IRSMART
Industrial Relations
for Smart-Workers in Smart Cities

WP4 National report

Smart working and Smart Cities: a territorial perspective in Italy

Davide Antonioli, Davide Dazzi, Gianfranco Franz, Marco Quatrosi

Università degli Studi di Ferrara

IRES EMILIA-ROMAGNA ISTITUTO RICERCHE ECONOMICHE SOCIALI

Co-funded by the European Union

This publication was produced for the project "IRsmart – Industrial Relations for Smart-Workers in Smart Cities", which was financially supported by the EU (CALL VP/2020/004 G.A. no VS/2021/0200). The information contained in this publication does not necessarily reflect the official position of the European Commission.

1. Introduction

The Italian context has its own peculiarities concerning the diffusion of smart-working and the level of evolution and implementation of the smart city model by over one hundred cities that differ significantly from each other. The two concepts, smart-working and smart cities, have been developed and analyzed often separately. We here mostly focus on the smart city concept, being smart-working fully researched in the previous work packages (WP2 and WP3).

The Smart City model is not a strictly defined and rigid paradigm exclusively based on the use of ICTs and on the consequent need for broadband network infrastructures. It is or should be considered as a comprehensive model, able in promoting and integrating actions, projects and investments in many different fields and sectors. Several dimensions or axes can be considered to describe a smart city: e.g. smart economy; smart mobility; a smart environment; smart people; smart living; and, finally, smart governance. These can be synthesized in a definition, among many others, of a smart-city: a city is smart "when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (Caragliu et al, 2011). Cocchia and Dameri (2013) and Cocchia (2014) point out how in a smart city technologies, ICT, logistics, transports, energy and so on, cooperate within an integrated information system producing benefits for citizens and firms. Smarter services result more efficient and integrated favouring the better development – possibly sustainable – in education, healthcare, transportation, facilities and building management, and workplace.

In the Italian context the studies concerning the smart city model are showing a contradictory and diversified situation that reproduces the usual polarizations of a country characterized by:

- a profound North/South dualism,
- the traditional and obvious strength of large metropolitan areas (Rome, Milan, Naples, Turin),
- the presence of very dynamic and attractive smaller metropolitan areas' (Bologna, Verona and, to varying degrees, Florence), which are often pivotal or nodes of highly urbanized regional systems,
- regional capitals of medium-small size but strongly characterized by the centralization in them of a large part of the regional tertiary and advanced quaternary system (Trento, Ancona, Perugia),
- an excessively large portion of the national and insular territory dramatically distant from increasingly necessary and decisive levels of smartness.

The underestimation of the smart city model by national and regional and municipality governments has produced a strong gap with the levels achieved by European capitals and cities. A gap that the National Recovery and Resilience Plan (NRRP) is trying to mitigate, with the financing of many smart urban measures.

Focusing on the Italian context, it is interesting to compare the Italian City ranks published in 2019 and 2022 by the Forum PA[1], the most reputed organization that collects data on local public administrations and that, for at least fifteen years, has been analyzing Italian progress or delays in the development of smart cities.
In 2019, on the basis of 6 criteria (economic strength, sustainable mobility, environmental protection, social quality, governance capacity, and digital transformation) and of 100 indicators, the smartest cities rank showed three cities at the top (Fig.1): Milan, Florence and Bologna, followed by a group of 7 medium size cities of which only Venice is a regional capital: Bergamo, Turin, Trento, Venice, Parma, Modena and Reggio Emilia. The Emilia-Romagna region, the second richest and more industrialized region of the country had 4 cities (Bologna, Parma, Modena and Reggio Emilia) in the first 10 positions while Lombardy, the richest and more industrialized Italian region only 2 (Milan and Bergamo).

[1] https://www.forumpa.it/

In 2022, due to the enormous growth of digitally delivered services during the Covid 19 pandemic, the Forum PA increased the number of services analyzed to compile the annual ranking, going from 41% monitored in 2019 to 82% in 2022. The digital dimension and the performance of increasing public capacity in providing digital services, which was only one of the six indicators in 2019, now becomes the central indicator, organized into 8 specific indicators (online services, municipal apps, enabling platforms, Social Public Administration, Open data, Openness, public WiFi, IoT).
The results of monitoring conducted at the end of 2022 show some changes in the top ten, with Florence leading the national ranking, Milan dropped to second place, 6 cities at the third place (Bergamo, Bologna, Cremona, Modena, Rome, and Trento), and two new entries, Cagliari and Genova, tied for ninth place, with Turin and Parma slipping to eleventh place, and with the Emilia-Romagna region which remains in the top ten with only two cities compared to four in 2019.
The analysis on smart cities in Italy shows a clear dichotomization, in line with the historical North/South divide: many of the cities in the first places of the rankings, both in 2019 and 2022, are in the northern part of Italy. Moreover, they tend to be large cities and to consolidate their position over time.

Linking the previous analysis with that of smart-working, which has mainly been concentrated on regulation aspects in Italy and on the managerial implications of the smart-working, as broadly conceived in Italy[2], provides a framework to understand the co-evolution we are seeing and experiencing in these years of smart cities and smart-working.

The data provided by Eurostat (Employment and social developments in Europe: 2020 review) confirms the low levels of smart-working diffusion in Italy, despite an intense growth of remote working in Europe, during the recent years. Looking at the Digital Economy and Society Index (DESI; https://digital-agenda-data.eu/datasets/desi/indicators) rightly at the beginning of the pandemic (2019), we notice that Italy did not perform well when compared by EU average in terms of digital skills as well as in terms of internet usage, well below the EU average. The same holds for the eGovernment indicators, which capture a scarce use of eGov tools by citizens. The outbreak of the COVID 19 pandemic forced the Italian economic system to quickly adapt to the challenge and to partially switch to and promote smart-working, in a very heterogeneous territorial context. In this situation, the pandemic triggered a dynamic that, on the one hand reinforced the role of large cities as hub for smart-workers and pushed them to ameliorate the already present services for workers who can work from home (e.g. fast internet speed, delivery services, coworking spaces, etc…), on the other hand it gave birth to interesting phenomena such as that of South Working (https://www.southworking.org/en/), a movement with the aim of stimulating the diffusion and the analysis of remote agile working from (especially) southern and inner Italian territory, empowering the latter also through the engagement of the local communities. Hence, two contrasting forces are underway on the Italian territory: one that tend to increase the territorial disparities, in favor of the large cities and the other that tend to reduce the territorial gaps.

Given such a situation in Italy the aims of the Italian Digital Agency, to favour the development of the digital society; foster the sustainable development and contribute to the diffusion of new digital technologies in the Italian industries is worthy, but somehow misaligned with the country's necessities and gaps, as they emerge from the indicators above on the smart cities and on the digital society. Indeed, the government seems to be reluctant to encourage the work from home, which needs a complex interaction between the territorial public actors, the private sector and the local communities, each category of actors having overlapping agendas. The different stakeholders too often move independently instead of searching for common/joint economies of scope and dialogue. For this reason, it is worth trying to use the instrument of social dialogue

[2] We here remind the broad meaning we intend for the term smart-working in Italy: we over extend the definition and meaning of the latter to encompass different form of outside-the-office way of working - e.g. teleworking, remote work, agile working.

to set up a common ground to discuss of the joint development and co-evolution of smart cities, but also smart territories, and smart-working. On this very research topic there is still a scant evidence of engagement of both researchers and stakeholders.

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

2.1 Theoretical approach: smart cities and smart-working

In the last two decades, the concept of "smart city" has become more and more popular in scientific literature and international policies. To understand this concept it is important to recognize why cities are considered key elements for the future. Cities play a prime role in social and economic aspects worldwide, and have a huge impact on the environment (Mori and Christodoulou, 2012). After almost twenty years of debate, contributes and very diversified local practices, sometimes supported by national and/or supranational policies, many definitions of smart cities still exist. This because the very first definition, conceived by the IBM think tank at the beginning of the XX century (before the 'smartphone revolution'), was considered a fuzzy concept and not always consistent. Before the pandemics, the concept of the smart city was limited to the application of technologies to cities. The use of the term proliferated with no agreed upon definitions. This has created confusion among local administrators and in urban policies. Some authors argue that "as the term "smart city" gains wider and wider currency, there is still confusion about what a smart city is, especially since several similar terms are often used interchangeably" (Albino et al., 2015, p. 3). Countless experts and researchers have highlighted how before talking about smart cities we need to talk about smart people and citizens prepared in the most advanced use of technologies. In this context, ideally smart working might also be a factor influencing specific issues related to (smart) cities (e.g., traffic, commuting). Nevertheless, information accuracy, data security, data sharing, and associated social equity and justice issues are challenges a smart city can generate when being integrated into resilient city systems. With no doubts part of this recent growth in interest is due to the Covid-19 pandemic and the complex global scenario determined by this crisis have assigned a strategic role to the Smart Cities objectives and achievement despite the widely shared awareness that technology and its many potential applications for a smarter everyday life do not automatically allow the achievement of well-being, social inclusion and safety, but a list of strategic goals allowed by the growing interest in the development of the smart city, in 2020 still forgot to consider smart working and all its possible definitions (Lytras et al., 2020). This has also repercussions in terms of (local) policy making and planning failing to boost smart-working in the heterogeneous italian territorial landscape.

2.2 Smart working potential in Italy

Although technological aspects such as ICT, IoT and digital applications, sensors and wireless remote control of homes and buildings still constitute the strong core of the Smart City model, the urgency brought about by the pandemic and the existing deep digital divide in many italian regions and communities have brought back to the agenda the issue of connection capacity for individuals and families and the urban endowment of broadband or wide broadband. With regards to the mainstream definitions of Smart City (Albino et. al. 2015, cit.) we can say that the covid pandemic brought some basic aspects back to the agenda, especially with respect to the issues of social exclusion and inclusion giving dominance to broad definitions as the following one:

"Smart city as a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create a sustainable, greener city, competitive and innovative commerce, and an increased life quality" (Bakici et al., 2012).

In terms of data collection, the Italian statistical database does not provide a clear distinction between smart-working and traditional working arrangements. In the Italian case, we divided the whole set of economic

activities (NACE classification) into three different categories, based on smart-working accessibility. The first category is related to those activities that have the best chance of including smart-working. The second category represents those activities with potential of including more smart-working, but that are still mostly carried out in traditional forms. The last category includes all those activities that, by nature, are not suitable for smart-working. Data on employees at LAU level and economic activities were retrieved from ISTAT (Italian National Institute of Statistics). Despite being comprehensive, it was only possible to classify economic activities by macro-categories (NACE A-U).

2.2.1 – Potential accessibility to the stock of smart working employees or business entities

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 https://www.espon.eu/sites/default/files/attachments/espon_accessibility_update_2006_fr_070207.pdf [7]. Data to construct this indicator come from the statistics on employment of ISTAT (National Italian Institute of Statistics). As already mentioned, employees were classified according to the level of smart-working accessibility in their activities:

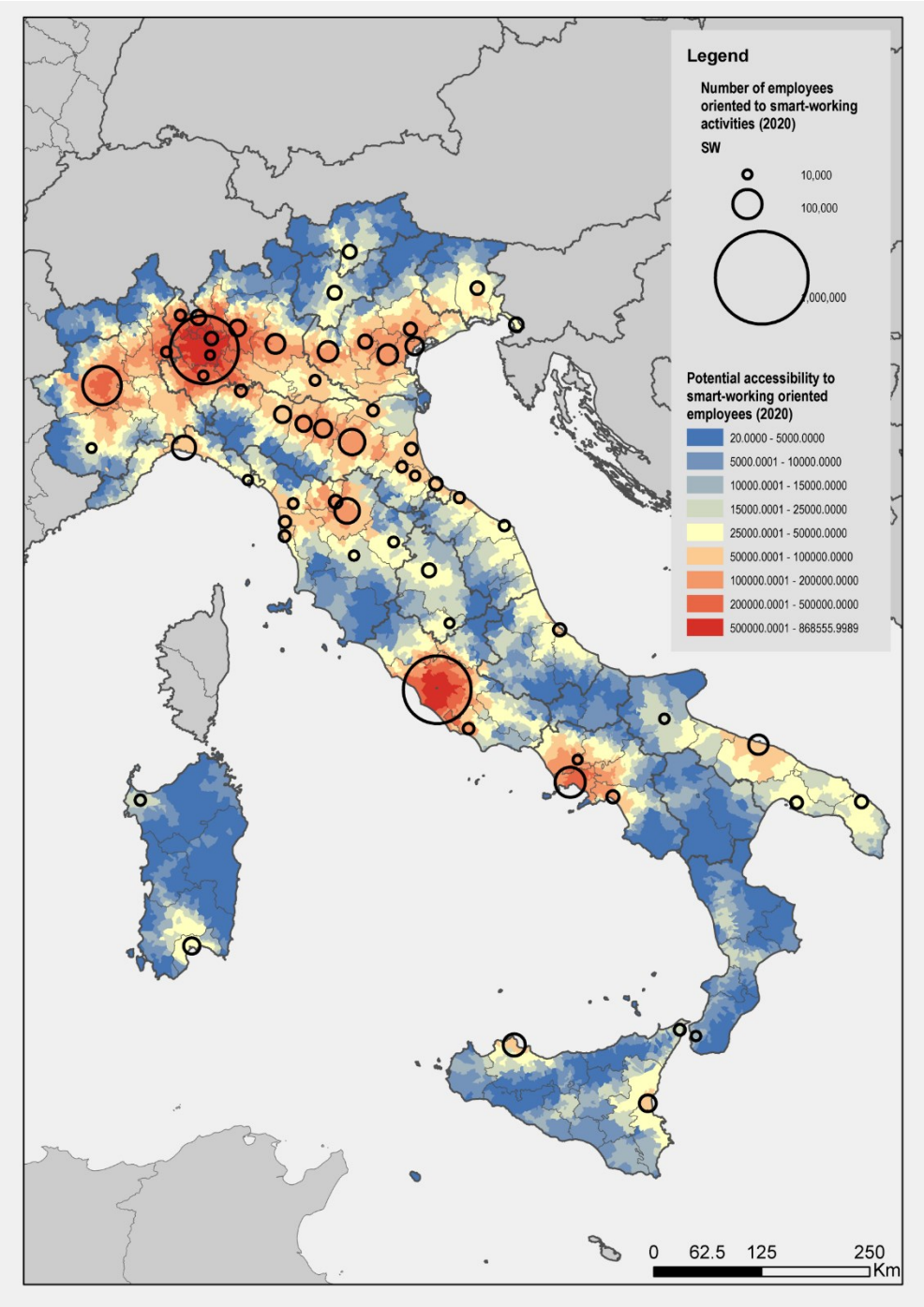
- smart-working oriented (sectors like ITC, financial activities, professional, scientific and technical activities etc.)
- partially smart-working oriented (real estate, retail or public administration)
- traditional sectors (industry, construction, transportation, accommodation etc.)

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 are obviously concentrated mainly in the top of the metropolitan hierarchy (Rome, Milan, Turin and Naples), but a very peculiar Italian urban system is showing a large horizontal Y, whose center is Milan, starting from Turin and reaching Venice and Rimini, crossing, along the first urban filament, the cities of Bergamo, Brescia, Verona, Vicenza, Padova and Mestre, and for the second urban filament, the cities of Lodi, Pavia and Cremona, in the Lombardy region, and Piacenza, Parma, Reggio Emilia, Modena, Bologna, Forlì, Cesena and Rimini. In the last 50 years, one of the largest metropolitan areas in Europe has developed around these two urban filaments or, using a different definition, a vast urbanized region in which between 20 and 25 million Italians live and work.
- two other urban filaments - or two other urbanized regions - of smaller territorial and demographic size are extended from Milan to Genoa and from Florence to Lucca, Massa Carrara, Pisa and Livorno.
- Finally, the Italian case is also characterized by the two large metropolitan areas of Rome and Naples. these are two urban systems now extended over almost the entire plain and hill territory of the two regions that host them (Lazio and Campania).

It is possible to say that about 35 million Italians live in these metropolitan areas that the map shows have a greater number of employees oriented to smart working activities and the greater potential accessibility to smart-working oriented employees at 2020.

Out from these territories there are some poles where the numbers and potentials are weaker: Palermo and Catania in Sicily, the metropolitan area of Bari, in the South-Eastern side and the city of Udine, in the North-Eastern side of the Country.



a

Fig. 1 SW Index 1 – the metropolitan concentration of the smart-working employees in Italy (2020). The potential accessibility of smart-working employees in 90 minutes.

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 heterogeneity of the Italian territory. The accessibility is higher in the urban areas of Rome, Milan, Turin, and Naples as the number of employees oriented to smart working. On the other hand, if in north-west Italy the accessibility is concentrated nearby the urban areas of Turin and Milan, in north-east Italy the accessibility is less concentrated and there are a lot of small poles of workers employed in smart working oriented activities. In center Italy, besides the urban area of Rome, it stands out a pole of both accessibility and smart workers in Tuscany in the urban area of Florence. Moving further south, except for Naples there is less accessibility but also less employees in smart-working oriented activities. All the big cities further south than Naples present more or less the same

accessibility level as well as the same number of workers employed in smart-working activities. Those results should be coupled with the ones in Fig 2 showing potential accessibility with respect to number of employees.

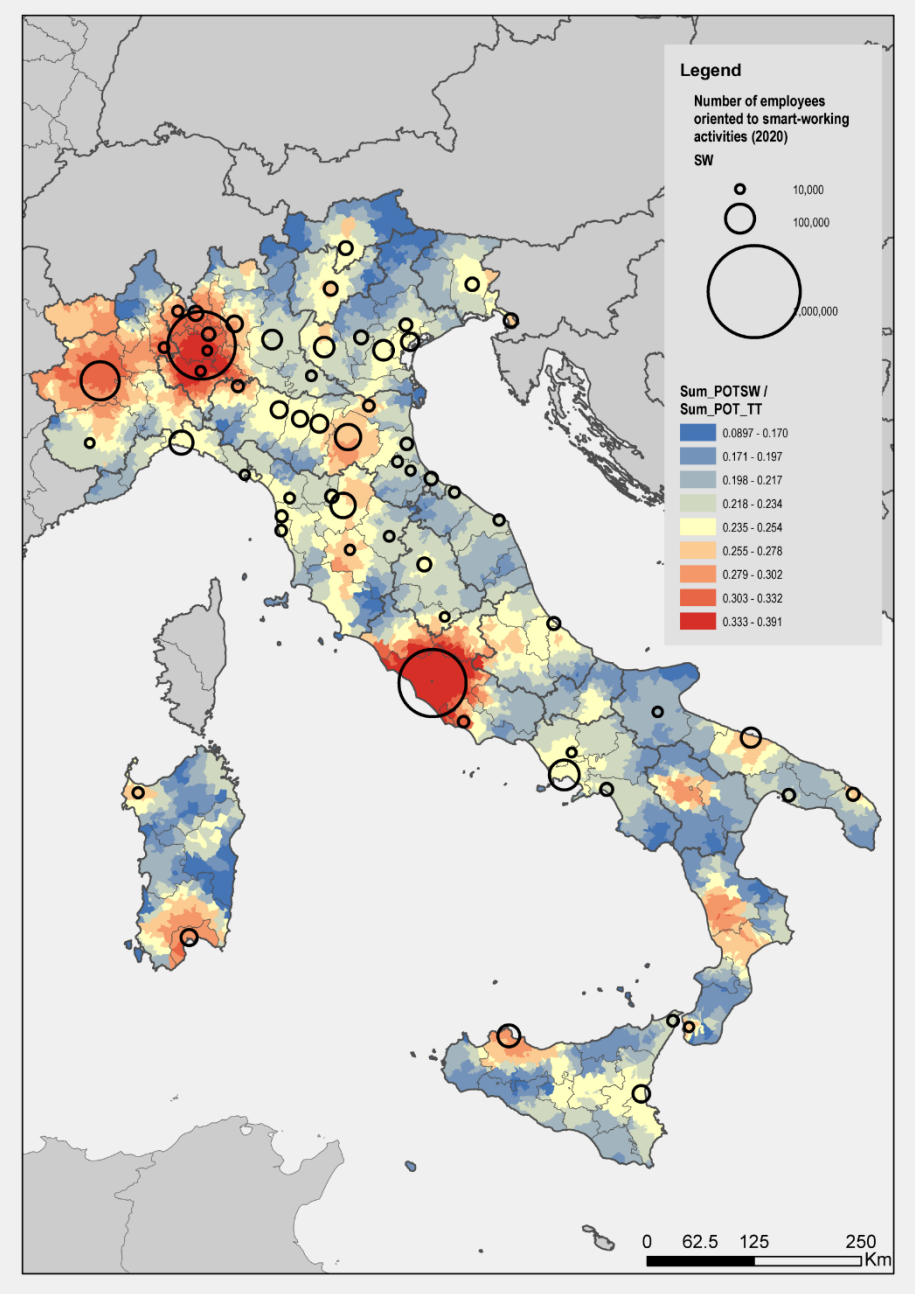


Fig.2 – Share of the smart-working potential accessibility index in the total local potential of employees

The map in Fig 2 displays how for southern urban areas there is a lot of potential that can be exploited in terms of possibility to carry out smart working. Though, this is not followed by workers employed in smart working-oriented activities. For instance, Basilicata region present a pole of higher accessibility but no employees in smart working-related activities. There is also Calabria region with a lower level of employees with respect to smart working accessibility. Those results show that there is unexpressed potential in those areas with respect to smart working activities. For instance, the phenomenon of *south working*, spread out during the COVID-19 pandemics, is characterized by workers in smart working activities from highly expensive urban areas in the north that moved to the south and carried out their work from there attracted by the lower cost of life.

This general depiction of where the smart-working employees might concentrate needs to be corroborated with an assessment of the magnitude of the indicator. This would mean to look at possible territorial anomalies that could influence the representation. 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). The objective would be to construct an alternative indicator that could take into account those spatial anomalies.

2.2.2 – A local index of spatial association between smart-working and other economic activities

For the second SW Index on smart-working diffusion in Italy the set of indicators selected is the one related to spatial association (LISA, see https://onlinelibrary.wiley.com/doi/full/10.1111/j.0016-7363.2005.00671.x , for more details) [8]. This index functions like a local Z score, assessing both the anomalies of the mapped values (e.g., distance to the local mean, in the negative exponential kernel of 90 minutes) and their territorial triviality (data normalized with the local standard deviation). If the index shows high positive/negative values this means that local ratios of smart-working employees that might be behaving atypically. On the other, the closer to 0 the value the more the LAU resembles a common situation.

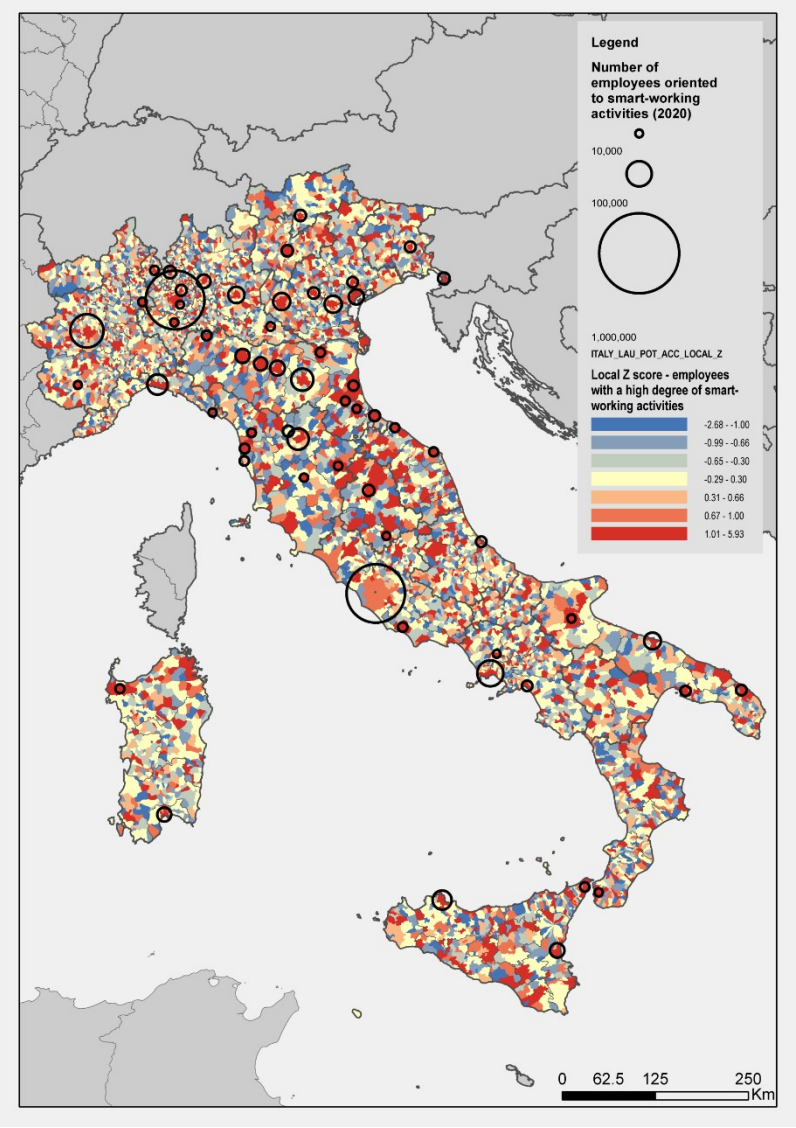


Fig. 3 SW Index 2 – identifying local concentrations of smart-working employees using an alternative method – the local Z scores.

Plotted at the scale of Italy, 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. As for other partners' context, also in Italy we cannot find large cities that are able to promote a significantly high diffusion of the smart-working employees, in their metropolitan areas. This might signal a high heterogeneity within metropolitan areas concerning, but not limited to, smart working accessibility. This situation might be a problem for planning and targeted policy design. Comparing this map with the one on (potential) accessibility (Fig 1 – Fig 2) there are a lot of areas especially in the south (Sicily, Calabria, Basilicata) that identify highly positive values of indicators (Fig 3), yet low accessibility. This might signal an uneven distribution among employees or smart working employability and infrastructure.

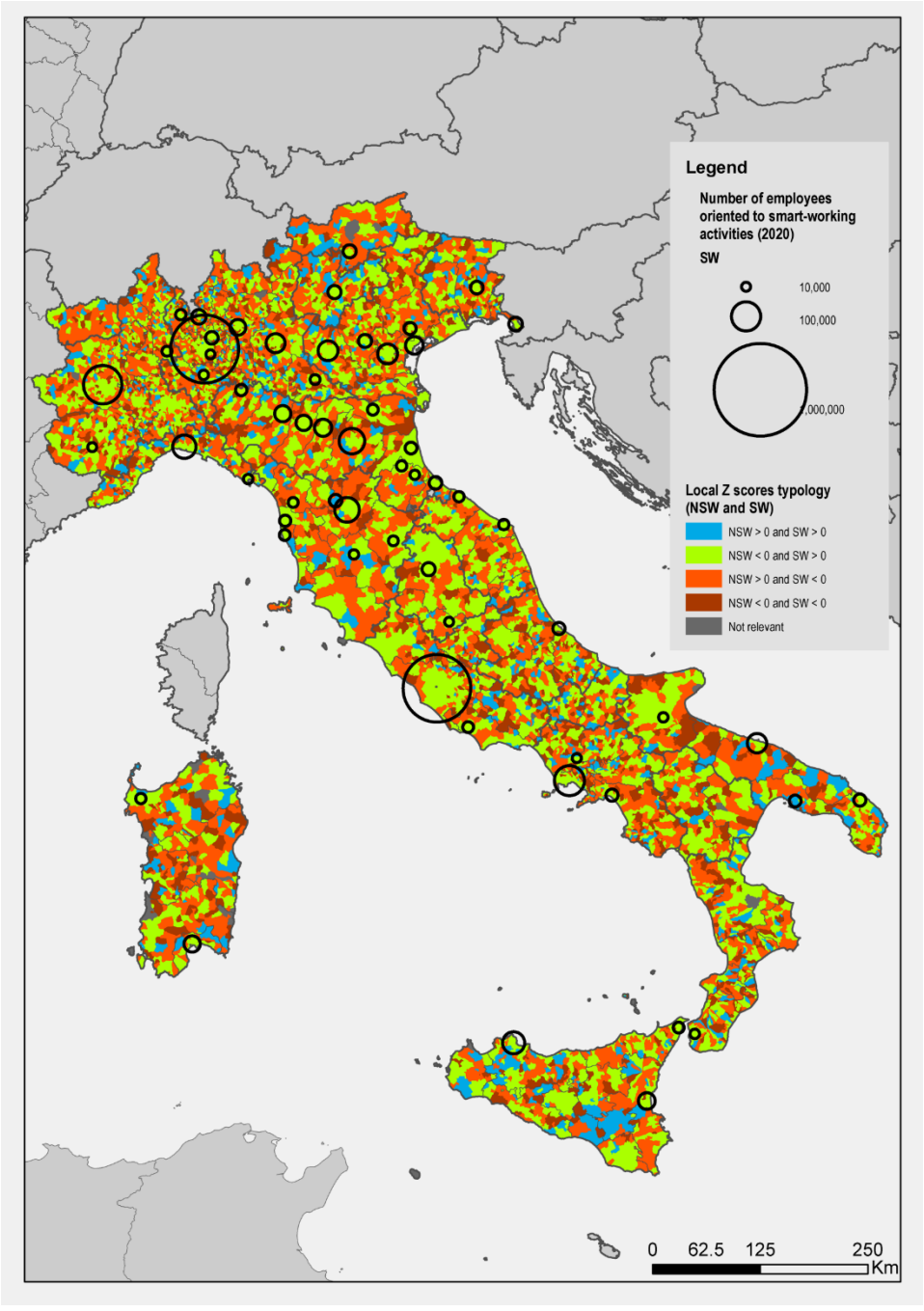


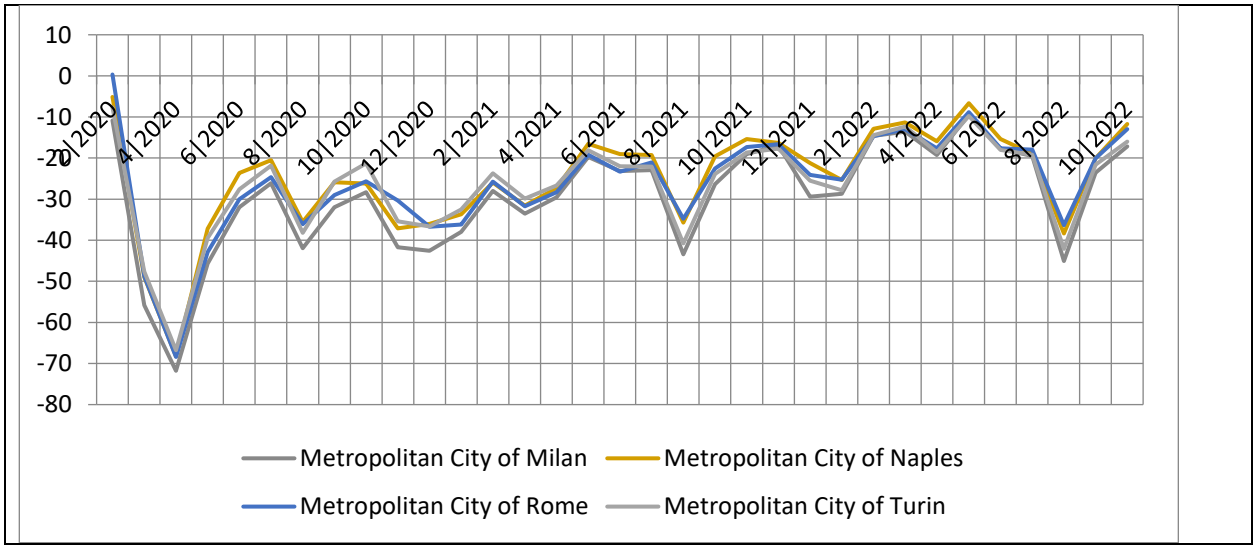
Fig. 4 A qualitative assessment of the smart-working employees vs. traditional employees, using the local Z scores

When looking at Fig 4 that combines the local Z scores of the traditional (NSW) and the smart-working employees there are areas of class no.2 immediately next to class no.3. It appears that there is a high territorial polarization even within LAU. In the north, there appears to be a prevalence of class no.2 and this might be related to vocation and specialization of that part of Italy. Moving further south, there is a higher prevalence of no.2 classes with high incidence of smart working activities with respect to non-smart working. With respect to the Romanian case, for instance in Italy there is a further layer of heterogeneity. There is difference between urban and rural areas but also differences between north and southern part of the country.

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

The impact of the smart working on the regional and urban mobility presents different trends in the 5 countries participating in the project. This impact can be measured and mapped using 2 approaches as clearly described in the Technical Report, using mobility data from joined with the NUTS3 geometry.

An evident benefit induced by the diffusion of smart-working in Italy, but also visible in the case of other studied countries, 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. During the pandemic the trends in urban mobility reached their negative peaks because of the lock-down tool used as containment measure, but shortly after the pandemic it is possible to appreciate that 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.



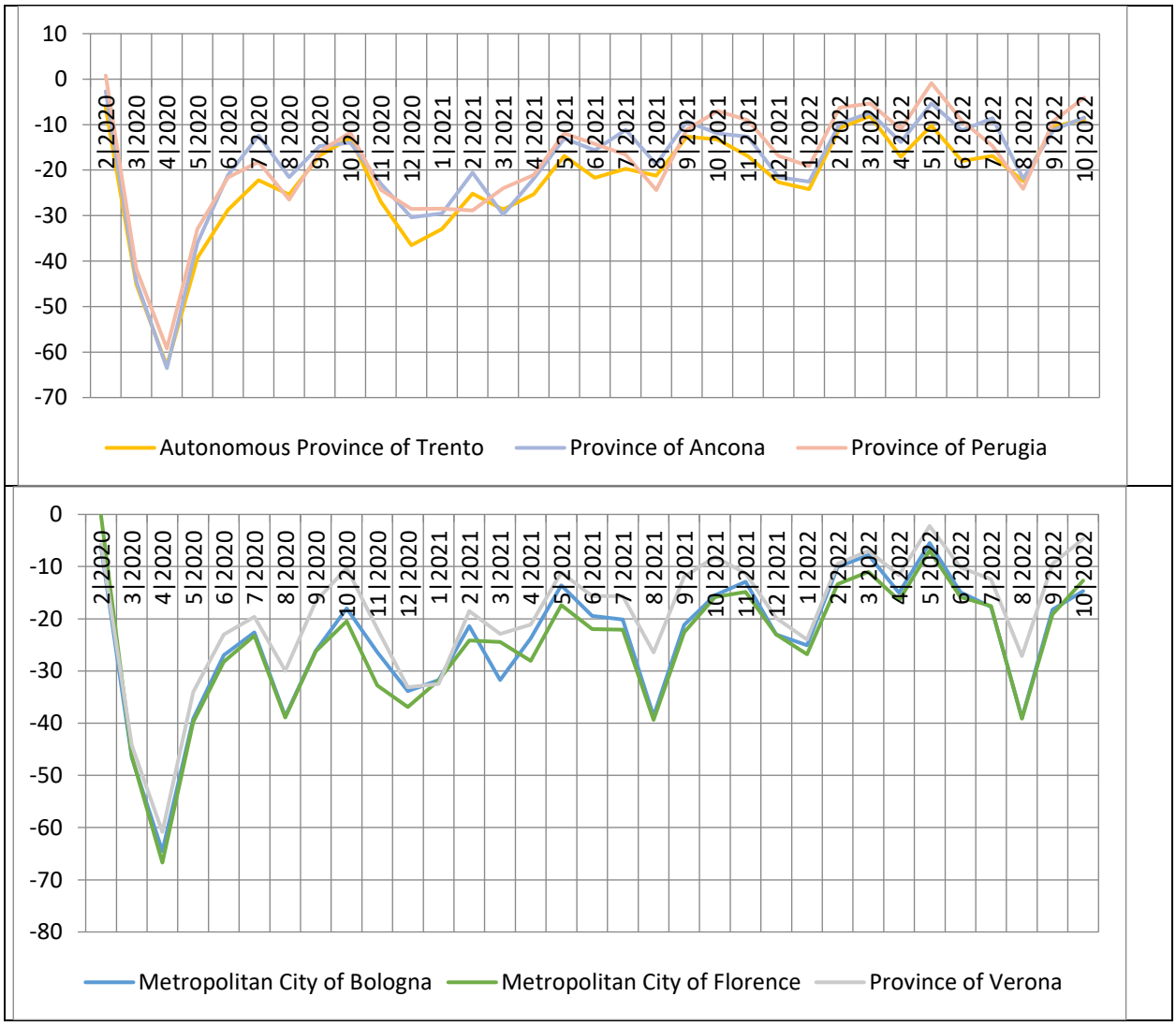


Fig. 5 Trends in the workplace presence between 2020 and 2023 (selected clusters of italian cities). Data source: Google LLC "Google COVID-19 Community Mobility Reports". https://www.google.com/covid19/mobility/

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 three cluster of Italian cities. The first cluster contains the 4 biggest cities: Rome, Milan, Turin, Naples. The second cluster includes the cities of Florence, Bologna and the Province of Verona. The last cluster is represented by the provinces of Perugia, Verona and the Autonomous province of Trento. All the cities in the sample, present the same monthly trend, mostly related to seasonality. It decreases in from the end of December to the beginning of January and from the end of June to the beginning of September. In terms of yearly trends, after 2020 there was a progressive and steady recovery of office work and mobility in general. In 2022, the elimination of most of the restrictions to mobility, affected the domestic demand and the pattern we observed starts to change its morphology.

3.2 The environmental effects of the smart working

There is a consistent link between smart working, mobility, and overall sustainability. As pointed out by researchers from the Milan Polytechnic University the estimated reduction in CO2 emissions, thanks to

smart-working, is approximately 450 kg per person per year. In addition, the increase in smart working arrangements might reduce the frequency of commuting in the urban context. This exerts a great impact on sustainability, not only from the environmental point of view. Less commuting might mean less congestions with lower amount of time spent stuck in traffic. This might have an effect on both reducing the time spent in commuting and stress related to traffic congestions. In strict environmental terms, it is difficult to trace the direct connection between traffic and environmental indicators as there are many other factors involved. The indicator chosen for this analysis is NO2 concentration. Data for the Italian case have been retrieved from the EEA Air Quality Platform and Statistics. This database records data from different territorial measurement stations for 2020 in the same urban areas. For the sake of this analysis, we selected those measurement stations located at the lowest altitude and those that measure level of pollution of traffic. This selection was made to analyze levels of concentration that are directly experienced by citizens and that might affect their well-being. Fig 6 shows the trends of monthly NO2 concentration over the 2020 for the four biggest Italian cities. All those cities follow the same monthly pattern with a decrease from January to April and a progressive increase. However, it is possible to spot some differences as Naples and Rome tend to present higher level of concentration in summer with respect to Milan and Turin. The trend is partially inverted at the end of September. This might be related to tourism patterns that it is higher in the Center-South than in the North.

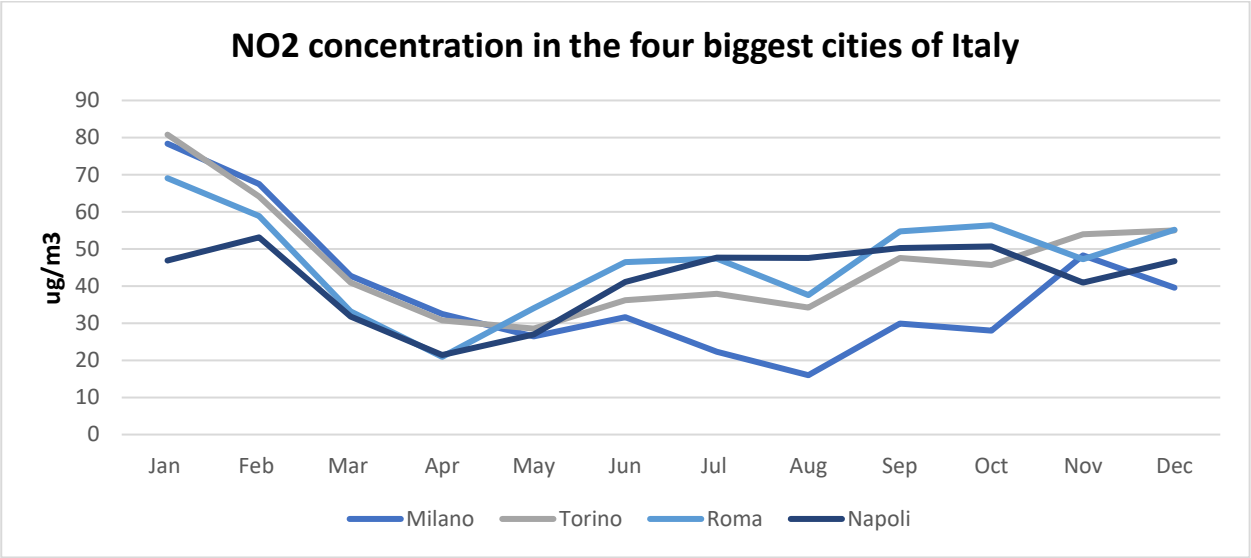


Fig 6. Dynamics of the NO2 concentration at urban scale (2020 – Italian selected cities)
Data source: https://discomap.eea.europa.eu/App/AirQualityStatistics/index.html#, EEA

In general, the trends of Greenhouse Gasses concentration are the same for the other gasses collected in the EEA database. Overall, concentration levels have not recovered the levels of January 2020, by the end of the same year. The chart in Fig 6 presents the same behavior as the one on mobility (Fig 5). The fall in concentration registered in April 2020 is the result of the restriction in mobility of March (Fig 5). Thus, it seems we are in front of a correlation between the decrease in mobility and the increase in the sustainability, at least from an environmental point of view. However, there might be some other factors influencing concentration related to the geographical characteristics (mountain, depressions) and meteorological patterns (winds, temperatures and precipitations' regime). The heterogeneity of the Italian case highlighted also differences related to the socioeconomic context (e.g., industries, tourism) of each territory. These elements were not taken into account in our modeling and represent a limitation of the approach, proposed in this report. However, from these preliminary findings we recognize the need to further investigate the direct link of smart working, mobility and sustainability.

4. Framing the bottlenecks impeding the development of smart working in Italy

The analysis above showed that despite the potentialities, the spread of smart working is highly polarized and heterogeneous in the Italian territory. It is true that, smart working cannot be applied to all the economic activities. Thus, the economic vocation of the specific territory highly influences the territorial accessibility. On the other hand, especially in the south there are areas that despite being accessible to smart working are not exploited. However, inequalities are present not only among regions but also at urban and peri-urban level.

4.1 Internet speed

The indicator collected on internet speed at LAU level is one reliable proxy on the difference of ICT infrastructure implementation. Through the analysis of internet speed, it might be possible to spot inequality in internet access and in turn lower smart working accessibility, with the use of place based policies, which are highly connected to the territory.

Fig 7 shows the map of the distance between internet speed in the specific LAU and the national average. A higher distance (blue color) identifies an unequal access to internet of the specific territory. A lower distance (red color) identifies a LAU with above-average internet access. Metropolitan cities present systematically an above-average internet speed. This is valid throughout the country with no regional differences. Looking at the map the colors of the index go from yellow to red signaling mostly an above-average internet speed. Some northern regions such as Piemonte presents a highly polarized internet speed with the metropolitan areas (Turin) presenting higher levels opposed to mostly blue-colored areas. The same is valid for Emilia-Romagna where internet speed is higher in the areas of the provincial capitals. The center goes from yellow to blue (with the exception of the big red areas of the regional capitals). In the south the distance from the average is less pronounced with indexes goes from 0 to 2 points higher than the national average internet speed. As it can be notices, given the Italian geo-morphology, the areas with internet speed below the average are the less populate mountain and inner areas.

4.2 Trend in internet use

The disparities between internet access are more evident in the center with areas that present an internet speed 0.5 lower than the national average. For instance, in some areas of Tuscany, Abruzzo and Molise regions. Lazio presents the most polarized situation with the red big area of the metropolitan city of Rome bordered with blue-colored areas. The explanation might be related mostly to the economic vocation of those territories as most of the blue-colored areas are rural areas. There might be also demographic trends with the majority of the population that is moving from rural to urban areas and often to big cities. This generates two different issues related to the technological difficulties of installing internet infrastructures and the limited market potential due to the low demographic density in urban LAU.

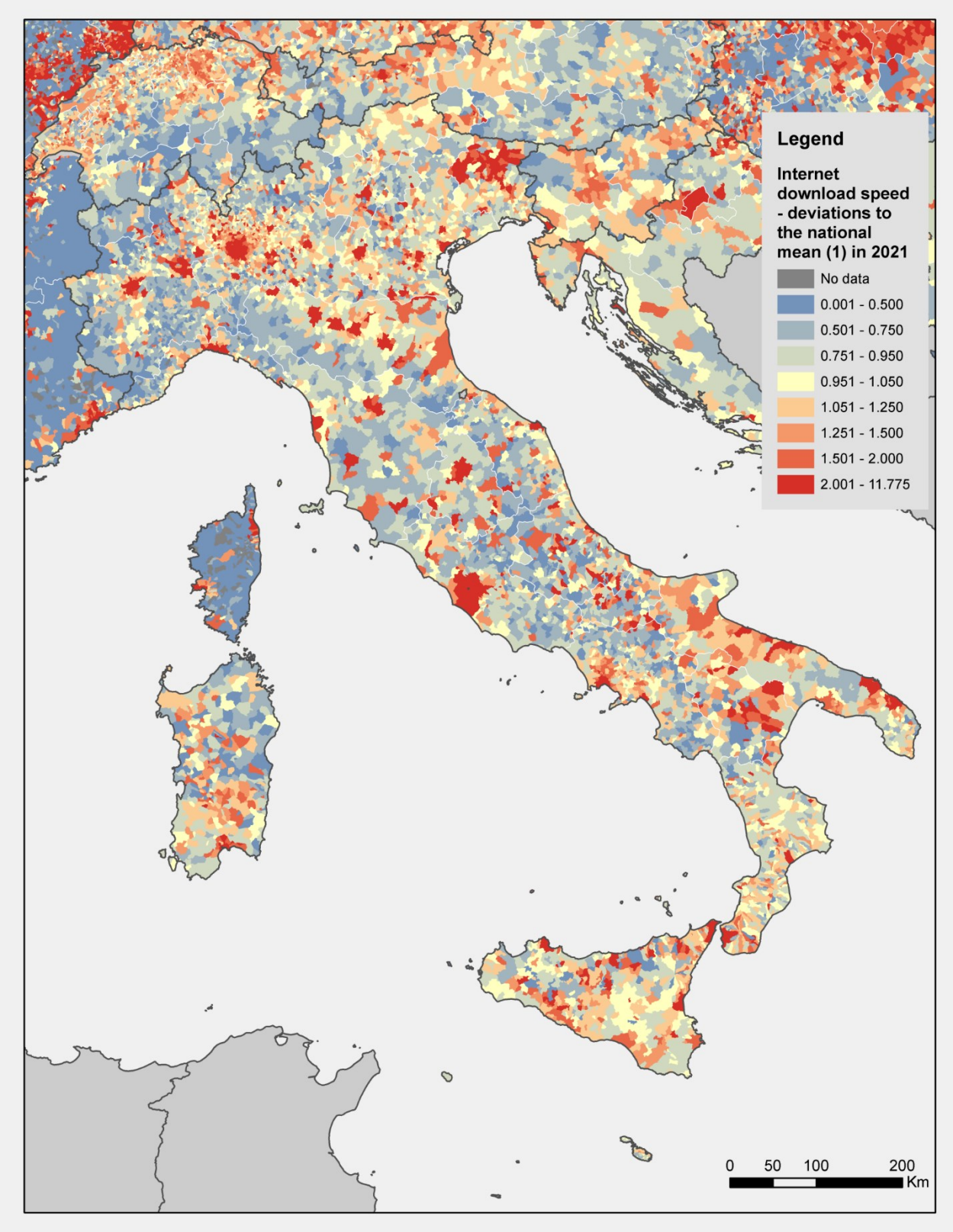


Fig. 7 – Deviations to the national mean – Internet download speed in 2021. Data source: [PENDING]

What is true, as it emerges from DESI data, is that Italian population still has huge steps to do in order to catch up with the average EU indicator of internet usage (see Fig 8)

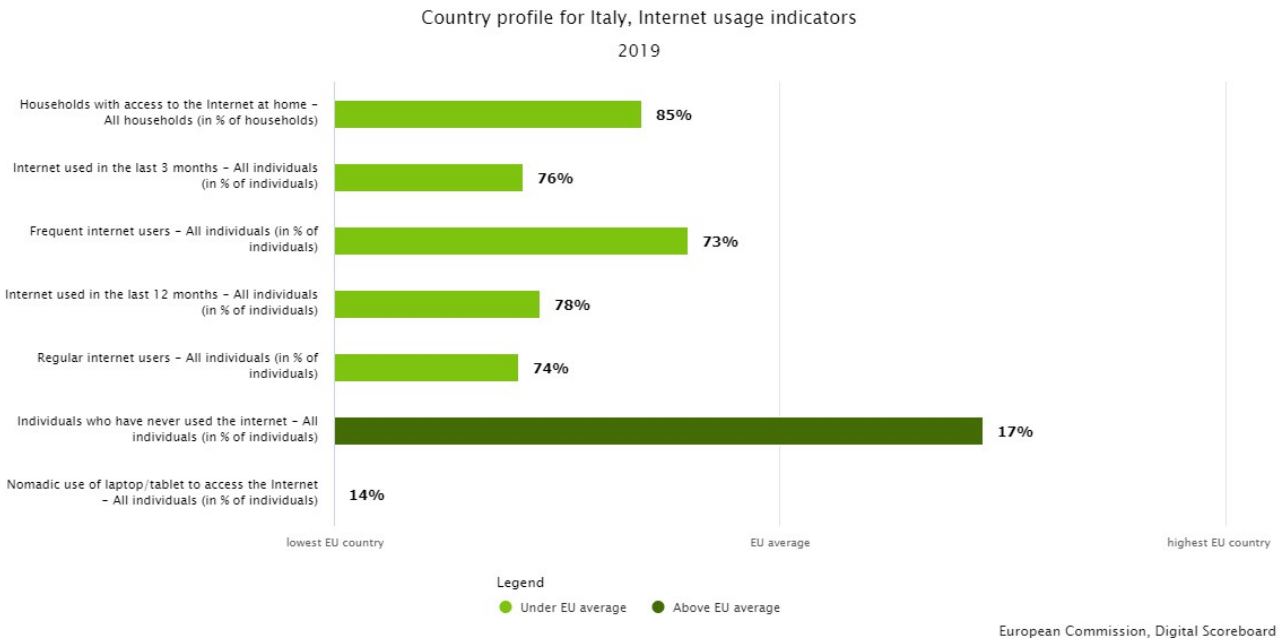


Fig 8 – Internet usage in Italy; DESI indicators (https://digital-agenda-data.eu/)

Through the internet speed and internet usage it was possible to highlight the potential challenges in terms of territorial disparities. Overall, the country experiences a digital divide with other EU countries such as France or Germany. Moreover, this critical situation is characterized by evident disparities between rural and metropolitan areas. These disparities are highlighted especially in some regions (Emilia Romagna, Piemonte, Tuscany). This difference is mostly driven by the economic vocation of the territory (agricultural), but also by demographic trends. There is also the further layer of the technological difficulties of implementing ICT infrastructures in some areas. Despite those differences cohesion policies appear to have shortened the distance between north and south at least from the viewpoint of ICT infrastructure and internet access.

The construction of participative models in dealing with the issues here reported might generate experiences characterized by: acceptance, inclusiveness, equity and accessibility. In this direction are going the smart-communities experiments, which are also based on the capacity to bring at the same table different stakeholders, with their own interests: e.g. companies-cities. The watchword in this context of analysis is *complexity* when we want to make business, public administration and research dialogue, on the one hand, and the role of industrial relations becomes a territorial one, on the other hand, with a change in perspective and tools.

5. Smart city from the perspective of industrial relations

If the relationship between industrial relations and smart working has been built, first, in an initial climate of mistrust and, then, in the emergency management, the dialogue with the concept of smart city requires a prospective transformation for industrial relations. The reference context is no longer just the company but becomes the territory. The territory takes on a new contractual prominence because it is within the territory that bargaining must succeed in reconciling the material and immaterial differences that the acceleration of smart working has progressively laid bare, and it must govern the challenges that smart cities pose in terms of planning, sustainability, transparency, knowledge, and quality of life and work.

The challenges that smart city strategies pose to industrial relations mainly refer to a new contractual prominence of the territorial level or a more effective confederal convergence of national sectoral collective bargaining (at least on) on topics related to digitalization. The challenges are as follows:

- *Coordinating with Multiple Stakeholders*: Smart cities involve collaboration among various stakeholders, including businesses, governments, citizens, and technological partners. Industrial relations must navigate these complex relationships to ensure effective cooperation and communication.
    - Accessibility to the digital potential of a smart society (whether it is smart working or smart city) still suffers, as already introduced in the previous pages of the report, from strong territorial and sectoral polarization. A system of collective bargaining focused on the national sectoral level (first level) and company level (second level), as it is now in Italy, risks exacerbating differences rather than reducing them as it takes a partial and non-confederal (territorial) perspective. Moreover, the phenomenon of South Working (previously introduced as well) needs to find a contractual framework that goes beyond the company boundaries because it connects a company with a territorial context different from the territorial practices it is accustomed to dealing with. In this regard, it is worth highlighting the experience of the "Pact for Work and Climate in Emilia-Romagna" ("In Emilia-Romagna, we build the future together") signed in 2015 and then renewed in 2020 by the Region together with local authorities, trade unions, businesses, schools, universities, environmental associations, the Third sector, volunteers, professions, Chambers of Commerce, and banks. In this pact, the smart city (mainly related to mobility) and smart working are explicitly identified as common objectives of the territorial community.
- *Addressing Sustainability and Environmental Impact*: Smart cities aim for sustainable development and reduced environmental footprint. Industrial relations should work towards incorporating green practices and promoting environmentally responsible approaches within industries.
    - Just like smart working, the concept of a smart city also redefines urban and suburban mobility by reducing commuting on the one hand, and altering the relationship between work schedules and the city's schedules (public services, commercial services, local transportation, social services, and family services) on the other hand. Managing mobility is necessarily a public issue that requires public entities to play a regulatory role in line with an environmental sustainability strategy, rather than being left solely to individual company negotiations.
    - The strategy of transforming cities, especially large ones, into smart cities, employing Information and Communication Technologies (ICT), has gradually evolved to encompass various sectors and industries in both production and services. Today, the strategy of urban regeneration includes the idea of integrating new technologies into homes and services, but it also broadens the horizon to rethink ("re-generate") both large and small cities. This goes beyond mere redevelopment and planned expansion of suburbs to address the needs of the people living in these cities, regardless of their location (as stated in the recent Document on Urban Regeneration and living policies[3] signed by Cgil, Cisl and Uil in 2021). However, not all of these needs can be met solely through the use of ICT. In this regard, the project "Nuove-Rigenerazioni" was born within the trade union context, in collaboration with Fillea-Cgil and Spi Cgil national unions, partnered with other research centers and civil society organizations

[3] https://binaries.cgil.it/pdf/2021/08/06/081518733-8d992676-5927-43ba-a53c-cbe0cb1c1b53.pdf

with a view to providing a platform for discussion and debate to foster a culture of sustainability[4].

- *Emphasizing Transparent Governance*: In smart cities, transparent decision-making and governance play a crucial role. Industrial relations need to advocate for transparent and participatory processes that involve workers in shaping the future of their industries and communities.
    - Digital networks must become works of public interest, and the data flowing through them should become a common good, meaning they should be available and accessible to all the citizens. The idea is to build a public platform with data generated by citizens, allowing the creation of a public governance system for cities. The data that a smart city gathers on mobility, crowd density, parking saturation, territorial networks, tele-assistance, which are derived from citizens, should be returned to the citizens ("sustainable digital city") not only as a service but also as shared knowledge, promoting transparency and facilitating the exchange of information to reduce people's reluctance in sharing personal data.
- *Promoting Inclusivity and Equity*: Smart city initiatives should be inclusive, ensuring that all members of the workforce can participate and benefit. Industrial relations must advocate for fair and equitable access to opportunities and resources and guarantee better working condition for all.
    - The management of a smart city must also address its relationship with large digital platforms and the pressures they exert on working conditions and job quality. In this regard, it is worth noting that in Bologna, a city consistently ranked as a leading smart city, the "Charter of Fundamental Rights of Digital Workers in the Urban Context"[5] was signed in 2018 following the actions promoted by food delivery riders and their union organisations. This charter aims to ensure secure and dignified employment, even in the digital work sphere.
    - In a smart society, furthermore, work is not necessarily concentrated in a physical location but is spread throughout the territory. This gives rise to the need to build a network of coworking spaces that can enhance social interactions and promote inclusion. In this regard, the experience of territorial collective bargaining in Milan is noteworthy, as it has promoted the establishment of coworking centers equipped with services such as security, catering, and cleaning for smart workers and freelancers. These centers are located not in the city center but in the suburbs and hinterlands, easily accessible by bicycle or public transportation near subway stations. This placement reduces distances, minimizes commutes, and contributes to redesigning work hours based on the principles of environmental sustainability.
- *Fostering Lifelong Learning*: The rapid pace of technological advancements requires a continuous learning approach. Industrial relations should collaborate with employers to promote upskilling and reskilling opportunities for workers to adapt to changing job requirements.
    - Looking at the 2022 national DESI Index (The Digital Economy and Society Index) , Italy is narrowing the gap with the EU when it comes to basic digital skills, however still more than half of Italian people do not have at least basic digital skills (46% against 54% of the EU average). The share of digital specialists on the Italian workforce (3.8%) is below the EU average (4.5%) and future prospects are undermined by low rates of ICT enrolment and graduates (1.4% in Italy versus 3,9% in the EU). A significant change of pace in Italy's digital skills' readiness is crucial for the EU to reach the Digital Decade target on basic digital and ICT specialists.

[4] It offers tools for analysis and in-depth exploration, while encouraging policies oriented towards green building, urban regeneration, revitalization of urban outskirts, and the enhancement of rural areas in the country. The initiative promotes concrete actions and local initiatives to initiate pilot projects, starting with the most degraded large urban areas.

[5] http://www.comune.bologna.it/sites/default/files/documenti/CartaDiritti3105_web.pdf

6. Key findings and policy recommendations

From the analysis of the Italian case along the dimensions of smart cities, smart-working and environmental sustainability.

The main key findings emerged by the analysis of the Italian case can be summarized as follow.

- There are specific territories and metropolitan areas in Italy, that encompass about 35 million Italians, having a greater number of employees oriented to smart working activities and the greater potential accessibility to smart-working oriented employees at 2020, with respect to territories laying behind (e.g. scarcely populated and mountain territories).

- Workforce skills and population skills: the Italian society is still lacking of adequate skills to bear a shift to a digital society.

- Territorial disparities in terms of digital technology and territorial capital endowment that are exacerbating the north/south divide and the urban/rural divide.

- Environmental gains from smart-working and better urban life by reducing home-to-work (and vice versa) commuting and the consequent negative externalities

The main policy recommendation, that strictly follow the key findings are the following.

- The territorial disparities are due, also, to the different endowment in terms of technological infrastructure, which are essential to support smart-working (e.g. high-speed internet and reliable communication networks). The foreseen investments by the Agenda Digitale program have the aim, among others, to reduce disparities and create a digital society. To do that the policy interventions should be place based in order to answer to specific territorial needs. This way of proceeding should encourage the diffusion of smart-working in area with a current low potential, as well as increase the potential and the accessibility of relatively developed areas.

- Policies that promote skill development and training for remote work and in general to increase the population capacity to use eGovernment tools may be of help to build a capable workforce that is prepared for smart working and a society to support the development of smart cities and territories.

- Policies that address the disparities reduction are needed in Italy, to sustain a just transition both on the digital and on the environmental side.

- The last set of policies, which should be integrated with the previous ones, concerns the environmental sustainability dimension. An example of a framework for integrated policy interventions both on the labour and on the environment sides is the Emilia-Romagna region Pact for Work and Climate[6] . Integrating the agenda of policy makers and regional/local stakeholders is crucial for the success of the Pact.

Finally, in accordance with the last part of the report concerning the role of industrial relations in this process of co-evolution of smart cities and smart-working, which are still two phenomenon and concepts that are separately analyzed, a change in perspective, in tools in competences and in the dialogue among the social

[6] https://www.regione.emilia-romagna.it/pattolavoroeclima/ese-patto-per-il-lavoro-17x24cm_en_web.pdf

actors is necessary. The challenges are multifaceted and involve deeply the society and its members. The complexity of the challenge facing policy makers is unquestionable, and for that reason social dialogue can be a valuable tool for reducing that complexity and arriving at synthesis policies.

References

Albino V., and U. Berardi R. M. Dangelico (2015), Smart Cities: Definitions, Dimensions, Performance, and Initiatives, Journal of Urban Technology, 22:1, 3-21.

Anselin, L., Syabri, I., & Kho, Y. (2006). GeoDa: An Introduction to Spatial Data Analysis. Geographical Analysis, 38(1), 5–22. https://doi.org/10.1111/j.0016-7363.2005.00671.x

Bakici T., Almirall E., and Wareham J., (2012) "A Smart City Initiative: The Case of Barcelona," Journal of the Knowledge Economy 2: 1, 1–14.

Caragliu, A., Del Bo, C. and Nijkamp, P. (2011) Smart Cities in Europe. Journal of Urban Technology, 18, 65-82. https://doi.org/10.1080/10630732.2011.601117

CGIL, CISL, & UIL. (2021). RIGENERAZIONE URBANA E POLITICHE ABITATIVE NELLA NEXT GENERATION EU. https://binaries.cgil.it/pdf/2021/08/06/081518733-8d992676-5927-43ba-a53c-cbe0cb1c1b53.pdf

Comune di Bologna. (2018). Carta dei diritti fondamentali del lavoro digitale nel contesto urbano. Comune di Bologna. http://www.comune.bologna.it/sites/default/files/documenti/CartaDiritti3105_web.pdf

Cocchia A., (2014) Smart and Digital City: A Systematic Literature Review, Progress in IS (Smart City)

Dameri, R. P., and Cocchia, A. (2013). Smart City and Digital City: Twenty Years of Terminology Evolution. History, Computer Science.

ESPON.(2007). Update of Selected Potential Accessibility Indicators. https://www.espon.eu/sites/default/files/attachments/espon_accessibility_update_2006_fr_070207.pdf

Lytras, M. D., Visvizi, A., Jussila, J. (2020). Social media mining for smart cities and smart villages research. Soft Computing, 24, 10983–10987.

Mori K., and Christodoulou A., (2012) "Review of Sustainability Indices and Indicators: Towards a New City Sustainability Index (CSI)," Environmental Impact Assessment Review 32: 1; 94–106.

Co-funded by the European Union

Università degli Studi di Ferrara

ISTITUTO RICERCHE ECONOMICHE SOCIALI

ALEXANDRU IOAN CUZA UNIVERSITY of IAŞI