Smart-work and smart cities

National report – Romania

Work package 4

UNIVERSITATEA
„ALEXANDRU IOAN CUZA“
din IAȘI

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1. A brief introduction on the topics discussed in the national templates

The data provided by Eurostat (Employment and social developments in Europe: 2020 review) [1] confirms the low levels of smart-working diffusion in Romania, despite an intense growth of remote working in Europe, during the recent years. At the beginning of the pandemic period, the level of digital skills necessary for remote working among the Romanian employees was near to a score of 70, compared to the EU average of 100, the lowest value recorded at country level. This value describes the mixed skills of different categories of workers and activities, but we suspect that it mostly relies on the abilities of the ITC employees, which are strongly concentrated in the metropolitan areas. The outbreak of the COVID 19 pandemic forced the Romanian economic system to quickly adapt to the challenge and to partially switch to and promote smart-working, in a complex territorial context [2]. These dynamics were supported by an unbalanced Internet network that induced some penalties for the rural territory, in terms of speed and coverage [3]. One of the consequences of this cumulative frame of territorial disparities is the reinforcement of the role played by the large cities in the attraction of the smart-working employees, making those cities even smarter than before. Encouraging of the development of teleworking in Romania is the output of a complex interaction between the public actors (rarely the regional ones), the private companies and the local communities, each category of actors having overlapping agendas. For example, the Romanian state promotes a Digital Agenda set of policies that should focus on the elimination of the digital divide between the different parts of the Romanian territory. On the other side, the private companies active in ITC and business support are promotors of smart-working for different reasons, mainly cost reduction. The local communities are also investing and supporting the smart-working, but in subordination to other objectives, like the transformation of the local business environments in smart cities [4][5]. However, the particular Romanian case shows that the linkage between all these different strategies is far from being efficient and manageable, given the almost absolute absence of the local structures of governance in charge with the development of smart-working comprehensive projects. When active, these structures focus more on generating rapid solutions to inherent local problems, instead of focusing on the potential strategies for the near future. For example, given the fact that the ITC sector detains a major contribution in the Romanian GDP and a

strong pool of competences, the policy design is extremely interested in transferring these competences to the public sectors, using the Digitalization Agenda, but ignoring how this transfer will impact the local economic systems. To be more precise, before 2020, it was highly unusual for a person to benefit from a remote medical screening like MRI or CT, but now this practice is current even for hospitals located in unattractive areas for specialized doctors (small cities, mainly). Basically, the medical staff located in large cities can now provide consultancy and expertise for patients living in areas that they would have ignored before, in traditional working conditions. The doctors are using state of the art smart-working technical approaches and they impact the local hospital attractiveness. Summing up, the diffusion of smart-working practices is optimal for the actors involved: public institutions (hospitals), patients and doctors. In the same time, a question still should be addressed by policy makers: why the specialized doctors and medical personnel avoid settling in the unattractive areas for which they are working, preferring the large city? The example shows that the diffusion of smart-working in Romania is not a complete solution for the territorial problems linked to the regional or local lack of attractiveness for employment and public services, being more an alternative way to deal with the structural territorial challenges.

For the moment, the topic of smart working in relation with the territorial implications is an emerging cross-thematic of research, at least in the Romanian case. The scientific production is rather limited, with an emphasis on the general economic and social changes registered during the pandemic period. The main contributions (mainly scientific articles) are provided by economists and psychologist, lacking a spatial footprint in the data collection and the interpretation of the results, from a territorial perspective. This is the reason why we considered that this national report will need to focus on the relation between the territorial structures and the potential diffusion of smart working, using spatial analysis and mapping in order to evaluate the potential spatial impedance in this diffusion process.

2. Smart cities, smart working and territorial resilience in Romania

The Romanian case study shows that there is a strong connection between the transition of the traditional urban areas to smart-cities and the diffusion of smart-working practices. Yet, the process of urban transition is still arrhythmic, lacking a proper policy frame of interventions. The Romanian government published a guideline for the implementation of smart solutions for the urban challenges in 2016 (Ministry of Communication and Digital Society, Smart City for Smart Communities, 2016), but the level of generalization of this document is so high that it makes it less useful, from an operational point of view. For the moment, no other relevant guidelines were identified in the field of policy making. One of the reasons for this situation might be given by the fact that the concept of smart-city is more and more integrated in a broader decisional frame – the digitalization of Romania (a component of the National Plan for Resilience and Recovery). In compensation to this approach, there is an extensive and effervescent interest for the smart-city companies from other actors, the IT and automotive companies and the NGO and associations. This interest is federated and disseminated via a number of internet portals (www.arsc.ro – The Romanian Association for Smart Cities, https://smartcitiesofromania.ro/, https://scorcluster.ro/ro/ - a cluster of smart-city initiatives promoters, https://smartcityhub.ro/# - an IT Romanian company and other similar sites). The local administrative actors are also more and more attracted by the implementation of smart city projects, especially in the metropolitan areas with a

strong ITC component of the labor market (Cluj-Napoca, Iasi or Bucharest), but not only. As a matter of fact, the 4th position in the Romanian hierarchy is occupied by the medium-size city of Alba-Iulia, with rather a traditional economic orientation in manufacturing, according to the Smart City Scan in Romania, 6th edition, 2022 (www.vegacomp.ro). In 2022, about 1001 projects were finalized or in an on-going process. About 33% of these projects have a very clear objective – the management of the urban mobility, considered by the local decision takers and administrations as a top priority (see Annex 1). The second position is occupied by projects dedicated to increase the quality of the local governance – about 23 %. In some cases, the collaborations between the local administrations with the business ITC pool are examples of success in the digital transformation of cities, like in the case of Iasi (https://iasismartcity.ro/ platform – an example of collaboration between the public administration and a local association of ITC experts). However, in almost all the cases this form of collaboration never goes beyond the limit of the city core, placing the other LAU composing the metropolitan areas in a lagging situation. Our research also shows that the smart-working component is highly neglected in the elaboration of the local strategies of digital transformation, even if the benefits of the smart-working diffusion are clear form at least 2 points of view – urban mobility and environmental impact. Moreover, many promoters and partners in the smart-cities Romanian projects, mainly the IT market and the companies, are also strong demanders of new forms of labor market flexibility – smart-working employees, co-working spaces, different models of work schedules etc. In some Romanian cities, there is a contradiction between the emergence of new ITC urban districts based on class A and B offices and the strong demand for remote-work on the available jobs. Both the city centers and the peripheral areas are remodeled and reshaped in order to respond for the strong demand of office spaces, challenging an urban system based on other logics of functionality. If the diffusion of remote working will continue, the fate of these new and specialized districts will become a problem for the city planning. It also seems that these trends are far from equilibrium and this could be explained by the strong degrees of incertitude related to the general economic context after the pandemic period. Overall, the general conclusion of the analysis underlines the need for a better study of the emerging smart-cities in Romania. We suspect that the projects already implemented were decisional responses to urban problems that were left unsolved for years or even decades by the local administrations – traffic and congestion, environmental issues, inefficient urban governance etc. The smart solutions are partially solving this set of problems, but they demand time and expertise for fully working, especially in the large and the medium cities. When the smart-working will become a challenge for the urban management, the expertise already in place and the established networks of collaboration will react and define solutions.

The Romanian statistical databases do not provide a clear distinction between smart-working and traditional working, at least from the perspective of the indicators available in the datasets. This distinction is not traceable in the employment statistics or in the description of the companies' stocks, at NUTS3 or regional level. Moreover, employment data declined on the NACE classification of activities is no longer available at the scale of the local administrative units (LAU), since 2004. In this case, our investigation of the smart-working capabilities and their territorial profile for Romania used open data provided by the Registry of Commerce and available on the free data platform of the Romanian Government - https://data.gov.ro/dataset/situatii_financiare_2021. Basically, we aggregated all the Romanian companies (private bodies) by LAU and we obtained the total of number of local employees,

organized by the NACE sector, for 2021. This method has its limitations: no control on the input data quality, exclusion of the public employees and the self-employed or, given the size of the dataset, the obligation to work with only one indicator (no assessment of the financial indicators describing the companies). The data we obtained from the open data platform allowed us to create to indicators that describe the spatial distribution of the potentially smart-working employees, at the lowest administrative scale of Romania – the communes, the cities and the municipalities.

The first smart-working index (SW1) proposed in this national report is derived from a family of indicators intensely used in transportation geography and regional planning, known as potential accessibility measures [6]. Their technical and theoretical assessments are available in description of t https://www.espon.eu/sites/default/files/attachments/espon_accessibility_update_2006_fr_070207.pdf [7], but also in a large number of academic papers or research reports. When fueled with the proper data, one will use this model to better detect the territorial structures that shape the economic landscape of a region, a state or a larger area. In the case of Romania, accessing data describing the structure of the economic occupancy is not feasible. In this situation, we used proxy indicators like the employment structure provided by the Registry of Commerce in Romania, which details the NACE sectors employment. We aggregated the local employees in three categories:

- smart-working oriented (sectors like ITC, financial activities, professional, scientific and technical activities etc.)
- partially smart-working oriented (real estate, retail or public administration)
- traditional sectors (industry, construction, transportation, accommodation etc.)

For each aggregation of employees stocks at local level, the potential accessibility was calculated, using an exponential negative kernel of 90 minutes, with a span of 30 minutes. The map describes the territorial repartition of these stocks and highlights some interesting key findings for policy design:

- the smart-working employees concentrate mainly in the top of the metropolitan hierarchy (Bucharest, Cluj-Napoca, Iasi and Timisoara). Other large cities like Brasov, Constanta, Galati or Craiova are poorly represented on the map. This association might be caused by the presence of the university functions of the first four cities, a booster for the installation of the smart activities (IT, finance, and business support).
- at the opposite, areas with geographical specificities (mountain areas, the Danube Delta, remote rural areas near hermetic borders) are characterized by a systemic absence of smart-working employees, but this is almost a normal aspect, if one will take into account the fact that the local economic systems are in a fragile position.
- without being a general trend, the regional opposition between the Western NUTS2 and the Eastern ones is visible on the map, at least at the scale of the medium cities. This aspect raises questions about the spatial patterns of smart-working diffusion, in Romania, questions that should be addressed in policy and planning interventions. At the same demographic size (Arad and Bacau, for example), the local potential accessibility of smart-working employees is larger in the Western city of Arad.
- the role played by the academic and educational functions of the Romanian cities is also an important factor explaining these territorial distributions. The smart-working employees are more concentrated in cities with technical universities of tertiary institutions specialized in ITC (Cluj-Napoca, Iași or Timișoara).

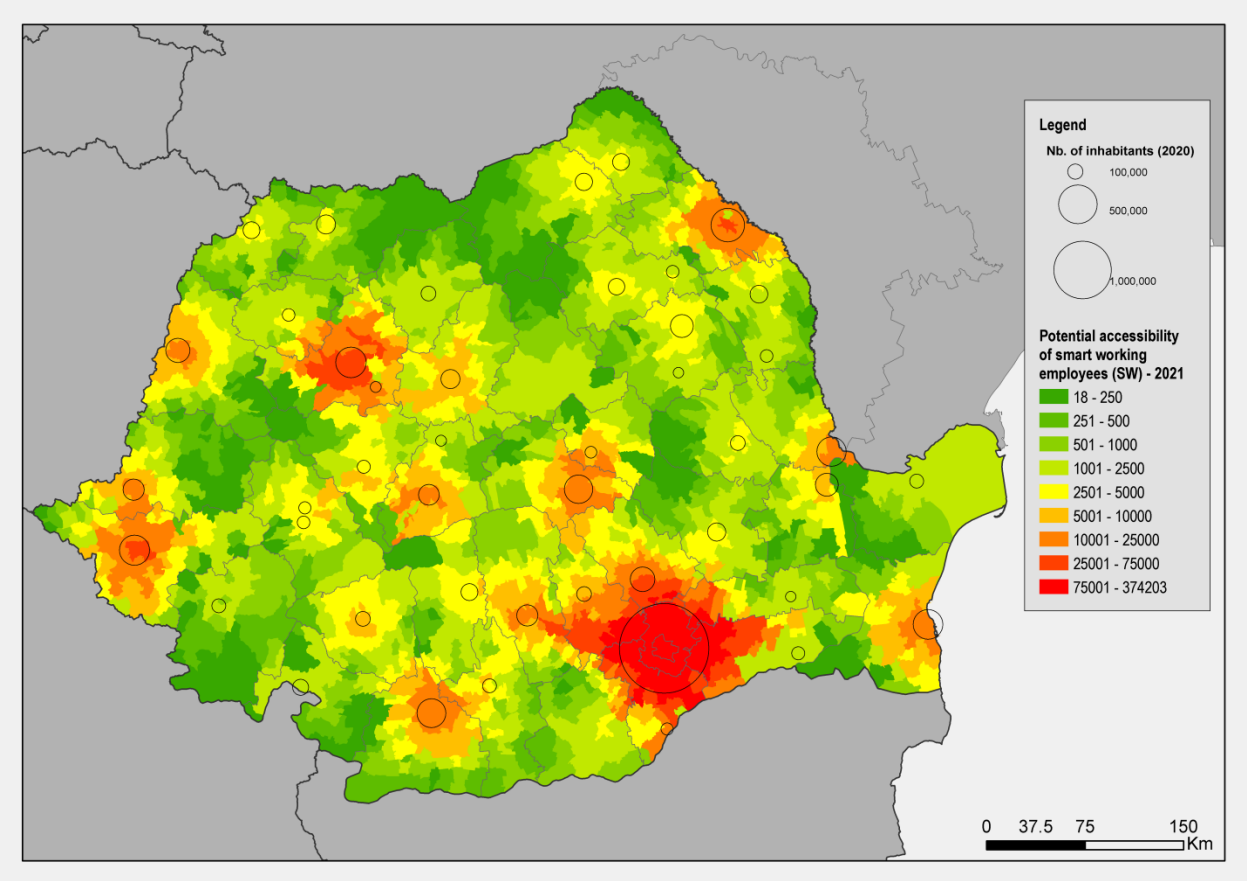

Fig. 1 SW Index 1 – the metropolitan concentration of the smart-working employees in Romania (2021). The potential accessibility of smart-working employees in 90 minutes. Data source: RECOM; GISCO Eurostat

The ratio between the smart-working potential accessibility and an identical indicator, calculated this time for the total amount of employees, depicts even clearer the urban triumvirate of Bucharest, Cluj-Napoca and Iasi. In the case of some Romanian large cities, like Constanta, the low share of smart-working employees in the local amount of work force is surprising, given the territorial endowment of Constanta: complete transportation network, metropolitan functions, quality of life and a long time forged business culture. Keeping the comparison, but lowering the demographic scale, the same situation can be identified at Sibiu. This interpretation of the map suggests that the process of smart-working diffusion might have channels that can be better identified by qualitative focused studies. When the concentration of smart-working employees in three metropolitan areas (by hazard, also historical capitals?) is so intense, one might think that the role of the secondary cities, like Constanta, Sibiu or Brasov, should become a topic of interest for the policy making. However, these hierarchies are very sensitive to policies and decisions that are taken away from the Romanian cities. As the ITC and smart-working employees are relatively mobile in the geographical space, it is possible that the inter-urban competition for the attraction of companies and specialized workforce becomes stronger and international. The emergence of the Bulgarian cities of the Black Sea cost (Varna and Burgas) in this field of activities will put a pressure on the Romanian stocks of smart-working personnel.

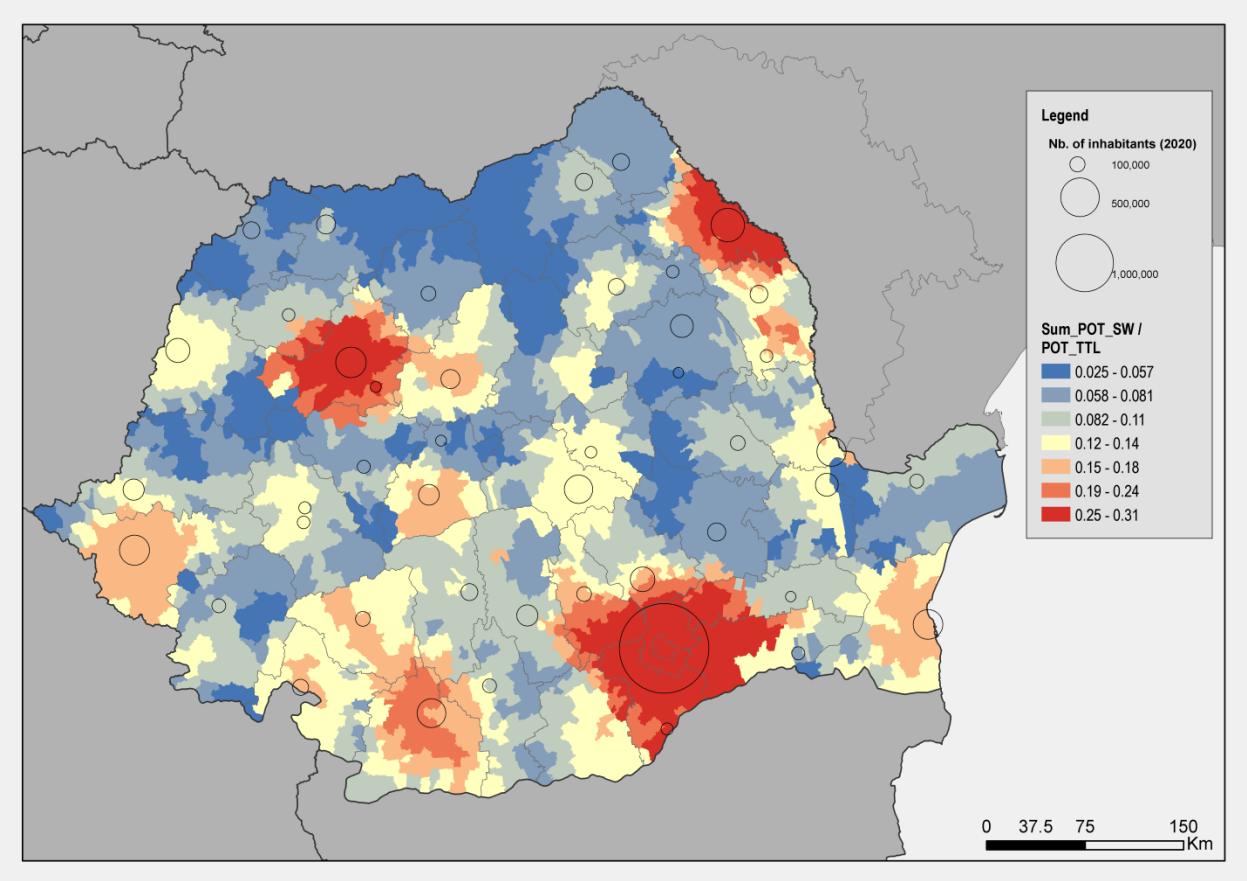

Fig.2 – Share of the smart-working potential accessibility index in the total local potential of employees. Data source: RECOM; GISCO Eurostat

This category of secondary cities is well endowed, from the infrastructure point of view, fairly internationalized and particularly interesting from the perspective of their location advantages (urban ambience, natural environment, a pro-active real estate market etc.). These cities might become the new smart-working receptacles, when the triumvirate will get saturated and generate diseconomies of agglomeration. This general depiction of where the smart-working employees might concentrate needs to be corroborated with an assessment of the magnitude of the indicator. In this case, a secondary index was built, using the same data and spatial constraints (90 minutes time distance around each LAU, by road network). Our intention is to develop an alternative indicator that could detect the spatial anomalies in the smart-working distribution of employees.

The elaboration of the SW Index 2 describing the smart-working diffusion in Romania is based on a second family of indicators widespread in spatial analysis, the local indicators of spatial association (LISA, see https://onlinelibrary.wiley.com/doi/full/10.1111/j.0016-7363.2005.00671.x , for more details) [8]. The index functions like a local Z score, assessing both the anomalies of the mapped values (distance to the local mean, in the negative exponential kernel of 90 minutes) and their territorial triviality (data normalized with the local standard deviation). High positive or negative values of the index describe

local ratios of smart-working employees that are behaving atypically; values closed to 0 are associated to the common cases or local situations.

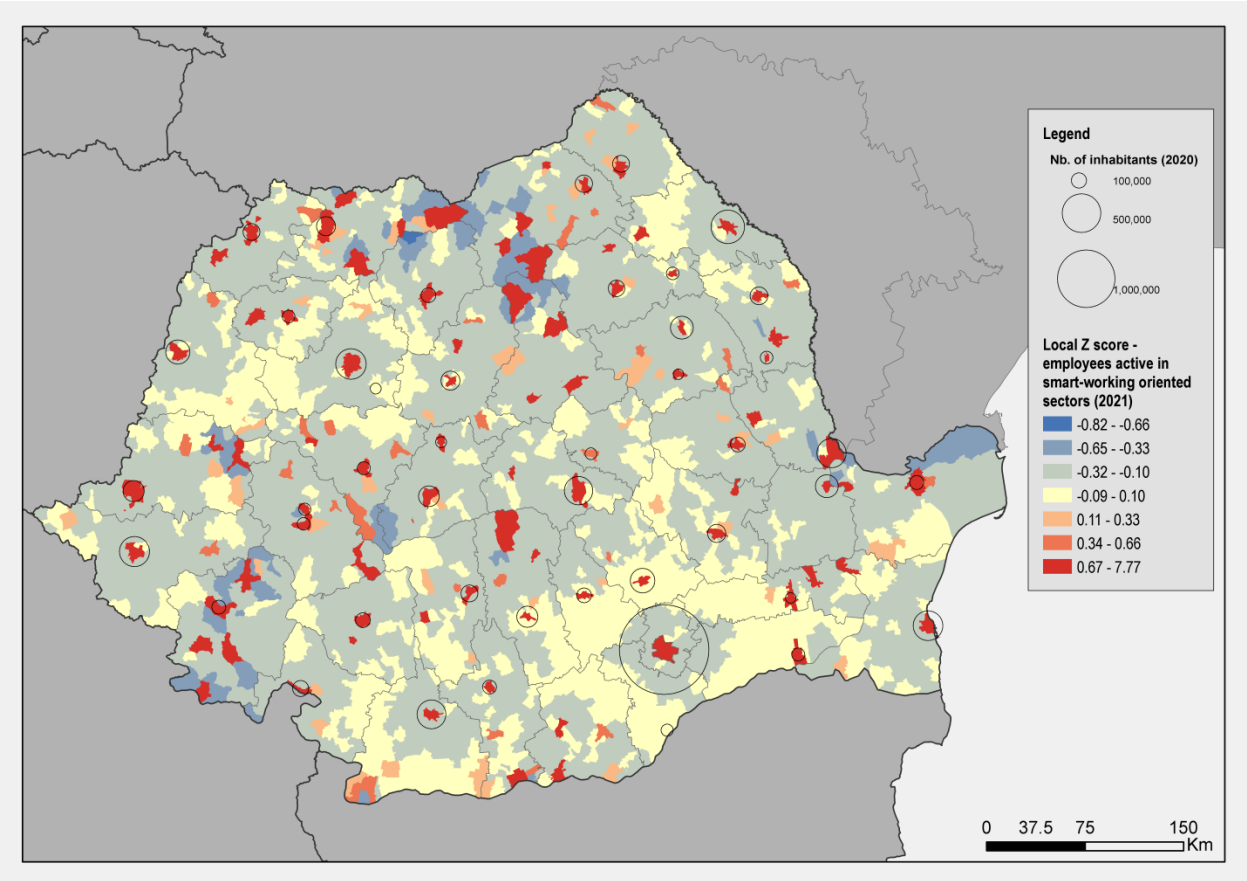

Fig. 3 SW Index 2 – identifying local concentrations of smart-working employees using an alternative method – the local Z scores. Data source: RECOM; GISCO Eurostat

Plotted at the scale of Romania, the SW Index 2 shows that the remarkable positive values (trends of intense concentration) can be dominantly found at the scale of the major components of the urban system. No Romanian large city, including Bucharest, is able to promote a significantly high diffusion of the smart-working employees, in their metropolitan areas. Given the fact that the local Z score is based on the shares of the smart-working employees in the local totals, this situation might be a problem for planning and policy design. In two specific Romanian mountain areas (NUTS3 of Suceava, Maramures and Caras-Severin), the local associations between high positive and high negative is an indication that the local economic systems are heterogeneous. The rest of the Romanian territory is included in two legend's classes closed to 0, meaning that no spectacular relative concentrations of smart-working employees can be detected. From a statistical perspective, there are two points of criticism regarding this index. In a first place, the local Z might be more suitable for the analysis of evolutions in time, signaling shifts in the accumulation or the dispersion of the smart-working employees. However, the lack of data makes this mission almost impossible, for the moment. The second remark is related to the administrative geometry that the researcher uses. The index cannot

incorporate yet the variation in size of the Romanian LAUs, making it sensitive to the LAU surfaces. In the Romanian case, this aspect is visible in the SE of the country, where the demographic densities are low and the administrative surfaces high.

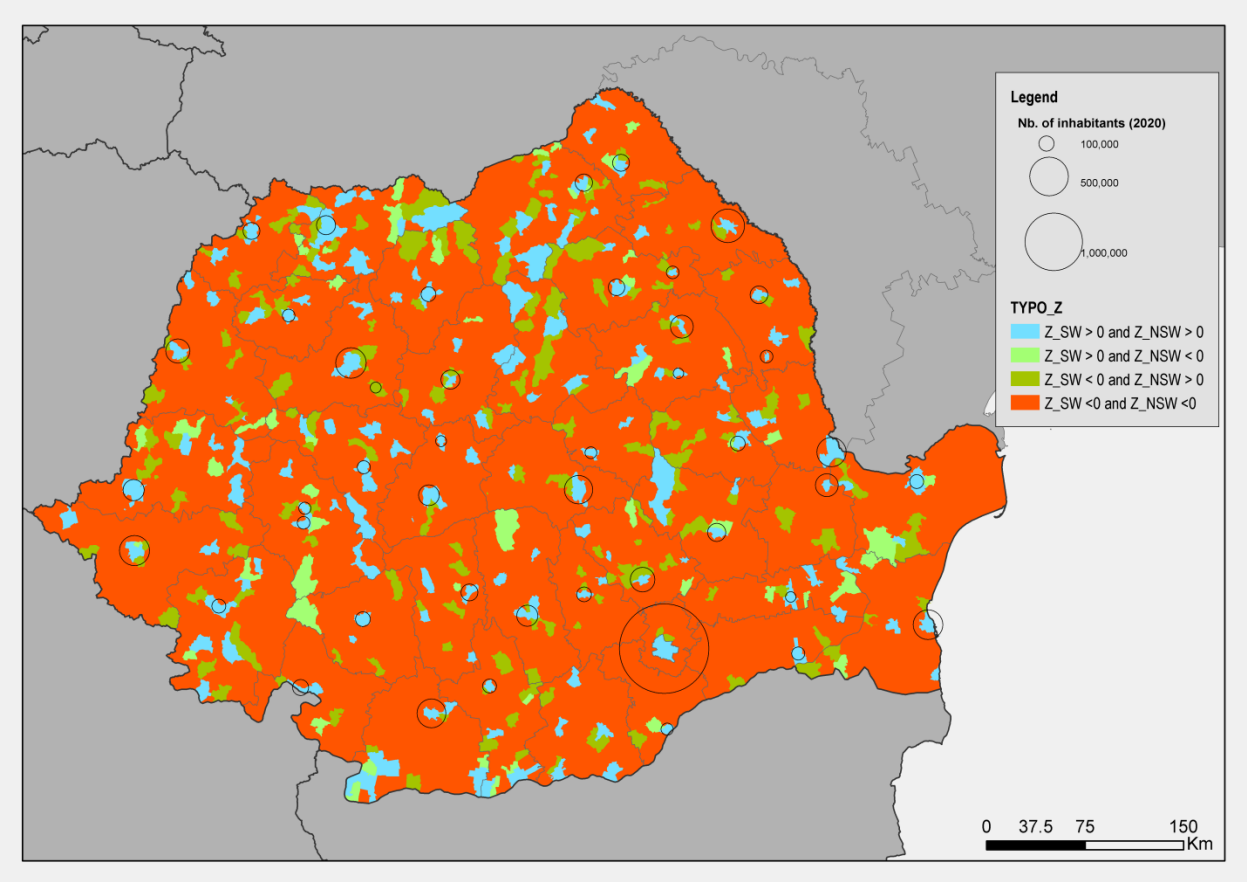

Fig. 4 A qualitative analysis of the smart-working employees vs. traditional employees, using the local Z scores. Data source: RECOM; GISCO Eurostat

This opposition between the urban LAU and the rural ones is also visible on the typology that combines the local Z scores of the traditional (NSW) and the smart-working employees. The map is dominated by the class no. 4 (relative absence of the both analyzed categories) and it is normal, if one will take into account the vocation and specialization of a large part of the Romanian rural space. In the cities, the situation is mathematically opposite (class no.1), at least for the major and medium component of the urban system (stronger presence of both the smart-working and the traditional sectors, from the perspective of the employees' relative shares). The intermediate cases are locally associated with the metropolitan satellites of the large cities (LAU like Miroslava, Otopeni, Apahida or Navodari), for the class no.2 , and with the local presence of small towns and market-places for class no.3. Compared to other case studies (France, for example), this intense polarization of the Romanian territory between the urban and the rural LAU can be a relevant topic for policy design, in the future. Moreover, a better understanding of the genetics of this strong set of urban-rural differences can act like a cross-thematic policy interest.

3. The impact of smart working on urban and regional mobility – lessons from the COVID19 pandemic period

One clear benefit induced by the diffusion of smart-working in Romania, but also visible in the case of other countries studied during the final part of our research, is the reduction of mobility, at different spatial scales. The employees' mobility is responsible for a consistent part of the urban pollution and it might affect the quality of urban life by its negative externalities – traffic congestion, urban stress and reduction of personal time budget. As a main key finding, after the installation of the Covid 19 pandemic and the closure period [9] [10], the trends of the intra-urban mobility for reaching the workplace are systematically placed on a recovery curve, similar to other activities. Using the mobility reports provided by Google, one can detect these recovery trends by plotting them. However, this exercise should be placed in a context of systematic cautions associated to the data quality (impossible to check, given the external source of the indicators) and the urban hierarchy of a studied country. For example, the urban system of Romania is known to be affected by an unbalanced share between a few large cities (the big 8 – about 20% of the urban population) and an archipelago of small and medium cities, the last ones concentrating a respectable demographic mass (almost 35 % of the urban population), but without being able to attract a comparative ratio of the economic initiative and smart-working employment. This territorial disparity will also reflect on the levels of urban mobility, much stronger in the top of the urban hierarchy and less visible for the cities composing the basis of the Romanian urban system.

The Google reports on mobility are reflecting well the particularities of the Romanian urban system, confirming that the concentration of economic activities and population in the cities endowed with metropolitan areas (Bucharest, Iasi, Cluj-Napoca, Timisoara etc.) is related to mobility patterns that are not visible in cities belonging to the intermediate urban echelon. In line with the findings exposed before and for illustration purposes, we have plotted only the data describing the major cities of Romania, as their trends might be considered relevant for policy design.

The data on mobility was aggregated by month, in order to eliminate a part of the inherent data noise (weekends, celebrations day, free days etc.). The analysis presented in this report focuses only on 7 major Romanian cities, for visibility reasons. Each of these cities has particular territorial functions and economic specializations, explaining how the recovery trends are shaped by the local context. For example, in the case of Constanta, the level of recovery is accelerated and associated to the touristic seasonality (June to September 2020 and 2021). Being a hot-spot of tourism on the Romanian Black Sea Coast, this trend is normal. In 2022, the elimination of a major part of the restrictions related to the external tourism, affected the domestic demand and the pattern we observed starts to change its morphology. The rapid recovery of Constanta is not only explained by the presence of the tourism activities, it might be associated to other economic activities related to the transportation sector, tertiary education and trade. The cases of Cluj-Napoca and Timisoara present an opposite situation, with slower rhythms of recovery. Both cities are engaged in a sound process of economic internationalization, adding IT hub functions in their portfolio of urban activities. This specialization can be directed link to the slower dynamics of recovery, as a major part of the IT companies in Romania

encourage their employees to continue their activity in a teleworking regime, for different reasons – jobs productivity, costs reduction, team management etc.

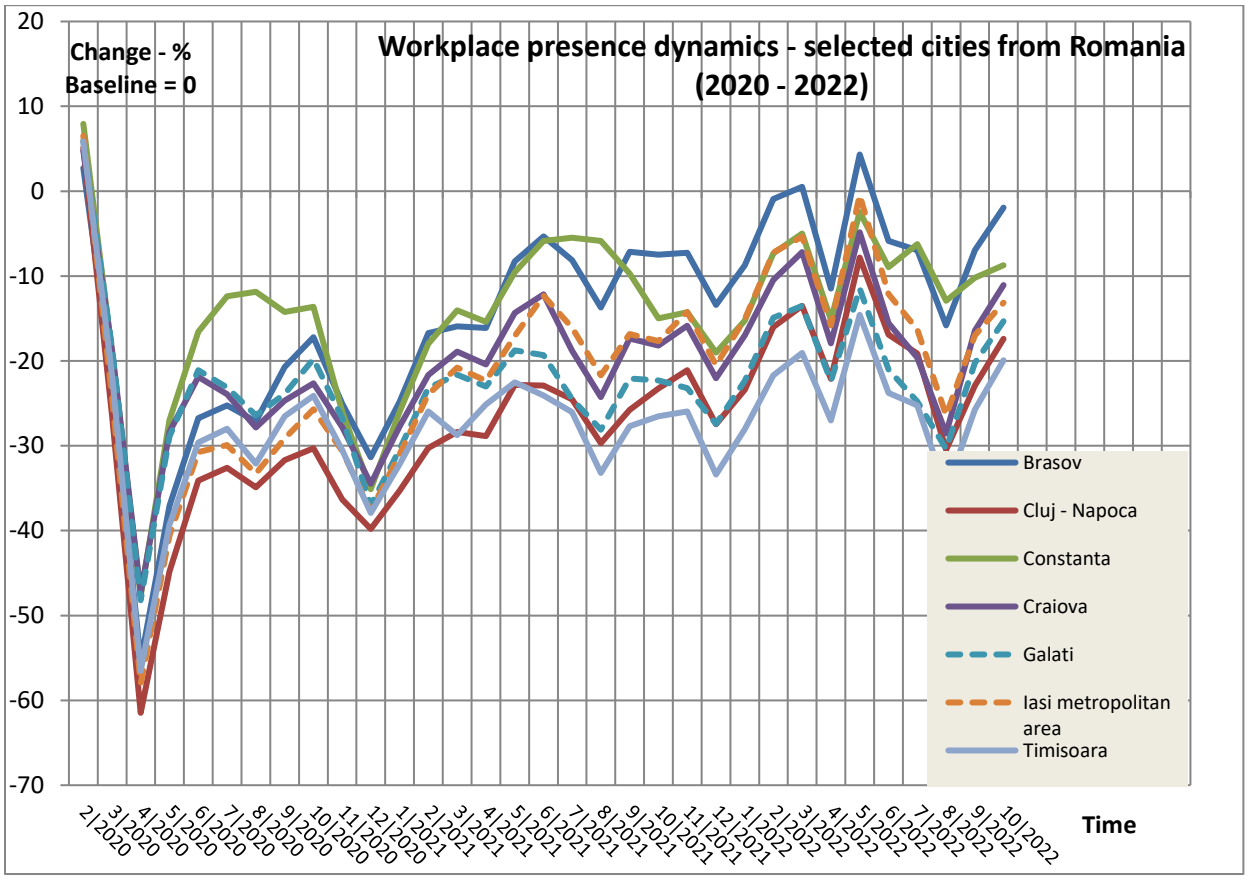

Fig. Trends in the workplace presence between 2020 and 2023 (selected Romanian cities). Data source: Google LLC "Google COVID-19 Community Mobility Reports". https://www.google.com/covid19/mobility/

In the case of Romania, the relation between the environmental indicators and the reduction of mobility is scale dependent and a matter of territorial context, at least from the perspective of the indicator we analyzed – the concentration of NO2. This chemical is usually the output of traffics and industrial activities and it was considered relevant for our analysis [11] [12]. Based on the data collected from the EEA Air Quality Platform and Statistics (to be labeled properly), there is a clear distinction between the level of pollution's reduction in 2020 and the location of the measurement station [13]. For example, the measurements points placed in rural areas depicts levels of limited and stable or low variation pollution, during the 2020, while the urban and suburban ones indicate a depression of the indicator for March, April and May, followed by a recovery trend. Statistically, one could investigate even more these trends and correlate them with the levels of mobility, but this investigation will need specific methodological precautions, out of the scope of this report. Focusing on the scale of the Romanian large cities (approximately 300 000 inhabitants), the urban trends are generally following the same rule – depression and recovery, with the notable exceptions of Constanta and Galati. In the case of

Constanta, the impact of the tourism season might be responsible for the peaks of the NO2 concentration in June and July, in relation with an increased local mobility. Galati has a normal flat trend given by the industrial specialization of the city, a specialization that was impossible to be switched to teleworking for obvious reasons. Cluj-Napoca, with a diversified economic profile, including a sound ITC stock of companies and employees, relies less on traditional activities and it was able to rapidly implement smart-working strategies. This adaptation is a potential explanation for the rapid reduction of the NO2 concentrations in March, April, May and June (2020). Even after the partial re-opening of the economic activities and the inherent mobility increase, the level of pollution is clearly more limited, compared to the beginning of the year. The cities of Craiova and Brasov follow the same pattern as Cluj-Napoca, but with different points of starting levels of NO2 concentration.

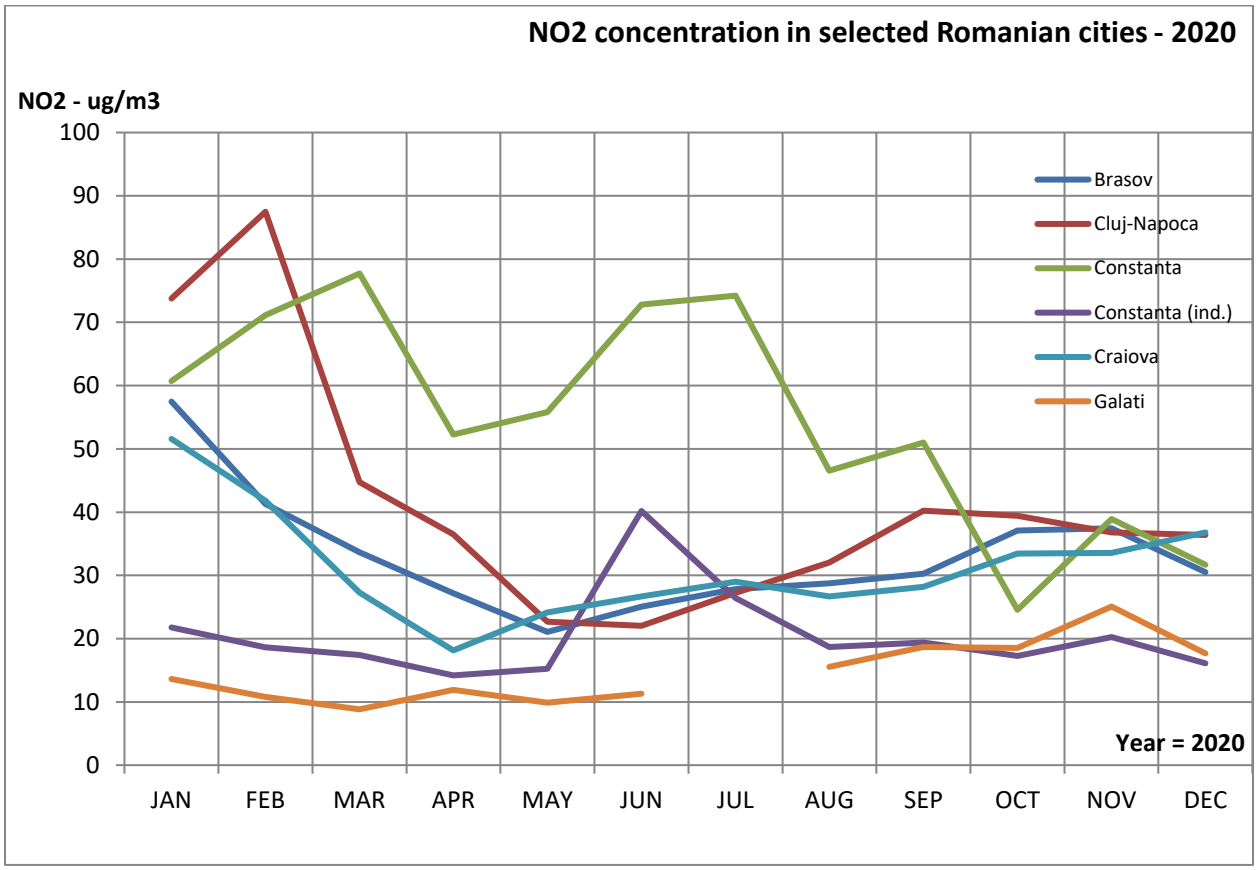

Fig. Dynamics of the NO2 concentration at urban scale (2020 – Romanian selected cities)
Data source: https://discomap.eea.europa.eu/App/AirQualityStatistics/index.html#, EEA

The trends observed during the analysis of the NO2 concentration are also observed for other chemical compounds included in the EEA database, like the CO. However, in some cases it is difficult to evaluate the role of some natural factors and geographical contexts in the dynamics of the urban pollution. The position on the Black Sea shore of Constanta or the location of Brasov in a mountain depression has an impact on the local meteorological patterns (winds, temperatures and precipitations' regime). These elements were not taken into account in our modeling, being a limitation of the approach we proposed in this report.

4. Framing the bottlenecks impeding the development of smart working in [name of the country involved in the project]

In a national context, the evaluation of the Internet download speed at local scale shows that the economic disparities at work in the Romanian territory can be correlated with the spatial distribution of this indicator. At regional scale, the opposition between the LAU situated in the North-East of Romania and the rest of the country is easy to identify. This opposition occurs even in the situation where the largest city of North-East (Iasi) is a competitive hub in the ITC and business support operations. In some cases, values lower than 50 % of the national average can also be observed in the areas with geographical specificities – mountain areas, Danube Valley or Danube Delta, associated to the demographic dispersion and densities.

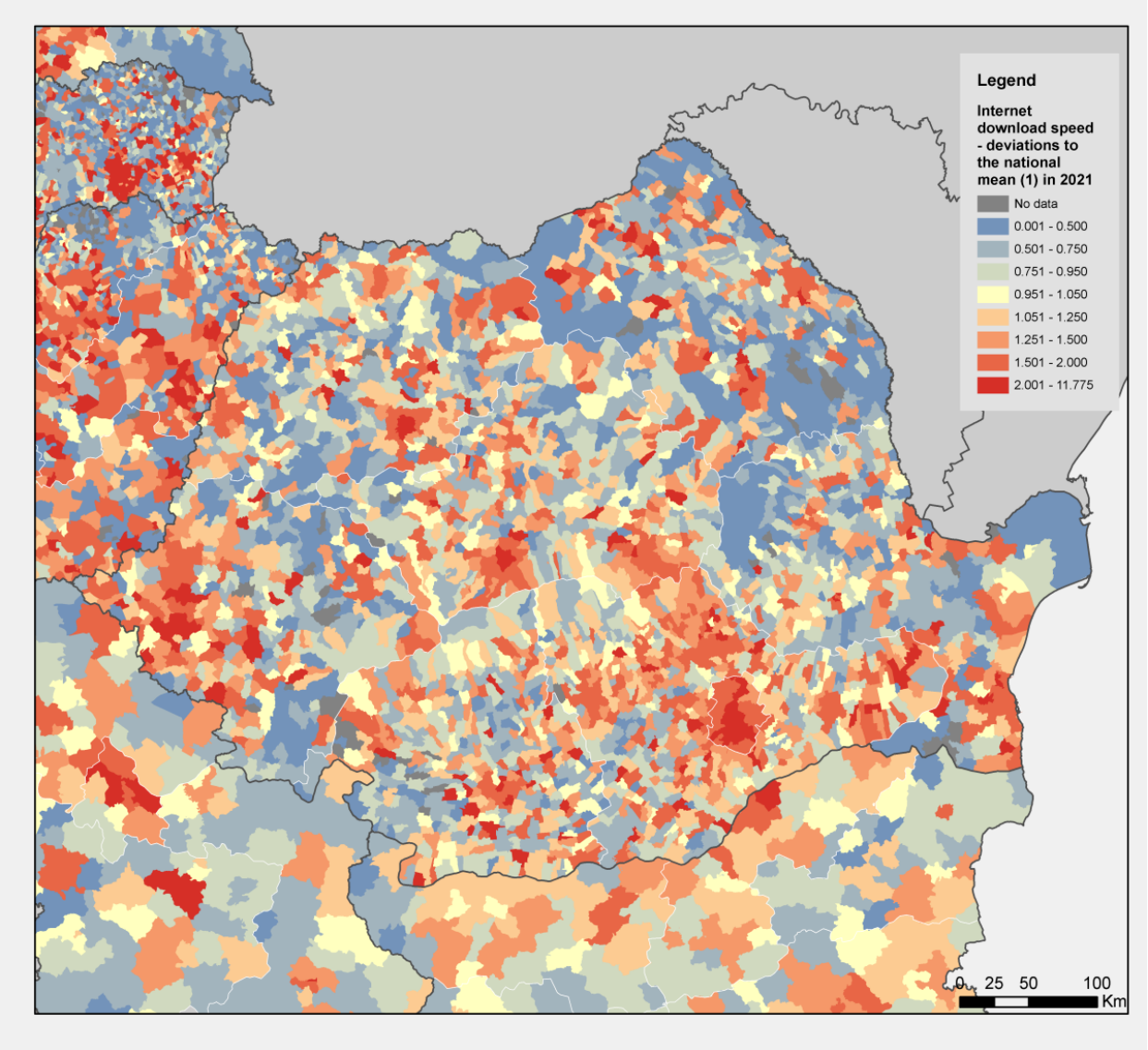

Fig. 5 – Deviations to the national mean – Internet download speed in 2021. Data source: Ookla database; GISCO Euorstat

The explanation of this situation is triggered by the technological difficulties of installing the needed infrastructures, but also from the limited market potential (low demographic densities and demand). In the perimeter of the metropolitan areas, the values of the indicator are systematically higher than the national mean, with some differences between the core-cities – Constanta and Iasi have lower values than Timisoara and Cluj-Napoca, according to the Ookla database.

The main conclusion relevant for policy design is linked to the potential challenges that the Internet download speed might develop, in terms of territorial disparities [14] [15]. For the moment, the Romanian digital divide is organized by the opposition between the metropolitan areas and the rural spaces nearby, an opposition that is manageable. The main concerns might be the future scales of regional manifestation of this disparity, especially in the case of the North-East Region. This part of Romania already cumulates territorial disadvantages (low rhythms of reindustrialization, reduced accessibility and connectivity, high shares of employees active in the traditional sectors etc.). Countering these disadvantages takes time and complex policy interventions. However, dealing with the digital divide is less complicated and it might become an example of good practices in increasing the territorial cohesion, in Romania.

5. Key findings and policy recommendations

This final part of the report should encompass the relevant/key findings of the points 2, 3, 4 and these key findings should fuel a set of limited policy recommendations, at EU and national level.

From a policy perspective, there are several factors that could encourage the diffusion of smart working in Romania:

- **technological infrastructure**: smart working requires a robust technological infrastructure to enable remote work, such as high-speed internet and reliable communication networks. Investments in the infrastructure development could encourage the diffusion of smart working in Romania. If the Internet speed measured at local scale places Romania in a fair position, at European scale, dealing with the coverage problems and the territorial disparities of this technological endowment is clearly a long term stake. The Romanian Agencies for Territorial Development in charge with the financial programming at NUTS2 scale should take into consideration the fact that keeping their regional competitiveness in the future will strongly depend on the ITC infrastructure. A tri-partite dialogue between these agencies and the ministries of Regional Development and Research, Innovation and Digitalization might function as a first step in detecting how to better shape initiatives and projects in this field of decision.

- **workforce skills**: The availability of a skilled workforce that is capable to work remotely can facilitate the adoption of smart working. Policies that promote skills development and training for remote work could help building a capable workforce that is prepared for smart working. This formation is largely linked to the presence of universities in the territory, but the vocation of these public institutions is not only dedicated to the training of the smart-working future employees, they have other missions beside. Other forms (even informal) and instruments of formation can be envisaged by policy makers. For example, during the previous financial programming frames, a strong emphasis was put on the lifelong learning projects, managed by different institutions and Romanian agencies. When the financing

paradigm switched recently to recovery and resilience policies, these forms of adult education and workforce training became less visible. In this case, renewing some of these training opportunities might be a solution to cover some of the challenges of dealing with the workforce skills in the future. A mix of actors (universities, specialized high schools, Agencies for Regional Development and local NUTS3 decisional bodies) should promote these activities, in the near future.

- **a better articulation between the different territorial agendas** is needed: the policies related to the diffusion of smart-working in Romania should avoid being reactive to challenges. For the moment, there is little concern regarding the diseconomies of agglomeration generated by the high levels of ITC concentration in the metropolitan areas, but in time these issues will insert themselves on the public agendas, at local or regional level. The concurrence on the labor market of digital skilled employees, the pressure on the Internet networks, the intensity of AI introduction in the work flows will generate new challenges for the policy design. The national, the regional or the local strategies related to territorial planning largely ignore the spatial dimensions of the smart-working, being more attracted by the more operational concept of smart-city (see Annex 1). The set of documents we analyzed are long-term programmes and projects of planning, many of them being launched before the COVID – 19 pandemic. A needed step for encouraging and framing the diffusion of smart-working in Romania might involve upgrading the territorial agendas of the policy makers, in order to better cope with the challenges of smart-working.

- more studies are needed. This final recommendation might sound like a scientific cliché, but it describes well the lack of structured information on this topic of research – the smart working diffusion in Romania. The elementary information that can be collected from official sources is limited in terms of economic sectors coverage and it is hard to update by normal GIS and technical routine. Policy makers may need that the relevant data describing the smart working stakes to be easier to access. For example, there is almost no information regarding the occupancy of the Romanian employees, so no insight or zoom-in is possible, in relation to the smart-working diffusion mechanism.

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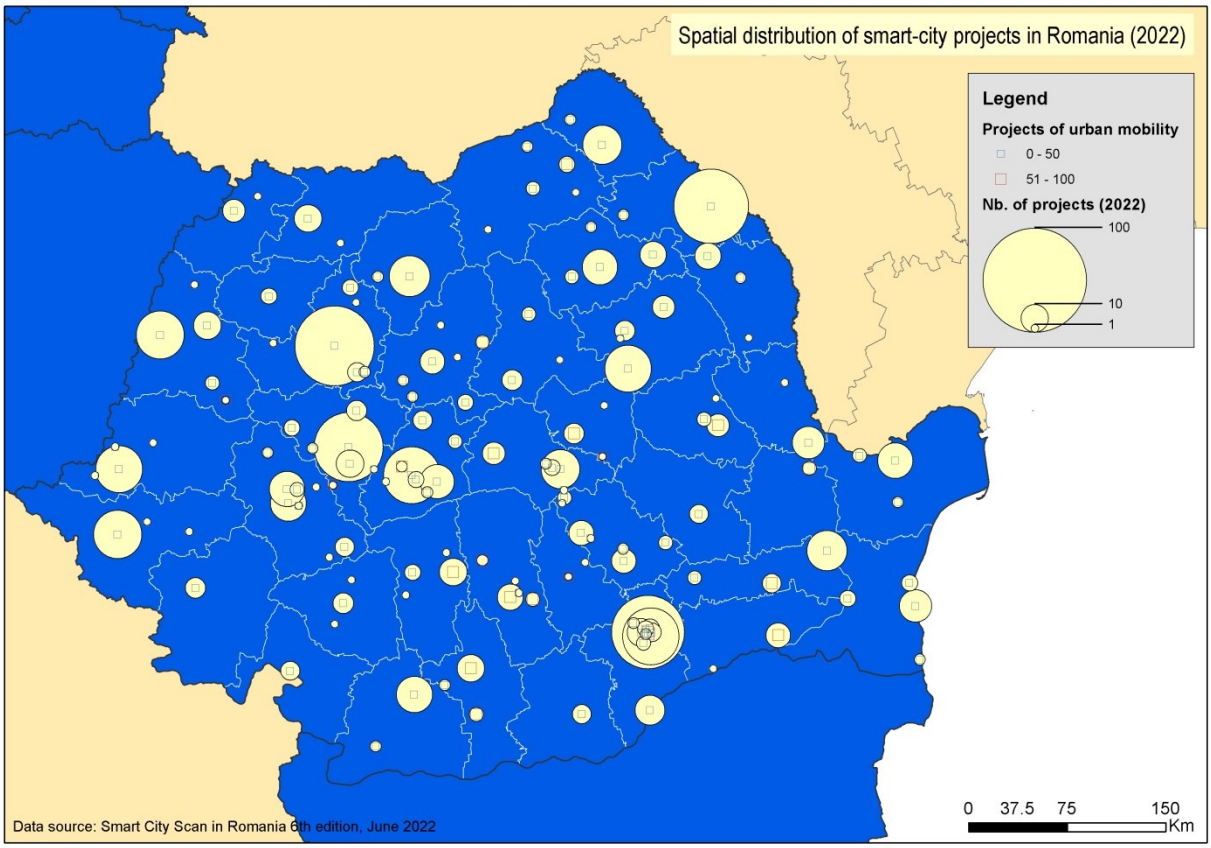
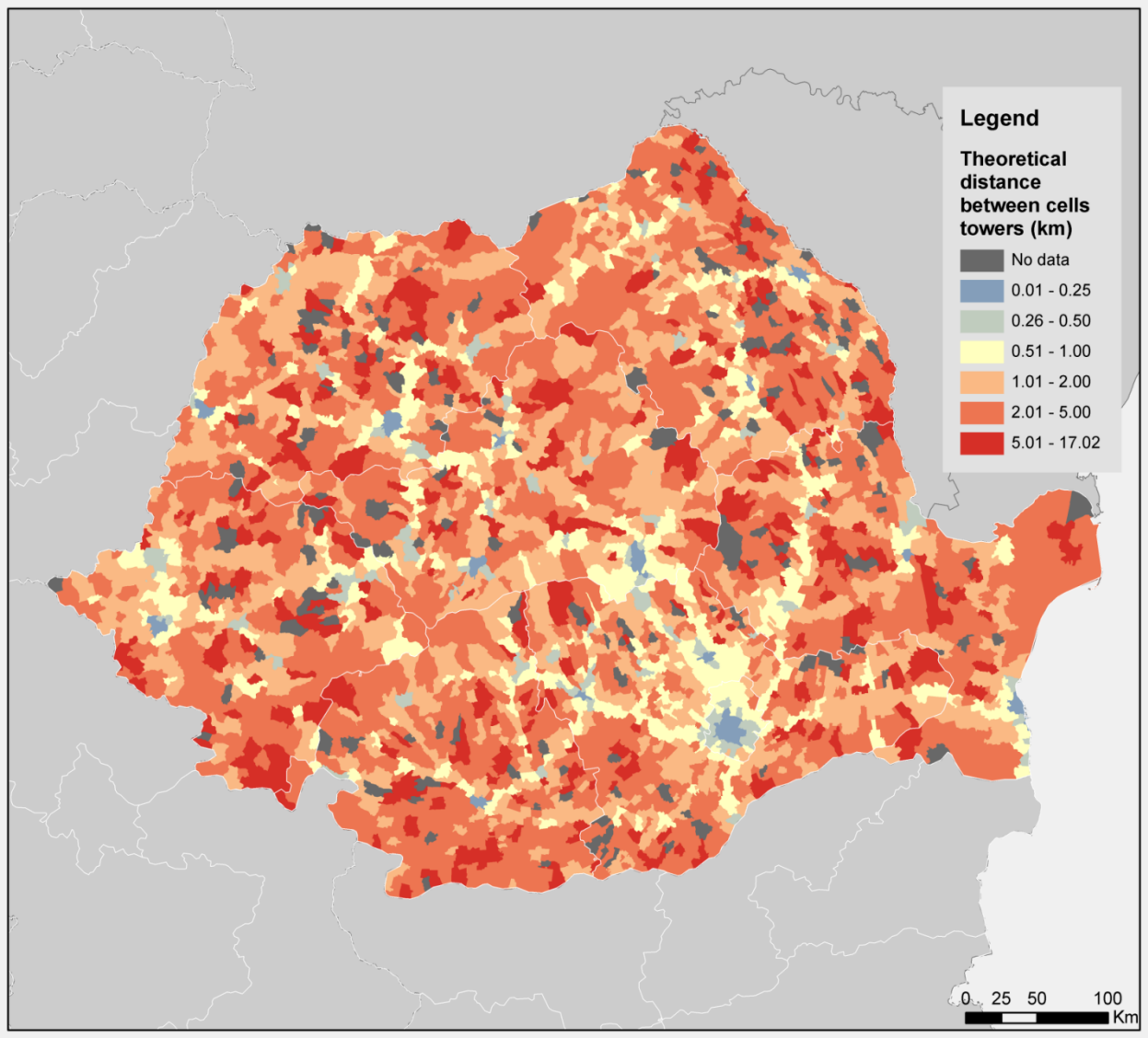
Annex 1 – Mapping smart-city projects in Romania – a cumulative distribution for 2022.



Annex 2 – Theoretical distance between the mobile telephony cells in Romania (2021)



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