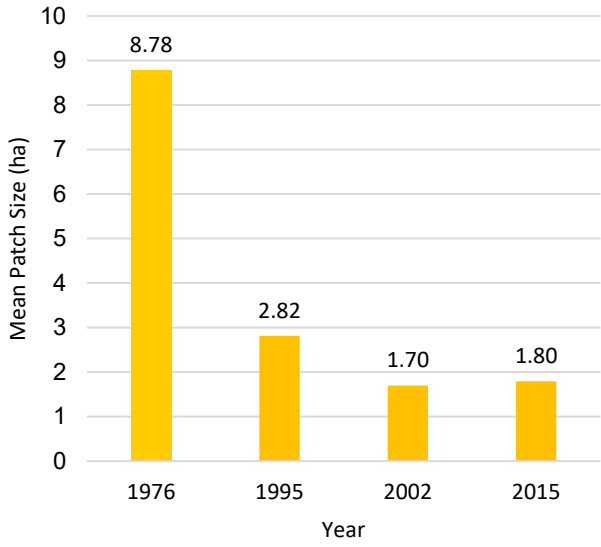

Figure 14. Mean patch size in 1976, 1995, 2002, and 2015

Future trend of vegetable production areas in Thawi Watthana district

The average decreasing rate of the vegetable production area was 20.38 ha/year. Extrapolation using this rate to predict vegetable production areas in the future suggests that all areas will disappear by 2055 (Figure 15).

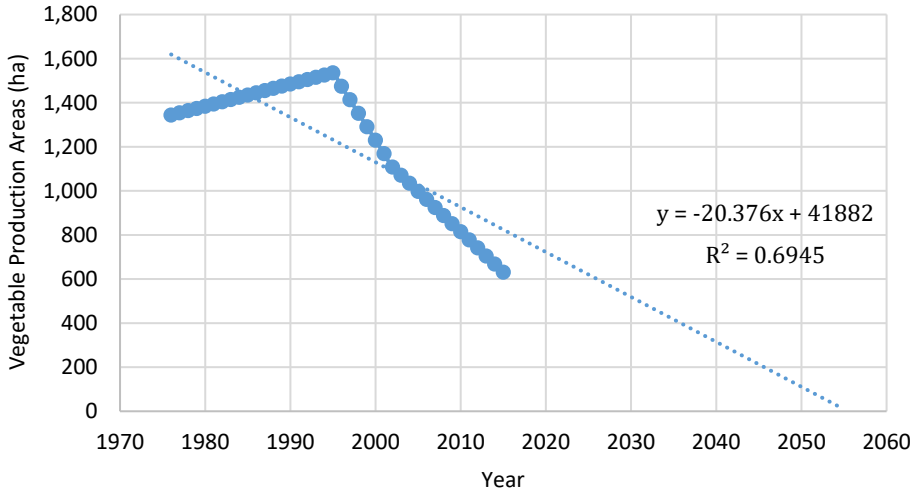

Figure 15. The projected decreasing trend of Thawi Watthana vegetable production areas

Discussion

The results of the spatial analysis in Thawi Watthana district revealed the decreasing trend of vegetable production areas in general in Sala Thammasop and Thawi Watthana sub-districts due to the fact that both are located near the city and on the spot along the urban expansion corridor. These prime vegetable production areas are located in the western fringe area of Bangkok Metropolitan Region, where rapid urban sprawl has taken place on the surrounding agricultural lands (Rimmer 1995, Ooi 2005). Bangkok is Thailand's primary city, and the Bangkok Metropolitan Region is one of the fast-growing mega-urban regions in Southeast Asia (Falkus 1993, Short and Pinet-Peralta 2009, Grossman et al. 2015). These agricultural lands losses have not only occurred on the western fringe where fruit orchards and vegetable production areas are, but they also happened on the northern and eastern boundary, where rice paddy fields are, and on the southern edge, where fish ponds are (Chomchan et al. 1990). However, transportation routes have a significant influence on the agricultural land loss on the overall fringe area of Bangkok.

Transportation routes, especially roads, have exerted a considerable influence on urban development in the Bangkok Metropolitan Region (Bangkok Metropolitan

Administration 1996). There has been rapid urban development (housing estates, commercials, factories, and warehouses) along the major transportation routes leading to the Bangkok city center (Ooi 2005). The remaining agricultural lands along the road have deteriorated due to the spillover from urban sprawl (Mekvichai et al. 1990, Davivongs et al. 2012).

The findings from the spatial analysis are conformable to the working hypothesis that vegetable production areas in Thawi Watthana district decreased earlier in the areas closer to roads. At sub-district level, Sala Thammasop sub-district, where Borommaratchachonnani road, a primary route, cuts through in east-west direction, leading to the center city, continued losing its vegetable production areas and with the road construction, the rate accelerated. The decrease in vegetable production areas in the Thawi Watthana sub-district started in a later period (1995-2015), due to its greater distance from the Borommaratchachonnani road.

The construction of primary roads and later secondary roads affected the landscape structure of the former agricultural matrix. Vast continuous vegetable production areas have been fragmented over time and started with the construction of these road networks. The 50 m-wide road of Borommaratchachonnani is a major transport corridor and an infrastructure for urban development. On the contrary, it is also a significant disturbance corridor that disaggregated the vegetable production matrix as a result of the corridor width effect (Forman and Godron 1991). The results from the landscape configuration analysis (determined by the increase in patch number and patch density and the decrease in mean patch size) revealed a continuously increasing trend of land fragmentation from 1976 until 2002. The road network which cut through the vast vegetable production areas of Thawi Watthana district could have initiated the urban development process. Regarding land economic value, road accessibility with lower land prices attracted real estate developers to purchase these roadside vegetable gardens to develop their housing estate projects (Rondhi et al. 2018). This urban development along the road network involved disturbance patches in the former matrix of vegetable production areas.

These effects of urban sprawl that made agricultural land changes coincide with other cities. In Puerto Rico, during 1977-1994, urbanization increased with 42%, and almost all took over the existing agricultural land (Del Mar López et al. 2001). Urbanization caused a significantly decreased food supply to the people (Forman 2014). In the mega-urban regions of Jabotabek and Bandung of Indonesia, 15,900 ha of prime agrarian land of rice paddy fields has transformed into housing and industrial use during 1980-1989 and continued (Dharmapatni and Firman 1995). Agricultural lands on the western coastal plain of Taiwan, where five major cities (Taipei, Hsinchu, Taichung, Chiayi, Tainan, and Kaohsiung) are located, were found to include almost 20% of agricultural land converted to urban land during 1971-2006 and most of the new farmland became

smaller patches (Lee et al. 2015). This urban sprawl that occurred in various cities caused not only agricultural land loss but also land fragmentation (Carsjens and Van der Knaap 2002).

Conclusions

The decline of vegetable production areas in Thawi Watthana district is severe and it could lead to its complete loss by 2055. On the analysis of vegetable production area changes, data from aerial photographs and satellite images during 1976-2015 indicated that vegetable production areas in the district have been in a decreasing trend, especially since 1995. They fell at an average rate of 20.38 ha/year. The landscape configuration analysis on vegetable production areas, precisely land fragmentation, indicated the occurrence of the urban encroachment process on the vegetable production areas. The study of land fragmentation characterized by the patch number, the patch density, and the mean patch size revealed a continuously increasing land fragmentation from 1976 until 2002.

Even though this district was designated as an agricultural area since the second Bangkok Plan (1982-1986) and through the four other Comprehensive Plans in 1992, 1999, 2006, and 2013, this was unable to prevent the reduction of its vegetable production areas. This study suggests that relying only on the plan is not sufficient to protect the loss of peri-urban agricultural areas. Although a GIS database is one useful tool to monitor and analyze physical changes, other factors and measures are also important. The monitoring system on the fragmentation of agricultural lands is essential as a database to find suitable measures to control urban sprawl in various cities. Further studies should be conducted to understand other factors behind these changes, which will lead to effective preservation measures of vegetable production areas. Above all, since urban agriculture is a complicated issue, the public realization of its importance is one of the critical factors that support the preservation of existing agricultural lands in urban and peri-urban areas. Knowledge distribution is one measure that can be done immediately.

Acknowledgments

The authors would like to acknowledge the research fund from the Thai Government via Kasetsart University Research and Development Institute (KURDI).

References

ASKEW M. (2002) Bangkok: Place, Practice and Representation, Routledge, London.

BANGKOK AGRICULTURE OFFICE (2018) Bangkok's Agricultural Census 2017, Retrieved from: bangkok.doae.go.th.

BANGKOK METROPOLITAN ADMINISTRATION (1996) The Bangkok Plan: A Vision for the Bangkok Metropolitan Administration Area 1995-2005, Retrieved from: 3d-cpd.bangkok.go.th.

BANGKOK METROPOLITAN ADMINISTRATION (2014) Bangkok Comprehensive Plans, Retrieved from: 3d-cpd.bangkok.go.th.

BELLO W., CUNNINGHAM S., POH L. K. (1998) A Siamese Tragedy: Development and Disintegration in Modern Thailand, Zed Books, London and New York.

BURCHELL R. W., DOWNS A., MCCANN B., MUKHERJI S. (2005) Sprawl Costs: Economic Impacts of Unchecked Development, Island Press, Washington, D.C.

CARSJENS G. J., VAN DER KNAAP W. (2002) Strategic land-use allocation: dealing with spatial relationships and fragmentation of agriculture, Landscape and Urban Planning 58 (2-4), 171-179.

CHOMCHAN S., SILAPACHARANAN S., PEERAPUN W. (1990) Land Use Development in Bangkok and Major Cities: Directions and Problems, Thailand Development Research Institute, Retrieved from: www.tdri.or.th.

CHOOCHUYSUWAN J., CHIRAPIWAT T. (2013) The impacts of land transportation routes on residential and commercial land-use characteristics in agricultural water-based communities at Klong Om Nont, Nonthaburi Province, City and Environment 3 (2), 13-28.

DAVIVONGS V., YOKOHARI M., HARA Y. (2012) Neglected Canals: Deterioration of Indigenous Irrigation System by Urbanization in the West Peri-Urban Area of Bangkok Metropolitan Region, Water 4 (1), 12-27.

DEL MAR LÓPEZ T., MITCHELL AIDE T., THOMLINSON J. R. (2001) Urban Expansion and the Loss of Prime Agricultural Lands in Puerto Rico, Ambio 30 (1), 49-54.

DHARMAPATNI I. A. I., FIRMAN T. (1995) Problems and Challenges of Mega-Urban Regions in Indonesia: The case of Jabotabek and the Bandung Metropolitan Area, in: McGee T. G., Robinson I. M. (eds.), The Mega-Urban Regions of Southeast Asia, UBC Press, Vancouver, pp. 296-314.

FALKUS M. (1993) Bangkok: From Primate City to Primate Megalopolis, in: Barker T., Sutcliffe A. (eds.), Megalopolis: The Giant City in History, Palgrave Macmillan, London, pp. 143-165.

FORMAN R. T. T., GODRON M. (1991) Landscape Ecology, Wiley, New York.

FORMAN R. T. T. (2014) Urban Ecology: Science of Cities, Cambridge University Press, Cambridge.

GILLHAM O. (2002) The Limitless City: A Primer on the Urban Sprawl Debate, Island Press, Washington D.C.

GIRADET H. (2005) Urban agriculture and sustainable urban development, in: Viljoen A., Bohn K., Howe J. (eds.), Continuous Productive Urban Landscapes:

Designing Urban Agriculture for Sustainable Cities, Architectural Press, London, pp. 32-39.

GROSSMAN N., TREERUTKUARKUL A., ALGIE J. (2015) Thailand's Sustainable Development Sourcebook: Issues & Information, Ideas & Inspiration, Didier Millet, Bangkok.

HARA Y., TAKEUCHI K., OKUBO S. (2005) Urbanization linked with past agricultural landuse patterns in the urban fringe of a deltaic Asian mega-city: a case study in Bangkok, Landscape and Urban Planning 73 (1), 16-28.

HARA Y., THAITAKOO D., TAKEUCHI K. (2008) Landform transformation on the urban fringe of Bangkok: The need to review land-use planning processes with consideration of the flow of fill materials to developing areas, Landscape and Urban Planning 84 (1), 74-91.

HIRSCH P. (2009) Revisiting frontiers as transitional spaces in Thailand, The Geographical Journal 175 (2), 124-132.

HUNG T., YASUOKA Y. (2000) Remote Sensing and GIS to Study the Sub-urbanization Dynamics: A Case Study in Northern Bangkok, Thailand, Proceedings of the International Conference Chao Phraya Delta: Historical Development, Dynamics and Challenges of Thailand's Rice Bowl 1, pp. 111-123.

JACOBS J. (1970) The Economy of Cities, Vintage, New York.

JONES G. W. (1997) The thoroughgoing urbanization of East and Southeast Asia, Asia Pacific Viewpoint 38 (3), 237-249.

JONGKROY P. (2009) Urbanization and Changing Settlement Patterns in Peri-urban Bangkok, Kasetsart Journal of Social Sciences 30 (3), 303-312.

JONGKROY P., THONGBAI C. (2014) Patterns of the Spatial Distribution of Urbanized Areas in Thailand, Kasetsart Journal of Social Sciences 35 (1), 30-44.

KAOTHIEN U. (1995) The Bangkok Metropolitan Region: Policies and Issues in the Seventh Plan, in: McGee T. G., Robinson I. M. (eds.), The Mega-Urban Regions of Southeast Asia, UBC Press, Vancouver, pp. 328-340.

LEE Y.-C., AHERN J., YEH C.-T. (2015) Ecosystem Services in Peri-urban Landscape: The Effects of Agricultural Landscape Change on Ecosystem Services in Taiwan's Western Coastal Plain, Landscape and Urban Planning 139, 137-148.

LEITÃO A. B., MILLER J., AHERN J., MCGARIGAL K. (2006) Measuring Landscapes: A Planner's Handbook, Island Press, Washington D.C.

LOVELL S. T. (2010) Multifunctional Urban Agriculture for Sustainable Land Use Planning in the United States, Sustainability 2 (8), 2499-2522.

MCGEE T. G. (1995) Metrofitting the Emerging Mega-Urban regions of ASEAN: An Overview, in: McGee T. G., Robinson I. M. (eds.), The Mega-Urban Regions of Southeast Asia, UBC Press, Vancouver, pp. 3-26.

MCKINSEY GLOBAL INSTITUTE (2018) Smart Cities in Southeast Asia, McKinsey & Company, Retrieved from: https://www.mckinsey.com/~/media/mckinsey/

business%20functions/operations/our%20insights/smart%20cities%20in%20southeast%20asia/mgi-smart-cities-in-southeast-asia.pdf

MEKVICHAI B., FOSTER D., CHOMCHAN S., KRITIPORN P. (1990) Urbanization and Environment: Managing the Conflict, Thailand Development Research Institute, Retrieved from: www.tdri.or.th.

MURAKAMI A., MEDRIAL ZAIN A., TAKEUCHI K., TSUNEKAWA A., YOKOTA S. (2005) Trends in Urbanization and Patterns of Land Use in the Asian Mega Cities Jakarta, Bangkok, and Metro Manila, Landscape and Urban Planning 70 (3-4), 251-259.

OCAMPO R. B. (1995) The Metro Manila Mega-Region, in: McGee T. G., Robinson I. M. (eds.), The Mega Urban Regions of Southeast Asia, UBC Press, Vancouver, pp. 282-295.

OOI G. L. (2005) Housing in Southeast Asian Capital Cities, Institute of Southeast Asian Studies, Singapore.

PAXTON A. (2005) Food Miles, in: Viljoen A., Bohn K., Howe J. (eds.), Continuous Productive UrbanLandscapes: Designing Urban Agriculture for Sustainable Cities, Architectural Press, London, pp. 40-47.

QIU F., LALIBERTÉ L., SWALLOW B., JEFFREY S. (2015) Impacts of Fragmentation and Neighbor Influences on Farmland Conversion: A Case Study of the Edmonton-Calgary Corridor, Canada, Land Use Policy 48, 482-494.

RIMMER P. J. (1995) Moving Goods, People, and Information: Putting the ASEAN Mega-Urban Regions in Context, in: McGee T. G., Robinson I. M. (eds.), The Mega-Urban Regions of Southeast Asia, UBC Press, Vancouver, pp. 150-175.

ROBINSON I. M. (1995) Emerging Spatial Patterns in ASEAN Mega-Urban Regions: Alternative Strategies, in: McGee T. G., Robinson I. M. (eds.), The Mega-Urban Regions of Southeast Asia, UBC Press, Vancouver, pp. 78-108.

RONDHI M., PRATIWI P. A., HANDINI V. T., SUNARTOMO A. F., BUDIMAN S. A. (2018) Agricultural Land Conversion, Land Economic Value, and Sustainable Agriculture: A Case Study in East Java, Indonesia, Land 7 (4), 148.

ROSS H., POUNGSOMLEE A. (1995) Environmental and Social Impact of Urbanization in Bangkok, in: Rigg J. (ed.), Counting the Costs: Economic Growth and Environmental Change in Thailand, Institute of Southeast Asian Studies, Singapore, pp. 131-151.

SAJOR E. E., ONGSAKUL R. (2007) Mixed Land Use and Equity in Water Governance in Peri-Urban Bangkok, International Journal of Urban and Regional Research 31 (4), 782-801.

SHORT J. R., PINET-PERALTA L. M. (2009) Urban Primacy: Reopening the Debate, Geography Compass 3 (3), 1245-1266.

THAWIWATTHANA DISTRICT OFFICE (2020) Demographic Information 2020, Retrieved from: webportal.bangkok.go.th/thawiwatthana.

THONGDARA R., TANACHAIKHAN P., KULPRADIT K., TIBKAEW A. P. (2013) The Urban Expansion to Durian Orchard in Nonthaburi, Proceedings of the Asian Conference on Remote Sensing SC04, 243-251.

TSUCHIYA K., HARA Y., THAITAKOO D. (2015) Linking Food and Land Systems for Sustainable Peri-Urban Agriculture in Bangkok Metropolitan Region, Landscape and Urban Planning 143, 192-204.

SUTTIPONG P. (1993) A Study to Identify Suitable Patterns for Development and Conservation of Suburban Agricultural Area: A Case Study of Western Bangkok Greenbelt, Chulalongkorn University, Bangkok.

SUWANARIT A. (2010) The Urban Evolution in Tung Rangsit and Bangkok's Green Suburb Dynamic, Academic Journal of Architecture 59, 119-130.

VAGNERON I. (2007) Economic Appraisal of Profitability and Sustainability of Peri-Urban Agriculture in Bangkok, Ecological Economics 61 (2-3), 516-529.

VON THÜNEN J. H. (1998) The Isolated State, in: Simon J. L. (ed.), The Economics of Population: Classic Writings, Routledge, New York, pp. 211-216.

YOKOHARI M., TAKEUCHI K., WATANABE T., YOKOTA S. (2000) Beyond Greenbelts and Zoning: A New Planning Concept for the Environment of Asian Mega-Cities, Landscape and Urban Planning 47 (3-4), 159-171.

Journal of Urban and Regional Analysis 14–1 (2022): 79–100, https://doi.org/10.37043/JURA.2022.14.1.5

SMALL-TOWN DEPOPULATION IN THE WIELKOPOLSKIE VOIVODESHIP, POLAND

Karolina Józefowicz
Poznań University of Life Sciences, Poznań, Poland

Abstract: Driven by labour resources, entrepreneurship and labour market aspects, demographic conditions form an important factor of socio-economic development. The evolving potential of the population results in changes affecting not only the demographic structure itself but also the whole economic system of a territory. The demographic processes in small towns differ in regard to both the demographic condition components and dynamic processes (changes over time), just like in the case of other territorial units. This paper shows the demographic changes taking place in the small towns of Wielkopolskie voivodeship, Poland (2003-2005 and 2016-2018), with a focus on analysing the actual population growth using the Webb method. This leads to identifying eight types of small towns, differing in their pattern of relationships between the natural increase and the net migration rate. The analysis finds that most small towns in the Wielkopolskie voivodeship are affected by depopulation, and a negative net migration rate had an impact on this process. Due to the emigration of the working-age people, the permanent depopulation processes distorted the population pyramids of small towns. The predominance of small, depopulating cities in Wielkopolskie is a characteristic phenomenon and similar processes occur in other Polish voivodeships.

Keywords:

small towns;

depopulation;

Webb typology;

Wielkopolskie voivodeship

Email: karolina.jozefowicz@up.poznan.pl

Initial submission: 12.02.2020; Revised submission: 12.12.2020; Final acceptance: 22.12.2020

Introduction

Driven by labour resources, entrepreneurship and labour market aspects, demographic conditions form an important factor of socio-economic development (Małopolskie Obserwatorium Polityki Rozwoju 2010). The evolving potential of the population results in changes affecting not only the demographic structure itself but also the whole economic system of a territory (Kamińska and Mularczyk 2014, Gløersen et al. 2016, Sardak et al. 2018, United Nations 2019). Hence, the condition and formation of demographic processes directly affect the situation of territorial units. They are also a criterion necessary for further research concerning various socio-economic levels (Kazimierczak and Szafrańska 2019).

Depopulation, which means people leaving a territory, is driven by intertwined components: natural increase (births – deaths) (Gwiaździńska-Goraj et al. 2020) and the net migration rate (immigration – emigration). Depending on their strength, these factors may be responsible for the actual population growth. Negative growth is related to people moving away and it has adverse social, economic and demographic consequences (Majdzińska 2018).

Since depopulation started to be surveyed in Poland, it has been driven by different nationwide processes. The early 1990s were marked by economic difficulties. The shrinking labour market and the resulting reduction in employment and high unemployment rates, in a situation where baby-boomers had just entered the employment market, made it incredibly difficult to find a job. The consequences of the above were reflected by the declining fertility rates, which in the case of cities reached concerning levels. On the one hand, the economic situation contributed to a decline in the birth rates, and consequently, a decrease in the overall population numbers, and a shift in economic proportions between the age groups. On the other, this is also when the EU opened its labour markets to Polish employees. The 2004 European Union accession allowed many Poles to find a job on much more financially attractive terms. Additionally, the Schengen agreement enabled people to move freely, resulting in a strong economic migration of Polish people. By 2017, over 2.5 million Poles lived abroad, 75% of which were city residents (Statistics Poland 2017, 2018). Such a high share of the urban population among the emigrants can be explained by the rapid development of the emigration mechanism among the urban community.

Although small towns dominate Poland's urban centre structure, they are home to a small share of its population (every fifth urban resident lives in a small urban centre), which also declines year after year. This is not the case for small urban centres – referred to as satellite centres – located near big cities. They benefit from the sub-urbanisation of large urban centres, becoming bedroom communities for people who are economically connected to big cities through their employment (Krzysztofik 2019).

Yet, an interesting question arises: how is the demographic shift perceived in small towns located further away from large urban centres? From the perspective of the research methodology used in this study, which of the elements of the depopulation process affected the population movements in small towns?

This paper aimed to present the demographic change from the perspective of actual population growth in the Wielkopolskie voivodeship's small towns. Identifying small city types based on the relationships between actual growth components made it possible to indicate the components which had a decisive impact on population growth (or decline) in the given territory. Using a dynamic approach to examine this phenomenon highlighted the demographic change vectors in the territorial units covered by this analysis.

The empirical material used in this paper were the natural increase and the net migration rate figures expressed in relative terms (per 1,000 population [‰]). Two periods (2003-2005 and 2016-2018) were analysed to ensure a dynamic approach to this study and average figures were used for each of them. The use of a three-year average made it possible to avoid the impact of variation in the included variables. On the one hand, these time intervals were chosen in an attempt to provide the most recent picture of this phenomenon. On the other, the relevant data was readily available at the Local Data Bank of Statistics Poland (2019). The study covered 89 small towns in the Wielkopolskie voivodeship[1].

Literature

According to Van Dalen and Henkens (2011), population decline is not a new phenomenon but rather something common (Coleman and Rowthorn 2011) and universal (especially since the first half of the 20th century) (Dumont 2017). In the interwar period, the prospects of population decline in Western European countries, which were visible in population forecasts, prompted the introduction of pro-natalist policies (Coleman and Rowthorn 2011, Van Dalen and Henkens 2011). While the second population decline began by the end of the 20th century, it was commonly believed until the 1980s – based on the theory of demographic change – that the previous pattern would repeat itself (without any reasonable evidence for that) (Coleman and Rowthorn 2011). In reality, no one foresaw that the decline in fertility, improvements in the quality of life and increased life expectancy would cause people to opt for smaller families (Raleigh 1999, Leeson 2002). In light of the already mentioned pro-natalist policies, it is now believed that migration will enable population maintenance for many countries (particularly Western countries), and thus

[1]The cities of Jaraczewo, Chocz, Dobrzyca and Opatówek were not covered by this study. They gained their city status after 2005, making it impossible to carry out an analysis for the 2003-2005 period.

serve as a catalyst for societal development (Coleman and Rowthorn 2011, Sardak et al. 2018). This belief is somewhat favourable for regions suffering from the negative consequences of population decline (Bouvier 2001), especially when overpopulation occurs in many parts of the world (Gløersen et al. 2016, Janicki 2017).

Given the general trends, it is worth referring to those related to urban and rural areas that are particularly important for this article's topic. This concerns primarily urbanisation and suburbanisation, both of which are part of the so-called city life cycle. They are shaped by globalisation (perceived multidimensionally), which is considered a contemporary process determining city development (e.g. in Europe, including Poland) (Zborowski et al. 2012).

As in the case of changes in the world population, it is necessary to emphasize the political, social and economic factors influencing the costs of urbanisation in the context of urban development (Kantor-Pietraga 2014). The process of industrialisation after World War II, which was related to the urbanisation process (migration of people from the countryside to cities) in the second half of the 20th century, not only strengthened cities but it also created new ones (Dumont 2017, Spórna 2018, Mickovic et al. 2020). In global terms, this process is also related to the introduction of new means of transport, i.e. the general increase in mobility (Antrop 2004), which stimulated the development of urban networks. In turn, suburbanisation is a phenomenon that is visible in many countries but its intensity and spatial structures vary. In the case of Poland, this process coincides with depopulation, i.e. the period from the late 1980s (Węcławowicz 2002). The quality of life improvements that drive the movement of people to rural and suburban areas (Hlaváček et al. 2019) also affect the basic socio-economic functions of the influx areas (Hardi et al. 2020).

Urban sprawl is also associated with suburbanisation (Hwang and Woo 2020), and according to Egidi et al. (2020), it is a much more controversial phenomenon affecting territorial reorganisation. Being an unplanned form of urban development, it leads to the expansion of large and medium-sized cities into the surrounding rural areas, including small towns. Yet, another trend accompanying the demographic changes in cities, which is determined by such things as suburbanisation (Szafrańska et al. 2019), is the shrinking cities phenomenon. This problem was noticed in the United States and Western Europe as early as the mid-twentieth century (Lima and Eischeid 2017, Šerý et al. 2018, Runge et al. 2020) while in Poland it became visible in the 1990s (Zborowski et al. 2012). The city shrinkage process mainly affects cities focused on traditional industry; hence it primarily impacts medium and large cities, and it is considered to be an economic effect of globalisation (Gløersen et al. 2016). The literature includes claims that city shrinkage can occur even in the case of towns with a population exceeding 10,000 inhabitants (Bartosiewicz et al. 2019). Its consequences lead to a negative

feedback loop created by such factors as declining birth rates and decreasing public revenues (Lima and Eischeid 2017).

To summarise this part, it is also worth emphasising that all demographic changes – in this case, depopulation and the accompanying urbanisation, suburbanisation, and city shrinkage processes – are distributed differently both in the scope of territory and occurrence periods. Thus, while urbanisation was not a new phenomenon in such countries as Belgium, United Kingdom and the United States, other ones – like Poland and Portugal – experienced it much later (Leeson 2002).

Local Context

Emigration was a dramatic process which had such a distorting effect on Poland's demographic structure that the demographic peak expected in the 2004-2011 period was virtually unnoticeable (Krzysztofik 2019). The reason behind this was that most emigrants were young people, i.e. ones who could potentially establish new families. This should be regarded as a major contributing factor to the Polish demographic crisis and the other aspect of urban depopulation. Today, economic and migration issues are not the exclusive reasons behind the demographic changes, including depopulation. The factor that involves the rural population's status should also be mentioned here, i.e. their socio-economic situation which makes people move from cities to suburban areas. However, that aspect is more often discussed in the context of big and mid-sized cities than small towns (Krzysztofik 2019).

Urban depopulation can ultimately result in a reduction in the number of urban centres classified as small, medium, and big. This is the consequence of the suburbanisation phase which has been progressing in Poland since the early 1990s. These changes can primarily affect mid-sized cities (with a population of 20,000-100,000 people) approaching the lower threshold of size classification. Indeed, depopulation may result in them being re-classified as small towns. Krzysztofik (2019) has been working on forecasting the demographic changes in Polish cities in a 20–25-year period and he claims that depopulation will also affect big cities (with a population over 100,000 people), which can lose as much as 30% of their residents by 2030.

The demographic processes in small towns differ in regard to both the demographic condition components and dynamic processes (changes over time), just like in the case of other territorial units. Defining a small town is a complicated task due to the need to classify them by their size. Various approaches suggested that a classification can include towns with a population of up to 5,000 people, as well as towns and cities with a population of up to 20,000, 50,000, 80,000 or even 200,000 people (Szymańska and Grzelak-Kostulska 2005, Caplan and Harvey 2010, Runge 2012, Steinführer et al. 2016, Hopkins and Copus 2018, Agergaard et al. 2019).

In Poland, small towns are defined as urban centres with a population of up to 20,000 people (Podogrodzka 2013), and the study presented in this paper is focused on this size group. According to Statistics Poland (2018), in 2018, small towns accounted for over 75% of all cities in Poland (712 cities) and 13% of Poland's total population lived there. The greatest number of small towns among Poland's 16 voivodeships[2] was recorded in the Wielkopolskie voivodeship (Figure 1) – 93 small towns.

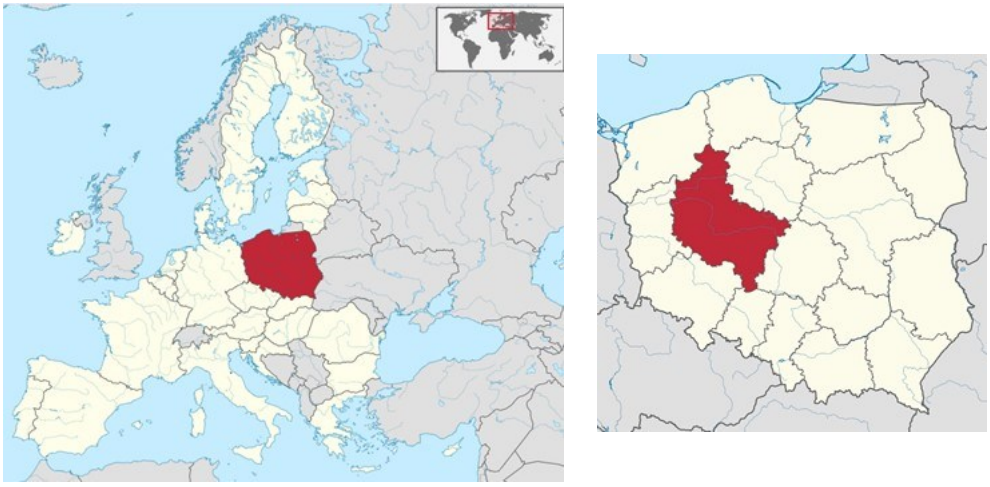

Figure 1. Location of Wielkopolskie voivodeship in Poland. Source: Wikimedia Commons (2020)

Methodology

As part of examining the demographic situation in terms of actual population growth, small towns in the Wielkopolskie voivodeship were grouped based on the J. W. Webb's typology. This approach was used by several researchers, including Kupiszewski et al. (1997), Serafin (2010), and Kurek et al. (2015) – to identify the population types at municipality level; Musiał-Malago (2018), Gwosdz et al. (2019) – to study selected medium and large cities; Długosz (2001) – to analyse cities and municipalities of a selected voivodeship; Kosiński (1964) – to determine the population types at district level; Biały and Długosz (2015) – to create a typology of EU countries; as well as Wiśniewski (2014) – to carry out a study concerning the European territory of Russia. The population change trends in the NUTS 2 regions and the selected EU cities were also included in a report by the European Commission (European Commission 2011).

[2]A voivodeship is a government administration unit and the largest unit in the basic territorial division of Poland. 16 voivodeships were established under the Act of July 1998 on the introduction of the basic three-tier territorial division of the state. Wielkopolskie voivodeship may also be considered part of the NUTS 2 region (code: PL41) (according to the EU NUTS classification – Nomenclature of Territorial Units for Statistics).

The authors who used the Webb typology in the context of small Polish cities include: Kwiatek-Sołtys (2015), Kamińska and Mularczyk (2016), and Bartosiewicz et al. (2019). The Webb typology enables the identification of relationships between the natural increase and the net migration rate. The resulting combinations formed 8 demographic unit types (Małopolskie Obserwatorium Polityki Rozwoju 2010) (Figure 2).

A, B, C and D correspond to demographically active units (which exhibit population growth), whereas E, F, G and H are demographically inactive units (with a noticeable population decline).

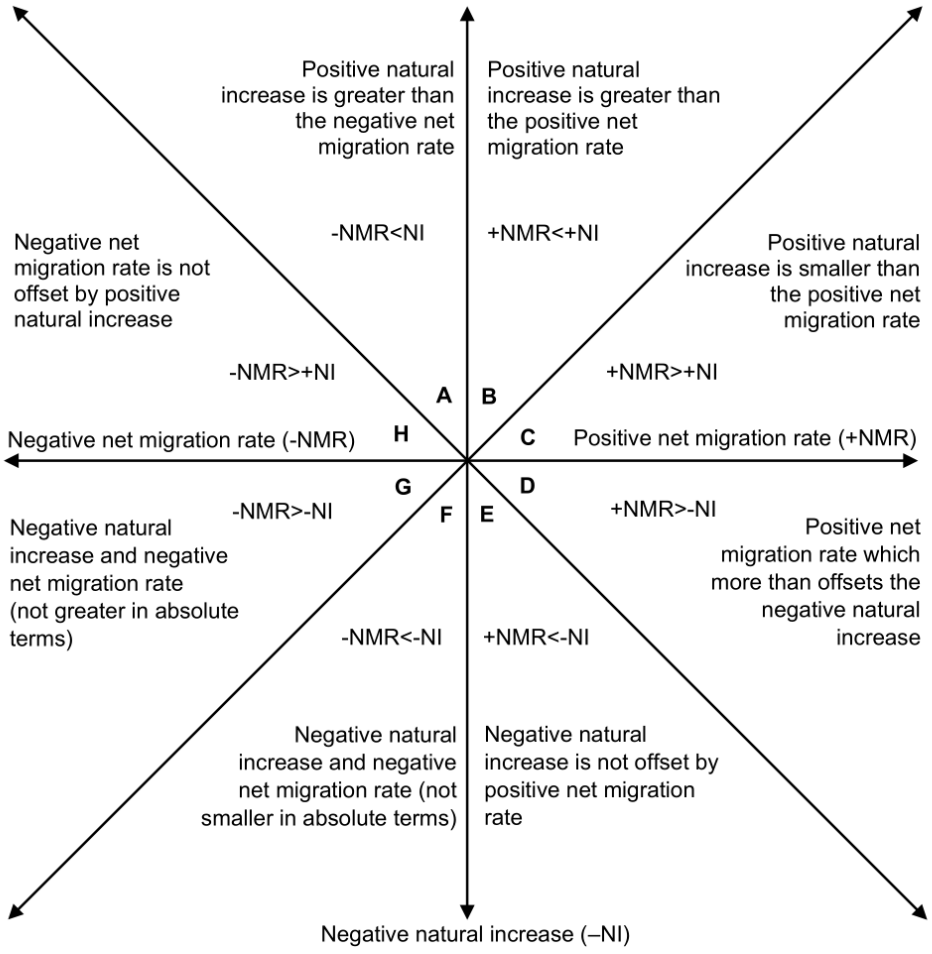

Figure 2. Population movement types according to Webb.
Source: own compilation based on Małopolskie Obserwatorium Polityki Rozwoju (2010)

The typological transition matrix (Table 1) was used to provide a more complete picture of the changes taking place in small towns in surveyed the periods. This makes it possible to identify the movements between the category types defined by Webb (Kurek et al. 2015). Four sections exist in the matrix (Kurek et al. 2015):

- I: steady growth; population growth occurred in both periods (A-, B-, C- and D-type small towns either kept the same type of relationships or moved within the identified combinations);
- II: growth; a population decline in the first period (the units are E-, F-, G- or H-type cities) is followed by population growth in the second period (small towns become A-, B-, C- or D-type cities);
- III: depopulation; population growth in the first period (small towns are A-, B-, C- or D-type units) is followed by a decline in the actual number of residents (the units become E-, F-, G- or H-type cities);
- IV: steady depopulation; either both periods were marked by depopulation, or the units retained the same type of relationships (small towns remain E-, F-, G- or H-type units).

This typology can be further analysed in more detail using subtypes which reflect the changes in the relationships between the components (Table 2).

Table 1. Four relationships between the Webb types in a dynamic approach

Types	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
A	I	I	I	I	III	III	III	III
B	I	I	I	I	III	III	III	III
C	I	I	I	I	III	III	III	III
D	I	I	I	I	III	III	III	III
E	II	II	II	II	IV	IV	IV	IV
F	II	II	II	II	IV	IV	IV	IV
G	II	II	II	II	IV	IV	IV	IV
H	*II*	*II*	*II*	*II*	*IV*	*IV*	*IV*	*IV*

Source: compilation based on Kurek et al. (2015)

Table 2. Relationships between 6 subtypes

Types	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
A	o	b	b	b	x	c	c	d
B	a	o	b	b	c	x	d	d
C	a	a	o	b	c	c	x	d
D	a	a	a	o	c	d	d	x
E	x	a	a	b	o	d	d	d
F	a	x	b	b	c	o	d	d
G	a	a	x	b	c	c	o	d
H	a	b	b	x	c	c	c	o

Source: Długosz (2001)

The subtypes identified six subsets combined with eight types of results in a 64-combination matrix of theoretical relationships. The subsets can be described as follows (Długosz 2001):

- o: stabilised; this is the case if the units do not change their Webb type during the periods analysed;
- x: reversed; this is the case if the units fundamentally changed their relationship pattern;
- a: growing natural increase; this is the case if the units shift to another Webb type because natural increase becomes more and more important;
- b: net migration rate growth; this is the case if a unit shifts to another Webb type because its net migration rate becomes increasingly important in its relationship with the natural increase;
- c: natural increase decline; this is the case if the units shift to another Webb type because natural increase becomes less and less important;
- d: net migration rate decline; this is the case if the unit's population type is affected by the net migration, losing its importance in relation to natural increase.

Results

The typology suggests that in the 2003-2005 period, the population growth in small towns in the Wielkopolskie voivodeship was slightly greater (54% of small towns) than depopulation; this is true for A-, B-, C- and D-type small towns (Figure 3). They formed a group of demographically active cities – a consequence of immigration, which involved compensating for the negligible depopulation (D-type) or exceeded the positive natural increase (C-type: 20 small towns). This group also included cities where the natural increase was greater than immigration (B-type: 12 cities) and greater than the positive increase that compensated for emigration, if any (in 2003-2005, it did not exceed 2‰) (A-type: 9 units), in the study period.

Demographically active cities were typically located in the central belt running from the north to the south of the voivodeship. The A-type was the most characteristic of cities located in the northern part of the voivodeship (Margonin, Złotów, Wysoka, Wyrzysk). In turn, C-type cities were spread between the central and southern parts of the voivodeship, and notably included Rydzyna, Kórnik and Pobiedziska, where a positive net migration rate considerably differed from what was recorded in other cities (10–18‰ compared to 5.2‰ as the average rate for that type of cities).

Most of the demographically inactive small towns were the ones with a negative net migration rate and a small positive natural increase, i.e. type H (23 cities). The city of Dobra, a complete outlier, was the only one to have recorded a negative net migration rate lower than 10‰ (-12.57‰) in the 2003-2005 period. Of all the identified types, the smallest sector was formed by units where natural decrease exceeded immigration (E-type: Przedecz and Czempiń). Small towns affected by depopulation were usually located at the voivodeship's borders, especially its eastern and western extremes. The

western part of the voivodeship included mostly H-type units (-NMR>+NI) while the eastern part was more diverse (E, F, G). However, in these cases, the effect of emigration was exacerbated by the natural decrease.

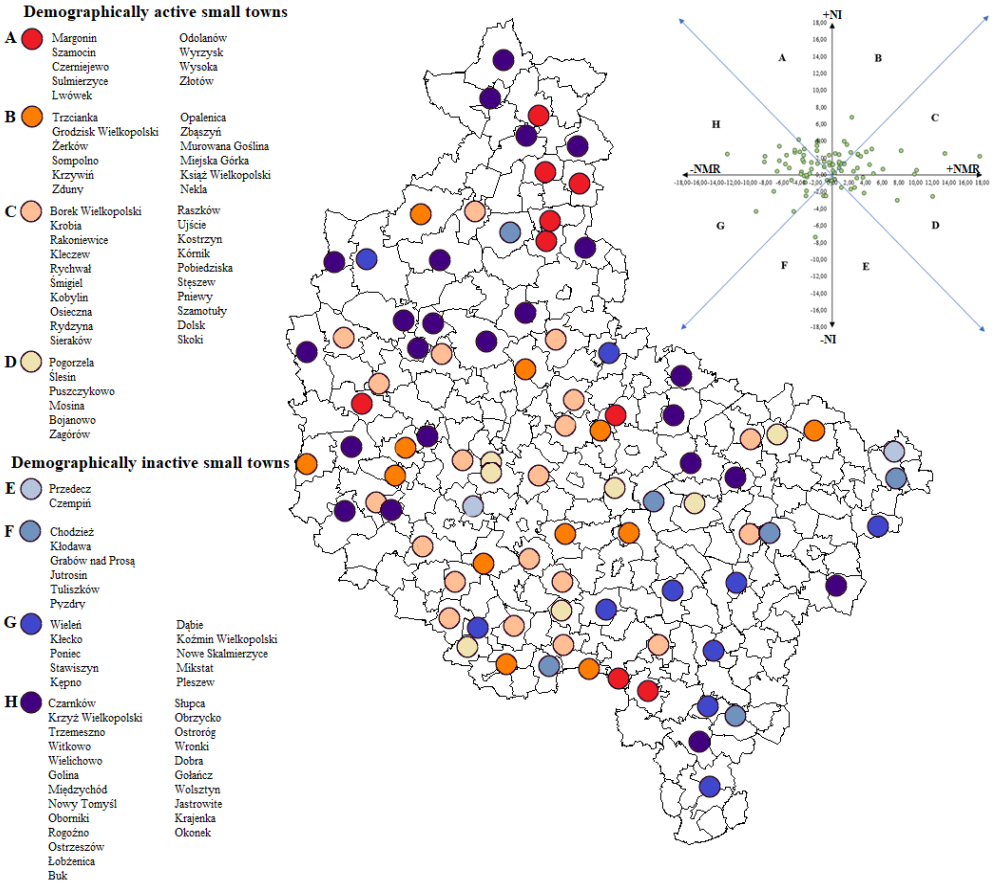

Figure 3. Typology of small towns population movements in the Wielkopolskie voivodeship (2003-2005), as identified using the Webb method.
Source: own study based on the Local Data Bank of Statistics Poland (2019)

The Webb typology revealed that both demographically active and inactive small towns had a relatively similar share in the first period. That period was marked by the dominant role of B-, C-, G- and H-type cities, i.e. the ones where the net migration rate played a decisive role; that very component was the key determinant of the actual number of residents in the 2003-2005 period.

The situation of small towns had been deteriorating until 2018. The number of small urban centres affected by depopulation increased to 70% (Figure 4). The dominant type

in the Wielkopolskie voivodeship was a small city with emigration exceeding the natural increase (26 G-type small towns and 27 H-type small towns). Hence, the cities struggled with a negative net migration rate and a negative (or slightly positive) natural increase.

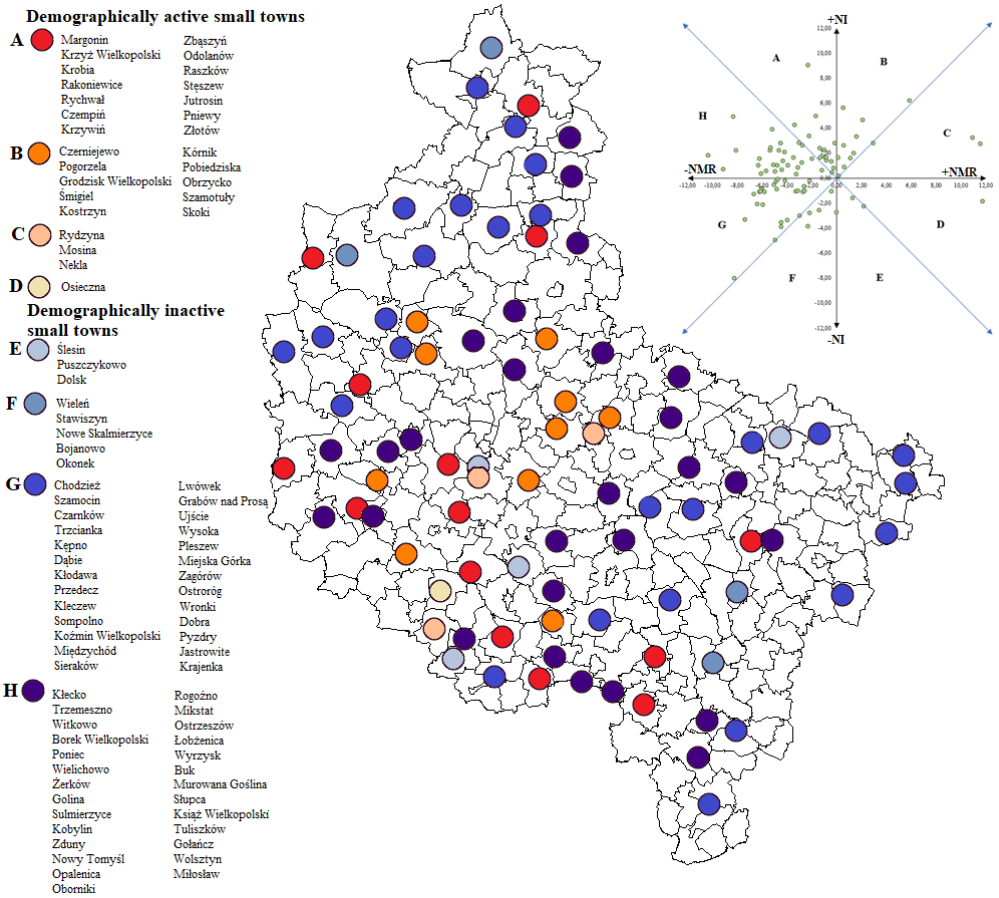

Figure 4. Typology of small towns population movements in the Wielkopolskie voivodeship (2016-2018), as identified using the Webb method.
Source: own study based on the Local Data Bank of Statistics Poland (2019)

C-type (Rydzyna, Mosina, Nekla) and D-type (Osieczna) small towns, i.e. the ones with a positive net migration rate, were a small group. Despite the considerable depopulation of small towns, the 2016-2018 period witnessed a rise in the number of A-type small towns whose natural increase exceeded their negative net migration rate (from 9 to 14) compared to the previous period. Therefore, in the 2016-2018 period, the central part of the Wielkopolskie voivodeship was represented by demographically active small towns while its eastern part could be referred to as a depopulation area.

The demographic trends were rather diverse in the 2003-2005 period while in the 2016-2018 period depopulation became truly severe. The number of small towns with both negative net migration rates and a negative natural increase (G-type) more than doubled. Therefore, both G- and F-type cities can be deemed to have been affected by severe depopulation.

When looking from another perspective, the delimitation of small towns proposed by Webb enabled the identification of the extent of urban shrinkage for the cities concerned. It was particularly noticeable in the case of small F- and G-type cities, where (in the context of demographic changes in the periods covered by this study) the trends were determined by the negative net migration rates and the negative natural increase. The above can be considered a long-term problem because it was already present in the first period examined. Rapid depopulation was also observed in small A- and B-type cities, which became F- and G-type cities during the periods considered. In this case, urban shrinkage was much faster in small towns.

The classification diagram was used to enable a more detailed approach to the type of relationships between the natural increase and the net migration rate (Figure 5). The conclusion is that 42% of small towns (type IV) follow a steady depopulation trend; the population of such cities either decreased or remained at the same level in the type distribution diagram in both 2003-2005 and 2016-2018 periods. Twenty-four small towns experienced depopulation. Only four small urban centres (type II) experienced population growth, i.e. improved their situation compared to the first period. Other cities (24 small urban centres) formed a territory with a steady population growth (type I; immigration growth and positive natural increase).

The types of small towns across Wielkopolskie voivodeship varied. Urban centres located in its eastern part were affected by steady depopulation (based on the Webb typology). That group also included small towns located in its north-western parts. Conversely, steady population growth was characteristic of small towns located in the voivodeship's central belt. Small towns on a steady growth path are the most viable towns from the perspective of what can be referred to as demographic stability. Also, they attract people which means that they benefit from the suburbanisation of big and mid-sized cities (including Poznań), which is noticeable in small towns in the central part of Wielkopolskie.

The study also identified a small group of cities exhibiting a growth trend, i.e. small cities which seem to withstand the pressure of depopulation quite well. However, when analysing their surroundings (locations near cities affected by depopulation or steady depopulation), it can be noted that they face the risk of being exposed to adverse scenarios in the future. Small towns affected by depopulation and steady depopulation are dominant. From a demographic perspective, they should be referred to as non-viable cities due to the negative net migration rates and negative natural increase.

Hence, they form a group of what can reasonably be expected to be 'ageing cities' due to a high share of elderly people in their population structures. As a consequence, they are being overtaken by other cities (which follow a steady growth trend) because of the latter's favourable socio-economic factors.

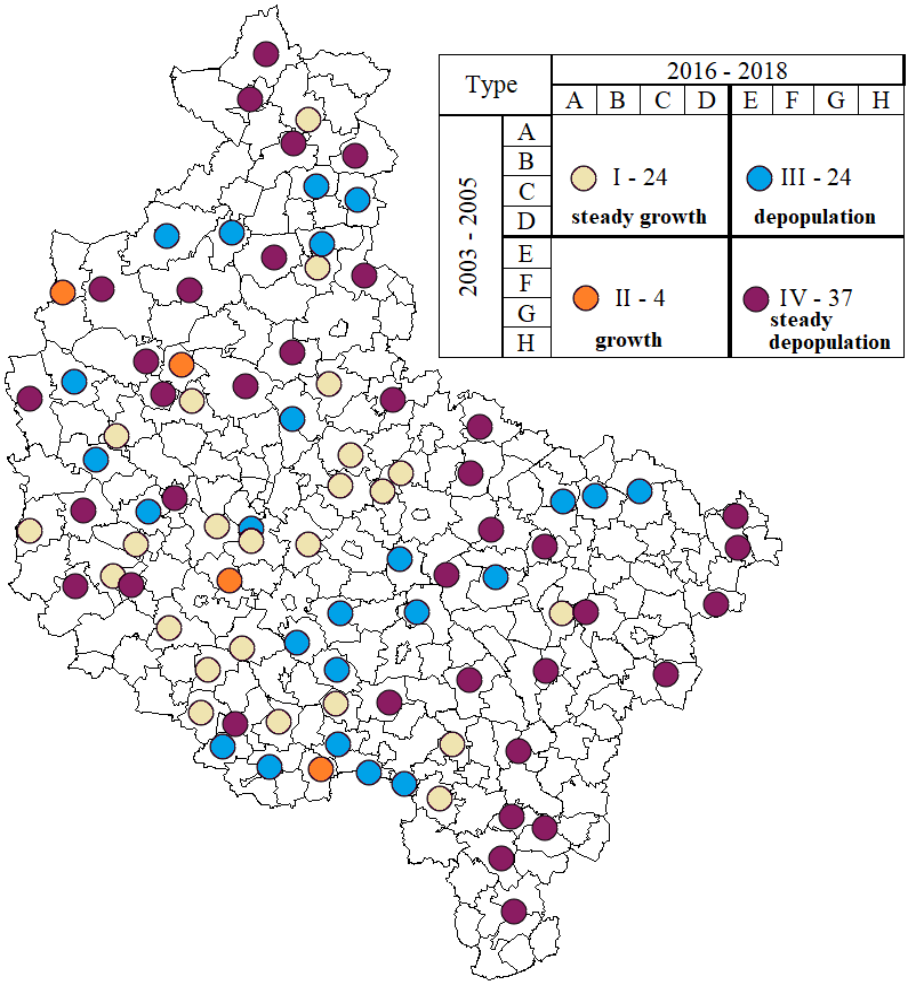

Figure 5. Types of relationships in the small towns of Wielkopolskie voivodeship.
Source: own study based on the Local Data Bank of Statistics Poland (2019)

Due to the dynamic nature of the discussed process, the author also divided small towns into subsets. Based on the analysis of changes in the relationships between the natural increase and the net migration rate in the 2003-2005 and 2016-2018 periods, it was possible to identify the transitions between the Webb migration types (Table 3).

Table 3. Relationship system in the context of small-town types and subtypes identified in the Wielkopolskie voivodeship

Types		2016-2018							
		A	B	C	D	E	F	G	H
2003 - 2005	A	3_o	1_b					3_c	2_d
	B	2_a	1_o	1_b				3_d	5_d
	C	6_a	6_a	1_o	1_b	1_c		3_x	2_d
	D		1_a	1_a		2_c	1_d	1_d	1_x
	E	1_x						1_d	
	F	1_a						4_d	1_d
	G						3_c	4_o	3_d
	H	1_a	1_b				1_c	7_c	13_o

Source: own study based on the Local Data Bank of Statistics (2019)

The division into subsets resulted in identifying 22 small towns whose relationships in the population movement type system did not change. However, that group included a considerable number of G- and H-type cities, i.e. territories affected by steady depopulation. While 5 small towns experienced a fundamental change in their situation, only one of them (Czerwiń) experienced a positive transformation (shifting from E to A). In the 2016-2018 period, 18 small towns saw a growing importance of natural increase; for 16 others, it was the opposite. In the second period, an increased role of the net migration rate (subset b) existed only in the case of 4 cities. In turn, the importance of the net migration rate decreased in the case of 23 cities (subset d).

The relationship system revealed a decline in both natural increase and net migration rate. This is reflected by the number of small towns which experienced a drop in the importance of both components. The above suggests that the out-migrating population were primarily young people. In small towns where the actual population growth is negative – as a consequence of the above process – that demographic trend takes the form of steady depopulation, which is extremely disadvantageous from the perspective of small-town development.

Between 2003 and 2005, no differences between small towns existed in the case of population movement components, and therefore the units covered by this study are located in a relatively compact cluster in the diagram. The conditions became much more diverse in the 2016-2018 period – natural increase and net migration rates for

small towns started to move away from the origin of the coordinate plane towards demographically-disadvantageous combinations.

Discussion

The above typology emphasised the importance of mutual relations between the natural increase and the net migration rate. Large outmigration levels presented in the study exacerbate the effects of natural decrease; this is caused by the emigration of the working-age population. If permanent, such population movements can result in the distortion of the small towns' population pyramids. This is exactly what happened in G-type cities. Hence, it may be assumed that the Webb typology developed in this paper, which grouped small towns according to the combination of the actual population growth components, made it possible to identify those that struggle with the ageing population problem. Therefore, it can be concluded that apart from urban depopulation, this study identified population ageing as an additional issue faced by small towns in the Wielkopolskie voivodeship.

The analysis of demographic changes, which was supposed to identify the demographic types of small towns in the Wielkopolskie voivodeship, ultimately boiled down to identifying new areas or such adverse consequences as declining birth rates, the emigration of young people and the ageing populations. The above are the only factors with demographic implications. Moving beyond demography, one can see a series of functional and spatial transformations which could be addressed in a separate scientific paper.

Indeed, small-town depopulation results in perturbing the cities' socio-economic structures. Small towns are believed to be local development centres as they provide support not only for their residents but also for their rural surroundings. Small town depopulation should be regarded as equivalent to a gradual loss of urban functions, which is a worrying prospect for their future. If the depopulation of small towns in Wielkopolskie persists or it further aggravates, it will ultimately result in a situation where a considerable number of small urban centres fail to perform the functions originally attributed to cities.

A city population drives the socio-economic progress by generating demand for goods, services, labour, education, recreation, and leisure. As a result of depopulation, a city no longer attracts entrepreneurs, investors, customers, tourists, and residents. Hence, as cities shrink demographically, they have less and less to offer in the socio-economic dimension. Based on the findings, cities in the eastern part and the western belt of Wielkopolskie voivodeship (which exhibit either depopulation or steady depopulation trends) are particularly vulnerable to the risk of functional transformation or they are already experiencing a gradual loss of their functions. Additionally, this trend is

noticeably spreading westwards. Yet, in this case, city functions may be lost to a different extent because of the presence of adjacent small towns with a steady population growth. In summary, the demographic transformation process proves to be the most beneficial to small towns exhibiting a steady population growth trend, which continues to develop even in the era of demographic crisis and urban shrinkage – much to the detriment of other small urban centres. In the case of such cities, their development includes not only the demographic aspect but also economic progress.

Conclusions

The demographic processes occurring in the Wielkopolskie voivodeship's small towns resulted in a decline in the population potential. Between 2003 and 2005, the cities covered by this analysis were more diversified in terms of population movement types than in the 2016-2018 period (despite similar population movement component values). This was reflected in the diversification of the Webb typology structure. Until 2018, small towns had similar combinations of natural increase and net migration rates; this affected the typology results in the second period covered by this analysis.

Since 2003, small towns have been facing depopulation. In the 2003-2005 period, these processes were largely driven by emigration, which had an even stronger impact in the 2016-2018 period. This is evidenced by the increase in the number of cities classified as G- and H-type units based on the Webb typology. As for the intensity of that process, G-type small towns were in a particularly disadvantageous situation (-NMR>-NI). They faced emigration exceeding the negative natural increase, and consequently, nearly half of small towns (37) exhibited steady depopulation. The predominance of small, depopulating cities in the Wielkopolskie voivodeship is a characteristic phenomenon and similar processes occur in other voivodeships in Poland too (Bartosiewicz et al. 2019).

The typology developed in this paper provides a picture of small city demographic structures. Permanent depopulation processes due to the emigration of working-age people distorted their population pyramids. As a consequence, E-, F-, G- and H-type cities can be considered demographically old. The permanent outflow of people results in such negative consequences as workforce shortage and decreased public income in many small towns, which leads to the loss of their vital development segments. Although city shrinkage rarely occurs in the case of small towns, the consequences of the population outflow experienced by such towns are identical to those indicated by Lima and Eischeid (2017). This suggests that the appropriate terms referring to these phenomena that disturb the functional structure of small towns should be introduced.

In the context of this study, the emergence of further depopulation trends seems interesting. Towns located within the area of Poznań (a big city) are likely to be an

exception. This is the case where small towns can expect a continued population inflow. This is related to suburbanisation, which has been progressing since the 1990s in the largest Polish cities, including Poznań. Thus, the population of small towns near Poznań will continue to increase due to the influx of Poznań residents. On the other hand, the urbanisation of small towns will also become more noticeable thanks to the migrants from other cities and the rural areas who will move there due to their professional activities in Poznań. Nonetheless, it must be noted that any gains due to the migration of new people to small towns are but a partial compensation for the ageing local populations (McMillan 2015). The influx of people (mainly of working age) to small towns in the heart of Wielkopolskie voivodeship results in their simultaneous outflow from other areas, including small towns, and it hinders their sustainable development (Kamińska and Mularczyk 2014).

A yet another topic that should be briefly discussed in the summary is the impact of urban sprawl and suburbanisation processes on the areas experiencing a population influx, which Hlaváček et al. (2019) and Kovács et al. (2019) refer to in the context of environmental quality and they identify a disturbance in sustainable development in the case of both phenomena. This mainly applies to areas (cities, rural areas) located in the vicinity of large cities, where not only the landscape features (Hardi et al. 2020) but also the functional structures are disturbed (for a broader description of the unfavourable transformations in rural areas, see Hlaváček et al. 2019), effectively leading to uncontrolled development. Nonetheless, it is a socio-economic development opportunity for small towns – despite the development pressure that they may be subject to (Samat et al. 2020).

References

AGERGAARD J., TACOLI C., STEEL G., ØRTENBLAD S. B. (2019) Revisiting Rural-Urban Transformations and Small Town Development in Sub-Saharan Africa, The European Journal of Development Research 31, 2-11.

ANTROP M. (2004) Landscape change and the urbanization process in Europe, Landscape and Urban Planning 67 (1-4), 9-26.

BARTOSIEWICZ B., KWIATEK-SOŁTYS A., KUREK S. (2019) Does the process of shrinking concern also small towns? Lessons from Poland, Quaestiones Geographicae 38 (4), 91-105.

BIAŁY S., DŁUGOSZ Z. (2015) Typologia demograficzna krajów Europy wg Webba w latach 2005-2025 (Demographic types of European countries by Webb in 2005-2025), Kultura i Polityka 18, 151-164.

BOUVIER L. F. (2001) Replacement Migration: Is it a Solution to Declining and Aging Populations? Population and Environment 22 (4), 377-381.

CAPLAN K., HARVEY E. (2010) Small town water and sanitation delivery. Taking a wider view, WaterAid, London.

COLEMAN D., ROWTHORN R. (2011) Who's afraid of population decline? A critical examination of its consequences, Population and Development Review 37, 217-248.

DŁUGOSZ Z. (2001) Próba dynamicznej typologii ruchu ludności w świetle klasyfikacji Webba na przykładzie województwa małopolskiego (An attempt at a dynamic typology of population movement in the light of Webb's classification on the example of the Małopolskie Voivodeship), in: Kortus B. (ed.), Człowiek i przestrzeń, IGiGP UJ, Krakow, pp. 61-70.

DUMONT G.-F. (2017) Urban demographic transition, Urban Development Issues 56, 13-25.

EGIDI G., CIVIDINO S., VINCI S., SATERIANO A., SALVIA R. (2020) Towards local forms of sprawl: A brief reflection on Mediterranean urbanization, Sustainability 12 (2), 582.

EUROPEAN COMMISSION (2011) Regional Challenges in the Perspective of 2020 – Phase 2: Deepening and Broadening the Analysis, European Commission, Retrieved from: www.ec.europa.eu.

GLØERSEN E., DRĂGULIN M., HANS S., KAUCIC J., SCHUH B., KERINGER F., CELOTTI P. (2016) The impact of demographic change on European regions, European Committee of the Regions, Brussels.

GWIAŹDZIŃSKA-GORAJ M., PAWLEWICZ K., JEZIERSKA-THÖLE A. (2020) Differences in the quantitative demographic potential–A comparative study of Polish–German and Polish–Lithuanian Transborder Regions, Sustainability 12 (22), 9414.

GWOSDZ K., SOBALA-GWOSDZ A., GÓRECKI J., JARZĘBIŃSKI M., ROTTER-JARZĘBIŃSKA K., FIEDEŃ Ł. (2019) Potencjał miast średnich w Polsce dla lokalizacji inwestycji BPO/SSC/IT/R&D: analiza, ocena i rekomendacje (Potential of medium-sized cities in Poland for the location of BPO/SSC/IT/R&D investments: analysis, evaluation and recommendations), Ministerstwo Inwestycji i Rozwoju, Warsaw.

HARDI T., REPASKÁ G., VESELOVSKÝ J., VILINOVÁ K. (2020) Environmental consequences of the urban sprawl in the suburban zone of Nitra: An analysis based on landcover data, Geographica Pannonica 24 (3), 205-220.

HLAVÁČEK P., KOPÁČEK M., HORÁČKOVÁ L. (2019) Impact of suburbanisation on sustainable development of settlements in suburban spaces: smart and new solutions, Sustainability 11 (24), 7182.

HOPKINS J., COPUS A. (2018) Definitions, measurement approaches and typologies of rural areas and small towns: a review, The James Hutton Institute, Retrieved from: www.hutton.ac.uk.

HWANG U., WOO M. (2020) Analysis of inter-relationships between urban decline and urban sprawl in city-regions of South Korea, Sustainability 12 (4), 1656.

JANICKI W. (2017), Depopulation as an opportunity for, not a threat to cities and regions: a paradigm change, Europa XXI 32, 89-96.

KAMIŃSKA W., MULARCZYK M. (2014), Demographic types of small cities in Poland, Miscellanea Geographica 18 (4), 24-33.

KAMIŃSKA W., MULARCZYK M. (2016) Structure of demographic types of small towns in Poland. Spatial and temporal approach, European Spatial Research and Policy 23 (2), 27-47.

KANTOR-PIETRAGA I. (2014) Both external and internal factors as an explanation of depopulation of cities on the area of Poland, Environmental & Socio-economic Studies 2 (3), 56-64.

KAZIMIERCZAK J., SZAFRAŃSKA E. (2019) Demographic and morphological shrinkage of urban neighbourhoods in a post-socialist city: the case of Łódź, Poland, Geografiska Annaler: Series B, Human Geography 101 (2), 138-163.

KOSIŃSKI L. (1964) Typy zmian ludności w Polsce w latach 1951-1960 (Types of population changes in Poland in the years 1951-1960), Przegląd Geograficzny 36 (4), 661-677.

KOVÁCS Z., FARKAS Z. J., EGEDY T., KONDOR A. C., SZABÓ B., LENNERT J., BAKA D., KOHÁN B. (2019) Urban sprawl and land conversion in post-socialist cities: The case of metropolitan Budapest, Cities 92, 71-81.

KRZYSZTOFIK R. (ed.) (2019) Przemiany demograficzne miast Polski. Wymiar krajowy, regionalny i lokalny (Demographic changes of Polish cities: National, regional and local dimension), Instytut Rozwoju Miast i Regionów, Warsaw, Krakow.

KUPISZEWSKI M., BERINDE D., TEODORESCU V., DURHAM H., REES P. (1997) Internal migration and regional population dynamics in Europe: Romanian case study, University of Leeds, Retrieved from: eprints.whiterose.ac.uk.

KUREK S., WÓJTOWICZ M., GAŁKA J. (2015) The changing role of migration and natural increase in suburban population growth: The case of a non-capital post-socialist city (The Krakow Metropolitan Area, Poland), Moravian Geographical Reports 23 (4), 59-70.

KWIATEK-SOŁTYS A. (2015) Population changes as litmus paper of the socio-economic development level of small towns in Poland, Annales Universitatis Paedagogicae Cracoviensis. Studia Geographica 8, 39-53.

LEESON G. W. (2002) The changing face of the population of Europe - Geographical distribution, urbanization, depopulation and international migration, Nordregio, Stockholm.

LIMA M. F., EISCHEID M. R. (2017) Shrinking cities: rethinking landscape in depopulating urban contexts, Landscape Research 42 (7), 691-698.

LOCAL DATA BANK OF STATISTICS POLAND (2019) Statistics Poland, Retrieved from: bdl.stat.gov.pl.

MAJDZIŃSKA A. (2018) Obszary depopulacyjne w Polsce w latach 2002-2014 (Depopulating Areas in Poland, 2002-2014), Studia Demograficzne 1 (173), 23-54.

MAŁOPOLSKIE OBSERWATORIUM POLITYKI ROZWOJU (2010) Małopolskie miasta – funkcje, potencjał i trendy rozwojowe (Małopolska cities – functions, potential and development trends), Malopolska, Krakow.

MCMILLAN R. (2015) Anticipating subnational depopulation: Policy responses and strategic interventions to regional decline, University of Waikato, Retrieved from: researchcommons.waikato.ac.nz.

MICKOVIC B., MIJANOVIC D., SPALEVIC V., SKATARIC G., DUDIC B. (2020) Contribution to the analysis of depopulation in rural areas of the Balkans: Case study of the Municipality of Niksic, Montenegro, Sustainability 12 (8), 3328.

MUSIAŁ-MALAGO M. (2018) Kurczenie się miast Polski — analiza i pomiar zjawiska (Shrinking Polish cities - analysis and measurement of the phenomenon), Rozwój Regionalny i Polityka Regionalna 42, 91-102.

PODOGRODZKA M. (2013) Demografia małych miast polski - wybrane zagadnienia (Demography of small Polish cities - selected issues), Studia Ekonomiczne 144 (1), 147-164.

RALEIGH V. S. (1999) Trends in world population: how will the millenium compare with the past? Human Reproduction Update 5 (5), 500-505.

RUNGE A. (2012) Metodologiczne problemy badania miast średnich w Polsce (Methodological problems of studying medium-sized cities in Poland), Prace Geograficzne 129, 83-101.

RUNGE A., RUNGE J., KANTOR-PIETRAGA I., KRZYSZTOFIK R. (2020) Does urban shrinkage require urban policy? The case of a post-industrial region in Poland, Regional Studies, Regional Science 7 (1), 476-494.

SAMAT N., MAHAMUD M. A., TAN M. L., TILAKI M. J. M., TEW Y. L. (2020) Modelling land cover changes in peri-urban areas: a case study of George Town Conurbation, Malaysia, Land 9 (10), 373.

SARDAK S., KORNEYEV M., DZHYNDZHOIAN V., FEDOTOVA T., TRYFONOVA O. (2018) Current trends in global demographic processes, Problems and Perspectives in Management 16 (1), 48-57.

SERAFIN P. (2010) Zmiany w potencjale demograficznym ludności wiejskiej w województwie małopolskim w latach 1996-2006 (Changes in the Demographic Potential of Village Population in the Małopolskie Voivodship 1996-2006), Zeszyty Naukowe 821, 79-96.

ŠERÝ O., SVOBODOVÁ H., ŠILHAN Z., SZCZYRBA Z. (2018) Shrinking of cities in the Czech Republic and its reflection on society: Case study of Karviná City, Geographica Pannonica 22 (1), 68-80.

SPÓRNA T. (2018) The suburbanisation process in a depopulation context in the Katowice conurbation, Poland, Environmental & Socio-economic Studies 6 (1), 57-72.

STATISTICS POLAND (2017) Informacja o rozmiarach i kierunkach czasowej emigracji z Polski w latach 2004-2016 (Information on the size and directions of temporary emigration from Poland in 2004-2016), Główny Urząd Statystyczny, Retrieved from: www.stat.gov.pl.

STATISTICS POLAND (2018) Informacja o rozmiarach i kierunkach czasowej emigracji z Polski w latach 2004-2017 (Information on the size and directions of temporary emigration from Poland in 2004-2017), Główny Urząd Statystyczny, Retrieved from: www.stat.gov.pl.

STEINFÜHRER A., VAISHAR A., ZAPLETALOVÁ J. (2016) The Small Town in Rural Areas as an Underresearched Type of Settlement. Editors' Introduction to the Special Issue, European Countryside 8 (4), 322-332.

SZAFRAŃSKA E., COUDROY DE LILLE L., KAZIMIERCZAK J. (2019) Urban shrinkage and housing in a post-socialist city: relationship between the demographic evolution and housing development in Łódź, Poland, Journal of Housing and the Built Environment 34, 441-464.

SZYMAŃSKA D., GRZELAK-KOSTULSKA E. (2005) Małe miasta w Polsce - zmiany ludnościowe i funkcjonalne w drugiej połowie XX wieku (Small towns in Poland - demographic and functional changes in the second half of the 20th century), Prace Naukowe / Akademia Ekonomiczna w Katowicach, 59-90.

UNITED NATIONS (2019) World Urbanization Prospects: The 2018 Revision, United Nations, New York.

VAN DALEN H. P., HENKENS K. (2011) Who fears and who welcomes population decline? Demographic Research 25, 437-464.

WĘCŁAWOWICZ G. (2002) Przestrzeń i społeczeństwo współczesnej Polski (The space and society of contemporary Poland), PWN Scientific Publishing House, Warsaw.

WIŚNIEWSKI R. (2014) The spatial and nationality aspects of depopulation in the European part of the Russian Federation, Geographia Polonica 87 (1), 47-59.

ZBOROWSKI A., SOJA M., ŁOBODZIŃSKA A. (2012) Population trends in Polish cities – stagnation, depopulation or shrinkage? Prace Geograficzne 130, 7-28.

Journal of Urban and Regional Analysis 14–1 (2022): 101–127, https://doi.org/10.37043/JURA.2022.14.1.6

THE ROLE OF SOCIAL CAPITAL OF TOURIST HOST COMMUNITIES IN LOCAL DEVELOPMENT

Jamileh Tavakolinia,
Mohammad Kazem Shams Pouya
Shahid Beheshti University, Tehran, IRAN

Abstract: The inefficiency of top-down planning and a purely economic and quantitative view of development lead researchers and institutions to emphasise the role of social dimensions in local development. Especially, social capital plays a central position among the local development dimensions. The present study tackles both social capital dimensions—the characteristics of an individual or an attribute of the society. Given the importance of the neighbourhood as the smallest cell in spatial organisation and urban planning, this research covers a tourist host neighbourhood in the context of a developing country. With the help of 100 random samples from Darakeh, Tehran municipality in Iran, the study investigates how social capital of tourist host communities contributes to local development and in terms of neighbourhood components. The results confirm the importance of links and trust, and the mental and objective dimension of participation. Further, trust in the neighbourhood council and municipality has the greatest role in residents' desire to participate in local decisions, also contributing to the success of municipality in providing tourism and local services.

Keywords:

local development;
neighbourhood links;
social capital;
trust;
Tehran

Email: mshams1362@yahoo.com

Initial submission: 20.03.2020; Revised submission: 10.10.2020; Final acceptance: 22.12.2020

Introduction

Today, by increasing the problems and challenges of metropolitan cities, paying attention to the social issues and concepts in planning has been largely emphasised. Social capital is considered one of these concepts including values, norms, beliefs, trust, and formal and informal institutions at the local level, and it provides the necessary tools for community development (Akbari 2006). In recent decades, this concept was allocated a pivotal role in the humanities and social sciences research. For instance, Putnam (1995) revealed that the Americans not only bowl less today than they did fifty years ago but also some bowl more than others. This is one of the major and simple messages of Putnam (1995)'s influential study of social capital in America (Alexander 2007). Azkia and Firoozabadi (2004) indicated a special place of participation and willingness to group work in cooperative operating systems compared to the micro-units.

Moscardo et al. (2017) concluded that tourism is a tool for destination community well-being that occurs across all aspects of tourism including academic research and academic and government guidance for tourism planners and policymakers. Kc and Morais (2014) identified the role of social capital among tourism micro-entrepreneurs in the context of People-First Tourism (P1T) and it resulted that People-First Tourism is a marketplace connecting tourism micro-entrepreneurs with visitors who want to have a real presence in the place, and it has a positive impact on the places they visit.

In another study, Abdollahi (2004) emphasised the role of social cohesion, social trust, and the consolidation of social relationships, and intergroup generalised trust in social development. Alexander (2007) asserted that fundamental distinctions between social and economic issues, including education, membership in a religious institution such as the church, agriculture, and unemployment, determine the level of social capital in a society. Also, there is no evidence for a much-debated link between diversity and social capital.

The empirical findings of Nunkoo (2017) demonstrate that trust is the strongest determinant of residents' attitudes toward an event. De Andrade Bock and Macke (2014) indicated that the relationships based on trust, norms of reciprocity, identification, and the elements related to social capital theory may be decisive for the group strengthening and continuity, as it is facing a period of transformation. Pramanik et al. (2019) examined the impact of trust and collective action on the local tourism of Kampung Tajur. The result showed that trust was a robust predictor of attending a religious meeting, participating in managing a homestay, and joining for community work (Pramanik et al. 2019).

Sakurai (2006) discusses the roles of social capital in economic development, and he concludes that millers in the clusters adopt innovation in the milling technology, and

they establish a quality/price relationship that is critical for market development. Besides, the lower information costs among them as well as bridging social capital enable millers in the clusters to provide farmers with loans. Moscardo et al. (2013), using the social capital approach, discuss the relationship between the characteristics of tourism development and its role in the social capital of the target community.

Rezazadeh et al. (2016) reported a positive relationship between tourism development and sustainable urban development through the mediation of social capital. Generally, social capital research has gradually moved from macro-scale toward micro-scale (neighbourhood), and its role in promoting tourism has attracted the researchers' attention. In the same vein, Khakpor et al. (2009) concluded that local sustainability is achieved by strengthening social capital. Hwang (2012) examined the relationship between social capital and the level of citizens' participation in collective activities related to tourism. Also, Pongponrat and Chantradoan (2012) confirmed the role of social capital as a driving force and as a mechanism in the planning success for local tourism activities. Further, Hwang et al. (2012) evaluated the collective actions in local communities, and they drew a framework for sustainable rural tourism, contributing to understanding the relationship between tourism works and social identity. Furthermore, Zhao et al. (2011) emphasised the influence of social capital on the individuals' decisions to start a tourism business. McGehee et al. (2010) asserted a relationship between the length of residence and tourism-related social capital as well as a relationship between tourism-related social capital and cultural capital, political capital, human capital, privately built capital, and financial capital, but no relationship exists between tourism-related social capital and public built capital or natural capital.

Over the past two to three decades, most development agencies have been formed in Europe, North America, and East Asia, for economic purposes and to increase competitiveness. Also, in the 1990s and the past 5 years, Development Agencies have been established in many developing countries, and their much wider growth is now occurring. Sometimes, Development Agencies are being established as a 'bottom-up' process to encourage local development (Mountford 2009).

One of the main objectives of local development is the improvement of life quality. Rastegar et al. (2017) declared that institutions governing the city, especially municipality and city council, do not care about the opinions and views of people in planning, and thus public participation is very low. Hence, he proves the difference between the views of managers and citizens regarding the impact of social capital on the quality of life.

Local development can make an important contribution to the national economic performance, and it has become more critical with increased global integration and competition, population mobility, technological advances, and consequential spatial differences and imbalances. Effective local development can reduce disparities

between poor and rich places, add to the stock of locally generated jobs and firms, and increase the overall private sector investment (OECD 2013a).

Another topic of interest for local development is tourism. Tourism is an important sector at various territorial levels that can lead to the economic growth of a place. Tourism is also a fundamental part of the OECD member countries, and a key part of the service-based economy (OECD 2020).

Tourism can affect local economic development through the creation and growth of new enterprises (International Trade Centre 2009). Tourism can help reveal local riches, even for local people. History shows that tourists (at least pioneering ones) have often been the first people to understand – and even sometimes simply to "see" – the assets of a region, which were not recognized as such by the local people. That is true for cultural resources; Egypt and Greece are perfect examples, but some parts of France, Spain, or Italy have also been discovered in this way (OECD 2010).

For Storper et al. (1998), the local and regional search for prosperity and well-being is focused upon the sustained increases in employment, income, and productivity that remain at the heart of economic development. Beer et al. (2003) acknowledges that a "rational consensus has been reached on the concept of local and national economic development: it is a set of activities and actions that are taken to promote economic prosperity in an area". Also, promoting social participation and inclusion through tourism-oriented projects can help integrate communities and interact with socially excluded groups (European Commission 2020).

This often-dominant economic focus in local and regional development has broadened since the mid-1990s in an attempt to address social, ecological, political, and cultural concerns (Geddes and Newman 1999). In general, traditional views of regional development have focused on economic factors and resource exploitation processes. In the same way, regional tourism development is mostly measured in terms of economic components, such as increasing employment and land values (Macbeth et al. 2004). This approach usually ignores the role of the social capital of tourist host communities in local development. Therefore, this issue is one of the highlights of the present study.

Methodology

Darakeh Valley is surrounded by mountains from the east, west, and north, and the Darakeh neighbourhood is located at the foothills of the Alborz mountains. The discovery of old objects in this neighbourhood indicates its historical antiquity. Due to its special geographical location, Darakeh neighbourhood welcomes hundreds of tourists and mountaineers, especially on weekends (Darakeh Neighbourhood Council 2007). The seasonal river of Darakeh, originating from the northern heights, passes through the valley. Darakeh mountainous area is one of the most beautiful recreational

areas of Tehran province due to its natural features and high diversity of plant species (Mehrabian et al. 2005). The houses in this area are located near each other on the slopes of compactly and densely heights and they are connected by narrow and steep alley gardens (Shabani 2000). The neighbourhood of Darakeh is located in District 1 of Tehran Municipality (Figure 1). Darakeh is 800 years old and one of the old neighbourhoods of Tehran (Darakeh Neighbourhood Council 2007).

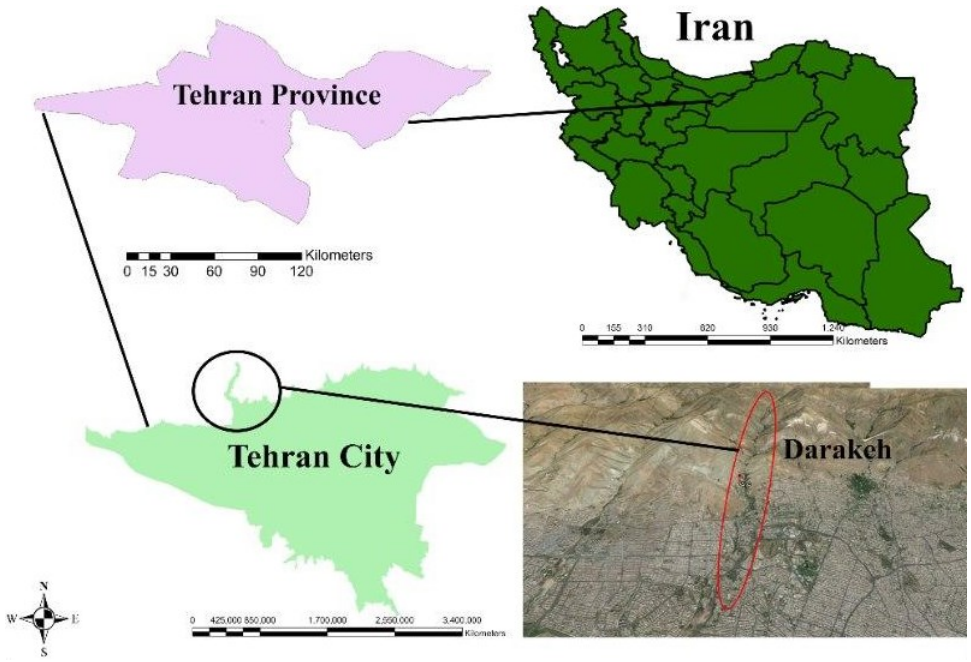

Figure 1. Location of the study area in the city and province of Tehran

The present study was conducted based on a descriptive-analytical method. The population of the Darakeh neighbourhood included 4200 people in the latest census of population and housing (Statistical Center of Iran 2011). The sample size was determined by the sampling method of sample size determination by the statistical ratio method. According to the neighbourhood population, 100 questionnaires were randomly distributed in the neighbourhood to increase the accuracy of the conformity of the sample size with a minimum sample size in the survey research. The present study aimed to analyse the role of the social capital of tourist host communities in the local development of the Darakeh neighbourhood in Tehran.

The components and items related to social capital and local development are:

I. Components and items of social capital
1.1. Neighbourhood links

- Sharing concerns about the neighbourhood problems
- Liking the neighbourhood
- The existence of sincere relationships among the neighbours

1.2. Trust

- Family members
- Neighbours and residents of the neighbourhood
- Neighbourhood Council
- Municipality

II. Components and items of local development

2.1. Partnership (mental dimension)

- The desire to participate in tourism decisions in the neighbourhood
- The attention rate of local authorities and managers to the needs and opinions of the neighbourhood residents
- Believing in the presence of women in neighbourhood decisions

2.2. Participation (practical dimension)

- Following appointments with the local directors to express neighbourhood problems
- Participating in the neighbourhood decisions
- The success rate of the municipality in providing tourism and local services

The research questions were designed in the five-point Likert scale from very low to very much, and the final variables were transformed from a sequential level to a distant level. The linear regression was used to predict and analyse the role of social capital in local development. Additionally, path analysis or the statistical method of applying standard beta coefficients of multivariate regression in structural models were used to obtain quantitative estimates of causal relationships (unilateral interaction or quartile) between a set of variables. The path analysis explains a more important or more meaningful route (Habibpour and Safari 2013). Therefore, the options and variables with an insignificant role in the variance of the dependent variables or with low beta coefficients were excluded from the final model, path analysis model, and analyses. Finally, the variables with the most important role in explaining the dependent variable were determined.

The linear regression method was used to analyse the effect of each independent variable on the dependent variables, and the path analysis method was used to evaluate the model of causal relationships between the variables. Therefore, the sum of the two components of neighbourhood links and trust was entered into the SPSS software to examine the effect of social capital on local development. Based on the results of the linear regression and the standardised regression coefficient (Table 1), the social capital with a beta coefficient of 0.62 plays a great impact on the local development of the study area. Further, given that the F value is significant in the error

level less than 0.01 (Table 2, Table 3), the independent variables have a high explanatory power, and they can explain well the variation rate and the variance of the dependent variable. Thus, the regression model is appropriate.

Table 1. The regression model of the effect of social capital on local development

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.628[a]	.394	.388	.50398

Predictors: (constant), [a] social capital

Table 2. Results of ANOVA with dependent variable: local development

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.185	1	16.185	63.723	.000[b]
	Residual	24.891	98	.254		
	Total	41.077	99			

[b] Predictors: (constant), social capital

Table 3. Results of the correlation coefficients with dependent variable local development

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.936	.206		4.543	.000
	Social Capital	.526	.066	.628	7.983	.000

Results

In the present study, the relationship between the components of social capital and local development is examined. Basically, development takes place in the social and human sense, or in the physical sense within space. This space starts with the individual and the family and it continues to the international level.

Years of experience in applying different development approaches show that due to the diversity of human societies, it is not possible to advise a single development prescription. In this regard, with the entry of sociological perspectives into the field of development, especially since the 1990s, new hypotheses to solve local problems such as poverty, unemployment, inequality, etc. were proposed. Under these circumstances, theories of social capital were proposed to strengthen local institutions and to

empower people, while creating a capacity to prosper the economic situation and the local community and to achieve development.

In a new perspective, the issue of local development entered the development debate. Local development was introduced as part of the development space and system that prioritises participatory approaches and the empowerment of local communities in a specific geographical and spatial area. In this regard, participatory approaches became more prominent (Ebrahimpour et al. 2016). As an intermediary between the city and the citizens, the role of urban neighbourhoods has also been considered (Ahad et al. 2014).

Examining the effect of neighbourhood links on local development

The share of the component of neighbourhood links in explaining the local development is 0.53 (Table 4). Considering the significance of the F value at the error level less than 0.01 (Table 5), also following the results of Table 6, it is concluded that the component of neighbourhood links has a significant statistical effect on the explanation of changes in the dependent variable.

Table 4. The regression model of the effect of neighbourhood links on local development

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.536[a]	.287	.280	.54675

[a] *Predictors: (constant), neighbourhood link*

Table 5. Results of ANOVA with dependent variable: local development

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.781	1	11.781	39.408	.000[b]
	Residual	29.296	98	.299		
	Total	41.077	99			

[b] *Predictors: (constant), neighbourhood links*

Table 6. Results of the correlation coefficients with dependent variable: local development

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.484	.175		8.465	.000
	Neighbour-hood Links	.340	.054	.536	6.278	.000

Among the items related to the component of neighbourhood links, sharing a concern with the beta coefficient of 0.45, liking the neighbourhood with a beta coefficient of 0.44, and the existence of intimate relationships with a beta coefficient of 0.42 indicated that the sharing concern is more involved in explaining the variations of the dependent variable (Figure 2).

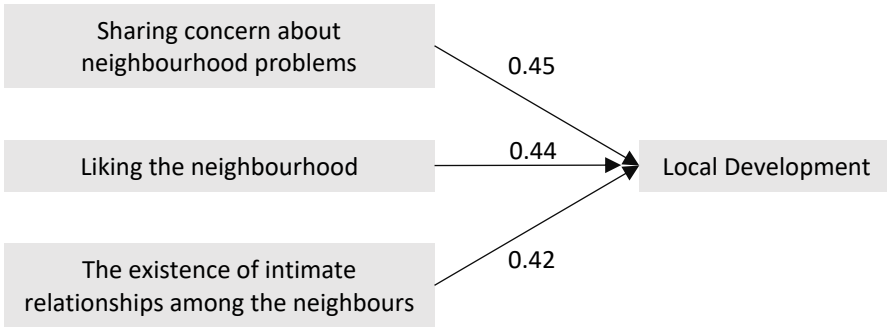

Figure 2. The path analysis model of the effect of neighbourhood links on local development in terms of triple variables

In addition, the share of the neighbourhood links in the explanation of local development in terms of mental participation and practical participation is 0.56 and 0.35, respectively (Figure 3). Therefore, neighbourhood links largely contribute to the explanation of local development in terms of mental participation.

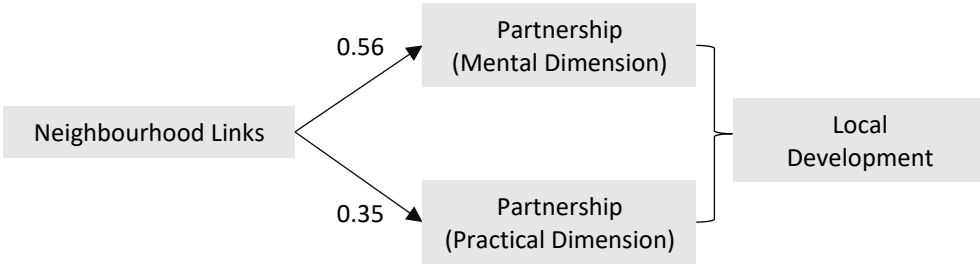

Figure 3. The path analysis model of the effect of neighbourhood links on the components of local development

Among the items related to the component of neighbourhood links, sharing a concern with the beta coefficient of 0.46, liking the neighbourhood with a beta coefficient of 0.50, and the existence of intimate relationships with a beta coefficient of 0.41 demonstrated that liking the neighbourhood share is more in explaining the variations of the dependent variable (local development in terms of mental participation). Furthermore, sharing concerns with a beta coefficient of 0.32, liking the neighbourhood with a beta coefficient of 0.25, and the existence of intimate relationships with a beta

coefficient of 0.32 are involved in explaining local development in terms of practical participation (Figure 4).

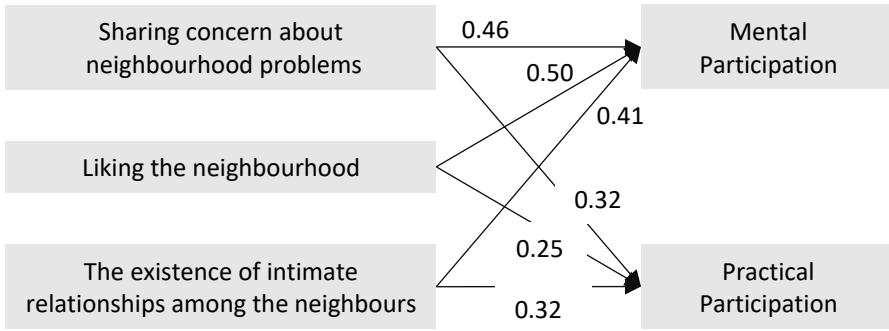

Figure 4. The path analysis model of the effect of neighbourhood links variables on the components of local development (mental participation and practical participation)

Evaluating the effect of trust on local development

Based on the results of the regression model and the standard coefficients (Table 7), the share of the component of trust in explaining the dependent variable of local development is 0.58. Therefore, due to the significance of the F value at the error level less than 0.01 (Table 8), also following the results of the correlation coefficients (Table 9), the component of trust has a significant statistical effect on explaining the variations of the dependent variable.

Table 7. The regression model of the effect of trust on local development

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.587[a]	.344	.337	.52430

[a] *Predictors: (constant), trust*

Table 8. Results of ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.137	1	14.137	51.428	.000[b]
	Residual	26.939	98	.275		
	Total	41.077	99			

[a] *Dependent variable: local development;* [b] *Predictors: (constant), trust*

Table 9. Results of the correlation coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.960	.225		4.264	.000
	Trust	.526	.073	.587	7.171	.000

[a] *Dependent variable: local development*

The contribution of trust to the local development in terms of variables indicated that trust with a beta coefficient of 0.63 can influence the mental dimension of participation, and with the beta coefficient of 0.36 it affects the practical dimension of participation (Figure 5).

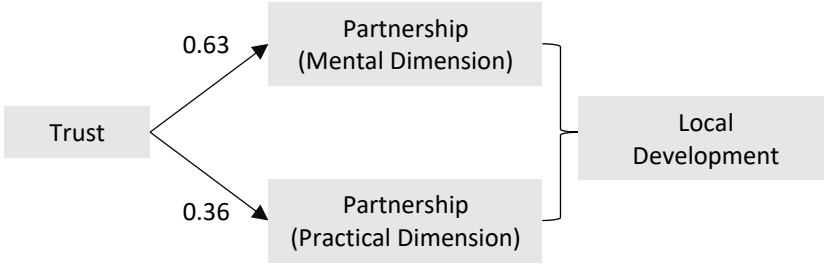

Figure 5. The path analysis model of the effect of trust on the components of local development

Trust in the neighbourhood council is very important – the share of the component of trust in the neighbourhood council in explaining the dependent variable is 0.52 (Table 10). Considering the significance of the F value at the error level less than 0.01 (Table 11), and the results of Table 12, it can be concluded that trust in the neighbourhood council with the beta coefficient of 0.52 has the largest share according to the residents' opinions and needs by the local authorities and managers. Further, trust in the neighbourhood council and municipality with a beta coefficient of 0.47 and 0.41 (Table 12) had the highest share in the success rate of the municipality, respectively.

Table 10. The regression model of the effect of trust in the neighbourhood council on the attention to the opinions and needs of the residents by the local authorities and managers

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.524[a]	.275	.267	.82401

[a] *Predictors: (constant), trust in the neighbourhood council*

Table 11. Results of ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.219	1	25.219	37.142	.000[b]
	Residual	66.541	98	.679		
	Total	91.760	99			

[a] Dependent variable: residents' opinions and needs; [b] Predictors: (constant), trust in the neighbourhood council

Table 12. Results of Correlation Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.524	.207		7.371	.000
	Trust in the Neighbourhood Council	.420	.069	.524	6.094	.000
2	(Constant)	1.268	.260		4.872	.000
	Trust in the Neighbourhood Council	.455	.087	.478	5.247	.000
3	(Constant)	1.679	.215		7.821	.000
	Trust in the Municipality	.364	.081	.415	4.518	.000

Dependent variable for each model: 1. Residents' opinions and needs; 2-3. The Success Rate of the Municipality

Trust in the neighbourhood council with a beta coefficient of 0.32 played the most role in following appointments on neighbourhood affairs. Then, trust in the neighbours and municipality had a beta coefficient of 0.28 and 0.26, respectively (Table 13). Also, the trust in the neighbourhood council with a beta coefficient of 0.34 had the largest share for the participation in neighbourhood-related decisions (Table 14). Therefore, the results indicate a significant role of trust in the neighbourhood council for the local development.

Table 13. Results of the correlation coefficients with dependent variable: Following Appointments and Neighbourhood Affairs

	Model	Standardized Coefficients	Sig.
		Beta	
1	(Constant) Trust in the Neighbourhood council	.322	.000 .004
	Trust in Neighbours	.280	.036
	Trust in the Municipality	.260	.000

Table 14. Results of the correlation coefficient with dependent variable: Participation in neighbourhood-related decisions

Model		Standardized Coefficients	Sig.
		Beta	
1	(Constant)		.000
	Trust in the Neighbourhood Council	.342	.000

Overall, the results of the statistical analysis indicate that the social capital of tourist host communities plays a significant role in local development. The sum of the results and the effect of the variables on each other are summarized in Tables 15 to 18, and graphically displayed in Figure 6.

Table 15. The effect of social capital (neighbourhood links) on local development (mental participation)

Social Capital	Path Coefficient
Neighbourhood Links	0.56
Sharing Concerns about the Neighbourhood Problems	0.46
Liking the Neighbourhood	0.50
The Existence of Sincere Relationships Among the Neighbours	0.41

Table 16. The effect of social capital (neighbourhood links) on local development (practical participation)

Social Capital	Path Coefficient
Neighbourhood Links	0.35
Sharing Concerns about Neighbourhood Problems	0.32
Liking the Neighbourhood	0.25
The Existence of Sincere Relationships among the Neighbours	0.32

Table 17. The effect of social capital (trust) on local development (mental participation)

Social Capital	Path Coefficient
Trust	0.63
Neighbours and Residents of the Neighbourhood	0.26
Neighbourhood Council	0.58
Municipality	0.55

Table 18. The effect of social capital (trust) on local development (practical participation)

Social Capital	Path Coefficient
Trust	0.36
Neighbours and Residents of the Neighbourhood	0.24
Neighbourhood Council	0.38
Municipality	**0.28**

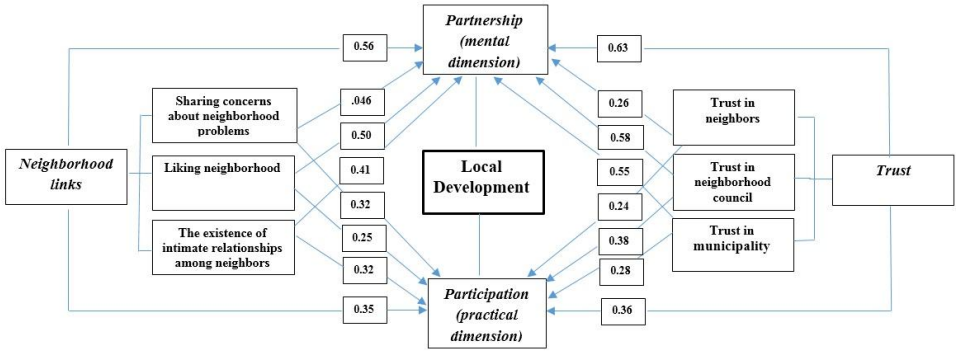

Figure 6. The path analysis model of the impact of social capital of tourist host communities in the local development

Discussion

Before examining the implications of the results, it is necessary to categorise and evaluate the approaches and studies of social capital. Capital means any asset which generates the production capability including material capital, human capital, knowledge capital, and social capital (Qodosi 2005): "social capital refers to the norms and networks contributing people to engage in collective action" (Woolcock and Narayan 2000: 225), and it pertains to the social relations between humans (Behzad 2003, Rutten et al. 2010). This was first considered by Hanifan (1916), who used the term to refer not to the personal property but to "that in life which tends to make these tangible substances count for most in the daily lives of people, namely goodwill, fellowship, mutual sympathy, and social intercourse" (Hanifan 1916). This concept was subsequently applied in the classic works of Jacobs (1961). Jacobs (1961) explained that the compact social networks in the old and mixed suburban districts constitute a form of social capital with more responsibility concerning the maintenance of cleanliness, the absence of street crime, and the decisions on improving life quality, compared to the agents of the formal institutions such as the police and the law enforcement forces (Saadat 2007).

The social capital was rooted in the works of sociologists like De Tocqueville, Durkheim, Weber, Marx, and Simmel (OECD 2001, Majedi and Lahsaeizadeh 2007, Shiani and Mousavi 2011). Over the past decades, Coleman (1988) and Putnam (1993) were given abundant credit to the term "social capital" (Sharifian-Sani 2002, Macbeth et al. 2004). According to Coleman (2000), social capital encompasses a variety of categories with two basic components: they all involve some aspects of social structures, and they facilitate certain actions of the actors – whether individuals or institutional actors – within the structure.

However, the social capital of the actors of the society, whether in the traditional society or in the modern society today, has an individual character and it is at the disposal of the actor (Ejtehadi 2007). But the initial formation of social relations and neighbourhoods takes place face to face in space, the continuation of which eventually leads to the emergence of social capital (Khakpoor and Pyri 2006).

In a sense, the views and studies of social capital can be divided into two categories. First, the studies that examine the totality of small or large human groups, such as school, city, and society, and focus on "social convergence" and "social solidarity" (Hanifan 1916, Putnam 1993, Putnam 1995, Fukuyama 2001).

For Putnam (1995), social capital involves trust, norms, and networks that facilitate co-operation to gain common benefits. Such an approach fails to recognize the role of the state in strengthening social capital by integrating competing factions within a comprehensive dialogue and reducing social inequalities through welfare policies (Macbeth et al. 2004).

Fukuyama (1999a) also sees the root of many social problems in the absence of social capital. The component of trust and its importance in Fukuyama (1995)'s research is also important (Sharifian-Sani 2002). Fukuyama (1995) sees social capital as inconsistent with government involvement: "cultures inclined toward voluntary associations (...) can create large economic organisations spontaneously and do not need the state's support" (Fukuyama 1995). Fukuyama (1999b) examines the relationship between social capital and civil society. In general, the Putnam (1993) and Fukuyama (1995) approach can be placed at the macro level, and Bourdieu (1986)'s view at the micro level (Ghaneirad and Hosseini 2005).

Trust is one of the elements of civil society and it plays a role in the interaction between the state and the people (Mousavi et al. 2012). Trust is critical to the well-being of citizens. Of course, interpersonal trust is not just a matter of economic issues. People seem to have more satisfying lives when they live in an environment of trust and trustworthiness, and when they are more trusting and trustworthy themselves, even controlling for income (Algan 2018).

Evidence shows that, in an integrated community, transaction costs (costs of information, monitoring contracts, conflicts) are considerably reduced due to the extension of trust networks. Moreover, societies with high levels of trust can overcome agency problems more easily (Gnesi 2010). For example, transaction costs may be lowered as a result of cooperation and trust embodied in inter-firm or intra-firm networks. Trust is likely to reduce the cost of negotiations, incomplete information, and inessential bureaucracy (OECD 2001). Furthermore, social capital at the individual/household level will facilitate access to the market and it will increase income through markets because outside connections and networks are also included in the social capital (Sakurai 2006). In the present study, trust in the neighbourhood council as the elected institution of the people was more than trust in the municipality as a government institution whose members are appointed. Although the residents collaborate with the municipality to advance local projects, if city managers keep their promises and interact more with the local communities, it will also increase social capital and reduce the service costs.

Second, there are the researchers who, by analysing the relationship between the individual and the society, have once again introduced the concept of "social structure" and its impact on the individual and his behaviours (Bourdieu 1986, Coleman 1988, Coleman 2000).

Bourdieu (1986) considers social capital as a relatively durable network of more or less institutionalised relationships with cognition and commitments like mutual trust. He was one of the first theorists to extend the concept of capital beyond the economic sphere with its emphasis on material exchange, including non-economic forms of capital, such as cultural and social capital. According to Bourdieu (1986), capital is represented in four basic forms, each of which can be exchanged or 'cashed in' for any other form. These are economic, cultural, social, and symbolic capital.

Bourdieu's approach emphasises the role of the individual, which implies the need to investigate the networks and investment in social relations (Righi 2013). He postulates that social capital reproduces inequality in a particular way by allowing some people to mobilise capital for their benefit by taking out of the picture the vulnerable populations (Manzano Nunez 2016). In sum, Bourdieu (1986)'s approach is concerned with both content and context, offering wide-ranging theoretical insights into class dynamics (as well as many other issues) and nuanced analyses of how people understand and navigate through cultural distinctions, and it is inconveniently complex for a policy idea intended to be generally applicable (Smart 2008).

Many international organisations consider social capital as an important tool of economic policies, and they invest in its production and measurement. Some institutions also have played a role in the normalisation of social capital. The international financial institutions ground their development strategies in developing

countries on strengthening the civil society and social participation, considering social capital as a tool to alleviate poverty and inequality (Gnesi 2010). The World Bank (1998) explicitly considers social capital as a policy tool. The Social Capital Initiative, launched in 1996, operationalized the concept of social capital, carrying out many research activities on definition and measurement issues. Besides, local development projects funded by the World Bank are largely based on the strengthening of voluntary organisations, as a means to promote the effective management of public services and common-pool resources (World Bank 1998).

The World Bank (1998) has wholeheartedly embraced social capital as it has attempted to move beyond the so-called Washington Consensus of global deregulation and market promotion (Smart 2008). The World Bank (1998) identified the social capital of society as including the institutions, relationships, attitudes, and values that govern the interactions among people and contribute to economic and social development. The study found that social capital is not just the sum of the institutions that make up the foundation of the society, but it also acts as a glue that binds them together. It includes the shared values and rules for social conduct expressed in personal relationships, trust, and a common sense of 'civic' responsibility that creates society as more than just a collection of persons (World Bank 1998).

United Nations (2008) focused on two important areas: 1) the ability of a society to work together, 2) a stable political, legal, and cultural framework. Therefore, the indicators that focus on linking and bridging the networks would seem most relevant to the SC approach (United Nations 2008).

OECD (2001, 2013b) has identified the difference between social capital and other types of capital. Firstly, social capital is relational rather than the property of any one individual, whereas some other forms of capital (human, produced economic and natural) can either belong to or be appropriated by individuals or businesses. Also, important is that social capital is created by societal investments of time and effort, but less directly than it is the human or produced economic capital.

In total, the results showed that institutions, especially local institutions such as councils, have an important role in increasing the people's participation in neighbourhood affairs and thus improving tourism and local development. Thus, as Coleman (1998) points out, the capacity of the social structure and social environment facilitates certain actions of actors. Of course, although Bourdieu (1986) and Coleman (1988) emphasise the intangible nature of social capital compared to other forms of capital, the results of the present study showed that by strengthening social capital, local development can be witnessed, especially in the practical dimension. The present paper confirms Hwang's (2012) research on the role of social capital in local development. At the same time, classifying participation in both mental and objective dimensions is one of the highlights and benefits of our study.

The results of the article also indicate that the amount or size of social capital in the process of a social relationship can increase or decrease; increasing and "accumulating" this capital creates goodwill and mutual trust among the actors. This is in line with the views of Hanifan (1916) and Coleman (1990).

Uphoff (2000) also divides social capital into two categories: (a) structural, and (b) cognitive. These categories are fundamental for understanding social capital. The structural category is related to various forms of social organisation, particularly roles, rules, precedents, and procedures, and also to a wide variety of networks that contribute to cooperation, and specifically to mutually beneficial collective action, which is the stream of benefits that results from social capital. The cognitive category derives from mental processes and resulting ideas, reinforced by culture and ideology, norms, values, attitudes, and beliefs that contribute to cooperative behaviour (Uphoff 2000). In this research, both aspects have been considered and, as Uphoff (2000) points out, the existence and continuity of each of these two types of social capital is problematic without the other, and the two are interrelated. Of course, contrary to Ostrom (2000)'s view that emphasises the role of large-scale institutions in facilitating social capital, micro-scale institutions including the neighbourhood council played an important role in this study.

In a more useful and comprehensive division, Woolcock and Narayan (2000) distinguish between four basic approaches to the social capital theory. The communitarian perspective equates social capital with such local organisations as clubs, associations, and civic groups. The networks' view, which attempts to account for both its upside and its downside, stresses the importance of vertical as well as horizontal associations between people and of relations within and among such organisational entities as community groups and firms. The institutional view argues that the vitality of community networks and the civil society is largely the product of the political, legal, and institutional environment.

It should be noted that neither the state nor societies are inherently good or bad; governments, corporations, and civic groups are variable in the impact that they can have on the attainment of collective goals. States, firms, and communities alone do not possess the resources needed to promote broad-based, sustainable development; complementarities and partnerships forged both within and across these different sectors are required. So, some scholars have recently proposed what might be called a synergy view, which attempts to integrate the compelling work emerging from the networks and institutional camps.

Therefore, in this research, the municipal institution was considered as a representative of the government at the local level, the neighbourhood council as a symbol of the civil society and elected by the people, and the local community as urban cells and the

smallest scale of urban planning, while the people's connections with each other and their trust were measured at different levels.

However, social capital in different countries has had certain results and consequences. In East Asia, governments have also invested in social capital by creating policies that provide an enabling environment for growth. In a study of Italy, Putnam et al. (1993) argue that a large number of voluntary associations among the people in Northern Italy explains the region's economic success. Switzerland, where the cantons joined in a confederation that supported the common objective of creating a sovereign state, offers an example of successful micro and macro level interaction. Local institutions are not initially required to share norms among themselves, other than the norm that is also common to the macro institution. But cohesion is likely to improve (through bonding and overlapping norms at the local level) as institutions work toward a common objective. This mutually reinforcing interaction between the micro and macro levels increases the stock of social capital. The transition economies of Eastern Europe and the former Soviet Union provide a dramatic instance of the importance of a constructive interaction between macro and micro level social capital and the costs of the absence of such interaction (Serageldin and Grootaert 2000).

It is necessary to mention that the study of the evolution and measurement of social capital, due to the qualitative and abstract nature of the concept of social capital, and finding a definite and acceptable number to express the social capital available in a large and complex society like Iran, it is not impossible, but it is a very difficult task, and especially if the available resources are not to be reliable the problem will be doubled. In many countries of Western Europe and North America, a lot of required information is collected through surveys called "public social surveys", as well as censuses that are conducted regularly and at short intervals. Unfortunately, information is not produced regularly in Iran and there is only one project surveying the values and attitudes of the population, which was carried out in 2000 and 2003, but relying on its data cannot give a complete picture of the long-term changes of the Iranian society.

Therefore, to explain the status of social capital in Iran, one should refer to upstream documents such as the 20-year vision document (Salehi Amiri and Amir 2013). On this horizon, the Iranian society is to be developed in accordance with its cultural, geographical, and historical requirements and based on ethical and Islamic, national, and revolutionary principles and values with an emphasis on religious democracy, social justice, legitimate freedoms, protection of human dignity and rights, and benefiting from social and judicial security. Additionally, it is envisaged for Iran to have advanced knowledge, and the ability to produce science and technology (Islamic Parliament Research Center 2003).

At the micro level, research also indicates a decrease in social capital in Iran (Tajbakhsh et al. 2003, Souri 2005, Abdolahi and Moosavi 2007, Dini Torkamani 2007). The results of the above research show that old or intra-group social capital (among acquaintances) is more than new, as well as inter-group social capital (among strangers). As we move from the family level to higher levels, i.e. relatives, friends, colleagues, neighbours, fellow citizens and compatriots, the number of social capital decreases, which is consistent with the results of the present study. Accordingly, regarding local development, the trust should be generalised from blood-related and informal relations toward formal and institutional levels. Therefore, the findings of this article confirm the results of the World Bank (1998) and the OECD (2013b). It is worth noting that trust in the neighbourhood council played the greatest role in the success of the municipality in providing local and tourism services, indicating the interaction of the residents with this institution and the important role of this local institution in promoting and realising local development. All these cases indicated that increasing trust also can play a role in reducing costs, which in turn corroborates with the results of the OECD (2001) and Gnesi (2010).

As Putnam (1993) points out, part of this refers to the ability of the individuals to build "bonds" within their group and "bridges" to other groups and it is deeply tied to the belief that the quality and quantity of group activity are key sources of a community's strength and its ability to work for its betterment. As explained in this article, the component of neighbourhood links has played an important role in social capital, which is related to the cognitive social capital, and it is necessary that the governing institutions also play a more important role as mediators in this field, and they need to have more interaction and synergy with the local community. In total, if the organisational structure is more horizontal, its institutional success rate will increase in social participation.

Conclusions

The present study aimed to evaluate the role of the social capital of tourist host communities in the local development in the Darakeh neighbourhood, which is located in district 1 of Tehran. Based on the extensive research conducted in this article, it can be said that in most studies, social capital is considered either as an individual characteristic, which emphasises relationships and, according to Bourdieu (1986), it is exchangeable, or as an attribute of a society (OECD 2013b), which focuses on the role of networks that facilitate co-operation to gain common benefits (Putnam 1995, OECD 2001) and, to govern the interactions among people and to contribute to economic and social development (World Bank 1998). Within this approach, social capital is based on interpersonal and generalised trust. But the present study focuses on both features of social capital.

Social capital, with the components of trust and neighbourhood links, and local development, with the component of mental and practical participation, were examined by using the regression analysis. Finally, the path analysis model was drawn. The results indicated that the social capital of tourist host communities plays a role in the local development, based on the components of neighbourhood links and trust. Of course, classifying participation in both mental and objective dimensions is one of the highlights and benefits of our study.

In general, the components of neighbourhood links and trust played a greater role in explaining local development, especially in terms of mental participation. By separating the variables of neighbour links, sharing concerns about the problems in the neighbourhood with the residents could play a higher role in the local development. However, among the variables of the component of neighbourhood links, liking the neighbourhood and sharing the concerns played the most important role in the local development in terms of the mental dimension of participation. Therefore, only sharing the concerns about the problems of the neighbourhood is not sufficient for the residents' willingness for participating and paying attention to the problems of the neighbourhood by the local authorities and managers. Thus, liking the neighbourhood by the residents played the main role in local development in terms of mental participation. Among the components of neighbourhood links, sharing concerns, along with the existence of intimate relationships among the residents could significantly influence the local development in terms of a practical dimension. Therefore, the existence of the intimate relationship along with other options including the sharing concerns about neighbourhood issues is very important for following the appointments to address the neighbourhood problems and participating in making decisions and the success of the municipality in providing local services and tourism.

Regarding the component of trust, the results of the linear regression indicated the effect of trust on local development, especially from the perspective of the mental dimension of participation. Among the options of trust, trust in the family and the neighbours could slightly affect the local development in mental and practical dimensions of participation. Accordingly, regarding local development, trust should be generalised from blood-related and informal relations toward formal and institutional levels.

The significant role of the neighbourhood council in the local development could enhance its importance in responding to the citizens and developing neighbourhoods, compared to the other options. The results of the analysis showed that the trust in the neighbourhood council and municipality had the greatest role in the residents' willingness to participate in the neighbourhood decisions regarding mental participation, following appointments with the local managers to express the neighbourhood issues, and participating in the neighbourhood decisions. It is worth

noting that trust in the neighbourhood council played the greatest role in the success of the municipality in providing local and tourism services, indicating the interaction of the residents with this institution and the important role of this local institution in promoting and realising local development.

All these cases indicated that increasing trust can also play a role in reducing costs. Hence, trust is considered as the foundation of sincere relationships, and, together with other options such as sharing the neighbourhood problems and following appointments to express neighbourhood problems, it is leading to the realisation of sustainable local development in conjunction with neighbour links. So, the presence of local managers in the neighbourhood and the creation of public spaces can contribute to the continuation and enhancement of the motivation among the neighbourhood residents to pursue neighbourhood affairs and to participate in its practical dimension. Finally, the municipality and council can benefit from this potential to provide better service to tourists. Overall, this paper demonstrated the role of social capital in local development which was examined and approved in the context of a developing country, and therefore it is necessary to follow this issue by other researchers.

References

ABDOLLAHI M. (2004) Social development, Journal for Management and Development Process 18 (4), 14-21.

ABDOLAHI M., MOOSAVI M. (2007) Social capital in Iran: Current Status, Prospect, and Feasibility, Social Welfare Quarterly 6 (25),195-234.

AHAD N. R. M., YARIGHOLI V., OJAGHLO R. (2014) The Role of Social Capital in Sustainable Local Development: A Case Study of Tehran Narmak Neighborhood, Urban Studies 4 (12), 25-50.

AKBARI G. (2006) Social capital and urban governance, Geographical Researches 83, 135-154.

ALGAN Y. (2018) Trust and social capital, in: Stiglitz J., Fitoussi J.-P., Durand M. (eds.), For good measure: advancing research on well-being metrics beyond GDP, OECD Publishing, Paris, pp. 283-320.

ALEXANDER M. (2007) Determinants of social capital: new evidence on religion, diversity and structural change, British Journal of Political Science 37 (2), 368-377.

AZKIA M., FIROOZABADI S. A. (2004) Social capital and its role in manufacturing organizations (Case study of Karkheh watershed), Iranian Journal of Sociology 5 (4), 49-72.

BEER A., HAUGHTON G., MAUDE A. (eds.) (2003) Developing locally: An international comparison of local and regional economic development, Policy Press, Bristol.

BEHZAD D. (2003) Social capital: As a context for mental health promotion, Social Welfare Quarterly 2 (6), 43-53.

BOURDIEU P. (1986) The forms of capital, in: Richardson J. G. (ed.), Handbook of theory and research for the sociology of education, Greenwood Press, New York, pp. 241-258.

COLEMAN J. S. (1988) Social capital in the creation of human capital, American Journal of Sociology 94 (S), S95-S120.

COLEMAN J. S. (1998) Foundations of social theory, Harvard University Press, Cambridge.

COLEMAN J. S. (2000) Social capital in the creation of human capital, in: Dasgupta P., Serageldin I. (eds.), Social capital: A multifaceted perspective, The World Bank, Washington, D.C., pp. 13-39.

DARAKEH NEIGHBOURHOOD COUNCIL (2007) Identity document of the neighbourhood of Darakeh, Retrieved from: www.tehran.ir.

DE ANDRADE BOCK I. A., MACKE J. (2014) The social capital and the development of collaborative networks in the tourism sector: a case study on The Grupo Gestor do Turismo Rural do Rio Grande do Sul (Rural Tourism Steering Group) - RS, Brazil, Revista Brasileira de Pesquisa em Turismo 8 (1), 23-41.

DINI TORKAMANI A. (2007) An Explanation for Falling of Social Capital in Iran, Social Welfare Quarterly 6 (23), 147-172.

EBRAHIMPOUR H., NEMATI V., BADFAR S. (2016) Local development (participation, empowerment, social capital), First National Conference on Geography, Ardabil, Retrieved from: www.civilica.com.

EJTEHADI M. (2007) Social Capital, Human Sciences 53, 405-416.

EUROPEAN COMMISSION (2020) Study on the contribution of tourism to local and regional development - evidence from the European Structural and Investment Funds 2012-2018, Publications Office of the European Union, Brussels.

FUKUYAMA F. (1995) Trust: The social virtues and the creation of prosperity, The Free Press, New York.

FUKUYAMA F. (1999a) The great disruption: Human nature and the reconstitution of social order, The Free Press, New York.

FUKUYAMA F. (1999b) Social capital and civil society, IMF Conference on Second Generation Reforms, International Monetary Fund, Retrieved from: https://www.imf.org/-/media/Websites/IMF/imported-full-text-pdf/external-/pubs/ft/wp/2000/_wp0074.ashx

FUKUYAMA F. (2001) Social capital, civil society and development, Third World Quarterly 22 (1), 7-20.

GEDDES M., NEWMAN I. (1999) Evolution and conflict in local economic development, Local Economy 14 (1), 12-26.

GHANEIRAD M., HOSSEINI F. (2005) Values, network relationships, and participation in non-governmental organization (an empirical study among the Tehran's youths), Iranian Journal of Sociology 6 (3), 97-123.

GNESI C. (2010) Social capital and local development: an application of the social network analysis to the XI and XVI boroughs of Rome, Roma Tre University, Retrieved from: arcadia.sba.uniroma3.it.

HABIBPOUR K., SAFARI R. (2013) SPSS application guide for surveying research (quantitative data analysis), Loya, Tehran.

HANIFAN L. J. (1916) The rural school community center, The ANNALS of the American Academy of Political and Social Science 67 (1), 130-138.

HWANG D. (2012) Influence of social capital of community-based action in tourism development: a study of social network analysis, University of Illinois, Retrieved from: www.ideals.illinois.edu.

HWANG D., STEWART W. P., KO D. (2012) Community behavior and sustainable rural tourism development, Journal of Travel Research 51 (3), 328-341.

INTERNATIONAL TRADE CENTRE (2009) Tourism-led Poverty Reduction Programme, International Trade Centre, Retrieved from: www.intracen.org.

ISLAMIC PARLIAMENT RESEARCH CENTER (2003) The perspective of the Islamic Republic of Iran on the horizon of 1404 SH, The Parliament of Iran, Retrieved from: rc.majlis.ir.

JACOBS J. (1961) The death and life of great American cities, Random House, New York.

KC B., MORAIS D. B. (2014) Assessment of social capital in tourism micro-entrepreneurship: people-first tourism (P1T) context, TTRA 2014 International Conference: Tourism and the New Global Economy, 646-650.

KHAKPOR B., MAFI E., BAVAN POURI A. (2009) The role of capital in the regional stable development case study: Sajjad area in Mashhad, Journal of Geography and Regional Development 7 (12), 55-81.

KHAKPOOR B., PIRY I. (2006) City social pathology and the role of citizens' social and physical capital in reducing it, a geographical perspective, Journal of Social Sciences 1 (2), 13-30.

MACBETH J., CARSON D., NORTHCOTE J. (2004) Social capital, tourism and regional development: SPCC as a basis for innovation and sustainability, Current Issues in Tourism 7 (6), 502-522.

MAJEDI S. M., LAHSAEIZADEH A. A. (2007) Relationships between contextual variables, social capital and satisfaction from quality of life: a case study in rural areas of Fars Province of Iran, Village and Development 9 (4), 91-135.

MANZANO NUNEZ R. (2016) Linking social capital: a forgotten component of social capital, Journal of Epidemiology & Community Health 70 (5), 526.

MCGEHEE N. G., LEE S., O'BANNON T. L., PERDUE R. R. (2010) Tourism-related social capital and its relationship with other forms of capital: an exploratory study, Journal of Travel Research 49 (4), 486-500.

MEHRABIAN A. R., YOUSEFZADI M., ZAHZAD B., SONBOLI A., PARSIAN H. (2005) Diversity of plant species in Evin-Darakeh mountainous region, Environmental Sciences 2 (7), 13-27.

MOSCARDO G., SCHURMANN A., KONOVALOV E., MCGEHEE N. G. (2013) Using tourism to build social capital in communities: New pathways to sustainable tourism futures, BEST EN Think Tank XIII: Engaging Communities in Sustainable Tourism Development, 219-236.

MOSCARDO G., KONOVALOV E., MURPHY L., MCGEHEE N. G., SCHURMANN A. (2017) Linking tourism to social capital in destination communities, Journal of Destination Marketing & Management 6 (4), 286-295.

MOUNTFORD D. (2009) Organising for local development: the role of local development agencies, OECD, Retrieved from: www.oecd.org.

MOUSAVI M. N., GHANBARI H., ESMAEILZADEH K. (2012) Spatial analysis of the relationship between social capital and urban sustainable development. Case Study: cities of West Azarbaijan province, Geography and Development Iranian Journal 10 (27), 51-62.

NARAYAN D., CASSIDY M. F. (2001) A dimensional approach to measuring social capital: development and validation of a social capital inventory, Current Sociology 49 (2), 59-102.

NUNKOO R. (2017) Governance and sustainable tourism: What is the role of trust, power and social capital? Journal of Destination Marketing & Management 6 (4), 277-285.

OECD (2001) The well-being of nations: The role of human and social capital, OECD Publishing, Paris.

OECD (2010) OECD LEED Policy review on: "Sustainable tourism and local development in Apulia region", Retrieved from: www.oecd.org.

OECD (2013a) Delivering local development: new growth and investment strategies, OECD Publishing, Paris.

OECD (2013b) How's Life? 2013: measuring well-being, OECD Publishing, Paris.

OECD (2020) OECD Tourism trends and policies 2020, OECD Publishing, Paris.

OSTROM E. (2000) Social capital: a fad or a fundamental concept? in: Dasgupta P., Serageldin I. (eds.), Social capital: A multifaceted perspective, The World Bank, Washington, D.C., pp. 172-214.

PONGPONRAT K., CHANTRADOAN N. J. (2012) Mechanism of social capital in community tourism participatory planning in Samui Island, Thailand, Tourismos: An International Multidisciplinary Journal of Tourism 7 (1), 339-349.

PRAMANIK P. D., INGKADIJAYA R., ACHMADI M. (2019) The role of social capital in community based tourism, Journal of Indonesian Tourism and Development Studies 7 (2), 62-73.

PUTNAM R. D. (1993) The prosperous community: social capital and public life, The American Prospect 4 (13), 35-42.

PUTNAM R. D. (1995) Tuning in, tuning out: The strange disappearance of social capital in America, PS: Political Science & Politics 28 (4), 664-683.

PUTNAM R. D., LEONARDI R., NONETTI R. Y. (1993) Making democracy work: Civic traditions in modern Italy, Princeton University Press, Princeton.

QODOSI H. (2005) The relationship between social capital and economic development from the perspective of institutionalism, The University of Social Welfare and Rehabilitation Sciences, Tehran.

RASTEGAR M., HATAMI H., MIRJAFARI R. (2017) Role of social capital in improving the quality of life and social justice in Mashhad, Iran, Sustainable Cities and Society 34, 109-113.

REZAZADEH M. H., ZEHI F. H., RAD R. E. (2016) The study of moderating role of social capital in the relationship between the development of urban tourism and sustainable urban development (case study: Zahedan), Current Urban Studies 4 (4), 461-475.

RIGHI A. (2013) Measuring social capital: Official statistics initiatives in Italy, Procedia - Social and Behavioral Sciences 72, 4-22.

RUTTEN R., WESTLUND H., BOEKEMA F. (2010) The spatial dimension of social capital, European Planning Studies 18 (6), 863-871.

SAADAT R. (2007) The estimation of level and distribution of social capital in Iran's provinces, Social Welfare Quarterly 6 (23), 173-195.

SAKURAI T. (2006) Role of social capital in economic development: evidence and issues, in: Yokoyama S., Sakurai T. (eds.), Potential of social capital for community development, Asian Productivity Organization, Tokyo, pp. 217-235.

SALEHI AMIRI S. R., AMIR S. E. H. (2013) Strategies for promoting social capital in the country according to the 20-year vision document of the system, Strategy 22 (66), 61-84.

SERAGELDIN I., GROOTAERT C. (2000) Defining social capital: an integrating view, in: Dasgupta P., Serageldin I. (eds.), Social capital: A multifaceted perspective, The World Bank, Washington, D.C., pp. 40-58.

SHABANI N. (2000) Spatial planning and leisure activities in the mountain valleys with emphasis on environmental sensitivities, case study: Northern District of Darakeh, Shahid Beheshti University, Tehran.

SHARIFIAN-SANI M. (2002) Social capital: main concepts and theoretical framework, Social Welfare Quarterly 1 (2), 5-18.

SHIANI M., MOUSAVI M. T. (2011) Analyzing the social capital status in Kerman city, Social Welfare Quarterly 11 (41), 93-122.

SMART A. (2008) Social Capital, Anthropologica 50 (2), 409-416.

SOURI A. (2005) Social capital and economic performance, Journal of Economic Research 69, 87-108.

STATISTICAL CENTER OF IRAN (2011) Population and Housing Census 2011, Retrieved from: www.amar.org.ir.

STORPER M., THOMADAKIS S. B., TSIPOURI L. J. (1998) Latecomers in the global economy, Routledge, London.

TAJBAKHSH K., SAGHAFI M., KOHESTANINEJAD M. (2003) Social capital and social policy (Social capital investigation in Iran, todays), Social Welfare Quarterly 3 (10),155-200.

UNITED NATIONS (2008) Measuring sustainable development, United Nations, Retrieved from: www.oecd.org.

UPHOFF N. (2000) Understanding social capital: learning from the analysis and experience of participation, in: Dasgupta P., Serageldin I. (eds.), Social capital: A multifaceted perspective, The World Bank, Washington, D.C., pp. 215-249.

WOOLCOCK M., NARAYAN D. (2000) Social capital: Implications for development theory, research, and policy, The World Bank Research Observer 15 (2), 225-249.

WORLD BANK (1998) The Initiative on defining, monitoring and measuring social capital: Overview and program description, The World Bank, Retrieved from: www.worldbank.org.

ZHAO W., RITCHIE J. R. B., ECHTNER C. M. (2011) Social capital and tourism entrepreneurship, Annals of Tourism Research 38 (4), 1570-1593.

Journal of Urban and Regional Analysis 14–1 (2022): 129–153, https://doi.org/10.37043/JURA.2022.14.1.7

DEFINING AND DEVELOPING A RURALITY INDEX FOR TURKEY

Onur Sungur, Merve Kılınç Yılmaz

Burdur Mehmet Akif Ersoy University, Burdur, Turkey

Abstract: Correctly defining the term "rural" and determining the rurality level of provinces/regions are very important for effective regional/rural planning. A well-defined and consistent rurality index will be useful in putting forward the current rurality level of regions and in implementing appropriate rural development policies. In this study, a rurality index was developed, and the rurality level was calculated at provincial level in Turkey. As Multi-Criteria Decision-Making techniques, Entropy and TOPSIS methods were used in the study. Eighteen variables were used under four sections, which are: (1) demographic, (2) economic, (3) agriculture and livestock activities, and (4) urbanisation and infrastructure. Provinces were ranked and divided into five categories according to their rurality level and a rurality map was created for Turkey. It is also expected that the results would be useful for policy makers.

Keywords:

rural development;
rural area;
rurality index;
entropy;
TOPSIS;
Turkey

Email: kilink.merve.003@gmail.com

Initial submission: 06.04.2020; Revised submission: 21.10.2020; Final acceptance: 22.12.2020

Introduction

The term "rural area" needs to be well understood and defined for rural planning and rural development policies. Effective rural development policies need to be based on an accurate and consistent classification of the main characteristics of different regions. Developing a consistent rurality index and defining the territories by their rurality levels is important for the identification of both needs and opportunities of rural areas (Li et al. 2015). Historically, rural development and rural areas have been primarily associated with non-urbanization and agriculture. However, Isserman (2005) gives an example of the Grand Canyon, USA. The Grand Canyon is in metropolitan America, and, at the same time, it has more than a million farmers. Therefore, the separation of territories as town or country, rural or urban does not reflect the complex reality of today (Isserman 2005).

A thorough and accurate understanding of the main characteristics of different rural areas and the classification of rural areas by their rurality levels can provide important information for decision-makers and policymaking. In other words, more knowledge on rurality allows more inclusive policies in regional/rural planning (Temel 2013, Li et al. 2015).

Turkey, as a developing country, has been struggling with regional imbalances for a long time. Since the beginning of the planned development period in 1963, many plans, programs, projects, and policies have been put into practice to decrease the regional disparities. Regional development plans, provincial development plans, the local-regional-sectoral incentive system, and the Priority Regions in Development (PRD) are the first initiatives that come to mind among the tools that have been implemented so far for a balanced regional development in Turkey. In addition, the National Rural Development Strategy (NRDS) 2014-2020 is an important strategy for achieving rural development and reducing rural to urban migration (Turkish Republic Ministry of Agriculture and Forestry 2015). However, as explicitly stated in the NRDS, there is any rurality index showing which areas in Turkey are defined as "rural" (Turkish Republic Ministry of Agriculture and Forestry 2015). In this context, the necessity of the production of a new definition of rural areas is also evaluated within the scope of NRDS: "in addition to the study to define what a rural area is, a general rurality index study will be conducted for rural areas at province and district level if needed" (Turkish Republic Ministry of Agriculture and Forestry 2015: 15).

Defining rural areas in a consistent way is an important issue for Turkey. Because the rural population, the rural employment (agricultural employment) and the size of rural economic activities (agriculture and farming) still have great importance for the economy of Turkey. According to the Turkish Statistical Institute (TUIK), nearly 8% of Turkey's total population (6.4 million people) live in villages (in other words, in rural

areas) and 18% of the total employment (about 5.3 million people) are employed in the agricultural sector by the year 2018 (Table 1). As of 2017, the share of the agricultural sector in GDP is 6%. In addition, according to World Bank Data, the rural population in Turkey is 24% by the year of 2019.

Table 1. Population of province/district centers and towns/villages by years

Year	Total population	Province and district centres	Share (%)	Towns and villages	Share (%)
1927	13 648 270	3 305 879	24.2	10 342 391	75.8
1940	17 820 950	4 346 249	24.4	13 474 701	75.6
1950	20 947 188	5 244 337	25.0	15 702 851	75.0
1960	27 754 820	8 859 731	31.9	18 895 089	68.1
1970	35 605 176	13 691 101	38.5	21 914 075	61.5
1980	44 736 957	19 645 007	43.9	25 091 950	56.1
1990	56 473 035	33 326 351	59.0	23 146 684	41.0
2000	67 803 927	44 006 274	64.9	23 797 653	35.1
2007	70 586 256	49 747 859	70.5	20 838 397	29.5
2008(*)	71 517 100	53 611 723	75.0	17 905 377	25.0
2009	72 561 312	54 807 219	75.5	17 754 093	24.5
2010	73 722 988	56 222 356	76.3	17 500 632	23.7
2011	74 724 269	57 385 706	76.8	17 338 563	23.2
2012	75 627 384	58 448 431	77.3	17 178 953	22.7
2013(**)	76 667 864	70 034 413	91.3	6 633 451	8.7
2014	77 695 904	71 286 182	91.8	6 409 722	8.2
2015	78 741 053	72 523 134	92.1	6 217 919	7.9
2016	79 814 871	73 671 748	92.3	6 143 123	7.7
2017	80 810 525	74 761 132	92.5	6 049 393	7.5
2018	82 003 882	75 666 497	92.3	6 337 385	7.7

(*) Differences in the population of "province and district centres" and "towns and villages" compared to the previous year resulted from the administrative division changes regulated by the Law no. 5747.

(**) Differences in the population of "province and district centres" and "towns and villages" compared to the previous year resulted from the administrative division changes regulated by the Law no. 6360.

Source: Turkish Statistical Institute (TUIK)

This study aims to develop a rurality index at provincial level for Turkey. As we know, to our knowledge, this study is the first attempt to calculate the rurality index at

provincial level in Turkey. By doing so, we aim to present the current rural situation of Turkey at provincial level, to obtain comparable results among the provinces by rurality levels, and to provide useful information to policy makers for rural development policies. The following steps have been implemented in the study to define, to develop and to calculate the rurality of provinces in Turkey:

- Similar studies were examined, and the data set was generated. At this stage, new variables that have not been used before were added to the data set as well as the variables obtained from similar studies.
- The appropriate analysis method was chosen according to the purpose of the study.
- In the first stage of the analysis, the importance of the criteria was calculated. In the second stage, using the importance levels in the decision-making analysis, the rurality levels of the provinces were calculated.
- In the last stage, Turkey's provinces, based on their rurality levels, were grouped and mapped in five different categories.

Defining rural areas and measuring rurality

The concept of "rural development" has gained importance especially in the last 15-20 years. The search for improving the living conditions and the welfare of rural people has gained momentum recently in connection with the strategies developed to create an environment for those people that live in prosperity (Kaypak 2012). In the period after the 1950s, rural areas have undergone significant changes/challenges and their importance in regional development has gradually increased (İnal Çekiç and Ökten 2009). Basically, agricultural development is concerned with improving the living conditions and economic well-being of farmers, herders, and agricultural workers. It mainly focuses on the utilisation of land-intensive natural resources such as agriculture, livestock, forestry, and fisheries. It includes improving agricultural resources (such as land, irrigation, human capital, and rural infrastructure), agricultural services, agricultural incentives, and technologies (International Fund for Agricultural Development 2016).

Rural development, on the other hand, is a broader concept than agricultural development. In general, it is defined as the process of improving the economic well-being, social welfare, and quality of life of individuals living in rural areas (Turkish Republic Ministry of Agriculture and Forestry 2015). According to the International Fund for Agricultural Development (2016), rural development is defined as the process of improving the opportunities and well-being of people in rural areas and it includes human development, social and environmental objectives, in addition to economic objectives. Therefore, rural development covers health, education, and other social

services. It also uses the multi-sectoral approach for the promotion of agriculture, mining, tourism, leisure, and niche manufacturing (Figure 1).

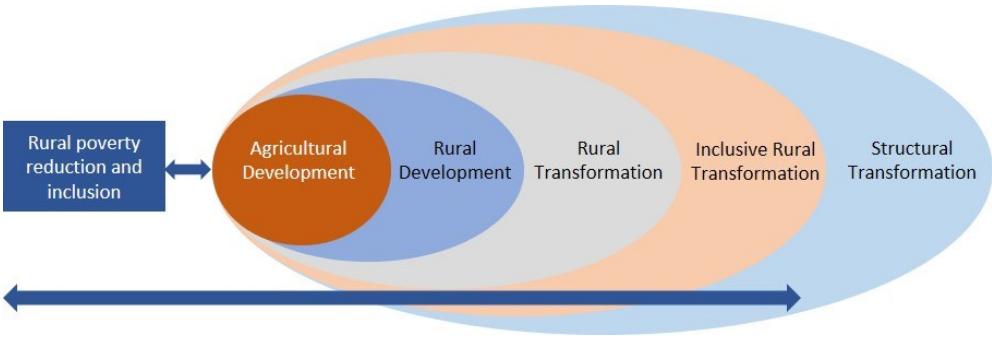

Figure 1. Agricultural development, rural development, and rural transformation. Source: International Fund for Agricultural Development (2016)

There is no single generally accepted definition of rurality. Rurality is a dynamic phenomenon that can be defined according to different perspectives (Woods 2011). This blurriness in the definition of rurality has attracted the attention of many researchers and it has led to the determination of the variables that should be used in defining rurality (Hoggart 1990, Halfacree 1993, Pierce 1996). In fact, since rurality covers a wide area, it can be measured and defined with different variables according to the focused perspective (Ilbery 1998, Bryden 2002, Ballas et al. 2003, Labrianidis 2004, Network of Independent Agricultural Experts in the CEE Candidate Countries 2004). Indeed, the definition of rural life varies according to the perception of each individual who lives in the rural (Halfacree 1995, Hoggart et al. 1995, Ilbery 1998). For this reason, the broad category 'rural' is obfuscatory, whether the aim is its description or theoretical evaluation, since intra-rural differences can be enormous and rural-urban similarities can be sharp (Hoggart 1990). Except for all these uncertainties, the knowledge and understanding of rural settlements' patterns and functions were constructed through the quantitative analysis of population data, measurements of distance between the settlements, and enumerations of service provision, combined with a range of socio-economic data (Woods 2011).

In its traditional definition, the "rural" area is defined as the area where the agricultural sector and agricultural activities are dominant, whereas the "urban" area is defined as the area where there are industrial and service activities. Until the 1970s, the industrialisation and tertiarisation of the economy coincided with the urbanisation process since urban areas have new job and entrepreneurship opportunities in the industrial-service sectors. Rural areas, on the other hand, remained as an ideal space for modern commercial agricultural activities (Saraceno 1994).

The rural area briefly defines the places where rural development activities can be carried out. In Turkey, the settlements with a population of less than 20,000 people (province and district centres, towns, and villages) are considered as "rural areas" in the NRDS (Turkish Republic Ministry of Agriculture and Forestry 2015). Bakırcı (2007) made a more comprehensive definition of rural areas in Turkey. He defined rural areas as the areas where the population density is low, economic activities are predominantly agricultural, natural conditions and traditional values are dominant in the shaping of life and social facilities (such as education-health-communication) are underdeveloped. Also, these areas provide recreation opportunities for the urban population, and they have strong social ties with them (Bakırcı 2007).

Although there is no single definition agreed upon in Turkey, it is observed that different definitions are made in different studies. However, due to the rapid development in the rural areas and the economic and social transformation in the countryside, it is not easy to define a rural area based on the distinction between urban and rural areas. Therefore, rural areas must be redefined. Using the population size alone is not sufficient for the definition of a rural area. Rather than making a single definition, countries also make different definitions including variables such as geography, environment, economic structure, and population (Yıldız 2009).

Various international institutions / organisations (such as OECD and the European Commission) and researchers have made different rural indicators and rural definitions in order to better define rural areas and to develop appropriate policies for rural areas. In literature, the studies by Cloke (1977), OECD (1994, 1996), Weinert and Boik (1995), and Dahly and Adair (2007) are the main ones. Cloke (1977) calculated the rurality index of England and Wales by the year 1961 and 1971 censuses. He performed the Principal Component Analysis using 16 variables and, as a result of the study, he found that the most rural region was Newcastle Emlyn.

Cloke (1977)'s methodology was widely used by various studies, and it proved as a useful tool to calculate the rurality levels of England and Wales. For example, Cloke and Edwards (1986) calculated the same rurality index using data from the 1971 and 1981 censuses, while Harrington and O'Donoghue (1998) created an index of rurality for the 1991 census data. Weinert and Boik (1995) identified rurality within the framework of health. They used only two variables: (1) the population of the county of residence (as reported in the census), and (2) the distance to emergency care as indicated by the self-report of study participants (Weinert and Boik 1995).

Some studies have been carried out in various countries for the continuous assessment of the rurality level. For example, studies on the change of rural areas were conducted by Cloke (1977), Cloke and Edwards (1986), and Harrington and O'Donoghue (1998) for England and Wales; by Ocaña-Riola and Sánchez-Cantalejo (2005), and Prieto-Lara and Ocaña-Riola (2010) for Spain; by Gulumser et. al. (2009) for Turkey; and by Long

et. al. (2009a, 2009b) for China. Within the context of the rural–urban continuum, Ocaña-Riola and Sánchez-Cantalejo (2005) calculated the rurality index of Spanish municipalities based on the Principal Component Analysis using the 1991 population, housing, and household survey data. Prieto-Lara and Ocaña-Riola (2010) replicated and updated the study of Ocaña-Riola and Sánchez-Cantalejo (2005) in order to capture the changes of the rurality level of Spanish municipalities, using the data of the 2001 census of population. They found that only 10% of the Spanish municipalities have changed their rurality status between 1991 and 2001 (Prieto-Lara and Ocaña-Riola 2010). Li et al. (2015) calculated China's rurality index using the data of the year 2000 and 2010 while performing the principal component analysis. As a result of the analysis, in which China was defined with six levels of countryside, it was observed that the Northern regions are less rural, while the rural areas were higher in the Southern and inner parts (Li et al. 2015).

Gülümser et al. (2010) compared the rurality levels of Turkey with 25-member countries of the European Union. In this study, countries were evaluated based on factors of underdevelopment, demography, urbanisation, higher education, and industrialisation. According to the results obtained in the study using the factor analysis, Turkey was identified as the country with the highest rurality index.

The determinants of rurality may vary among countries with different social backgrounds. Therefore, the selection of the variables used to construct the index should be based upon the context and social structure of the areas that are being studied (Harth et al. 2005, Ocaña-Riola and Sánchez-Cantalejo 2005, Nestorová Dická et al. 2019). In the literature, various indicators were used to define rurality (Table 2).

Table 2. The main rurality indicators in the literature

Variables	Studies
Population size	Waldorf (2006), Nestorová Dická et al. (2019)
Population density	Cloke (1977), Harrington and O'Donoghue (1998), Ocaña-Riola and Sánchez-Cantalejo (2005), Prieto-Lara and Ocaña-Riola (2010), Braga et al. (2018), Galluzzo (2018), Nestorová Dická et al. (2019)
Population growth rate	Gülümser et al. (2010)
Mean age	Nestorová Dická et al. (2019)
Percentage of population between 0-14 age, 14-49 age and above 65 age	Cloke (1977), Harrington and O'Donoghue (1998), Ocaña-Riola and Sánchez-Cantalejo (2005), Prieto-Lara and Ocaña-Riola (2010), Galluzzo (2018), Nestorová Dická et al. (2019)
Percentage of employment in agriculture, manufacturing, and service sector in the total employment	Cloke (1977), Ocaña-Riola and Sánchez-Cantalejo (2005), Gülümser et al. (2010), Prieto-Lara and Ocaña-Riola (2010)

Variables	Studies
Agricultural area (percentage in the total area)	Gülümser et al. (2010)
Migration rate	Prieto-Lara and Ocaña-Riola (2010), Galluzzo (2018), Nestorová Dická et al. (2019)
Fertility and mortality rates	Gülümser et al. (2010)
Housing (number of houses, percentage of inhabited housing, household density etc.)	Cloke (1977), Harrington and O'Donoghue (1998), Gülümser et al. (2010), Nestorová Dická et al. (2019)
Schooling rate	Gülümser et al. (2010)
GDP	Gülümser et al. (2010), Galluzzo (2018)
Distance to the nearest urban area (with 50-100-200 thousand population)	Cloke (1977), Harrington and O'Donoghue (1998), Nestorová Dická et al. (2019)

It is seen that different data are used depending on the purpose of the study and the region. Population density, the percentage of the population above 65 age, the percentage of active population (15-49 age), the percentage of employment in agriculture, manufacturing and service sectors in the total employment are widely used variables. Along with these variables, various additional indicators are also used such as the highway length, CO_2 emissions, electricity consumption (Gülümser et al. 2010), and time accessibility to the hospital (Nestorová Dická et al. 2019).

Nestorová Dická et al. (2019) determined the rural level of Slovakia in 2015 by considering various socio-economic factors using 14 different variables. These are: (1) population, (2), population density, (3) mean age, (4) percentage of population between 0-14 age, (5) percentage of population above 65 age, (6) percentage of population between 14-49 age (active population), (7) migration rate, (8) percentage of unemployed population in active population, (9) percentage of migrated active population, (10) percentage of inhabited housing, (11) percentage of family houses in all houses, (12) percentage of new houses built between 2010-2011 in total houses, (13) time accessibility to hospital, and (14) time accessibility to city with 50-100-200 thousand population. In this study, in which the principal components analysis was used in parallel with similar studies in the literature, it was concluded that the western region of Slovakia is less rural than the eastern region (Nestorová Dická et al. 2019).

Zhao et al. (2019) calculated the rurality index for Auckland and Northland regions of New Zealand. Unlike similar studies, rurality was evaluated from a health services perspective. While health criteria were included in the analysis during the calculation of the index, data used extensively in similar studies (such as the percentage of the population living on agriculture, animal husbandry or fishing, and the ratio of natural areas to the total area) were also included in the analysis (Zhao et al. 2019). In the study,

the Multiple Logistic Regression analysis was conducted and it was concluded that the regions were low rural (Zhao et al. 2019).

Methodology

"Rurality" has a structure that cannot be calculated with a single explanatory variable and it should be calculated by considering more than one variable. On the other hand, each variable does not affect the rurality level with the same intensity. Therefore, it is necessary to start calculating the rurality level by calculating the significance level of the variables. In addition, the model must allow comparison and ranking functions and it must be able to analyse with multiple alternatives and variables. Within the scope of these objectives, the Multi Criteria Decision Making (MCDM) method was used in the study. It is thought that the MCDM methods have a working mechanism that can give correct answers to the aims of the study.

The MCDM methods, which do not lose their ability to analyse in various situations (such as different measurement units, decision-maker's value judgments, missing information etc.), refer to multiple analysis methods adopting different approaches to the same objective rather than a single method (Hwang and Yoon 1981, Kuru and Akin 2012). Among MCDM methods, it was decided to use the Entropy method in determining the weights of the criteria, and the TOPSIS method in order to list the alternatives.

According to Shannon's Entropy approach, the degree of significance of the criterion depends on the nature of the data as well as on the subjective judgement of the decision maker (Çınar 2004). According to the entropy method, the most important data group is the group with the greatest irregularity (i.e., the largest entropy). The steps of the entropy method are as follows (Dashore et al. 2013, Tuş Işık and Aytaç Adalı 2017):

1. The decision matrix is normalised to eliminate the contradictions in different units of measurement (P_{ij}):

$$P_{ij} = \frac{a_{ij}}{\sum_{i=1}^{m} a_{ij}}; \forall_j \quad (1)$$

2. The entropy of *j* criterion is calculated:

$$E_j = \left(\frac{-1}{ln\ ln\ (m)}\right) \sum_{i=1}^{m} \left[P_{ij} * lnP_{ij}\right]; \forall_j \quad (2)$$

3. The uncertainty is calculated as the degree of diversity:

$$d_j = 1 - E_j; \forall_j \tag{3}$$

4. Weights (w_j) are calculated as the significance of j criteria:

$$w_j = \frac{d_j}{\sum_{j=1}^{n} \quad d_j}; \forall_j \tag{4}$$

Where i is the alternatives, j is the criteria, m is the number of alternatives, a_{ij} is the performance value of alternatives, P_{ij} is the normalised values, E_j is the output entropy, d_j is the variation coefficient and w_j is the weight of entropy.

Hwang and Yoon (1981) developed the TOPSIS as a MCDM technique (Shyjith et al. 2008, Ustasüleyman 2009), the second method used in this study. The logic of the TOPSIS method is to determine the positive and negative ideal solution, then to rank alternatives based on the relative proximity to the ideal solution. The positive ideal solution is a solution that maximises the benefit criterion and minimises the cost criterion. On the contrary, the negative ideal solution minimises the benefit criterion and maximises the cost criterion. The most appropriate option is the one closest to the ideal solution and the farthest from the negative ideal solution (Wu et al. 2008, Akyüz et al. 2011). The steps of the TOPSIS method are as follows (Alp and Engin 2011, Roszkowska 2011, Yıldırım and Önder 2015):

1. A $m*p$ size initial decision matrix is created in which alternatives and criteria are combined:

$$A = \left[a_{11}\, a_{12} \;\; a_{21}\, a_{22} \;\; \cdots\cdots \;\; a_{1p}\, a_{2p} \;\; \cdots\cdots \;\; a_{m1}\, a_{m2} \;\; \cdots\cdots\cdots\; a_{mp} \;\; \right] \tag{5}$$

2. The decision matrix (N) is standardised. It is calculated from the matrix A:

$$N = \left[n_{11}\, n_{12} \;\; n_{21}\, n_{22} \;\; \cdots\cdots \;\; n_{1p}\, n_{2p} \;\; \cdots\cdots \;\; n_{m1}\, n_{m2} \;\; \cdots\cdots\cdots\; n_{mp} \;\; \right] \tag{6}$$

One of the most frequently used methods of calculating the normalised value n_{ij} is as follows:

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{k=1}^{m} \quad a_{kj}^2}} \tag{7}$$

3. The weighted standard matrix is created by multiplying w_j by n_{ij}:

$$[w_1 n_{11}\ w_2 n_{12}\ \ w_1 n_{21}\ w_2 n_{22}\ \ \cdots\cdots\ w_n n_{1p}\ w_n n_{2p}\ \ \cdots\cdots\ w_m n_{m1}\ w_m n_{m2}\ \ \cdots\cdots\ \cdots w_m n_{mp}\ ] \qquad (8)$$

4. The positive ideal (A+) and negative ideal (A-) solutions are calculated. In order to form a set of ideal solutions, the biggest (the smallest if the related evaluation factor is minimised) of the weighted evaluation factors (column values) in the (V) matrix is selected:

$$V_j^* = \{maxV_{ij}|j \in J, minV_{ij}|j \in J\} \qquad (9)$$

5. The separation measures are calculated by using the Euclidean distance formula to reach the optimum alternative:

$$S^+ = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - V_j^*\right)^2} \qquad (10)$$

$$S^- = \sqrt{\sum_{j=1}^{n} \left(V_{ij} - V_j^-\right)^2} \qquad (11)$$

6. The closeness to ideal solution is calculated and the share of the negative discrimination criterion within the total discrimination criterion is examined:

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^+} \qquad (12)$$

7. Alternatives according to the proximity to the ideal solution (C_i^*) are ranked.

Where A is possible alternatives, m is the number of alternatives, p is the number of criteria, a^{ij} is the value of i alternative with respect to j criterion, n_{ij} is the normalised values of the j^{th} criterion, w_{ij} is the weighted normalised value of the j^{th} criterion.

Data set

In this study, in accordance with the literature and in addition to the literature, four different sections and 18 variables were used in order to determine the rurality level (Table 3).

Table 3. Variables

Section	Variable	Source	Data Year
(1) Demographic Indicators	Total Population	TUIK	2018
	Population Density	TUIK	2017
	Average Household Size	TUIK	2017
	Average Growth Rate of Population	TUIK	2013-2018
	Average Net Migration Rate	TUIK	2013-2018
	Active Population (rate of population of 15-64 ages in total)	TUIK	2018
	Crude Birth Rate (number of births per 1000 population)	TUIK	2018
	Infant Mortality Rate (number of deaths per 1000 live births)	TUIK	2018
(2) Economic Indicators	Gross Domestic Product per capita	TUIK	2017
	Agricultural GDP per capita	TUIK	2017
	Service GDP per capita	TUIK	2017
	Industrial GDP per capita	TUIK	2017
(3) Agriculture and Livestock	Number of Cattle per capita	TUIK	2018
	Number of Sheep per capita	TUIK	2018
	Total Agricultural Area per capita	TUIK	2018
(4) Urbanisation and Infrastructure	Number of Households	TUIK	2018
	Highway Length per 1000 km^2	TUIK	2018
	Electricity Consumption per capita	TUIK	2018

Source: Turkish Statistical Institute data prepared by the authors

The term rurality does not only mean the regions that are low populated and relatively less industrialised. Therefore, sparsely populated, and non-industrialized regions remain very weak in the definition of the rural. In accordance with the priority "the development of agriculture and animal husbandry in the country" in the development plans in Turkey, we focused more on agriculture and livestock activities in addition to other rurality indicators. For this reason, the number of indicators on agriculture and livestock is much more in our data set compared to other studies. In the previously studies conducted in Turkey aimed to measure the socio-economic development and to generate a "socio-economic development index", more generalised data sets (such as population density, fertility rate, infant mortality rate, schooling rate, GDP) were used (Dincer et al. 2003, Karabulut et al. 2004, Urfalıoğlu and Seyfullahoğulları 2004, Ersungur 2007, Yılancı 2010, Sakarya and İbişoğlu 2015, Kart and Keser 2019, Temurlenk and Abar 2019, Özlü et al. 2020). As we know, there is no study focusing on rurality at provincial level in Turkey. The current study separates from other studies both in accordance with Turkey's development plans and also due to the contribution to these plans.

The data were obtained from the Turkish Statistical Institute, and they were used at provincial (NUTS-3) level. The most up-to-date data were included in the study. However, since some variables (active population, number of cattle and sheep per capita, total agricultural area per capita etc.) are not found in the TUIK with their raw form, they were added to the analysis after proportioning the provincial population of the relevant year.

Results

The total population of Turkey in the year 2018 is 82,003,882 people and the average population per province is slightly higher than 1 million people (Table 4). The highest value for the total population is 15,067,724 (Istanbul) and the lowest value is 82,724 (Bayburt). The population density of Turkey is 105, the lowest population density is 11 and the highest population density is 2,892.

Table 4. Descriptive statistics

Variable	Mean	Min.	Max.
Total Population	1 012 393	82 274	15 067 724
Population Density	105	11	2892
Average Household Size	3	2	6
Average Growth Rate of Population	21.98	1.15	45.01
Average Net Migration Rate	29.88	2.64	51.01
Gross Domestic Product per capita	7 946.44	3 489	17 827
Agricultural GDP per capita	3.44	0.06	10.40
Industrial GDP per capita	7.84	1.53	29.43
Service GDP per capita	13.74	6.49	39.54
Number of Cattle per capita	0.38	0.01	3.10
Number of Sheep per capita	0.95	0.01	5.21
Total Agricultural Area per capita	0.40	0	1.44
Active Population	0.91	0.85	0.97
Highway Length per 1000 km^2	84.81	45.79	168.11
Number of Households	286 682	22 201	4 306 967
Crude Birth Rate	15.58	9.79	32.69
Infant Mortality Rate	9.20	4.62	17.24
Electricity Consumption per capita	2.51	0.67	8.07

First, the importance levels of 18 variables (criteria) were determined by the entropy method. The highest weight belongs to the active population density and the lowest weight belongs to the population density (Table 5).

Table 5. Criteria weights

Rank	Variable	Coefficient
1	Active Population	0.055922
2	Average Household Size	0.055896
3	Highway Length per 1000 km²	0.055890
4	Infant Mortality Rate	0.055882
5	Average Net Migration Rate	0.055875
6	Crude Birth Rate	0.055867
7	Gross Domestic Product per capita	0.055864
8	Service GDP per capita	0.055861
9	Average Growth Rate of Population	0.055852
10	Agricultural GDP per capita	0.055792
11	Electricity Consumption per capita	0.055773
12	Industrial GDP per capita	0.055707
13	Total Agricultural Area per capita	0.055564
14	Number of Sheep per capita	0.055482
15	Number of Cattle per capita	0.055463
16	Total Population	0.054767
17	Number of Households	0.054710
18	Population Density	0.053831

The most significant variable in the provinces of Turkey is the number of active population. It is observed that while the active population ratio is quite low in some provinces, it is quite high in some other provinces (for example in Istanbul). This large difference can easily be explained by the differences in the education and working opportunities of the provinces. The other most important variables are the average household size, the highway length per 1,000 km2, the infant mortality rate and the average net migration rate. On the other hand, it is seen that the population density has the lowest weight among the variables. From this point of view, it can be stated that the population density of the provinces does not show great differences in general. This criterion, which is frequently used in the studies in the literature, has been replaced by the active population, which has a qualitatively stronger representation ability in the entropy method results.

The results of the TOPSIS evidence five categories to divide the provinces according to their rurality levels (Table 6). While the first level rurality represents the provinces with the highest rurality level, the fifth level includes the provinces with the lowest rurality level.

Table 6. The rurality scores of Turkish provinces

First level rural provinces		Second level rural provinces		Third level rural provinces	
Ardahan	0.838	Amasya	0.774	Çanakkale	0.760
Kars	0.822	Bingöl	0.774	Kırklareli	0.760
Iğdır	0.817	Siirt	0.771	Uşak	0.759
Bayburt	0.808	Bitlis	0.769	Elazığ	0.759
Kırşehir	0.801	Kastamonu	0.769	Kütahya	0.757
Muş	0.800	Tokat	0.765	Kırıkkale	0.757
Ağrı	0.795	Hakkari	0.765	Artvin	0.756
Aksaray	0.792	Çorum	0.765	Bolu	0.756
Tunceli	0.791	Sinop	0.765	Konya	0.755
Burdur	0.790	Gümüşhane	0.764	Mardin	0.755
Erzurum	0.787	Edirne	0.764	Batman	0.754
Karaman	0.787	Nevşehir	0.763	Balıkesir	0.752
Çankırı	0.780	Isparta	0.762	Diyarbakır	0.752
Niğde	0.780	Şırnak	0.762	Adıyaman	0.749
Erzincan	0.779	Van	0.762	Şanlıurfa	0.748
Yozgat	0.778	Kilis	0.761	Eskişehir	0.746
Sivas	0.776				
Afyon	0.775				

Fourth level rural provinces		Fifth level rural provinces	
Malatya	0.746	Trabzon	0.730
Giresun	0.745	Mersin	0.728
Denizli	0.744	Zonguldak	0.726
Aydın	0.744	Sakarya	0.725
Bartın	0.744	Tekirdağ	0.724
Kahramanmaraş	0.744	Adana	0.720
Muğla	0.743	Yalova	0.719
Kayseri	0.740	Hatay	0.718
Karabük	0.739	Antalya	0.715
Bilecik	0.738	Gaziantep	0.713
Rize	0.736	Bursa	0.687
Ordu	0.736	Kocaeli	0.672
Manisa	0.736	İzmir	0.656
Samsun	0.735	Ankara	0.644
Düzce	0.734	İstanbul	0.091
Osmaniye	0.733		

At first sight, the results show that our rurality index works well. It is seen that the most rural provinces of Turkey are Ardahan, Kars, Iğdır, Bayburt and Kırşehir, Muş and Ağrı. First, all of the provinces with the highest rurality level are located in the eastern region of Turkey, except Burdur and Afyon (Figure 2). Ardahan, located at the northeastern part of Turkey, is the third least populous city of Turkey with only 98 thousand persons and a population density with only 20 people per km2. It has a -1.3 percent annual population growth rate and an almost -1.5 percent net migration rate during the period 2013-2018. The share of the agriculture sector in the city's total GDP is 37.4 percent (the highest value among 81 provinces) and the agricultural production per capita is 18,522 TL (the highest value among the 81 provinces).

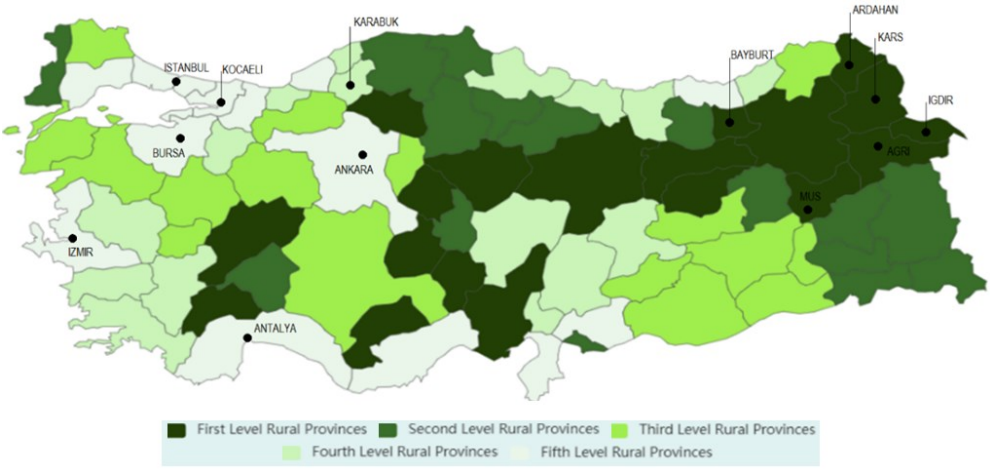

Figure 2. The rurality levels of Turkish provinces

Kars, the second most rural province of Turkey, is located next to Ardahan. It has almost 289 thousand people and the population density is 28.4 persons per km2. The annual population growth rate of Kars is -0.7 percent and the net migration rate during the period 2013-2018 is -2.2 percent. The share of the agriculture sector in the city's total GDP is 31.6 percent. The city exports only 208 thousand dollars, having the lowest export performance among the 81 provinces of Turkey.

Iğdır is located next to the Kars, and it has the third highest rurality level. It produces 36.4 percent of its total GDP from the agriculture sector. Bayburt is the least populated city of Turkey with 82 thousand people, and it has the fourth highest rurality level. Tunceli has the lowest population density in Turkey with only 11 people per km2. Ağrı has the lowest net migration rate with -2.8 percent in the period of 2013-2018.

On the contrary, the provinces with the lowest rurality index are Istanbul, Ankara, Izmır, Kocaeli, Bursa, Gaziantep, and Antalya. Based on the results, it is seen that the rurality level of Istanbul is considerably lower than the other provinces. Istanbul is the

most populous city and the financial capital of Turkey having more than 15 million people and a population density with 2,892 people per km2. The city produces almost 263 million TL in industry and 596 million TL in the service sector. The share of the industry sector in the total GDP is 31 percent and the share of the service sector is 69 percent. The share of the agricultural GDP is only 0.11 percent in the city's total GDP. Nearly one-third of Turkey's universities are located in Istanbul and 27 thousand academics work in these universities. Also, 30 percent of Turkey's enterprises are located in Istanbul. Istanbul produces 50.6 percent of Turkey's total export and at the same time 54 percent of the total import.

The province with the second lowest rurality score is Ankara, the capital of the Republic of Turkey. Ankara is also the second most populous city in the country, and it has a population density with 222 people per km2. The city produces 1.8 percent of its GDP from the agriculture sector, 29.7 percent from the industry sector and 68.4 percent from the service sector. There are 17 universities and 46 R&D centres specialised in fields such as computer, software, and defence industries.

Izmir, the third lowest rural province, is a port city located in the west and Turkey's third most populous city with more than 4.3 million people. It is a highly developed city in terms of R&D, innovation, and human capital. Kocaeli, located at the east of Istanbul, is considered Turkey's "industrial capital". Chemistry, automotive, and iron steel are the biggest industrial sectors. The city has a major role in the automotive industry with Bursa, another industrial city.

The most important result showing that our method works well is that while evaluating the weaknesses of the criteria, such as the population and land area of Karabük, it also takes into consideration its superiority in the industry (as one of the major provinces in iron and steel production in Turkey) and it does not assign a high rurality score to Karabük. This is also a reflection of the findings that the variable selection and the weighting methods are consistently designed as well as the method.

Most of the cities with the highest rurality level are located in the eastern part of Turkey. On the other hand, it can be clearly seen that the provinces with the lowest rurality index are located at the western part of Turkey and concentrated at the maritime. As a result of the analysis, nearly all provinces of the "First Level Rural Provinces" are located on the east. This result is not surprising as Turkey's eastern part is much less developed than the western part and the disparities between them are high (Özlem Önder et al. 2010), which is often called the "East-West Divide". There is a huge difference between the eastern and the western part of Turkey in terms of economic and social indicators such as per capita income, education, employment, unemployment, salaries etc. (Öcal and Yıldırım 2008, Filiztekin 2009, Celebioglu and Dall'erba 2010). In terms of many socio-economic indicators such as population,

income, GDP per capita, industry, employment, and financial indicators, Turkey's eastern part has remained quite backward compared to the West.

Discussion

The results obtained from this study are consistent with other studies that rank the provinces in Turkey. Although there are slight differences in the ranking of some provinces according to the data used by years, Istanbul is ranked first in terms of development in all studies (Karabulut et al. 2004, Urfalıoğlu and Seyfullahoğulları 2004, Ersungur et al. 2007, Yılancı 2010, Acar et al. 2019, Özlü et al. 2020). Istanbul is followed by Ankara, Bursa, Kocaeli and İzmir, in general. For example, in the study conducted by Dincer et al. (2003), the top five most developed provinces are Istanbul, Ankara, Izmir, Kocaeli and Bursa, while the five least developed provinces are Bayburt, Tunceli, Hakkari, Şırnak and Ardahan. According to the results obtained from this study, while the first five provinces are the same, only Ardahan and Bayburt provinces comply with our results as least developed provinces. In addition, Tunceli (73rd rank), Hakkari (57th rank) and Şırnak (50th rank) are included in the underdeveloped provinces group in compliance with our study.

In the ranking of Acar et al. (2019), the most developed provinces ranked as Istanbul, Ankara, Istanbul, Izmir, and Antalya, while the least developed five provinces are Van, Hakkari, Muş, Ağrı and Şırnak. Temurlenk and Abar (2019), on the other hand, found that the most developed provinces were Istanbul, Ankara, İzmir, Kocaeli and Bursa, while the five least developed provinces were Ağrı, Siirt, Muş, Hakkari and Şırnak. While the ranking of the five most developed provinces of the study is the same with our results, Ağrı (75th rank), Siirt (61st rank), Muş (76th rank), Hakkari (57th rank) and Şırnak (50th rank) are at the bottom of the list in compliance with our study. It is also clear that the rurality level of Turkey from the west to the east rises (the socio-economic development level decreases from west to east), as mentioned in many other studies (Dincer et al. 2003, Gulumser et al. 2009, Sakarya and İbişoğlu 2015, Acar et al. 2019).

Considering the analysis results, Eastern Anatolia and Southeastern Anatolia regions are more homogeneous compared to the other 5 regions. In the Mediterranean, Aegean and Black Sea regions, which have a coast to the sea and therefore they are advantageous in terms of trade and tourism opportunities, this homogeneous structure is disrupted, and the rurality index decreases because of these economic activities. Izmir, Antalya, and Trabzon can be given as examples of these provinces.

In addition, in some studies in the literature, it is seen that even the regions that are less rural in terms of socio-economic indicators are included in different groups by showing differences among themselves (Yılancı 2010). Although the socio-economic development level of some provinces is not high, it is concluded that the development

levels are relatively higher than the eastern regions due to the fact that some provinces are port cities, some are industrial cities, and some are tourism cities (Karabulut et al. 2004). While Eastern Anatolia and Southeastern Anatolia provinces are mostly in the same group in terms of rurality level, on the contrary, some important commercial cities in the Black Sea and Aegean regions separate from their regions and they disrupt the homogeneity of their groups (Özlü et al. 2020).

Conclusions

Identifying rural areas is not easy. Because the concept of "rural" does not have a single meaning and objective definition. The rural system is a complex system, and it cannot be defined by just one or two variables. An index consisting of many indicators is needed to define rural areas and to determine the level of rurality (Li et al. 2015). Areas with similar characteristics may have different degrees of rurality if they are located in areas that are quite distant from each other (Romano et al. 2016).

A well-developed and consistent rural index should be able to combine different indicators using objective and statistically verifiable weightings. A coherent index should also be based on a reliable theoretical framework, and the items like analytical reliability, accessibility, and the relationship between the variables and rural areas in the selection of variables should be considered (Romano et al. 2016).

In defining rurality, determining the quality and quantity of investment in the rural areas has become a frequently discussed issue in Turkey since the beginning of the 2000s. In the 2000s, various concrete and decisive steps have been taken towards eliminating regional imbalances and producing solutions to regional differences. As a result of the Government's prioritisation in this area, the studies on rural areas have increased. However, considering the national literature, rural indices are developed to define rural areas.

This study aimed to investigate the level of Turkey's rurality at provincial level by using 18 indicators especially focused on agriculture and livestock activities. In doing so, it is aimed to present the current rurality levels of the provinces and to rank them. This study is a pioneering work in this regard and the consistency of the results is very important for the literature and the future studies to be conducted in Turkey. When we look at the studies which have been conducted on rural areas, it is seen that there is no study in Turkey calculating and comparing the rurality level of the provinces. This study distinguishes it from other studies in three different aspects. These are: (1) the focus of the study (to agriculture and livestock activities to calculate the rurality at provincial level), (2) the criteria and (3) the analysis method. The data set used in the study was composed by the synthesis of similar studies and the addition of new ones. On the other hand, it was found that the Principal Components Analysis (PCA) was

generally used to determine and to compare the rurality index. In this study, the most commonly used MCDM methods (Entropy and TOPSIS) were used. It is thought that the study will enrich the literature from different perspectives.

The rural indices of the study showed consistent results and it is possible to develop the index and to obtain results that are more consistent by adding different variables and by applying different statistical methods.

References

ACAR S., BILEN KAZANCIK L., MEYDAN M. C., IŞIK M. (2019) Illerin ve bölgelerin sosyo-ekonomik gelişmişlik siralamasi araştirmasi SEGE-2017 (Socio-Economic Development of Provinces and Regions: Ranking survey SEGE-2017), Turkish Republic Ministry of Industry and Technology, Ankara.

AKYÜZ Y., BOZDOĞAN T., HANTEKIN E. (2011) Topsis Yöntemiyle Finansal Performansın Değerlendirilmesi ve Bir Uygulama (Evaluation of Financial Performance with Topsis Method and an Application), Afyon Kocatepe University Journal of Economics and Administrative Sciences 13 (1), 73-92.

ALP S., ENGIN T. (2011) Trafik Kazalarının Nedenleri ve Sonuçları Arasındaki İlişkinin Topsis ve AHP Yöntemleri Kullanılarak Analizi ve Değerlendirilmesi (Analysis and Evaluation of the Relationship Between the Causes and Results of Traffic Accidents Using the Topsis and Ahp Methods), Istanbul Commerce University Journal of Science 10 (19), 65-87.

BAKIRCI M. (2007) Türkiye'de Kırsal Kalkınma: Kavramlar-Politikalar Uygulamalar (Rural Development in Turkey: Concepts, Policies and Practices), Nobel Yayın Dağıtım, Istanbul.

BALLAS D., KALOGERESIS T., LABRIANIDIS L. (2003) A Comparative Study of Typologies for Rural Areas in Europe, 43rd European Congress of the Regional Science Association, 1-38.

BRAGA G. B., DE CARVALHO FIÚZA A. L, REMOALDO P. C. (2018) Eurostat Methodology Applied to the Characterization of Rural and Urban Brazilian Spaces, Bulletin of Geography. Socio-Economic Series 42,151-162.

BRYDEN J. (2002) Rural Development Indicators and Diversity in the European Union, Measuring Rural Diversity Conference, Washington, DC.

CELEBIOGLU F., DALL'ERBA S. (2010) Spatial Disparities Across the Regions of Turkey: An Exploratory Spatial Data Analysis, The Annals of Regional Science 45, 379-400.

ÇINAR Y. (2004) An Example of Multi-Qualified Decision Making and Evaluating the Financial Performance of Banks, Ankara University, Ankara.

CLOKE P. J. (1977) An Index of Rurality for England and Wales, Regional Studies 11 (1), 31-46.

CLOKE P., EDWARDS G. (1986) Rurality in England and Wales 1981: A Replication of the 1971 Index, Regional Studies 20 (4), 289-306.

DAHLY D. L., ADAIR L. S. (2007) Quantifying the urban environment: A scale measure of urbanicity outperforms the urban–rural dichotomy, Social Science & Medicine 64 (7), 1407-1419.

DASHORE K., PAWAR S. S., SOHANI N., VERMA D. S. (2013) Product Evaluation Using Entropy and Multi Criteria Decision Making Methods, International Journal of Engineering Trends and Technology 4 (5), 2183-2187.

DİNCER B., ÖZASLAN M., KAVASOĞLU T. (2003) İllerin ve Bölgelerin Sosyo-Ekonomik Gelişmişlik Sıralaması Araştırması (Socio-Economic Development Ranking Survey of Provinces and Regions in Turkey), Turkish Republic Prime Ministry State Planning Organization, Ankara.

ERSUNGUR Ş. M., KIZILTAN A., POLAT Ö. (2007) Türkiye'de Bölgelerin Sosyo-Ekonomik Gelişmişlik Sıralaması: Temel Bileşenler Analizi (Socio-Economic Development Ranking of Regions in Turkey: Principal Component Analysis), Atatürk University Journal of Economics and Administrative Sciences 21 (2), 55-66.

FILIZTEKIN A. (2009) Regional unemployment in Turkey, Papers in Regional Science 88 (4), 863-878.

GALLUZZO N. (2018) An Analysis of Rurality Index in Romanian countryside by a Quantitative Approach, Trakia Journal of Sciences 2, 134-139.

GULUMSER A. A., BAYCAN-LEVENT T., NIJKAMP P. (2009) Mapping Rurality: Analysis of Rural Structure in Turkey, International Journal of Agricultural Resources, Governance and Ecology 8 (2-4), 130-157.

GÜLÜMSER A. A., BAYCAN LEVENT T., NIJKAMP P. (2010) Türkiye'nin Kırsal Yapısı: AB Düzeyinde Bir Karşılaştırma (Turkey's rural structure: a comparison at EU level), ITÜDERGISI/a 9 (2), 133-144.

HALFACREE K. H. (1993) Locality and social representation: Space, discourse and alternative definitions of the rural, Journal of Rural Studies 9 (1), 23-37.

HALFACREE K. H. (1995) Talking About Rurality: Social Representations of the Rural as Expressed by Residents of Six English Parishes, Journal of Rural Studies 11 (1), 1-20.

HARRINGTON V., O'DONOGHUE D. (1998) Rurality in England and Wales 1991: A Replication and Extension of the 1981 Rurality Index, Sociologia Ruralis 38 (2), 178-203.

HARTH L. G., LARSON E. H., LISHNER D. M. (2005) Rural Definitions for Health Policy and Research, American Journal of Public Health 95 (7), 1149-1155.

HOGGART K. (1990) Let's do away with rural, Journal of Rural Studies 6 (3), 245-257.

HOGGART K., BULLER H., BLACK R. (1995) Rural Europe: Identity and Change, Arnold, London.

HWANG C.-L., YOON K. (1981) Multiple Attribute Decision Making: Methods and Applications. A State-of-the-Art Survey, Springer, New York.

ILBERY B. (ed.) (1998) The Geography of Rural Change, Routledge, London.

İNAL ÇEKİÇ T., ÖKTEN A. N. (2009) Sosyal Sermaye Perspektifinden Kırsal Kalkınma Sorunsalına Yeniden Bakış (Re-evaluation of Rural Development Problematic in the Context of Social Capital), MEGARON 4 (3), 203-213.

INTERNATIONAL FUND FOR AGRICULTURAL DEVELOPMENT (2016) Rural Development Report 2016: Fostering Inclusive Rural Transformation, Quintily, Rome.

ISSERMAN A. M. (2005) In the National Interest: Defining Rural and Urban Correctly in Research and Public Policy, International Regional Science Review 28 (4), 465-499.

KARABULUT M., GÜRBÜZ M., SANDAL E. K. (2004) Hiyerarşik Kluster (Küme) Tekniği Kullanılarak Türkiye'de Illerin Sosyo-Ekonomik Benzerliklerinin Analizi (The Similarity Analysis of Socio-Economic Characteristics of Provinces in Turkey Using Hierarchical Cluster Technique), Journal of Geographical Sciences 2 (2), 65-78.

KART R. B., KESER I. K. (2019) Türkiye'deki Illerin Sosyo-Ekonomik Gelişmişlik Düzeylerinin Belirlenmesi ve Yerel Seçim Oy Dağılımlarının Karşılaştırılması (Determination of socio-economic development levels and comparison of vote distributions in local elections for Turkish Province), The Journal of Turkish Social Research 23 (1), 25-52.

KAYPAK Ş. (2012) Ekolojik Turizm ve Sürdürülebilir Kırsal Kalkınma (Ecological Tourism and Sustainable Rural Development), Karamanoglu Mehmetbey University Journal of Social and Economic Research 14 (22), 11-29.

KURU A., AKIN B. (2012) Approaches and Applications fort he Use of Multi-Criterior Decision-Making Techniques in Integrated Management Systems, Journal of Suggestion 10 (38), 129-144.

LABRIANIDIS L. (ed.) (2004) The Future of Europe's Rural Peripheries, Routledge, London.

LI Y., LONG H., LIU Y. (2015) Spatio-Temporal Pattern of China's Rural Development: A Rurality Index Perspective, Journal of Rural Studies 38, 12-26.

LONG H., LIU Y., WU X., DONG G. (2009a) Spatio-Temporal Dynamic Patterns of Farmland and Rural Settlements in Su–Xi–Chang Region: Implications for Building a New Countryside in Coastal China, Land Use Policy 26 (2), 322-333.

LONG H., ZOU J., LIU Y. (2009b) Differentiation of Rural Development Driven by Industrialization and Urbanization in Eastern Coastal China, Habitat International 33 (4), 454-462.

NETWORK OF INDEPENDENT AGRICULTURAL EXPERTS IN THE CEE CANDIDATE COUNTRIES (2004) The Future of Rural Areas in the CEE New Member States, European Commission, Retrieved from: www.ec.europa.eu.

NESTOROVÁ DICKÁ J., GESSERT A., SNINČÁK I. (2019) Rural and non-rural municipalities in the Slovak Republic, Journal of Maps 15 (1), 84-93.

ÖCAL N., YILDIRIM J. (2008) Türkiye illerinin istihdam performansı: mekansal veri analizi (Employment performance of Turkish provinces: A spatial data analysis), Economics, Business and Finance 23 (266), 5-20.

OCAÑA-RIOLA R., SÁNCHEZ-CANTALEJO C. (2005) Rurality Index for Small Areas in Spain, Social Indicators Research 73 (2), 247-266.

OECD (1994) Creating Rural Indicators for Shaping Territorial Policy, OECD Publications, Paris.

OECD (1996) Territorial Indicators of Employment: Focusing on Rural Development, OECD Publications, Paris.

ÖZLEM ÖNDER A., DELIKTAŞ E., KARADAĞ M. (2010) The Impact of Public Capital Stock on Regional Convergence in Turkey, European Planning Studies 18 (7), 1041-1055.

ÖZLÜ S., DEDEOĞLU ÖZKAN S., BEYAZLI D. (2020) Kırsallık Göstergeleri Bağlamında Türkiye İllerinin Kümelenmesi ve Devinimi (Clustering and Motion of the Provinces in Turkey in the Context of Rural Indicators), Journal of Geography 40, 231-245.

PIERCE J. T. (1996) The conservation challenge in sustaining rural environments, Journal of Rural Studies 12 (3), 215-229.

PRIETO-LARA E., OCAÑA-RIOLA R. (2010) Updating Rurality Index for Small Areas in Spain, Social Indicators Research 95 (2), 267-280.

ROMANO S., COZZI M., VICCARO M., PERSIANI G. (2016) A Geostatistical Multicriteria Approach to Rural Area Classification: from the European Perspective to the Local Implementation, Agriculture and Agricultural Science Procedia 8, 499-508.

ROSZKOWSKA E. (2011) Multi-Criteria Decision Making Models by Applying the Topsis Method to Crisp and Interval Data, Multiple Criteria Decision Making 6, 200-230.

SAKARYA A., İBİŞOĞLU Ç. (2015) Türkiye'de Illerin Sosyo-Ekonomik Gelişmişlik Endeksinin Coğrafi Ağirlikli Regresyon Modeli ile Analizi (Analyzing the Socio-Economic Development Index of Cities in Turkey with Geographically Weighted Regression Model), Marmara Geographical Review 32, 211-238.

SARACENO E. (1994) Recent Trends in Rural Development and Their Conceptualisation, Journal of Rural Studies 10 (4), 321-330.

SHYJITH K., ILANGKUMARAN M., KUMANAN S. (2008) Multi-Criteria Decision-Making Approach to Evaluate Optimum Maintenance Strategy in Textile Industry, Journal of Quality in Maintenance Engineering 14 (4), 375-386.

TEMEL M. (2013) Kırsal Alanların Korunarak Kalkınmasında ve Planlanmasında Bir Araç Olarak Arazi Toplulaştırması: Avrupa Birliği-Türkiye Karşılaştırması

(Land consolidation as a tool for protection, development and planning of rural areas: A comparison of European Union-Turkey), University of Gazi. Institute of Science and Technology, Ankara.

TEMURLENK M. S., ABAR H. (2019) Türkiye'deki İllerin Sosyoekonomik Gelişmişlik Seviyeleri: 2008-2016 Dönemi (Socioeconomic Development Levels of Turkey's Provinces: 2008 - 2016 Period), Journal of Economics and Administrative Sciences 33 (4), 1115-1135.

TURKISH REPUBLIC MINISTRY OF AGRICULTURE AND FORESTRY (2015) Ulusal Kırsal Kalkınma Stratejisi 2014-2020 (National Rural Development Strategy), Ankara, Turkey.

TUŞ IŞIK A., AYTAÇ ADALI E. (2017) The Decision-Making Approach Based on the Combination of Entropy and Rov Methods for the Apple Selection Problem, European Journal of Interdisciplinary Studies 3 (3), 80-86.

URFALIOĞLU F., SEYFULLAHOĞULLARI A. (2004) İllerin Bazı Sosyo-Ekonomik Kriterler Altında Gelişmişlik Sınıflaması (Development Classification of Turkey's Provinces Under Some Socio-Economic Criteria), Marmara University Journal of Economic and Administrative Sciences 19 (1), 209-232.

USTASÜLEYMAN T. (2009) Bankacılık Sektöründe Hizmet Kalitesinin Değerlendirilmesi: Ahs-Topsis Yöntemi (Evaluation of Service Quality in Banking Sector: AHP-Topsis Method), Journal of Bankers 69, 33-43.

WALDORF B. S. (2006) A continuous multi-dimensional measure of rurality: moving beyond threshold measures, the American Agricultural Economics Association Annual Meeting, Retrieved from: ageconsearch.umn.edu.

WEINERT C., BOIK R. J. (1995) MSU Rurality Index: Development and Evaluation, Research in Nursing & Health 18 (5), 453-464.

WOODS M. (2011) Rural Geography: Processes, Responses and Experiences in Rural Restructuring, SAGE, London.

WU C.-R., LIN C.-T., TSAI P.-H. (2008) Financial Service of Wealth Management Banking: Balanced Scorecard Approach, Journal of Social Sciences 4 (4), 255-263.

YILANCI V. (2010) Bulanık Kümeleme Analizi İle Türkiye'deki İllerin Sosyoekonomik Açıdan Sınıflandırılması (Classifying Provinces of Turkey by Using Fuzzy Cluster Analysis Based on Socio-Economic Factors), Suleyman Demirel University: The Journal of Faculty of Economics and Administrative Sciences 15 (3), 453-470.

YILDIRIM B. F., ÖNDER E. (eds.) (2015) Operasyonel, Yönetsel ve Stratejik Problemlerin Çözümünde Çok Kriterli Karar Verme Yöntemleri (Multi Criteria Decision Making Methods for Solving Operational, Managerial and Strategic Problems), Dora Publishing, Bursa.

YILDIZ O. (2009) Avrupa Birliği'nde Kırsal Kalkınma İstatistikleri ve Uyum Sürecinde Türkiye'nin Durumu (Rural Development Statistics in the European Union and

Turkey's Situation during the Accession Period), University of Ankara. Institute of Science and Technology, Ankara.

ZHAO J., AMERATUNGA S., LEE A., BROWNE M., EXETER D. J. (2019) Developing a New Index of Rurality for Exploring Variations in Health Outcomes in Auckland and Northland, Social Indicators Research 144, 955-980.

Aims & Scope

Urban and regional questions are crucial in understanding the present territorial conditions. From the World Bank's 'rediscovery' in its 2009 Report of the potential of cities in encouraging economic growth, to the multiple ways in which cities are being drawn into the processes of neoliberalism, to the dynamic growth of cities in the developing countries in Asia far out stripping the scale of cities in the older urbanized nations – everywhere there are signs of a rapidly changing urban condition. The same is true for the regions where 'old questions' of regional economic disparity and uneven development are being given a new twist as economic globalization impacts the national and local arenas.

JURA, the **Journal of Urban and Regional Analysis**, working as an **Open-access journal** (**with two issues/ year, in February and in August — starting with 2020;** previously annually publishing in June and in December, for the period 2009-2019), was launched as a response to the exciting world of urban and regional research emerging in reaction to these changes happening in the real world.

JURA represents the initiative of the Interdisciplinary Center for Advanced Research on Territorial Dynamics (CICADIT) at the University of Bucharest working in collaboration with Ronan Paddison at the University of Glasgow, for the period 2009-2020. Starting with 2021, JURA is also supported by the Professional Association of Romanian Geographers (APGR). While the intention is that articles published by JURA will draw on examples throughout the world, particular emphasis will be given to urban and regional change as it is being experienced in Eastern Europe.

Transitional economies, and urban and regional shifts in the region since the end of the socialist regimes have been profound. The socialist regime had its particular effects on the regional economy and the cities, linked with structures that, in many ways, were very different from the trends apparent in Western Europe in the post-World War II period. Since 1990, change has been swift, challenging our theoretical understanding of the processes; for example, it is plausible to transport theories of contemporary urban change under neoliberalism developed in the advanced economies to the transitional economy. The legacy of the socialist regime, its imprint on the city physically and socially, provides further reason to suppose that urban (and regional) development in transitional economies is distinctive. These differences re-emphasise a consistent axiom underpinning the study of cities and regions: that if it is possible to point to broad theories that apply across different regions of the world, they often need to be modified to take into account local conditions.

Though JURA is primarily concerned with looking at urban and regional change in the transitional East European economies, case studies exploring similar problems, but in other parts of the world are certainly parts of the journal's agenda. The remit of the journal is emphatically interdisciplinary. The analysis of the urban and regional conditions needs to be interdisciplinary. In reality, urban and regional researchers usually tend to belong to a discipline reflecting their training whether as geographers, economists, sociologists, planners or any number of subjects concerned with the study of space and place. Our training very often endorses an appreciation of how other disciplines explore the city. For the journal, the acknowledgement of the many disciplines that are concerned with understanding cities and regions will be indicated by the different disciplinary backgrounds reflected in the published papers. Articles will be published by geographers, sociologists, planners, economists, political scientists, to mention just a few of the disciplines involved in the urban and regional study.

JURA plans to be a key outlet publishing topical articles dealing with cities and regions. In later issues, we plan to include a policy section outlining and discussing state and non-state initiatives aimed at improving cities and regions, together with the problems confronted by their implementation.

Edited by Prof. PhD. Ioan IANOȘ
© Journal of Urban and Regional Analysis
2009-2022