Challenges of sustainable urban development in Hungary

Project closing report

General overview

The basic hypothesis of this research was that the spatial pattern of land use, consumption and socio-economic division of Hungarian cities has fundamentally changed since the change of regime, due to new processes of urbanisation (e.g. urban sprawl, urban regeneration). Consequently, the social and environmental equilibrium of cities has also substantially changed. All these changes meant a lot of challenges for sustainable urban development and urban policy. Research questions of the project could be summarized along three major aspects.

<u>Questions on land-use changes</u>

- How has the land-use changed in the metropolitan regions of Hungarian cities?
- What have been the main triggering factors of urban sprawl (e.g. transport network, land-prices) around cities and what are the main consequences of the phenomenon?
- What has characterised the conversion of brownfield sites and the shrinkage of green areas?
- How has the social and environmental equilibrium changed in Hungarian city-regions?

<u>Questions on the environmental impacts of urbanisation</u>

- How has the spatial pattern of consumption of households regarding energy, water, food and raw materials and the level of waste production (i.e. metabolism) changed in the urban regions?
- What are the space-time characteristics of consumption of residents in different urban zones?
- What is the correlation between urban sprawl and the shifts in ecological footprint of cities?

<u>Questions on the liveability of urban neighbourhoods</u>

- Which parts of cities have been affected by renewal and downgrading?
- What are the expectations of people towards liveable urban neighbourhoods?
- What are the impacts of residential environment on local identity and social cohesion?

The research project was originally planned for 36 months (01.11.2016-31.10.2019), however, it had to be extended by ten months (until 31.08.2020) because the research tasks were widened and the acquisition of statistical data from different organisations (e.g. Hungarian Central Statistical Office, Global Footprint Network) took longer time than expected.

The group of participating researchers also changed in time. On the one hand, Sassné Eszter Berényi went on maternity leave from 01.01.2017. and left the institute of the principal investigator and Attila Csaba Kondor started a new NVKP project. Therefore, both of them could contribute much less to the actual research than it was originally expected. On the other hand, one young researcher (Zoltán Bertus) joined the project consortium as MTA young researcher on 1st September 2019, and his main task was to contribute to WP 4.1. and 4.2. focusing on urban spaces affected by upgrading. Changes among the participants did not endanger the successful accomplishment of the project, even the publication and dissemination activities became smoother after the entry of the two young colleagues.

Workflow and research results

In the proposal we elaborated 6 broad work packages (WPs) with concrete goals and responsible researchers. Due to the personal changes the circle of contributing researchers slightly changed compared to the plans, however, the expected outcomes were fully achieved. In the following we briefly summarize the main research results.

WP 1 – Literature review and state-of-the-art

At the beginning of the project the existing literature on sustainable urban development in Hungary and East Central Europe was critically reviewed. As it was revealed there were gaps in the literature regarding the environmental impacts and planning conflicts of urban sprawl and suburbanisation, as well as the social and environmental aspects of gentrification. Moreover, we also came to the conclusion that local municipalities consider only narrow segments of the 'smart city' concept as relevant fields of sustainability. Therefore, in the research we put more emphasis on these issues and widened the scope of the project accordingly.

WP 2 – Land-use changes in metropolitan areas

In this WP we investigated the challenges of land use changes in the urban region of major Hungarian cities. The main objective of the research was to detect the changes of land use in the urban regions of major cities from the 1950s until today. Special attention was paid to how the tempo and direction of land consumption changed after the change of regime in 1990. In order to explore the longitudinal land use changes we analysed standardised databases and maps (e.g. military topographic map from 1959, CLC from 1990 and European Urban Atlas from 2012, actual data of GoogleMaps). During the course of research we detected the socio-ecological effects of changing land use patterns around six major Hungarian cities (Debrecen, Győr, Kecskemét, Miskolc, Pécs és Szeged), the changes of the internal structure of these cities and the ecological impacts of urban development. Marked differences among the investigated urban regions were pointed out. While internal suburbanization (in-fill) was typical in Debrecen and Kecskemét, classic forms of suburbanization prevailed around Szeged and Pécs. In the boom-town Győr both processes commenced with above average speed, whereas land use changes around Miskolc were less dynamic, reflecting the recent socio-economic depression of the city. We also focused on the analysis of land-use changes in the intra-urban space and their implications. In doing so, we explored the process of abandonment of urban spaces due to the decline of production and the subsequent conversion of brownfields. We investigated the growing pressure on urban green areas caused by the transformation of urban fabric in three similar size cities from the Great Plain: Debrecen, Kecskemét and Szeged. Our research results shed light on a growing disequilibrium of accessibility of green spaces within urban societies and increasing challenges regarding environmental justice.

WP 3 – Environmental impacts of urbanisation

In this WP we investigate the changing level of urban metabolism and ecological footprint of urban areas. During the research we wanted to measure the consequences of urban sprawl and suburbanisation and to link top-down and bottom up ecological footprint approaches. First in Hungary, we measured the spatial and temporal changes of ecological footprint of commuting in the urban region of Budapest (i.e. the city and surrounding 185 suburban settlements). Basis of the calculation was the volume of commuting recorded in the censuses of 1990, 2001 and 2011, and the average CO_2 emission of different transport vehicles used for commuting.

Our result showed declining ecological footprint values throughout the 1990s, due to economic restructuring, declining mobility and high unemployment. However, after the turn of the millennium commuting started to grow again and the use of motor vehicles (private car and bus) in commuting substantially increased. This has resulted in growing footprint values. The spatial structure of commuting also went through substantial changes, the dominance of rail-commuting shrunk into a few transport axes, whereas the use of private car increased also in the less affluent sectors of the urban agglomeration. All these changes had impacts on the spatial configuration of ecological footprint within the metropolitan region.

As a next stage, first in East Central Europe, we made modelling for changes of ecological footprint in the Budapest urban region. First, we calculated the direct ecological (carbon) footprint of households in Budapest and its agglomeration with a bottom-up approach. We found that while the household footprint decreased by 11% in Hungary between 2003 and 2013, it increased by 6% in Budapest and by 8% in the suburban zone. In the suburban zone the growing ecological footprint is mainly the outcome of population growth, in Budapest the major factor of growth is the increasing consumption. As a second step we used top-down (or compound) approach considering GDP per capita data for the calculation of footprint values in the Budapest metropolitan region based on Global Footprint Network (GFN) between 2003 and 2013. The top-down (compound) calculations indicated growing EF values both in Hungary and in the BMR in the investigated period (as compared to the carbon footprint). Thus, improving eco-efficiency makes significant effects at the level of metropolitan region.

WP4 – Liveability of urban neighbourhoods

In this WP we investigated the impacts of regeneration processes in selected residential areas (e.g. inner-city neighbourhoods, housing estates). Another task was to collect information about forms of rehabilitation. We were also interested how social cohesion can be kept in residential neighbourhoods that are drifting apart in terms of welfare, quality of housing, social networks and attitude. We studied social change in inner-city neighbourhoods and different generations of housing estates in Budapest. Our results showed that both inner-city neighbourhoods and different generations of housing estates followed distinct trajectories after 2000. Their social and demographic composition remained very heterogeneous and became even more diversified due to the influx of new residents.

Research findings showed substantial differences among the investigated upgrading inner-city neighbourhoods, the actors of upgrading, and its forms and the socio-economic outcomes. Classic forms of gentrification were typical mainly in Budapest, where the process of regeneration and displacement was most advanced among the investigated cities. In the regional centres studentification was more prevalent. Altogether we found great diversity of newcomers (gentrifiers) in upgrading neighbourhoods, among them couples with children (family gentrification), students (studentification), young professionals (→,transitory urbanites').

Considering the changing composition of population in large housing estates we can conclude that the size and technology applied (pre-fab or brick) strongly affected the population change that took place in the different generations. In older generations (especially in the housing estates of the 1950s) the influx of younger, better educated strata could be detected, while in younger generations (both in the housing estates of the 1970s and 1980) an ageing process and a relative socio-economic decline took place. Although the share of residents with tertiary education is growing in all housing estate generations, its dynamics lags behind the Budapest average, so our results testified in relative terms a gradual downgrading process in the social status of housing estates. The composition of population by occupation groups demonstrated

clearly the social downgrading process of the high-rise pre-fab housing estates built in the 1970s.

As part of the micro-level studies we were also interested how the level of segregation of different socio-economic groups has changed. Our study area was Budapest. To detect changes in the pattern of social segregation in Budapest we used occupational data from the three post-socialist censuses of 1990, 2001 and 2011. For the sake of fine geographical resolution Budapest was divided into discrete territorial units (ca. 1600) on the basis of functional and morphological attributes. Occupational data were available for these small-scale units for each censuses which made fine spatial resolution possible. According to our findings growing income differences have been only slowly translated to new patterns of social segregation in Budapest. One important aspect of the new segregation pattern is that lower socio-economic groups became more segregated while upper occupational categories, especially professionals, became more evenly dispersed in the city.

WP5 Synthesis – innovative solutions and policy recommendations

In this WP we summarized the main environmental and social challenges of urban development that have emerged since the change of regime. Based on our empirical results we formulated policy recommendations and innovative solutions for policy and decision makers in order to mitigate the vulnerability of local communities and societies. Policy recommendations based on empirical research findings were excessively published in journal articles, a book on urban diversity, and various book-chapters published in edited volumes and a handbook on urban segregation.

WP 6 – Dissemination of knowledge

During the life-cycle of the project research results were excessively disseminated. Originally we planned to publish 4 articles in Q1-Q2 international scientific journals, finally we published 8 papers at this level 3 Q1 (all of them D1) and 5 Q2. In addition we published 2 articles in Q3 journals, so the number of internationally recognised journal articles was 10. Following the publication practices of the discipline (human geography) we also published our findings in Hungarian in such renowned journals such as Magyar Tudomány or Közlekedéstudományi Szemle. Altogether 5 Hungarian articles were published. Next to journal articles we published 1 book and 6 book chapters in edited volumes and a handbook. 3 of them were published in English with renowned publishers like Springer or Edward Elgar. The total number of publications to date is 22. As by-products of statistical data analysis great number of thematic maps have been produced that will be published in the 2nd volume of the new National Atlas of Hungary. Obviously, the present list of publications will substantially increase in the next couple of years, as many papers are currently under preparation or just before submission.

Next to paper publications we planned 6 presentations at national conferences and at least 4 presentations at international conferences. PI alone held 10 presentations at national and 7 presentations at international conferences. We list here only PI's national and international conference attendances:

National conferences:

- Kovács Z.: Új kihívások a magyarországi urbanizáció térfolyamataiban. Magyar Tudományos Akadémia Szegedi Akadémiai Bizottsága, Közgyűlési előadás. SZAB Székház. 2017. február 24.

- Kovács Z.: A kreativitás és a sokszínűség szerepe a városok versenyképességében a 21. század elején. A Dugonics Társaság előadóülése. Szeged, Városháza. 2017. május 30.

- Kovács Z.: A szegregáció- és diverzitáskutatás lehetőségei nagyvárosi terekben. XV. Településföldrajzi Konferencia. Plenáris előadás. Bük. 2018. április 5-6.

- Kovács Z.: Az elővárosi növekedés környezeti hatásai hazánkban. Előadás a IX. Magyar Földrajzi Konferencián. Debrecen. 2018. november 9-10.

- Kovács Z.: A város felfalja környezetét. Előadás az SZTE Szabadegyetem XXII. szemeszterében. 2018. november 28.

- Kovács Z.: A nyugat-európai és a kelet-közép-európai városfejlődés főbb társadalmi szerkezeti jellemzői: a közeledés és a távolodás jelenségei. Városok és városlakók c. konferencia. Plenáris előadás Budapest, MTA Kisterem, 2019. 05. 31.

- Kovács Z.: A kreatív gazdaság hazai térszerkezetének kihívásai. „Kreatív ipar, digitális gazdaság. Kautz Konferencia. Plenáris előadás. Győr. 2019. június 12.

- Harangozó G.-Kovács Z.-Kondor A. Cs.: A Budapesti Várostérség ökológiai lábnyoma lakossági fogyasztási alapú megközelítésben. Kautz Konferencia. Győr. 2019. június 12.

- Harangozó G.-Szigeti C.-Kovács Z.: A regionális ökológiai lábnyomszámítás módszertani lehetőségei. Kautz Konferencia. Győr. 2019. június 12.

- Egedy T.-Szigeti C.-Kovács Z.-Szabó B.: Az ingázásból származó ökológiai lábnyom csökkentésének lehetőségei a közösségi gazdaság révén a budapesti városrégióban. Kautz Konferencia. Győr. 2019. június 12.

International conferences:

- Kovács, Z.: Ecological and socio-economic effects of urban sprawl in the metropolitan area of Budapest. Association of American Geographers, Annual Meeting. Boston, 2016. április 4-9.

- Kovács, Z.: Land use changes and their socio-economic implications in the metropolitan area of Budapest. 6th EUGEO Congress. Brussels, 2017. szeptember 4-6.

- Kovács, Z.: Urbanization and territorial polarization in East Central Europe (plenáris előadás). Regional Studies Association Central and EASTERN Europe Conference. Cluj-Napoca, 2017. szeptember 10-13.

- Kovács, Z.: The impact of urban sprawl on the ecological footprint of cities: The case of Budapest Metropolitan Region. „Practital Geography and 21st Century Challenges" Thematic IGU Conference. Moscow 2018. június 4-6.

- Kovács, Z.: Measuring sustainability at the level of metropolitan regions. IGU Regional Conference, Quebec. 2018. augusztus 6-10.

- Kovács, Z.- Kovalcsik, T.- Vida Gy.: Potentials of social media analysis for tourism development. 7th EUGEO Congress, Galway. 2019. május 15-18.

- Kovács, Z.: Post-socialist cities 30 years later. What comes after post-socialism? "Urban and Housing Systems under Pressure: Varieties of Responses" Conference, Budapest. 2019. 09. 27-29.