

UNIVERSITY OF PÉCS
Faculty of Sciences
Institute of Geography and Earth Sciences
Doctoral School of Earth Sciences

**SOCIAL AND SPATIAL CHARACTERISTICS
OF THE SEX RATIO SHIFT IN INDIA**

Main findings of the PhD dissertation

Nándor Zagyi

Supervisor:

Dr. habil. Zoltán Wilhelm PhD

associate professor



Pécs, 2021

Address of the Doctoral School:	University of Pécs, Faculty of Sciences Doctoral School of Earth Sciences 7624 Pécs, Ifjúság útja 6.
Head of the Doctoral School:	Dr. habil. István Geresdi, Doctor of HAS Professor, University of Pécs, Faculty of Sciences, Institute of Geography and Earth Sciences, Department of Geology and Meteorology
Title of the doctoral topic cluster:	Population and Settlement Geography
Head of the doctoral topic cluster:	Dr. habil. András Trócsányi PhD Associate professor, University of Pécs, Faculty of Sciences, Institute of Geography and Earth Sciences, Department of Human Geography and Urban Studies
Discipline of the dissertation:	Population geography
Supervisor:	Dr. habil. Zoltán Wilhelm PhD Associate professor, University of Pécs, Faculty of Sciences, Institute of Geography and Earth Sciences, Department of Political Geography, Development and Regional Studies

1. INTRODUCTION

Certainly one of the most serious problems of today's social challenges is the occasionally huge difference between women's and men's social situation which can be perceptible mostly in the measure of women's disadvantages in the fields of employment, economy, politics, education and family life, as well as in access to financial resources and possibilities of individual emergence. These factors are the sources of particularly severe anomalies in some countries of the developing world that fundamentally threaten the existence of a sustainable society.

Although the incredible pace of socio-economic development we are currently witnessing, especially in Asia, has an effect on the reduction of gender disparities in income distribution, the appreciation of women's labor market and community status, and the change of institutional environment negatively discriminating against them and anticipates an improvement of their life prospects, significant masses of women do not take advantages effectively of benefits offered by social and economic reforms.

Moreover, in recent decades demographic downsides of such a development embodied in material goods resulting in new kind of negativ discrimination against women have also appeared in some places. Indeed, since the early 1990s, in some countries of patriarchal social structure, most notably in China and India, the proportion of females in childhood population has been declining sharply. This phenomenon, resulting from the fast spread of the practice of sex selective abortion involving female fetuses, generated by the expansion of intrauterine gender identification, can be responsible for the growing female population deficit as a social burden oppressing these societies. Such a manifestation of male preference, the use of technical innovations at the service of wrong issues against women will force these countries, at least in the medium term, for the next half century, into irreversible social determinisms that can be overwhelmed only at the expence of invaluable financial and moral sacrifices.

In my dissertation based on sociographic and demographic approach I have undertaken to reveal the Indian characteristics of the facts and phenomena underlying and influencing the above mentioned extremely diverse demographic processes, to evaluate their social effects and to analyse the spatial aspects of the sex ratio shift resulting from gender based fetal selection. In addition to my professional interest in the country and South Asia as a whole, the fact that India belongs to countries concerned not simply regarding the size of population having unhealthy gender composition, but considering the complexity of social factors being responsible for distorted sex ratios, as well as the regional differences of gender parities also contributed to my choice of topic. India, a country such as this offers a great opportunity to study the regularities forming and influencing sex ratio values.

2. OBJECTIVES AND RESEARCH METHODS

The basic objective of my dissertation is on the one hand giving a complex sociographic and demographic analysis on the Indian social background of the phenomenon called in the English language literature generally as 'missing women' i.e. depopulation affecting

mainly the age groups of female children and young adults, and on the other hand presenting the spatial concerns of abnormal sex ratios.

The research results of the dissertation are partly based on the synthesis of secondary, factual sources found in the relevant and referenced literature, and partly on the independent processing of data originating from reliable and widely recognized statistical collections relevant to our topic.

Of the latter, we must highlight the resource bases summarizing the results of the Census of India, considered a giant social event which was held for the first time in 1872 and most recently in 2011. Its data available at the district level allow of a comprehensive examination of the financial and demographic situation of society and therefore serve as the number one statistical source for analyzing populational issues.

Other important data sources giving also a great assistance to prepare this work are the estimates based on representative statistical data collections available in the National Family Health Survey (NFHS) or in the Sample Registration System (SRS) published in every ten years, as well, on the demographic processes, health and social status of the Indian population occurring between two censuses.

Last but not least, I mention the criminal statistics databases, published annually by the National Crime Records Bureau, which played a key role in the production of the research results of the dissertation.

In order to verify the mathematical relationships between the data sets of the sources indicated above, I performed correlation analysis in several cases, using the correlation (KORREL) function application of Microsoft Office Excel 2007, and as a result I accepted the correlation coefficient calculated by it.

I have applied tables, pictures, figures and diagrams created with the help of the 2007 version of Microsoft Office Word and summerized in separate lists to highlight my data and say, as well as maps edited with the Paint 3D graphics software available among the applications of the Windows 10 operating system.

Some of my maps are the result of my own data-based editing work using ArcGIS version 9.2, partly on my own and partly with my consultant.

3. HYPOTHESES

I have made the following conjectures in my dissertation:

- A mathematically verifiable relationship can be established between the incidence of violent crimes committed against females or representatives of both sexes and the extent of male surplus.

- The relationship between the prevalence of patriarchal social system and the deterioration of the femininity ratio will be justified on both quantitative and territorial basis.

- It will be proven that the decrease in fertility enhances the degree of intolerance against female births interpreting on the population and part of the country, respectively affected by the pressure of male preference.

- The hypothesis that denominational affiliation has a direct or indirect effect on the gender distribution of certain religious communities will be supported.
- The process of sex ratio transition will be recognizable, i.e. a gradual distortion of the gender composition and then a shift toward the normal range of values.

4. SUMMARY OF THE RESEARCH PROCESS

In my dissertation, I have undertaken to give a complex presentation of the sociographic, demographic, and regional concerns of the so-called ‘missing women’ phenomenon for India through processing of relevant literature backgrounds and analysing of available statistical data.

In doing so, I have highlighted the extent and causes of the female population deficit in India and beyond that, naming its two components, the pre- and postnatal female excess mortality, which mainly affects the childhood population and can be regarded as a consequence of selective abortion and negligent care, respectively. I have also presented the negative social effects of female population deficit, with particular reference to the relationships between masculinization and the extent of violence, based on the results of my own correlation calculations.

In the framework of the theoretical foundation of the topic, I have presented the biological and social factors influencing the gender distribution of the population, as well as the peculiarities of the formation of gender composition in India. I have reviewed the traditional social manners for the enforcement of gender preferences and the contemporary diagnostic methods that have become widespread in recent decades as their “modern” versions, which also allow of intrauterine sex selection, and based on my independent calculation results, I have estimated the annual number of missed births due to sex selective abortion in the period after the turn of the millennium.

I have described in detail the system of legal-administrative restrictions and material-awareness raising incentives aimed to curb the spread of sex selection, but considered to be fundamentally ineffective, expressing my view that the recent improvement in the degree of gender bias can be interpreted rather in the context of a spontaneous change of attitude following the rise of general social modernization.

I have dealt extensively with the motivational factors, economic, demographic and socio-cultural-religious components of the sex selection practice, as well as their Indian specifics, as social aspects which, in the context of patriarchal relations, have a compelling effect on the birth of male offsprings and on the avoidance of females births, and the consequences of which can be clearly demonstrated.

I have verified and evaluated the quantified correlations between social factors relevant to male birth preference, such as patriarchal family structure, declining fertility and religious affiliation, and the sex ratio deterioration, as well as the regularities in their spatiality.

Finally, I have presented the theoretical model of the sex ratio transition process defined by the relationship between social constraints and material-technical possibilities influencing the degree of sex selection, based on my own interpretation, as well as the characteristics observed in its spatial patterns regarding India.

5. RESULTS

My independent research results based on the pre-formulated hypotheses, can be summarized in the form of the following theses:

- The relationship between the number of violent crimes against life per one hundred thousand inhabitants and the masculinity index can be characterized by a coefficient of 0.48, so a moderate positive correlation ($0.4 < r < 0.7$) has been detected.

The value of correlation coefficient between the total number of crimes committed specifically against women per one hundred thousand women and the masculinity index is 0.38, which indicates a definite but weaker relationship between the variables ($0.2 < r < 0.4$).

A relatively close correlation between the non-gender specific, intentionally committed violent crimes involving physical abuse and the increase of rate of male excess, and a less definite correlation between violence against women and the degree of masculinisation, respectively seems to refute the widespread belief that the increase of the rate of male surplus is mainly accompanied by an increase of the number of crimes committed against women.

The only exception regarding the latter one is the relationship between the relative number of cases of abduction or illegal relocation of women and the degree of male dominance: in this respect a much closer, strong correlation can be described by a coefficient of 0.63. That is, a mathematically significant relationship between the disruption of the demographic balance of sexes in favour of men and the proportion of crimes against women per unit of population has been managed to demonstrate in the case of kidnappings and arbitrary changes of residence of persons against their will. This, in turn, seems to support the well-known fact that, as a result of the growing social demand for marriageable girls, "brides" sold or simply abducted due to a lack of financial resources for marriage in traditional sense are travelled illegally en masse through business networks organized for such transactions typically from poorer areas of the country to more developed regions having solvency.

- Indian traces of the matrifocal family structure and the matrilineal inheritance-descent system, respectively can be found among the Dravidian and tribal populations considered to be indigenous to the subcontinent, while no facts suggesting this can be discovered in the Indo-Aryan culture based on patriarchal tradition. On the grounds of this, I have hypothesized that male preference, which is not or hardly prevailing among the former ones, will have a perceptibly smaller influence on the degree of the sex ratio shift. In addition to the regional picture of differences in sex ratios standing out on district level (Figure 1), this expectation was also confirmed by the fact that, in contrast to the low femininity index interpreted for the total population aged 0–6 years, its value falls within the range corresponding to the normal male birth surplus among the scheduled tribes and the Dravidian population. In virtue of these, it can be stated with great certainty that in India, patriarchal family structure as a social constraint is one of the dominant influencing factors of gender-based fetal selection.

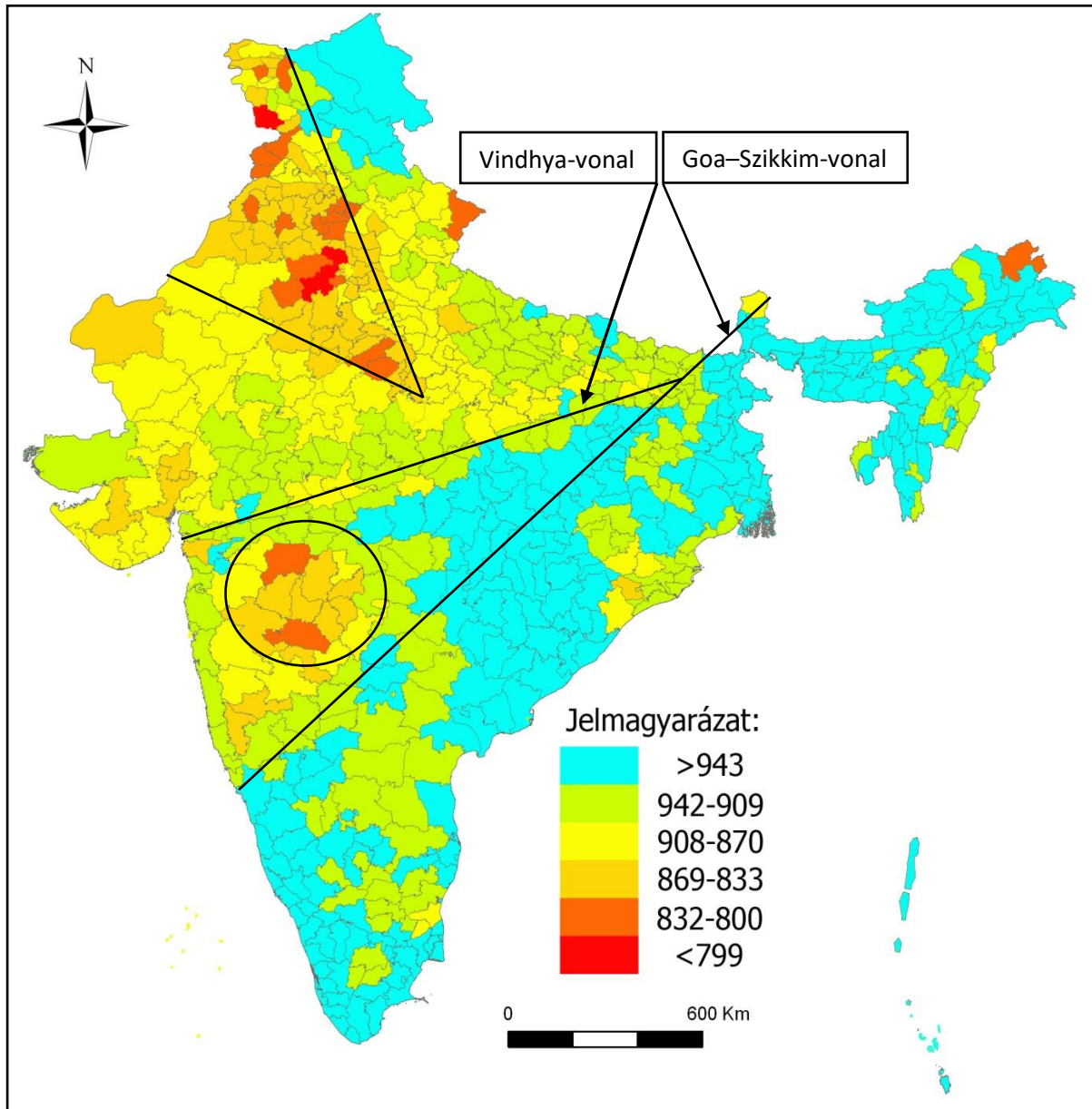


Figure 1. Femininity rate (girls / 1,000 boys) in the 0-6 age group by districts in 2011.
Based on CENSUS ONLINE 2011 edited by WILHELM Z. – ZAGYI N.

▪ Based on the results of correlation calculation, a clear connection was found between the sex ratio shift and the measure of fertility decline, that is, I was able to substantiate the hypothesis of demographic theory, that in a patriarchal social environment, a decline of fertility is accompanied by an increase of intolerance towards female births. Demonstrating this, referring to states in the north-northwestern part of the country most affected by male preference (northwest of the Goa-Sikkim axis) where the proportion of the tribal population is small (below the national average) I have performed a correlation study between the fertility rates and femininity indices for each district. The result of this proved a relationship that can be described with a coefficient of + 0.53, which, in addition to the effect of declining fertility on strengthening of sex-based fetal selection,

indirectly also supports the anti-discriminative effect of tribal social organization on women.

- A number of facts point to the relationship between the religious affiliation of a given community and the gender composition of the childhood and juvenile population, as well as the occurrence and prevalence of fetal selection, however, an exact interpretation of this system of relations based on mathematical definiteness is almost impossible in both intra- and inter-communal comparison.

Of the six religious denominations that constitute an independent statistical group, in the case of the Hindus, the Jains, and especially the Sikhs, among whom any unique social motivations regarding female birth intolerance can be identified, the femininity index in the 0–4 age group does not even reach the abnormally low national average. In their case, therefore, the practice of selective abortion can be assured. It is important to note, however, that in relation to religious aspects, it is not possible to generalize: in respect of use of sex selection there is no necessary and universal determinism between the religious affiliation of a social group and the negative discrimination against girls or women taking shape even in death surplus, as the connections between these two social factors in some cases do not occur as a result of direct or even indirect religious (doctrinal) but other social constraints prevailing within a given religious community.

As far as Buddhists, Muslims and Christians are concerned, there are no facts or phenomena that could be identified as factors influencing gender-based fetal selection, either in a doctrinal sense or in relation to traditional social motivations related to belonging to a religious community. This is also supported by the 2011 femininity indices of the 0-4 year old age group, which in the case of Buddhists are minimally below the lower limit defined at 943, but showing in this regard some flexibility, we can say that childhood sex ratios can be considered normal for all of them.

In the 5–19 age groups of the Buddhist and Muslim communities, we find stagnant-decreasing and continuously but slightly deteriorating femininity rates, respectively which indicates the increasingly declining excess mortality of girls. However, its magnitude or intensity does not reach a level that would necessarily or decisively indicate the prevalence of fetal selection.

Christians stand out from all denominations in that their gender composition does not show any abnormality: the sex ratio of the 0-9 age group indicate a normal male birth surplus according to biological determinations, while in the older age groups of children, the headcount advantage of boys over girls is gradually decreasing in line with the regular order of sex specific survival, thus, the abnormal female mortality surplus that is common in the Indian population and unique in the world can not be detected among them. In addition, the moderate predominance of women in the total population, slightly different from the ideal gender distribution, is also a curiosity in India.

- Finally, as assumed in the context of the interpretation of the sex ratio transition, regarding India as a whole, essentially the area situated northwest of the Goa–Sikkim axis and characterized by patriarchal family structure, it is quite obvious that so kind of social processes prevail in the country which are specific in the second stage of the transition. In the case of this particular region it is not just that except for some district abnormal sex ratios can be experienced but on a significant proportion of this area further declining femininity indices have been registered within the distorted value range. Areas having abnormal femininity more than a decade ago or values deteriorating further since then, as

well, form four relatively well-demarcated arrays, mostly connected by districts that have joined the process of sex ratio degradation in the last decade.

However, as the dynamics of the deterioration of the femininity index for the entire population aged 0-6 have slowed down in the last census decade, it also seemed likely that in a particular place or places there would be signs of a decrease in masculinity among the population entering the third stage of the sex ratio transition. According to our assumption, at least two areas entering in our opinion the third stage of the sex ratio transition in the early 2010s, can be identified (Figure 2).

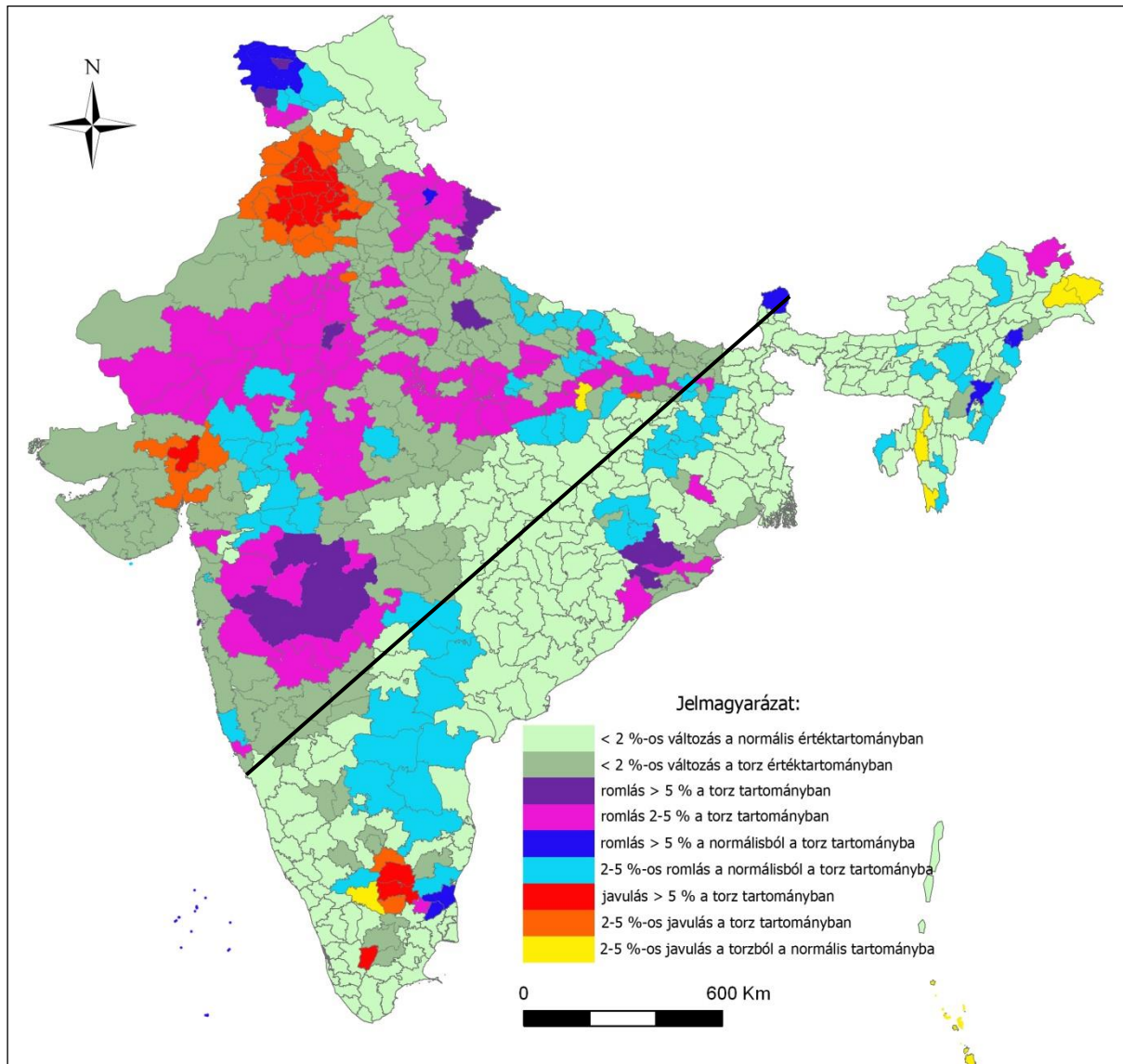


Figure 2. The extent and direction of the change in the femininity rate of the 0-6 age group between 2001 and 2011. Based on CENSUS ONLINE 2011 edited by WILHELM Z. – ZAGYI N.

Publications

1. Publications related to the topic of the dissertation

1.1. Papers published in periodicals and book chapters

1. **ZAGYI, N.** – KUSZINGER, R. – WILHELM, Z. (2021) Characteristic features of recent urbanisation in India in the light of the divergent development paths of metropolises. *Regional Statistics* (közlésre elfogadva). Megjelenés: 2021 február (online) és 2021/3. szám. A folyóirat Scimago-besorolása: **Q2**. (<https://www.scimagojr.com/journalrank.php?country=HU>)
2. WILHELM Z. – **ZAGYI N.** (2019) Kereszténység és vallásszabadság Indiában. *Vigilia* 84 (1) pp. 12–19.
3. **ZAGYI N.** (2018) A nemiarány-eltolódás folyamata és társadalmi következményei Indiában. In: Pap N. – Gonda T. (szerk.) *Magyar lábnyomok Indiában: A PTE 650 Kőrösi Csoma Sándor Emlékexpedíció kutatásai Indiában 2016-ban*. CampInvest Kiadó, Orfű, pp. 96–114.
4. WILHELM Z. – **ZAGYI N.** (2018) Történeti és jelenkori urbanizációs folyamatok Indiában. In: Pap N. – Szalai G. (szerk.) *Táj geográfus ecsettel*. Pécsi Tudományegyetem Természettudományi Kar, Pécs, pp. 119–143.
5. **ZAGYI, N.** – ÁCS, M. (2017) Christian missions as civil society movements at the service of the Indian society. *Civil Szemle* 14 (3) pp. 105–120. **WoS**: 000425838900007
6. KISS, K. – **ZAGYI, N.** (2014) Principal Characteristics of the Indian Micro, Small and Medium Enterprises (MSME) Sector and Its Importance in Rural Development. *Geographical Locality Studies* 2 (1) pp. 438–460.
7. WILHELM Z. – **ZAGYI N.** – NEMES V. – KISS K. (2014) A gyermekkori nemi arányok átalakulásának területi összefüggései Indiában a 2011-es népszámlálás tükrében. *Településföldrajzi Tanulmányok* 3 (1) pp. 139–149.
8. WILHELM, Z. – PAP, N. – **ZAGYI, N.** – PETE, J. – NEMES, V. (2014) Spatial Disparity in India Indicated by SENTIENT Index of Development and Its Relationship to the Religious Diversity. In: Tarrósy, I. – Tuka, Á. – Vörös, Z. – Schmidt, A. (eds.) *European Integration: Perspectives and Challenges. How 'Borderless' Is Europe?* IDResearch Ltd./Publikon Publishers, Pécs, pp. 383–400.
9. WILHELM Z. – DÉRI I. – SZILÁGYI S. – NEMES V. – **ZAGYI N.** (2013) Urbanizáció Indiában a 2001-es, valamint a 2011-es népszámlálás előzetes eredményeinek tükrében. *Településföldrajzi Tanulmányok* 2 (1) pp. 60–74.
10. WILHELM Z. – PETE J. – NEMES V. – **ZAGYI N.** (2011) Területi különbségek vizsgálata Indiában, különös tekintettel a vallási összetételre. *Humán Innovációs Szemle* 2 (1) pp. 77–79.
11. WILHELM, Z. – PETE, J. – NEMES, V. – **ZAGYI N.** (2011) The Survey of Spatial Disparity in India with the Application of the SENTIENT Index with Special Focus on Religious Composition. *Human Innovation Review* 2 (1) pp. 56–76.

12. ZAGYI N. (2011) Adalékok a Maldív-szigetek történeti és kulturális földrajzához. *Belvedere Meridionale* 23 (2) pp. 48–57.
13. ZAGYI N. (2009) A judaizmus múltja és jelene Indiában. *Modern Geográfia* 2009 (4) 48 p.

1.2. Publications related to conference presentations

1. WILHELM Z. – ZAGYI N. (2019) A kasmíri konfliktus: military landscape a „Boldog Völgy országá”-ban. In: Zagy N. – Szabó R. (szerk.) *Military landscape Baranyában: XI. Magyar Politikai Földrajzi Konferencia absztraktkötet*. Pécsi Tudományegyetem, Földrajzi és Földtudományi Intézet, Politikai Földrajzi, Fejlődési és Regionális Tanulmányok Tanszéke, Pécs. p. 38.
2. NEMES V. – ZAGYI N. (2016) A nemiarány-eltolódás alakulásának társadalmi és területi sajátosságai Indiában. In: Pajtókné Tari I. – Tóth A. (szerk.) *Magyar Földrajzi Napok 2016 konferenciakötet*. VIII. Magyar Földrajzi Konferencia, XVI. Geográfus Doktoranduszok Országos Konferenciája, Oktatás-módszertani és Földrajztanári Konferencia. Magyar Földrajzi Társaság, Budapest, pp. 290–300.
3. NEMES V. – ZAGYI N. (2016) A nemiarány-eltolódás alakulásának társadalmi és területi sajátosságai Indiában. In: Pajtókné Tari I. – Tóth A. (szerk.) *Magyar Földrajzi Napok 2016 absztraktkötet*. VIII. Magyar Földrajzi Konferencia, XVI. Geográfus Doktoranduszok Országos Konferenciája, Oktatás-módszertani és Földrajztanári Konferencia. Magyar Földrajzi Társaság, Budapest, p. 59.
4. WILHELM, Z. – ZAGYI, N. (2013) Spatial Indications Relating to Childrens’ Sex Ratio Transition in India. In: *35th Indian Geographers’ Meet and International Conference. Book of Abstracts*. University of Burdwan (India), Barddhaman, p. 134.
5. ZAGYI N. (2013) A vallásszabadság korlátai a mai Indiában. In: Balogh R. – Schmidt P. (szerk.) *A földtudományi kutatások új aspektusai. Tanítványok és mestereik a Kárpát-medence földtudományi kutatásában. Geographia Pannonica Nova* 17. PTE TTK – Publikon Kiadó, Pécs, pp. 117–129.
6. WILHELM, Z. – ZAGYI, N. (2012) Mit ér a lány, ha indiai? – Nemi arányok alakulásának vizsgálata Indiában. In: Nyári D. (szerk.) *Kockázat – konfliktus – kihívás. A VI. Magyar Földrajzi Konferencia, a MERIXWA Nyitókonferencia és a Geográfus Doktoranduszok Országos Konferenciájának tanulmánykötete*. SZTE TTK Természeti Földrajzi és Geoinformatikai Tanszék, Szeged, pp. 1037–1053.
7. WILHELM, Z. – ZAGYI, N. (2012) Mit ér a lány, ha indiai? – Nemi arányok alakulásának vizsgálata Indiában. In: Blanka V. (szerk.) *Kockázat – konfliktus – kihívás. A VI. Magyar Földrajzi Konferencia, a MERIXWA Nyitókonferencia és a Geográfus Doktoranduszok Országos Konferenciájának absztraktkötete*. SZTE TTK Természeti Földrajzi és Geoinformatikai Tanszék, Szeged, p. 248.

2. Other publications

2.1. Papers published in periodicals and book chapters

1. **ZAGYI N.** (2020) Szulejmán szultán turbéki sírkomplexumának rekonstrukciója. *Újkor.hu* (online) 2020. 10. 02. <http://ujkor.hu/content/szulejman-szultan-turbeki-sirkomplexumanak-rekonstrukcioja>
2. **ZAGYI N.** (2020) Beszámoló a Zrínyi–Szulejmán Kutatócsoport vizsgálati eredményeit összefoglaló könyvsorozat és dokumentumfilm bemutatójáról. ELKH Bölcsészettudományi Kutatóközpont (online) 2020. 09. 23. <https://btk.mta.hu/hirek/1577-beszamolo-a-zrinyi-szulejman-kutatocsoport-vizsgalati-eredmenyeit-osszefoglalo-konyvsorozat-es-dokumentumfilm-bemutatojarol>
3. **ZAGYI N.** (2020) Mordortól Mohácsig: A mohácsi csatáj történeti földrajzi kutatása. Recenzió. *Múlt-kor* (online) 2020. 08. 29. <https://mult-kor.hu/mordortol-mohacsig-a-mohacsi-csatataj-trteneti-fldrajzi-kutatasa-20200829>
4. SZÖTS-RAJKÓ K. – **ZAGYI N.** (2019) Helytállás, vitézség, hősiesség – Szulejmán szultán zarándokvárosának kutatása 2012–2019. Beszámoló. *Újkor.hu* (online) 2019. 12. 23.
5. WILHELM Z. – **ZAGYI N.** (2016) An Essential Synopsis of a Prominent Scholarly Life-Work: Geography, Development, Public Policy: Select Essays of Gopal Krishan. *Modern Geográfia* 2016 (1) pp. 1–2.
6. **ZAGYI, N.** (2013) Traditional Energy-Free Solutions for Ventilation and Air-Cooling in Arid Tropical Areas of Asia. *Geographical Locality Studies* 1 (1) pp. 58–79.
7. **ZAGYI, N.** (2013) The World Religions' Approach to Nature and Their Role Undertaken in the Preservation of Environmental Values. In: Sharma, D. – Mangat, H. S. – Surjit Singh, K. (eds.) *Readings in Population, Environment and Spatial Planning*. Institute for Spatial Planning and Environmental Research, Panchkula (Haryana), pp. 279–284.
8. WILHELM Z. – **ZAGYI N.** (2012) Bárdi László 80 éves. *Földrajzi Közlemények* 136 (3) pp. 343–344.
9. WILHELM Z. – **ZAGYI N.** (2010) Délnyugat-Ázsia. In: Tóth J. (szerk.) *Világföldrajz*. Akadémiai Kiadó, Budapest, pp. 1030–1086.
10. **ZAGYI N.** (2009) Egy sajátos zsidó életút. Sa'ad ad-Daula karrierje és bukása az II-kán Birodalomban. In: Tóth J. – Wilhelm Z. (szerk.) *Keleti horizontunk. Tanulmánykötet Bárdi László tiszteletére. Keleti Kiskönyvtár 4*. Publikon Kiadó, Pécs, pp. 265–280.