Chapter 23
Smart Cities, Local Community and Socioeconomic Development: The Case of Bologna

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Abstract This chapter investigates the metropolitan area of Bologna, Italy, aiming at understanding how the enforcement of a smart economy affects smart cities, and brings to social and cultural development. We especially focus on such as smart economy key factors, inter-linkages between smart economy and social development, cultural preservation, heritage conservation, and ecological management. Data analysis shows that smart initiatives do not guarantee any economic growth, especially in a context of economic and financial crisis. A good digital infrastructure can facilitate the circulation of information and offer new opportunities to economy and society, but it is not enough. We have observed that the traditional, local social structure, funded on cooperation, may rather represent a very interesting starting point toward a new peer-to-peer organization of economy and society. Notwithstanding, traditional social structures badly need an infrastructural update in order to effectively enforce new socioeconomic strategies.

Keywords ICT · Urban economy · Smart city · Bologna

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23.1 Bologna: A General Overview

Bologna is a Northern Italian city of more than 380,000 inhabitants in a metropolitan area that counts up roughly 1 million inhabitants. Bologna is the capital of the Emilia Romagna region, a compulsory point of passage between the North and the South of Italy.

Bologna became a metropolitan city in 2015. The metropolitan city, as defined by a recent administrative law, includes a large core city and the smaller surrounding towns that are closely related to it with regard to economic activities and essential public services, as well as to cultural relations and to territorial features. This means 56 municipalities on a territory of 3702.3 km^2, where Bologna itself is only 140.86 km^2.

Bologna's charming historical center is one of the best preserved in the world, where many ancient palaces and churches stand and witness the cultural relevance that Bologna has had in the course of the centuries.

The first settlement of Bologna date back to the sixth century BC, when it was named *Felsina*. Gaul tribes invaded the village renaming it *Bononia* during the fourth century, but it is under the Roman Empire that Bologna became thriving and prosperous. Its prestige kept growing up until the Western Empire crumbled during the fifth century AC and Bologna was sacked and occupied by Visigoths, Huns, Goths, and Lombards, progressively losing power, population, and lands.

The city reached again a peak of grandeur during the twelfth century. From then it has grown famous as a center of culture and innovation especially because of the *Alma Mater Studiorum*, the first European university, established in Bologna in 1088 B.C. (Fig. 23.1).

Nowadays the city is an important Italian center for industry, economy, and arts. Bologna University still keeps its charm, attracting several students who add up their young energy to the fascinating buzz of the city. Bologna is also one of the wealthiest cities of Italy, often reaching a good ranking in many sectors like life quality, innovation, transportation, technology and social initiatives.

Bologna has an official vision about smart city as the tool that best interprets the different citizenship demands, providing opportunities for the implementation of people life projects. Public and private stakeholders worked according to such a vision and made Bologna the second Italian smart city after Milan [1].

23.1.1 Geography and Administrative Boundaries

Bologna is placed on the road Emilia, a roman main route that runs for roughly 300 km through the Po valley, from the city of Rimini (East, by the Adriatic Sea) to the territory of Milan (Northwest). This is one of the main axes that determined the urbanisation of Northern Italy since the 3rd century AC. Such a route is nowadays

Fig. 23.1 Picture of Bologna taken from Asinelli Tower. *Source* Mko61 IT (Own work) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons. https://commons.wikimedia.org/wiki/File%3APano_of_Bologna.jpg
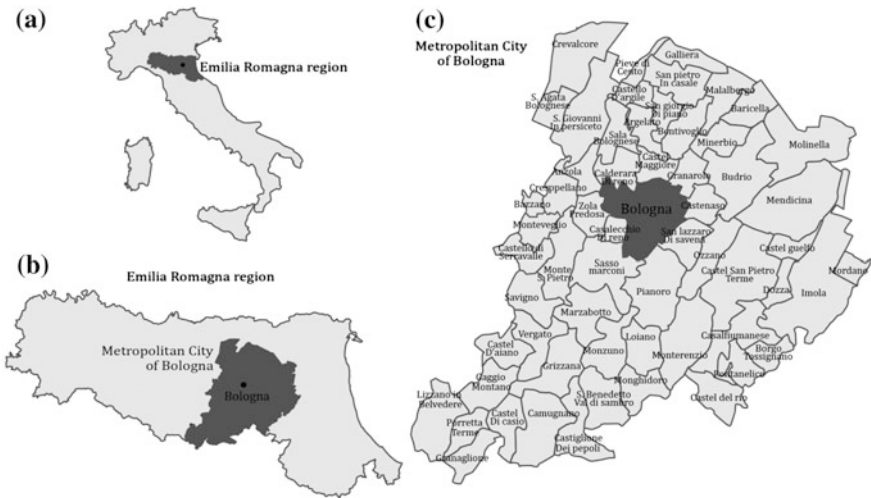
Fig. 23.2 Location of metropolitan city Bologna: **a** in Italy; **b** in Emilia Romagna region; **c** Municipalities of the metropolitan city

doubled by a motorway which forks in Bologna toward Central Italy. In fact, the city is posed at the foot of the Apennine Mountains, holding a strategic position along trading routes since the time of its foundation (Fig. 23.2).

Enclosed between the Reno river and the Savena torrent at 54 m above sea level, Bologna has at her backs the charming *Colli Bolognesi*, a famous rural hilly area covered by vineyards, and highly attractive for tourist and locals. The climate is continental (the climatic classification is "zone E, 2259 GR/G") with a wide temperature range between summer and winter, and frequent snowfalls.

23.1.2 Demography

As of January 1, 2015, Bologna had 386,181 residents, 181,417 (47 %) male, and 204,764 (53 %) female, with a density of 2741 people per km^2 and an average age of 46.5 years old, while the metropolitan territory counts 1004,323 inhabitants with a density of 2713 people per km^2 and an average age of 45.6 [2].

Due to the economical growth of the metropolitan area Bologna's residents drop in favor of the surroundings (see Fig. 23.3) and subsequently remained stable.

The number of immigrants is constantly growing since the '90s of the twentieth century. In total 58,873 foreigners represent the 15 % of the population on December 31, 2015 [3]. Over the years, the majority of immigrants were concentrated mainly in the *Bolognina* district thus transforming this popular area into a multi-ethnic neighborhood [4].
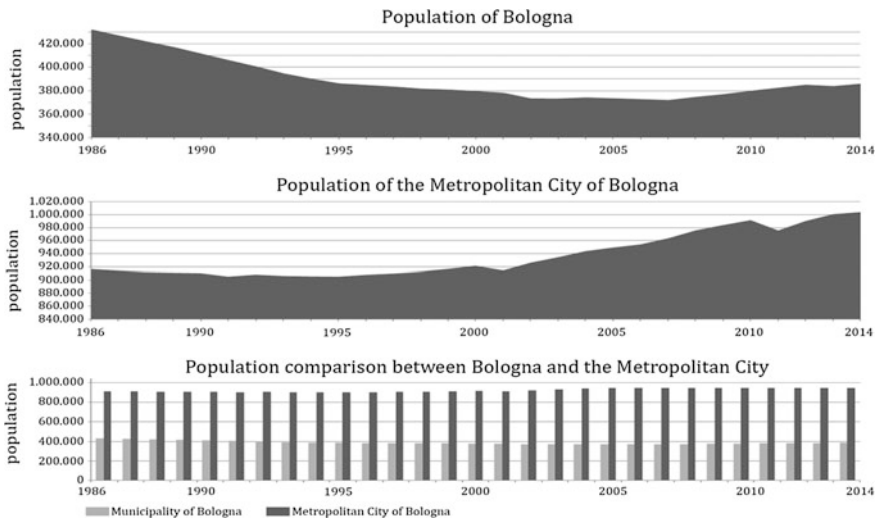

Fig. 23.3 Population change of Bologna, and the metropolitan city of Bologna

The municipality identified three possible demographic scenarios (low, middle, high) in the 2015–2030 timeframe, where the middle one is evaluated as the most likely to happen [5]. According to this one, the resident population should lightly increase, reaching 400,000 inhabitants in 2030. Average age is estimated to be 48 years. New births are expected to decrease due to the minor number of women in childbearing age, while the over 64 are expected to increase. Accordingly, the number of over 80 could rise from 35,429 to 41,000 representing more than 10 % of the population of Bologna [5]. Overall, the expected increase in the total population is due to immigration fluxes both from other areas of Italy and from abroad.

About immigration, the Italian Governments has tried to manage the immigration flow through two main tools: bilateral memorandum of understanding, which regulates the immigrants flow between Italy and auth Country, and introducing the felony of illegal immigration.

Unfortunately, the geo-political crisis in the Mediterranean basin is alimenting the illegal flows from north Africa and Turkey toward Italy and Greece. This enormous flow is putting in crisis the European Union (EU) which looks an effective policy on the reception of immigrants.

With reference to Bologna, actually 13.7 % of the population are immigrants [2, 21]. Local policies and the traditional local value of socioeconomic cooperation have avoided conflict and ghettos.

Figure 23.4 illustrates the demographic change in the metropolitan area of Bologna. Although there is a large prevalence of the municipality, we may see a particularly clear growth of the metropolitan city since 1971.
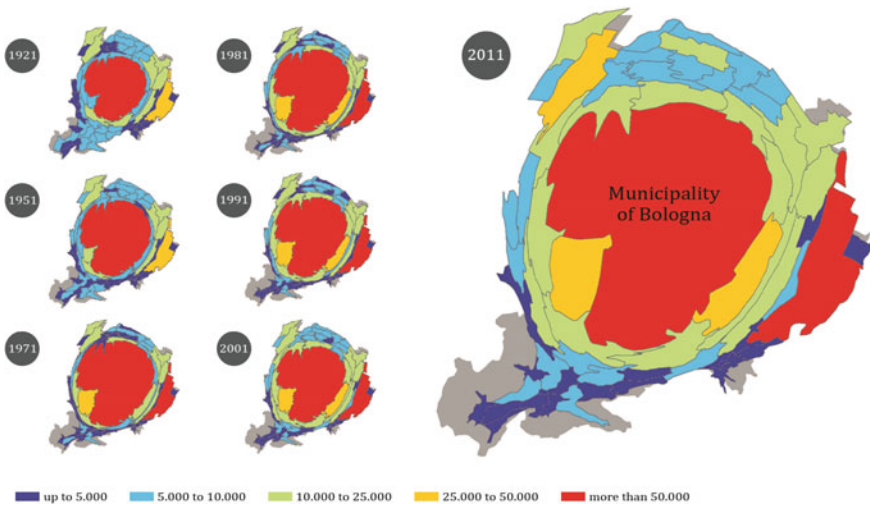
Fig. 23.4 Demographic trend in the metropolitan city of Bologna 1921–2011. *Source* Bonora (2014), Atlante del consumo di suolo, pag. 37. Bakersville

23.1.3   Governance

Established on April 7, 2014 and enforced on January 1, 2015 the new administrative entity of metropolitan city (*Città Metropolitana)* is one out of the 10 new Italian metropolitan cities [6]. The new governmental authority is represented by the metropolitan mayor who overlaps with the mayor of Bologna, along with the Metropolitan Council, and the Metropolitan Conference.

Related to the new institution, a big effort for involving the community has been the production of the *Piano Strategico Metropolitano di Bologna* (Bologna Strategic Metropolitan Plan) promoted by a committee of 34 institutions, mostly administrative institutions, and business associations, plus the chamber of commerce, labor unions, universities, and various organization of stakeholders. Officially launched in October 2011, the plan is the result of a voluntary process of many public and private subjects, aimed at building and sharing a vision about the future of the territory, 991 associations of citizens and organizations contributed to the plan and produced 551 project ideas. The process was concluded in 2013 [7].

The most significant value of the metropolitan plan is not only in the coordination of a wide territory of 56 municipalities, but in its capacity to define a shared and participated strategy, ready to operate.

Overall, the Municipality of Bologna first, and nowadays the metropolitan city, oriented the governance of the urban and rural territory toward an inclusive and shared model which has in the participatory process its most valuable asset. About this point, you can see the Sect. 20.5.

The active involvement of citizens and third sector is also supported by the implementation of the ICT platform *Iperbole2020* (http://iperbole2020.comune. bologna.it) and of several connected services that are steadily growing in number and quality.

23.1.4   Culture

Significant elements of economic, sociodemographic, and urban transformations affected the metropolitan area of Bologna since the last decades. They have generated a widespread, growing demand for culture. Facing such an increasing demand, the great potential of the metropolitan area cultural supply appears, however, limited by a strong each of homogeneity, in terms of size, financial resources, and management skills. This makes necessary the implementation of planning, development, coordination, and promotional policies, and the enforcement of cultural institutions and activities that can be only addressed properly at a territorial level. The Strategic Metropolitan Plan of Bologna aims thus at (i) establishing a regional "cultural system" network capable of triggering synergies between urban and suburban areas, (ii) rationalizing the use of financial and human resources allocated to cultural sectors by increasing economies of scale also through

different forms of partnership, (iii) improving local services and best practices by encouraging the growth of innovative and high-quality projects, characterized by strong public/private partnerships [8].

The European Union enclosed Bologna, along with eight other cities, with the designation "City of Culture" in 2000, and the UNESCO appointed Bologna as "City of Music" in 2006 because of its long and rich music tradition. These recognitions have given Bologna the opportunity to develop and showcase its cultural industry. Bologna offers an unbelievable number of dance events, theater, movies and music performances during its *Bologna Estate* (*Be'*) program. Several spectacles are for free and some are performed outdoor in the town squares. The annual *Bologna Festival*—one of the most relevant music festivals in Europe—organizes classical concerts which combine music, theater, dance, and visual arts. The *Porretta Soul Festival* gathers in the best soul and R&B musicians. The city has more than 50 public and private theaters, so there is definitely no shortage of venues. In this regard, the metropolitan plan has devoted several strategic actions to support and promote culture in multiple forms and as key for sustaining social inclusion. Actions include projects such as social-interaction theater, theater experience in education, atelier of visual and non-visual art, art therapy, musical events, etc. [8]

The city of Bologna was selected to participate in the Universal Exposition of Shanghai 2010 together with 45 other international cities.

The city has been an important center for advanced studies since 1088 when the University *Alma Mater* was established. This is the most ancient university in the Western world, counting 84,215 students in 2015. A total of 33 departments and 207 courses of which 52 international are supported by a rich budget, that amounted to 610.90 millions of euro in 2015 [9].

Many other cultural institutions operate in Bologna such as the Academy of Fine Arts with its 1500 students, the Conservatory *Giovanni Battista Martini* that, funded in the 1804, was the first public music school in Italy. Also, Bologna has been chosen by foreigner universities such as the Johns Hopkins University, Indiana University, Brown University, California University, for some of their programs.

In the metropolitan area there are more than 450 cultural institutions, public and private. The libraries are more than 250, of which 90 are of public access. Museums are 113, of which 45 are municipal, 19 radio stations, 8 TV channels, 9 major newspapers.

Among its wide heritage, *le Due Torri* (the two towers) are the symbol of Bologna, and its two most famous churches, the *Basilica di San Petronio,* established 1390, and the *Basilica di Santo Stefano* which is more than one thousand years old, are well known in Italy and abroad.

The features of Bologna can be synthesised by the famous slogan *Bologna la dotta, la grassa, la rossa* (Bologna the learned, the fat, the red). Such curious nickname, are due to three characteristics of the territory: the learned, as home to the university almost from a thousand years; the fat, because of its delicious cuisine; and the red, because red is the predominant color of its architecture (Fig. 23.5).

Fig. 23.5 Musicians in a public square of Bologna. *Source* Photo by Guglielmo Minervino

23.1.5 Mobility

The city and its metropolitan area are at the center of Italy's trades, as well of a mobility network. In Bologna two main motorway connect Northern and Southern Italy. Also, a 22-km orbital road surrounds half of the city. The negative aspect of such an intense traffic is air pollution.

The railway is important as well, Bologna has two main terminals, one of them dedicated to goods transportation. Five main railroad lines pass through Bologna, including the national high-speed line. The metropolitan rail network has 8 lines and 82 stations.

Bologna's international airport "Guglielmo Marconi" is only 6 km far from the city center and recorded 6,889,742 passengers in 2015, with an increase of 4.7 % versus 2014, reaching the seventh position for air traffic in Italy [10].

Urban mobility is assured by public day and night bus/tram service in both the urban and the suburban area, taxis and car rental. Bologna has also a car and a bike sharing service. A free taxi bike using a rickshaw called *Bi-Bo* is running the city center since 2010.

Bologna has a 120-km network of cycle paths divided into five radial routes which connect the center with the suburbs. For the future, an extension of cycle paths and an increase up to 1000 shared public bicycles are expected [11, 12]. The city aims at bringing the percentage of cycling up to 15 % within a decade through an awareness campaign in favor of soft mobility and road safety. A bikes ring road opened in 2015 which runs around the old town [12, 13]. A total of 165.5 km of

cycling path are expected to be reached within the 2016 investing an amount of 10,158,000 € from 2010 to 2016 [13]. Moreover, the construction of the first Italian bicycle's motorway, passing by Bologna, will start in 2016. This latter will link the cities of Bologna and Verona as part of the European cycle network *Eurovelo 7* [14, 15] (Fig. 23.6).

The Metropolitan City of Bologna has adopted in 2006 the Metropolitan Mobility Plan which identifies 10 strategies to improve the mobility network on a long period, aiming to develop a more integrated way of connecting places [16]:

Norway = 500 km
Sweden = 2.175 km
Denmark = 300 km
Germany = 660 km
Czech = 380 km
Austria 562 km
Italy = 1.970 km
Malta = none

Fig. 23.6   Eurovelo 7 cycling route. *Source* http://www.eurovelo.com/en/eurovelos/eurovelo-7

1. Bologna as a node of the European Transport Network.
2. New impulse to the metropolitan railway service. New interventions, redesign of the governance toward a metropolitan-scale economic sustainability of the railway service, integrated tariffs with the road transport systems, better accessibility to stations, ICT-based services for customers;
3. Three stations for the city of Bologna. Redefinition of the role of three Bologna's stations, physical improvement of the central station and its better integration with the urban traffic, a system of three stations as gates to the city;
4. Public transport in the city of Bologna. Redesign of public transport inside the city and towards the airport, new lines of tram and busses, intermodal nodes;
5. Integration of the provincial public transport. Integration and coordination between the provincial (now metropolitan) and local public transport systems, the latter separately managed by municipalities;
6. The community as main character in the design of rail services. More power to the Provincial administration in order to guarantee all of the 10 strategies. (The Province corresponds now to the metropolitan city. See Sect. 20.1.3);
7. The new ring road of Bologna and the North Loop. Integration between the two major planned road infrastructure of Bologna, and redesign of the secondary road system that connects them with the city;
8. Introduction of a road pricing for high-speed roads and tariff for parking lots inside the city as tool to finance new intervention for the not urban road system.
9. Transverse drivability: an integrated network. Strengthening of secondary roads in the suburbs and rural areas;
10. Logistics and freight transport. Reorganization of functional hubs and districts, improving their accessibility through dedicate ways, promotion and design of a system based on intermodal node like road-railway.

After 10 years almost such of the alone 10 strategies have been undertaken and many goals achieved. In general the vision was toward a more integrated metropolitan area at a time when municipalities were independent. Since 2016, this aspect can be carried on by the new metropolitan city administration with less problems in terms of coordination, bureaucracy, time consuming and efficiency.

23.1.6 Healthcare

Bologna ranked 12 in life quality in 2015 among Italian cities [17], and it always reached good positions through years as shown in Table 23.1. Also, in 2013, it holds the second position, among major Italian cities, in urban ecosystem quality with a score of 56.12 % [18]. About the quality of the air in the metropolitan city, in 2015, some criticality emerged about PM10 emissions that exceeded the day limit 11 times during the year, making Bologna the 27th worst city about such emission. It holds the 16th position about NO_2 emission in 2013, and the 11th position about

Table 23.1 Bologna's position about quality of life in the Sole24ore ranking about Italian cities

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Position	1	7	5	12	14	13	8	1	10	3	7	12

Source from Sole24Ore. Qualità della vita annual reports

O_3 still in 2013 [19]. However, it holds the 7th position among major Italian cities about air quality [20].

The Municipality of Bologna birth rate was 8.3‰ and the mortality rate was 12‰ in 2013 [21]. Life expectancy in Bologna in 2012 was 85.7 years for females (fifth city in Italy) and 80.5 for males (third city in Italy). The increase in life expectancy for men from 2010 to 2012 was 0.3 years, while it kept stationary for women [21].

111 sport societies every 100,000 inhabitants gave Bologna the fifth position among Italian major cities for number of sportive societies, and the seventh position for the number of athletes (8339 every 100,000 inhabitants) in 2012 [21].

The public agency that manages the National Health Service is one of the biggest in Italy for size and complexity. In the Metropolitan City of Bologna the agency is articulated in 6 territorial districts with a total of 9 general hospitals, 4 minor hospital, and 54 health centers. It cured 72,000 patients, counted more than 24,000 surgical interventions, and had an annual balance that exceeded 1.7 billion of Euro in 2013 [22].

The Institute of Neurological Science has been established in Bologna in 2011 by the National Health Service and the University of Bologna. This new pole is dedicated to high research and education, medical treatment and care [22].

23.1.7   Tourism

Bologna is permanently ranked among the most attractive cities of Italy due to its cultural heritage and fine cuisine. However, in the last year it also gained popularity among those who are interested in smart cities and ICT from both a professional and an educational point of view. In fact, Bologna hosts the *Smart City Exhibition* (www.smartcityexhibition.it) since 2012, a three-day event that collects and exhibits the most updated advancements in the field through keynotes, laboratories, conferences, business meetings, trainings, and an expositive section where enterprises presents to the public their best products and solutions. The exhibition has become soon the European landmark in urban innovation, with more than 7,000 visitors, 111 events, and more than 600 speakers in 2014 [23].

A total of 1760 hotels and hotel-like structures, of which almost 50 % in the Municipality of Bologna, with a total of 39,129 beds, represents the accommodation capability of the Metropolitan City of Bologna at the end of 2014, with an increase of +8.44 % compared to 2013 [24]. These faced 1651,981 arrivals (+1.18 % compared to 2013) and 3283,548 presences (−1.37 % respect to the

2013). 41 % were foreigner tourists, mostly from Germany, China and UK. Usually people stay in Bologna 2 days averagely [24].

"Bologna Welcome" is the tourist information service managed by the municipality and a private firm. The service promotes Bologna and its territory with two touristic offices in the city and a web portal (www.bolognawelcome.com) where visitors get information about museums, hotels and events. The website allows to download informative materials, a book, and a touristic card [25]. Since 2009 a bus company provides a sightseeing tour through the historic center.

The Metropolitan City of Bologna has a touristic program of local promotion that indicates strategies and intervention to be implemented within the year. The program gets revised and refunded every year. Bologna expects to increase the welcome tourist services by implementing new technological devices, cultural events, greenways and cycle paths, and local food promotion in 2016 [26].

23.2 Steps Toward the Smart City

This paragraph wishes to illustrate the steps planned by the local governments in order to make Bologna a smart city.

During the 90s the Municipality of Bologna and the regional government devoted many financial efforts for building digital infrastructure. Actions have been taken also by other organization, like the University with its computer science department, research centers, and small and medium private firms.

23.2.1 Local Digital Agenda

The first step toward the digitalization was the adoption of the Local Digital Agenda (LDA) by the Municipality on January 14, 2012 [27]. LDA is aimed at answering the local ICT demand by strategic sectors such as school, economy, society, and mobility according to the Italian and European policy toward a digital society.

Such LDA of Bologna is in line with the European Union strategy called Europe 2020 proposed by the European Commission in 2010. Part of the strategy is the European Digital Agenda (EDA). Its main objective is to develop a Digital Single Market (DSM) to better exploiting the potential of Information and Communication Technologies in order to foster innovation, economic growth and progress. The Digital Single Market constitutes one of the seven pillars of Europe 2020 strategy for the growth of the European Union [28], and it is also one of the 10 political priorities of EU 2020 [29] (Table 23.2).

The Digital Single Market is made up of three policy areas. (i) Better online access to digital goods and services: helping to make the EU's digital world a seamless and level marketplace to buy and sell; (ii) An environment where digital networks and services can prosper: designing rules which match the pace of

Table 23.2 EU Pillars and priorities of the 2020 strategy

Europe 2020–7 pillars	Europe 2020–10 priorities
Achieving the digital single market	Jobs, growth and investment
Enhancing interoperability and standards	Digital single market
Strengthening online trust and security	Energy union and climate
Promoting fast and ultra fast internet access for all	Internal market
Investing in research and innovation	A deeper and fairer economic and monetary union
Promoting digital literacy, skills and inclusion	A balanced EU-US free trade agreement
ICT-enabled benefits for EU society	Justice and fundamental rights
	Migration
	A stronger global actor
	Democratic change

Source https://ec.europa.eu/digital-agenda/en/europe-2020-strategy; and http://ec.europa.eu/priorities/index_en

technology and support infrastructure development; (iii) Digital drive for growth ensuring that Europe's economy, industry and employment take full advantage of what the digitalisation offers [29].

Another important goal of the Local Digital Agenda of Bologna was the reinforcement of democracy and social inclusion [27]. Interalie, the agenda encourages citizen participation by using digital technology. To support the participation process, the local government initiated other important actions, such as the launch of social networks, reorganization of back offices, use of tool to increase e-participation and finally, the use of app for taking advantage of services from the municipality [27].

Moreover, Local Digital Agenda offers a social and cultural promotion of the city. The Municipality of Bologna promotes and supports digital inclusion and cultural development by supporting free internet access and digital school projects. It introduce whiteboards, laptops, tablets, and e-content in schools, and transforms libraries in knowledge environments where citizens can support their cultural growth.

Bologna is one of the Italian national center of excellence in such a field, and now the local Governments of the metropolitan area are investing resources toward smart initiatives.

The Local Digital Agenda proposal presented by the Municipality of Bologna has been improved through a participate process with the community that in the first 6 months of 2012 has produced several proposals. These have been collected by an online platform *Iperbole2020* and discussed during several focus groups, and events promoted either by the municipality or by private non-profit associations.

The numbers are: 9700 visits to the online platform, 700 tweet with the hashtag #agendadigitalebo, 80 proposals from the online form, 30 sponsored events, 9 promoted events [27].

The last implemented proposal is the conversion of 30 sociocultural centers into Digital Centers where Wi-Fi hotspots were installed, thus contributing to increasing the network of free Wi-Fi accesses inside Bologna [30].

23.2.2 Bologna Smart City

Immediately after the experience of the Local Digital Agenda, the Municipality of Bologna and a consortium of public and private companies and organizations, including Bologna University, signed a memorandum of cooperation (July 2012). The memorandum aimed at identifying the guidelines for transforming Bologna into a smart city [31].

The goal is to make Bologna an intelligent and sustainable system where resources, optimization allows to both qualifying the existing services and creating new ones for a city open to the participation and the creative contributions of citizens. Projects and proposals arising from this collaboration are part of the recent Strategic Metropolitan Plan (see Sect. 20.1.3) [31].

The Bologna Smart City platform has identified seven key areas worth a development effort.: (i) Cultural heritage; (ii) Iperbole 2020 Cloud and crowd; (iii) Smart networks; (iv) Sustainable mobility; (v) Safe and sustainable neighborhoods; (vi) Health and welfare; (vii) Education and technical training [31].

The Smart City Plan for Bologna is addressed in the Sect. 20.4.

23.2.3 iCity

Particularly interesting is the multi-partner European project "*iCity*" [32], supported by the European Union funds. Goal of *iCity* is the creation of an European open platform integrated with similar partners platforms existing in Genoa, London, and Barcelona. These platforms help creative citizens, businesses, universities and associations in co-designing and managing shared services or applications through ICT infrastructure, software tools, and open data.

The guiding principle is that of "The five I": making cities Intelligent, Integrated, Innovative, Inclusive and Internet-enabled. The theme is the creation of new models of interaction between citizens and territory through the use of services and open data that the government made public [32] (Table 23.3).

Table 23.3 It shows the available opened information systems for Bologna at this moment

Bologna	Generic sensor data	
	Transport and mobility	TPER-QueryHelloBus; QueryHellobus4ivr; QueryResale CISUM-metropolitan traffic; CISUM-parking
	e-Government	
	Environment	Air quality
	Tourism and culture	CISUM-events; Cineteca DVD/VHS Catalogue; Agenda Cultural
	GIS	Geocoding
	Wi-Fi	WiFi Live Monitoring

Source iCity Project. Retrieved from http://www.icityproject.eu/information-systems-map

23.3 Economic Structure

In what follows we analyze the economic structure of Bologna's metropolitan city. To do this we have analyzed several statistical data and report from the Italian Statistical Agency (ISTAT) and from local government agencies, such as Emilia Romagna Region, and Metropolitan City of Bologna.

The goal is to provide an accurate picture of Bologna's economy in the last decade, and to search current trends linked with Smart City initiatives.

Despite its wide use we lack, a definition of what the label "smart city" really means. We have used the smart cities' definition sketched by the European Smart City initiative, i.e. a city that addresses public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership, and has the following focuses: Governance, People, Living, Mobility, Economy and Environment [33].

According to the above definition, we will try to understand whether and how smart city initiatives have influence on economy, social inclusion, innovation, entrepreneurship, trademarks, productivity and the integration in the international market.

By smart economy we mean the development of e-business and e-commerce, ICT-enabled and advanced manufacturing and delivery of services, ICT-enabled innovation, new products, new services and business models, smart clusters and eco-systems (e.g. digital business and entrepreneurship). Smart economy also entails local and global inter-connectedness and international embedding with physical and virtual flows of goods, services and knowledge.

One should finally note that all the economic indicators of the last years have been influenced by the economic and financial crisis originated in 2008. This made our job much harder, in order to identify the effective trends of what has a direct link to smart city.

23.3.1 Metropolitan City of Bologna and Its Economy

If economic performance of Emilia Romagna was near the bottom of Italy's 20 regions in 1970, the region ranks first today. Emilia Romagna also ranks 10th among European Union's 122 economic regions, and its unemployment rate is worse than in 7 other European regions only. Its per capita income is 30 % higher than the national average and 27.6 % higher than the EU average [35].

Bologna is the most populous city of the region, and it is the commercial and communication hub of the area.

Economy is characterized by a prosperous industrial sector, traditionally based on the transformation of agricultural and zootechnical products, machinery, automobiles, footwear, textile, engineering, chemical, printing and publishing industries, as well as financial, insurance and retail activity.

Macroeconomic indicators—such as value added, number of firms, and employment—show a substantial downtrend linked to the global crisis and the decrease of domestic consumption and investment. Figure 23.7 shows a substantial decrease of new enterprises in the metropolitan area in 2009.

The pro capita GDP of Bologna is still among the highest in Italy, thanks not least to a solid, active productive fabric, and an ever-growing tertiary sector. In general, since 2000–2011 the metropolitan area has increased its GDP (Fig. 23.8).

An interesting point concerns the economic model of Bologna and, more widely of the Emilia Romagna region characterized by co-operatives.

Co-operatives are the foundation of the region's economic makeup. More than 30 % of the 43,000 Italian co-operatives are located in Emilia Romagna, making it
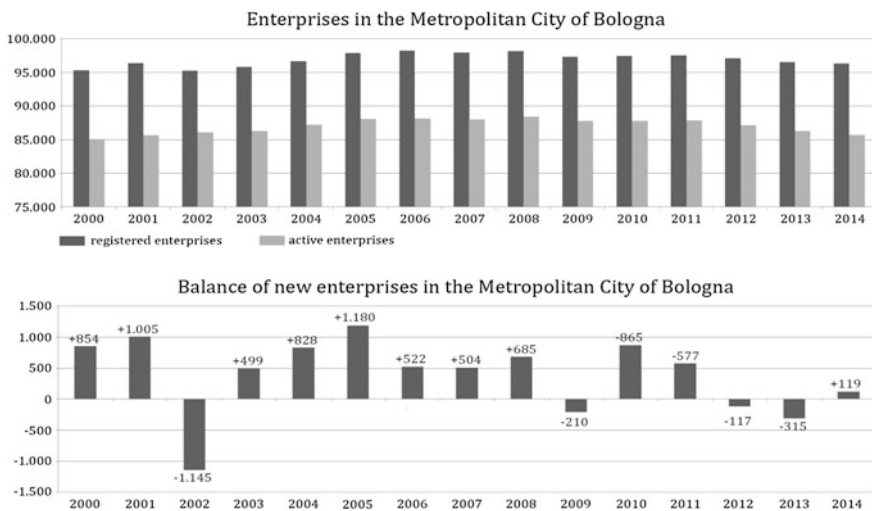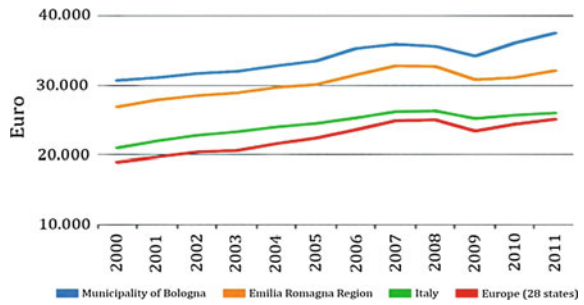

Fig. 23.7 Enterprises in the metropolitan city of Bologna. *Source* Camera di Commercio di Bologna, Report 2015

Fig. 23.8 Pro capita gross domestic product in the metropolitan city of Bologna, since 2000–2011. *Source* Eurostat

one of the most concentrated co-operative sectors in Europe. In Bologna two out of three citizens are members of a co-operative, with most belonging to several ones.

Co-operatives directly account for over 40 % of the region's GDP. Indirectly, through their economic spin-offs and their involvement in production, distribution, training, and marketing networks, the co-operatives of Emilia Romagna account for a much higher contribution to the region's economy.

The sectors in which co-operative firms are strongest include retail, construction, agricultural production, housing, manufacturing, and social services. Most public works, including large-scale engineering, construction, and heritage restoration projects, are carried out by building co-operatives owned by their employee members. In the Metropolitan City of Bologna the growth rate of cooperatives is +1.56 % in 2014 while it is +2.13 % for the Municipality of Bologna. Also, seven municipalities of the metropolitan area registered a growth rate of more than 10 % [34].

Figure 23.9 shows economic sectors and their trend in 2008, 2011, and 2013. There is a prevalence of the commercial sector that shows a stable trend in the last years, then construction industry, real estate and accommodation activities. Agriculture and manufacture, although have a bit slowed down have had the same trend. Telecommunication and information sectors show a stable trend in the period between 2008 and 2013.

About the productivity, regional data show that it is below the European average. Firms in Emilia Romagna have a decent innovation performance, despite they are less productive than EU firms on average. Such a poor regional performance can be explained by the industrial structure that is mainly based on SMEs and by the poor diffusion of ICT with respect to the rest of the EU (e.g., just 67 % of households have Internet access vs. an EU average of 74 %) [34].

As shown in Fig. 23.10, production trend (blue line) remains uncertain with production, turnover and orders declined again in 2012.

Research and development (R&D) investments show that regional firms' awareness about innovation issues is growing, yet much more effort is needed for improving firms' innovation performance. Regional firms carry out insufficient—yet growing—R&D activity and hardly collaborate with partners (businesses or institutions) in research and innovation.
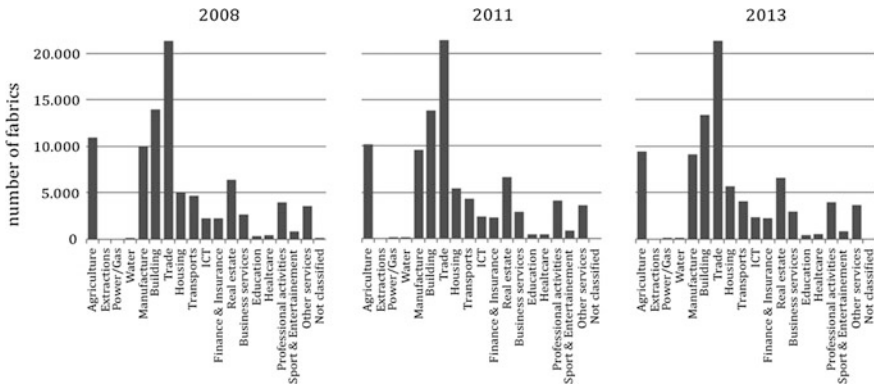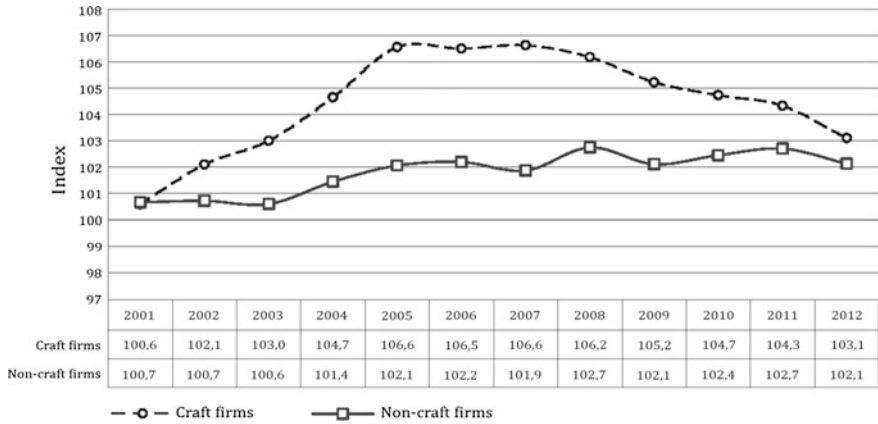
Fig. 23.9 Economic fabric in the metropolitan city of Bologna, divided in sectors. *Source* Camera di Commercio di Bologna, Report 2014
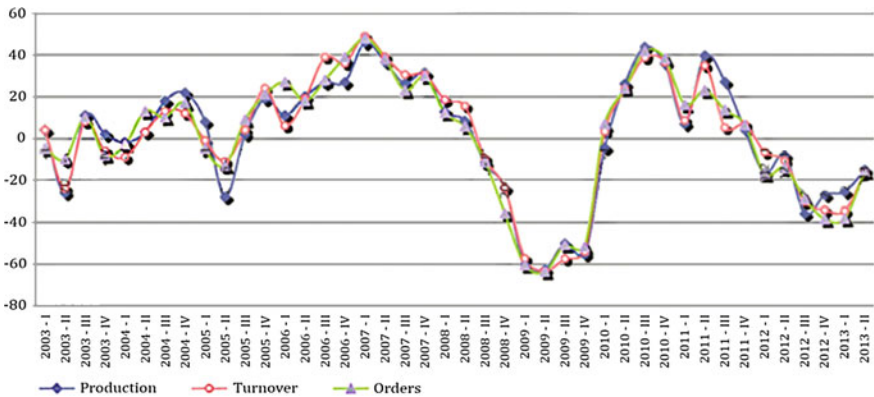
Fig. 23.10 Trend and relationship between production and turnover, by quarters, since 2003–2013 in Bologna. *Source* IRES and Unioncamere, Report 2013

In Higher Education, investment in Emilia Romagna, like in many other regions, lags behind in terms of tertiary education rate and in terms of GDP share allocated to higher education. In order to build a sustainable knowledge society, Emilia Romagna, with the support of national government, needs to boost investment in tertiary education and in its research system.

In term of innovation, available data refers to the region. ESIC's report [35] compares the regional innovation system of Emilia Romagna to the average performance of the EU according to various indicators of the European Service Innovation Scoreboard [35]. Relative performance is measured against the performance of the best performing region of the total 262 EU regions taken as 100 and of the worst performing region taken as 0.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Craft firms	100,6	102,1	103,0	104,7	106,6	106,5	106,6	106,2	105,2	104,7	104,3	103,1
Non-craft firms	100,7	100,7	100,6	101,4	102,1	102,2	101,9	102,7	102,1	102,4	102,7	102,1

— o — Craft firms   —□— Non-craft firms

Fig. 23.11 Craft and non-craft firms in the metropolitan city of Bologna since 2001–2011. (Index 2000 = 100). *Source* IRES and Movimprese

The decline of loss value and export between 2007 and 2011 has affected the business world. In particular, craft firms decreased by 2 %, and this trend doesn't seem to slow down. Third sector shows a moderate decrease by −0.1 % (Fig. 23.11).

Figure 23.12 provides an overview of the general socioeconomic situation that frames service innovation. The graphs reflect the importance of service innovation in the region and measure its transformative capacity. Finally, in Fig. 23.13 we can see indicators which capture the five innovation system dimensions such as entrepreneurship, knowledge development, innovation, financing and collaboration.

Emilia Romagna performs about the EU average on the wider framework conditions of service innovation. The only area where the region lags behind the EU27 average is service innovation input [35].

In terms of structural indicators, Emilia Romagna performs close to the EU average on indicators assessing collaboration and networking and financing. While the region lies above average on innovation and business model generation, it lags behind the EU27 average on entrepreneurship, and knowledge development and transfer [35]. This is also reflected in the distance from the best scores. Most strikingly, the region does relatively badly on the 'share of innovators collaborating with others', on employment share in knowledge intensive services and on labor productivity growth. Conversely, the region does relatively well on the share of self-employed people such as potential innovators/entrepreneurs and on the share of innovating firms that have received public financial support, which reflects the ability of the regional government to target innovators. Thus while there are many entrepreneurs and potential innovators and an effective public support structure, there seem to be significant obstacles to commercialization, knowledge transfer and, therefore, growth. The figures above indicate clearly that there are considerable
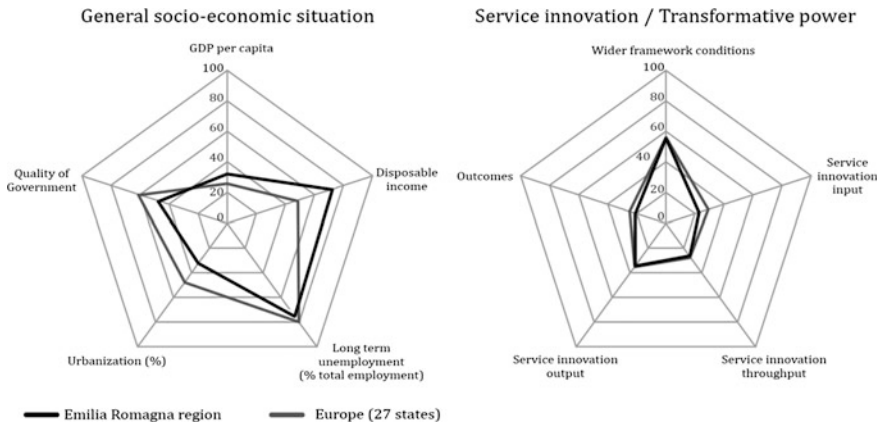
Fig. 23.12 Regional profile of Emilia Romagna region on the European service innovation scoreboard. *Source* European Service Innovation Centre (ESIC). Policy brief for Emilia Romagna, Report 2014
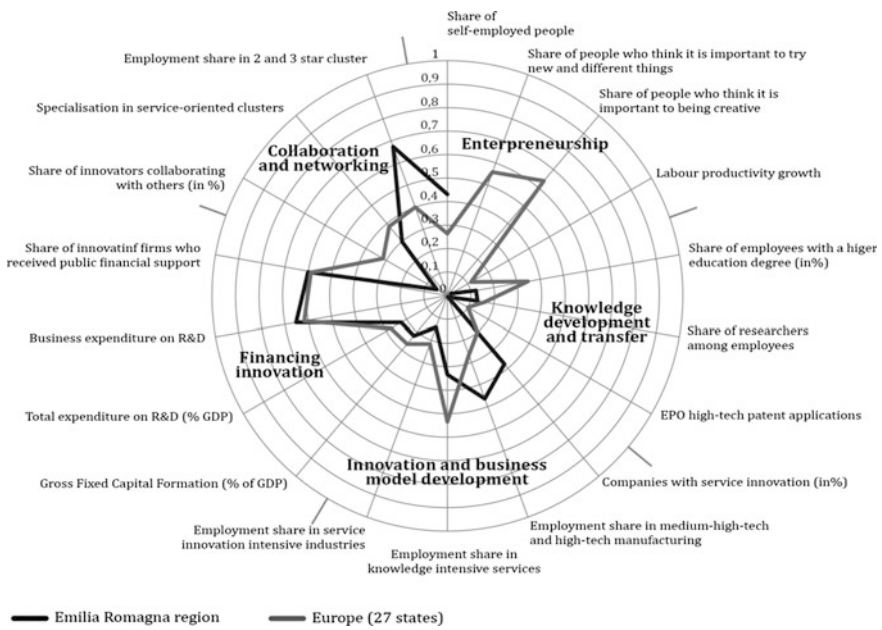
Fig. 23.13 Distance of Emilia Romagna Region from the best performing regions and EU27 average in terms of service-innovation related structural indicators. *Source* European Service Innovation Centre (ESIC). Policy brief for Emilia Romagna, Report 2014. *Note* The *black line* is interrupted due to unavailable data

possibilities for Emilia Romagna to further exploit the potentiality of service innovation [34].

Industrial change, global crisis, economic uncertainty, and variation in demographic patterns have create social friction in labor market. Charts show a general increase of unemployment during the last years (Fig. 23.14). Such a negative trend is particularly pronounced if we look at chart 14d showing unemployment level by age groups. Youth is particularly affected by unemployment.

Socioeconomic uncertainty and demographic and structural change that are occurring in the metropolitan area demand immediate politico-economical choices so to reduce social fracture and financial unsustainability.

About export and import business, data show the difficulty of the metropolitan system in dock economic recovery. In Fig. 23.15 we see the main import export sectors: mechanical industry, transport systems, chemical industry, fashion and agro-food sector.

As shown in Fig. 23.16 the role of the European Union in the dynamic of exchange is predominant. EU covers 67.9 % of import and 47.9 % of Bologna's export.

Export toward other European countries is close to 11 %, with a good trade share with Turkey, whose economy has expanded significantly in the last years.
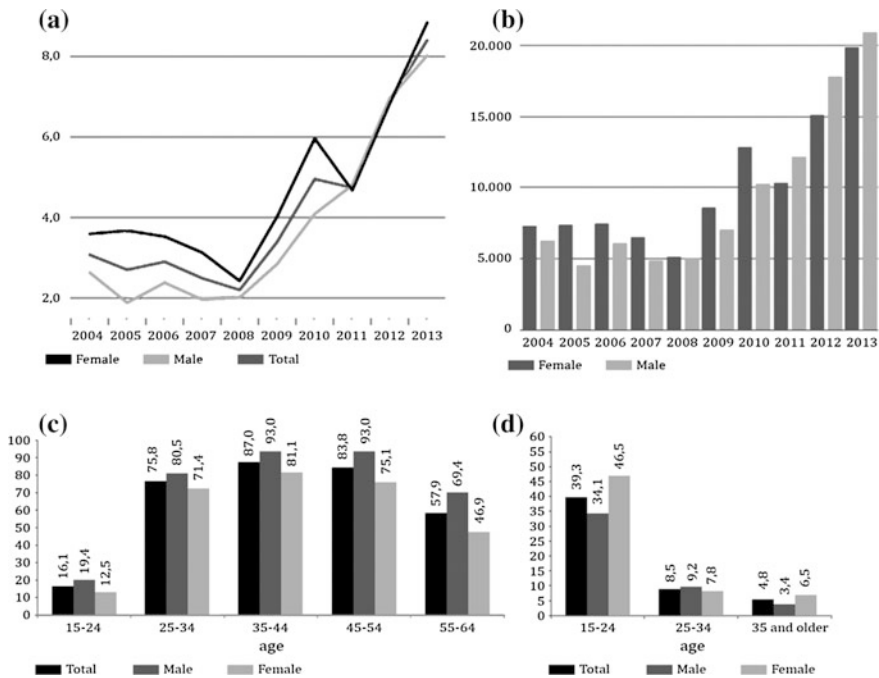

Fig. 23.14 a Unemployment rate (older than 15 years old); **b** Unemployment amount; **c** Employment rate by age groups in the metropolitan area; **d** Unemployed level, divided by age groups in the metropolitan area. *Source* Italian National Statistic Agency—ISTAT
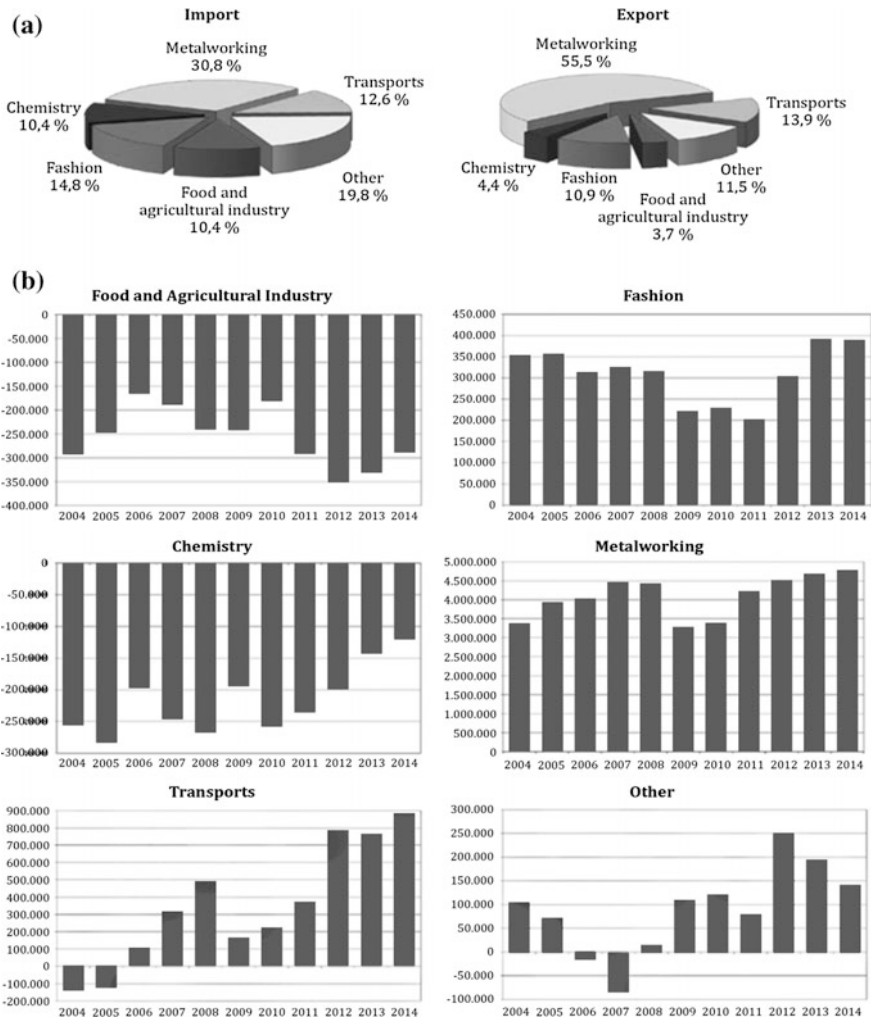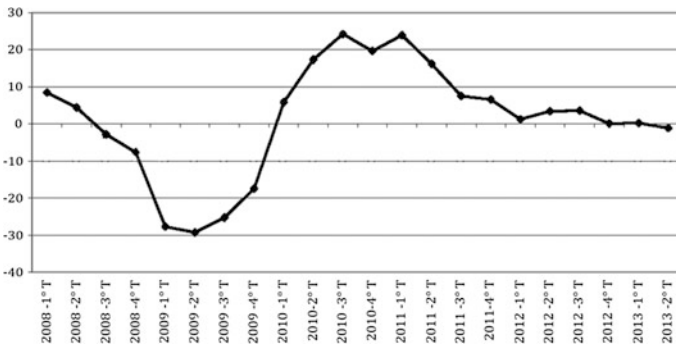
Fig. 23.15 **a** Foreign trade in 2014; **b** Import export balance since 2004–2014 about the main sectors. *Source* Camera di CCIAA, report *Import & export dell'area metropolitana di Bologna—2014*. Retrieved from http://www.bo.camcom.gov.it/statistica-studi/osservatorio-economico/commercio-estero/import-export-a-bologna-2014. Accessed 20 April 2015

Also important is the trade exchange with Asia, where export is close to 21 %, with a particular flow to Central Asia region. Export has significant value toward North America and European Countries outside the EU.

Particularly interesting is Fig. 23.17. It shows the metropolitan export since 2008 and the export collapse during 2009 after the world crisis of 2008. Although there has been a significant increase in 2010, the graph shows a downward trend over the period 2011/2013. 2014 data show a moderate growth of export [34].

Main countries of import

Main countries of export
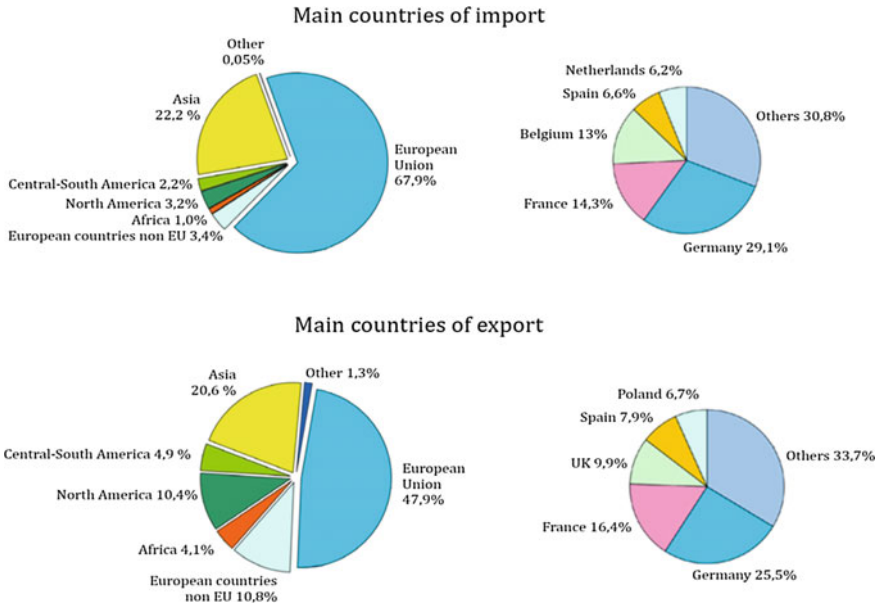
Fig. 23.16 Import Export trend in 2014 and main destination. Source: IRES after ISTAT. *Source* Camera di CCIIAAAA, report *Import & export dell'area metropolitana di Bologna*—2014. Retrieved from http://www.bo.camcom.gov.it/statistica-studi/osservatorio-economico/commercio-estero/import-export-a-bologna-2014. Accessed 20 April 2015

Fig. 23.17 Export trend in 2008–2013 in the metropolitan city of Bologna, by quarters. *Source* Camera di CCIIAAAA, report Import & export dell'area metropolitana di Bologna—2014. Retrieved from http://www.bo.camcom.gov.it/statistica-studi/osservatorio-economico/commercio-estero/import-export-a-bologna-2014. Accessed 20 April 2015

Figure 23.18 shows how the percent of export has changed geographically. Although the export toward UE is decreased by 8.6 % between 2001/2012, EU remains the main market.
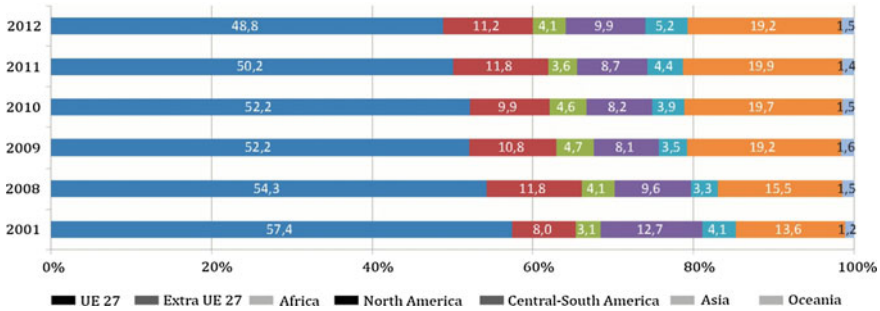
Fig. 23.18 Export, in %, about the metropolitan area with geographical destination of goods. *Source* Italian National Statistic Agency—ISTAT; Emilia Romagna Institute Economical and Social Research—IRES

Fig. 23.19 Income pro-capita of families in Euros. *Source* Urbes Report 2015
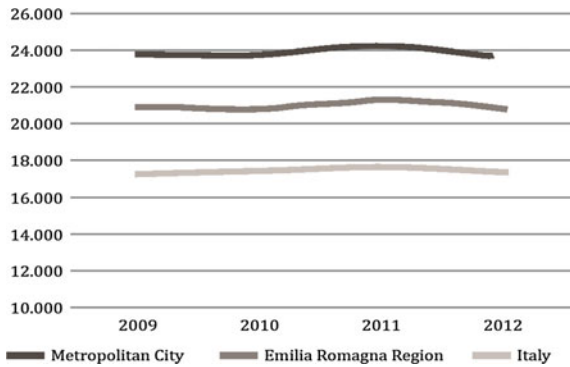
To conclude this paragraph, we would like to analyze the trend of the metropolitan area families' income. Figure 23.19 compares the metropolitan income to the regional and the national income.

23.4 The Smart City Plan and Its Influence on Economy, Society and Land-Use

In this paragraph we introduce the Smart City Plan for Bologna and we try to analyze whether it has generated positive effect on society and economy.

As we know, even though there has been an increased focus on urban development policies during the last years, the very "*smart city*" concept is still in search of a rigorous definition [36].

However, there are two ideas that are relevant in literature: ICT and related new economy. These two attributes appear in the issue "Smart cities in Europe", where

Caragliu, Del Bo, and Nijkamp label a city as 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*". [37].

But what do we mean when we talk about ICT and new economy?

The Organisation for Economic Co-operation and Development (OECD) member countries agreed to define the "*ICT sector as a combination of manufacturing and services industries that capture, transmit and display data and information electronically*" [38]. Manufacturing industries refers to: (i) information processing and communication including transmission and display; (ii) electronic processing to detect, measure and/or record physical phenomena or control a physical process.

Services industries must be intended to enable the function of information processing and communication by electronic means. One important feature of the OECD ICT sector definition is that it breaks the traditional dichotomy between manufacturing and services activities.

Although the definition is not yet consistently applied, it is important because it gives a first approximation of the ICT sector. The existence of a widely accepted definition of the ICT sector is the first step toward comparisons across time and countries.

The term *New Economy* (NE) describes aspects or sectors of an economy that are producing or intensely using innovative technologies. This relatively new concept applies particularly to industries where people depend more and more on computers, telecommunications and the Internet to produce, sell and distribute goods and services [39]

An important innovation of NE is the dual use of new technologies: on one hand there is the production of new technologies, and on the other hand there are companies that use these technologies to realize their core business.

In general NE refers essentially to the use of the internet and ICT as fundamental tools in the economical exchange e-business, or the use of digital technology in the management of administrative or financial documents (e.g., invoices, legal documents) [40]; E-commerce, or buying and selling via electronic devices, stock market, marketing of goods and services, etc.; e-learning, that refers the use of the internet to develop courses; e-government, or the use of the internet to improve quality of services for citizens and companies; e-procurement referring the processes of restocking a company in term of services and goods.

ICT economy refers to company that equip, produce or distribute ICT, such as hardware and software, etc. Usually we refer to both these manufacturing sectors as intangible sectors.

The phenomenon of the NE is linked to social transformation and the affirmation of what is called "knowledge society". Usually the term refers to microelectronics, biotechnology, telecommunications, robots and computers companies that enforce innovative skills into economic processes.

NE is characterized by a few common attributes such as (i) globalization, that describes a process by which national and regional economies, societies, and

cultures have become integrated through the global network of trade, communication, immigration and transportation [41]; (ii) growth of dematerialization; (iii) use of technological platforms for commercial and financial brokering.

23.4.1 Smart City Plan

The mission of the Smart City Plan for Bologna is about answering to several questions such as how to create a city oriented to citizens, how to support socioeconomic development, and how to enforce the European strategy 2020. The European strategy wishes to make the European economy more smart, sustainable and inclusive. Deliverables are higher levels of employment, productivity and social cohesion. Concretely, the Union has set five ambitious targets to be reached by 2020: (i) Employment, (ii) Research & Development, (iii) Climate change, (iv) Education (v) Fighting poverty and social exclusion [42]. The smart initiatives are part of the above plan where local governments—municipalities in this case—develop strategies with focus on local community.

The municipality of Bologna started the process to becoming a smart city in 2012 (see Sect. 20.2).

Aim of the Smart City Plan is to pool resources, talents and ideas to make the city more environmentally sustainable, reduce costs, avoid energy waste, improve life quality, guarantee social inclusion and participation, education and health, and promote culture as a means for local community's economic development.

The partnership aims at outlining priorities, strategies and tools for the development of the Bologna Smart City project, including access opportunities to national and European funding.

The project platform also offers an opportunity to experiment a new model of joint work among different institutional stakeholders, as well as between public and private sectors. The aim is to create a context for the development and implementation of actions and projects which have great impact on the local community.

The Bologna Smart City's partners prepared an action plan identifying an initial group of key priorities [31]:

1. Cultural Heritage (requalification of the historical center and its cultural heritage, tourism development);
2. Iperbole 2020 Cloud and Crowd (redesigning the Iperbole Civic Network, based on cloud technologies and an integrated digital identity, joining the contents and services of the PA, businesses and the local community);
3. Smart networks (Smart grid, Ultra-Broadband Fiber to the Home (FFTH) and Smart Lighting);
4. Sustainable Mobility (development of an intelligent mobility network—also electricity based);
5. Safe and sustainable neighborhoods (Redevelopment of the public and private heritage to increase energy efficiency and production, monitor building security,

waste management, social housing, automation systems, co-working, services and new fields for knowledge workers and researchers);

6. Health and Welfare (e-care, e-health, process optimization and business intelligence);

7. Education and technical training (development of projects in the educational field, fostering a new technical and scientific culture).

To understand what kind of impact such actions can have on the socioeconomic structure, it is necessary to illustrate shortly the above actions and their goals.

23.4.1.1   Cultural Heritage

This point wishes to develop a cultural network with all the local cultural structure, such as libraries, museums, theaters, and archives. In addition, the municipality wishes to apply a policy for the rational use of human and financial resources.

For the above projects, ICT play a key role in term of management of the information and data set, in developing a digital network that connects all the cultural institutions.

23.4.1.2   Iperbole 2020 Cloud and Crowd

The new civic network of Bologna (www.comune.bologna.it) aims to offer a new and innovative digital environment for improving a bidirectional communication (local government citizens), services available from local offices, to develop new forum and communities, sharing areas, etc.

Iperbole 2020 will be a digital open platform that will contain three sub-environments [43]: (i) services for citizens; (ii) communication area; (iii) shared area. Each subenvironment calls to: (i) improve digital services for citizens; (ii) develop a more efficient communication from municipality to citizens; and (iii) facilitate the creation of bottom-up contents and peer to peer activities.

Each citizen will have access to several online services through Iperbole, including a personal area, with a personal dossier containing administrative and sanitary information, paid or non-paid bills, and enrollment at courses. About the first point—services for citizens—an important initiative has been the adoption of the digital identity card, a document aimed at several public services—such as sanitary, social and administrative. In addition, every Bologna's inhabitant was endowed by a personal certified e-mail address. Through this e-mail, every citizen can communicate with public offices with an e-mail that has legal value. This service has been created by a joint venture of private firms and public agencies. However, this service was stopped since November 2, 2015 due to lack of funds. Further, bureaucratic issues made more expansive the release of digital cards than the normal paper cards issuing [44].

The necessity to develop a more efficient and incisive communication between municipality and citizens brought the municipality to plan several activities, both internal, where the communication office has been reorganized, and external for a more coherent use of social network, such as Facebook and Twitter, a general reorganization of the institutional websites, and the creation of a social web TV.

Finally, an open digital environment area has been developed for local community to create bottom-up contents and peer to peer activities. The goal is supporting innovation processes and the creation of economic, social and cultural solutions and initiatives directly by the local community. To do this, citizens and non-profit organizations may use a digital platform—called civic network—that supports their activity in developing new services, innovative solutions and new p2p economic models such as crowd-sourcing and crowd-funding.

23.4.1.3 Smart Networks

By Smart Networks action the municipality wishes to improve network infrastructures such as internet, electricity, gas and water.

The scope of smart grids is to provide innovative solutions for the production of electricity and heat, by use of non-programmable renewable resources, such as solar, and existing network infrastructure.

According to the European Digital Agenda, local government in cooperation with public agencies and private companies is developing a plan to ensure by 2020 all citizens to have access to fast Internet and innovative services. Broad band is a key factor for a number of quite specific projects that wish galvanize local economy, and support sociocultural growth.

Educational sector is one of the areas that local and regional governments wish to support through the ICT with a plan called "digital school." The plan is developing a broadband connection that connects all the schools, so to use an innovative pedagogy with double educational environment: one for the teachers and another one for the students. By 2020 all the schools of the metropolitan area will be connected to fast internet and they should access without delay to digital resources such as libraries, museums, etc.

Local and regional governments have also proposed a series of amendments to local legislation in order to implement rapidly new infrastructures.

To measure how important this field is for the city, Fig. 23.20 shows the rapidly growing population's access to broadband, particularly in the inner city.

23.4.1.4 Sustainable Mobility

Sustainable Mobility promotes friendly mobility systems, so to reduce the environmental impact of private vehicular traffic in the urban area.

Strategic actions are both to reduce the use of private cars in favor of public transport but also to improve cycle network, pedestrian safety, and electric public

Fig. 23.20 Proportion of the population access to broadband in 2012. *Source* Istituto Tagliacarne
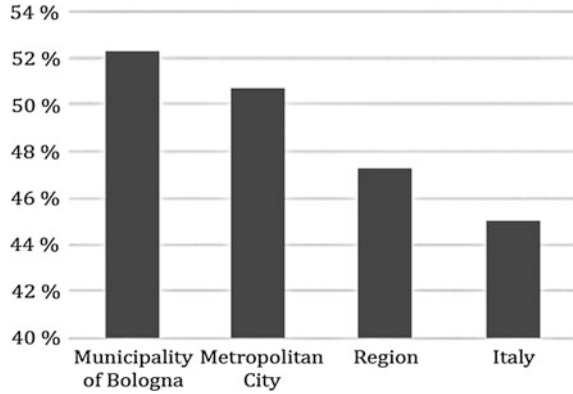
systems of transport. Reduction of 20 % of the urban vehicular traffic has been obtained through the system SIRIO, a check point system that works all around the city center allowing access to all authorized vehicles [45].

In addition, local government supports the private vehicles stocks renewal by financial incentives, circulation facilities for vehicles that do not use fossil fuels.

Other planned projects use the ICT in order to rationalize traffic. In particular, projects such as Insert and Marconi permit the access to intelligent transport systems such as traffic lights coordinate by a software with busses' GPS localization system. This permits to adjust traffic light sequences so that it is given priority to the public transport vehicles.

The Centre for Supervision and Integration of Urban Mobility Information (CISIUM) is a system that shall collect and process any information about mobility in the metropolitan area [46] in order to:

- provide an up-to-date overview of the metropolitan mobility situation making it possible to take adequate action;
- help the users make decisions regarding a journey by presenting various options;
- direct those already on the road in private vehicles, toward the least congested route;
- regulate traffic lights to help ease congestion in the most critical areas.

To communicate the information, variable message panels, radio broadcasts, Internet and text messages to mobile phones are used.

The same strategy has been developed for car sharing service with 11 emplacements where it is possible to take a car.

Figures 23.21 and 23.22 show data about mobility and the result following the local policies for a more sustainable life style. Graphs show light and dark situation where good results, such as increase in cycle paths density or the reduction of pedestrian mortality and reduction of private vehicles is balanced by a high average travelling time or the substantial linear trend of travelling km per inhabitants of the local transport systems.
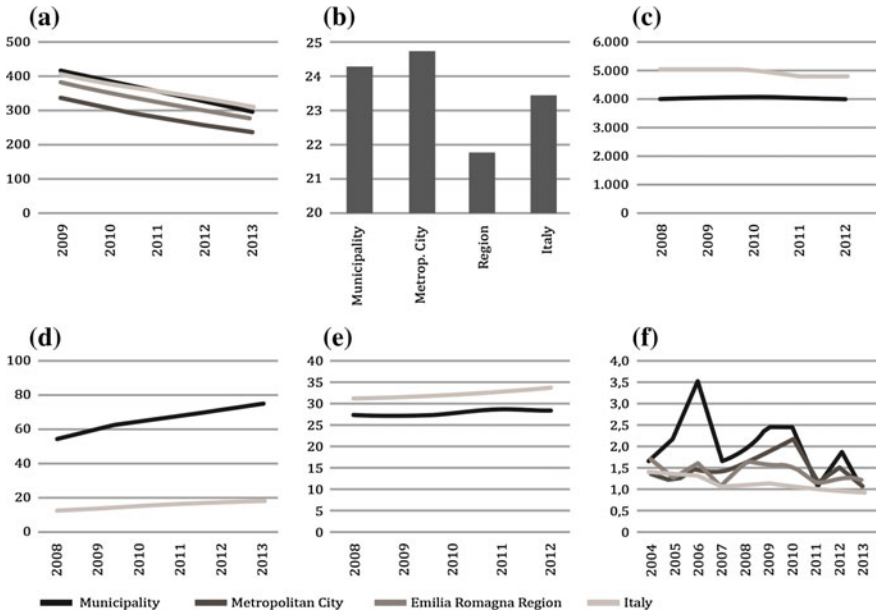
Fig. 23.21 **a** Number of cars Euro 4 standard per 1000 inhabitants; **b** Time spent travelling, year 2011 (in minutes); **c** Travelled km per inhabitants of local transport systems; **d** Cycle paths density per 100 km^2; **e** Available square meters of pedestrian areas per 100 inhabitants; **f** Pedestrian mortality rate every 100,000 inhabitants. *Source* Urbes Report 2015. Dipartimento Programmazione Settore Statistica del Comune di Bologna
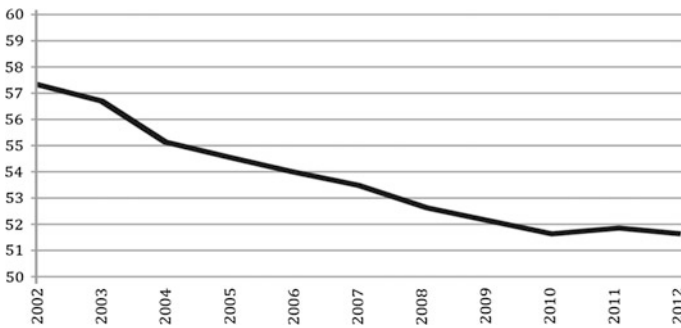
Fig. 23.22 Reduction of vehicles in the municipality of Bologna since 2002 (vehicles/100 inhabitants). *Source* Urbes Report 2015. Dipartimento Programmazione Settore Statistica del Comune di Bologna

23.4.1.5   Safe and Sustainable Neighborhoods

SSN is a plan to promote sustainability and resilience via restructuring public property, promote energy efficiency and green energy production, waste management, social housing, home automation, and co-working.

One of the main goals of the smart policy of the metropolitan city and regional government is to change the urban policy in term of land use.

This is a relevant theme in a country as Italy that has a fantastic cultural and architectural heritage.

As showed by the following images, during the twentieth century there has been an increased use of soil by urban development.

Figure 23.23 shows land use change occurred between 1955 and 1980: urbanized area growth by six times, and fallows and unproductive area growth more than 15 times.

Following Figs. 23.24, 23.25 and 23.26 show urban evolution of the inner city since the first decade of the twentieth century. In the face of a substantial steadiness of the density of m^2 of urban parks and green spaces and availability of m^2 of urban parks per inhabitants, images show that the most important increase in urbanization took place between 1919 and 1971 (Fig. 23.26). The growth of the urbanized metropolitan areas have risen from 25 to 225 km^2 (Fig. 23.24).

Finally, Fig. 23.26 shows that there has been a severe downturn except in the 10 years from 1982 to 1991.

Local and regional governments have taken various measures to address such a situation. Particularly, as a specific measure, a new metropolitan master plan was adopted. It wishes to stop soil consumption and open an innovative urban policy that, through specific rules can promote a sustainable land use discouraging sprawl in favor of compact urban development supported by public transport systems. Furthermore, the plan establishes other relevant options to support an equilibrate
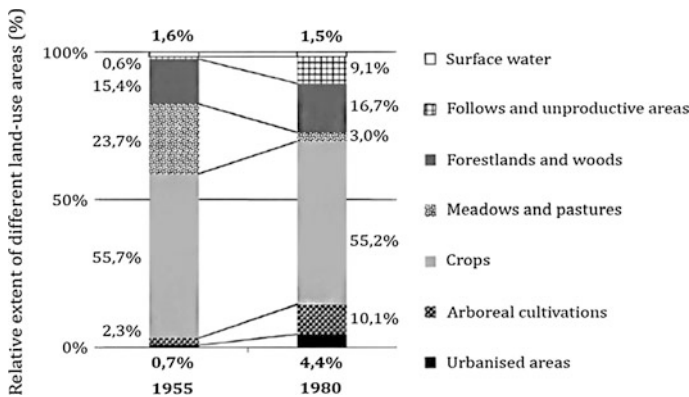
Fig. 23.23 Land use changes in the district of Bologna between 1955 and 1980. *Source* data derived from the National Research Council of Italy

Fig. 23.24 The growth of urbanization in the metropolitan city of Bologna. *Source* Atlante del consumo di suolo, a cura di P. Bonora, Baskerville, Bologna 2013
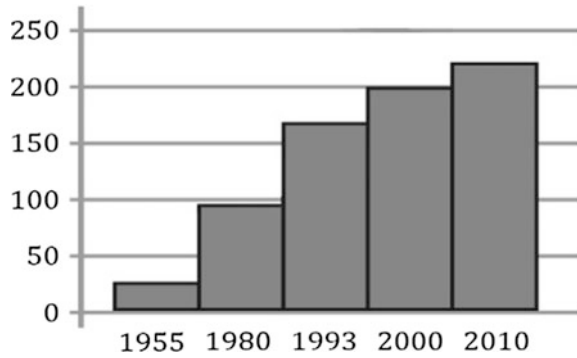

land use, such as the use of tax as way to encourage best practices and discourage financial speculation and new sprawl, soil protection of arable land and monitoring of soil consumption through satellite images, and restoration of the existing built environment.

Another fundamental point of this new urban policy concerns resilience.

As we know, resilience is the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner.

So, to reinforce local resilience, metropolitan government, with the partnership of Emilia Romagna Regional Environmental Agency (ARPA), Kyoto Club and Ambiente Italia, implements the Local Adaptation Plan called BLUE AP (Bologna Local Urban Environment Adaptation Plan for a Resilient City), that will make the city more resilient and prepared to handle the consequences of climate change [47].
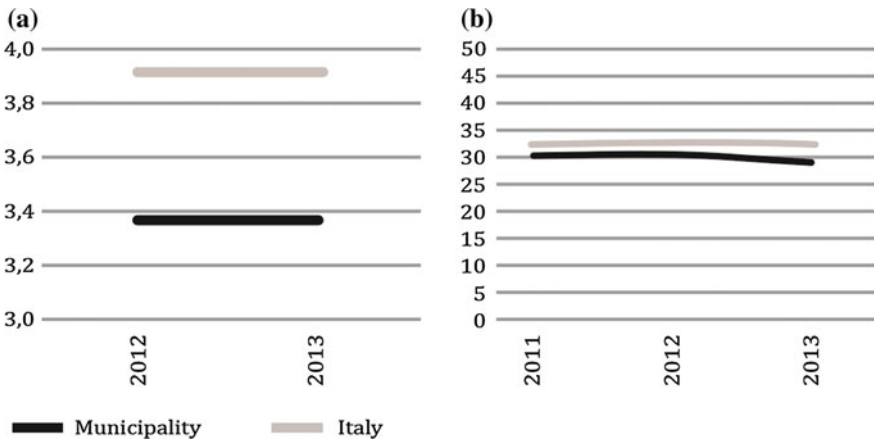
Fig. 23.25 **a** Density per 100 m^2 of urban parks and historic green spaces; **b** Availability of urban parks m^2 per inhabitants. *Source* Urbes Report 2015. Dipartimento Programmazione Settore Statistica del Comune di Bologna

This also occurs through the creation of a Local Climate Profile and the involvement of stakeholders and citizens on the territory.

BLUE AP is a LIFE + project for the implementation of an Adaptation Plan to Climate Change for the Municipality of Bologna, providing some concrete local measures to test.

The BLUE AP planning and testing actions developed in the city of Bologna will lead to the creation of guidelines useful for the definition of similar adaptation plans, that can be adopted by other medium-size Italian cities. Bologna will be the pilot-city that, first in Italy, will face climate changes with the appropriate and creative tools.
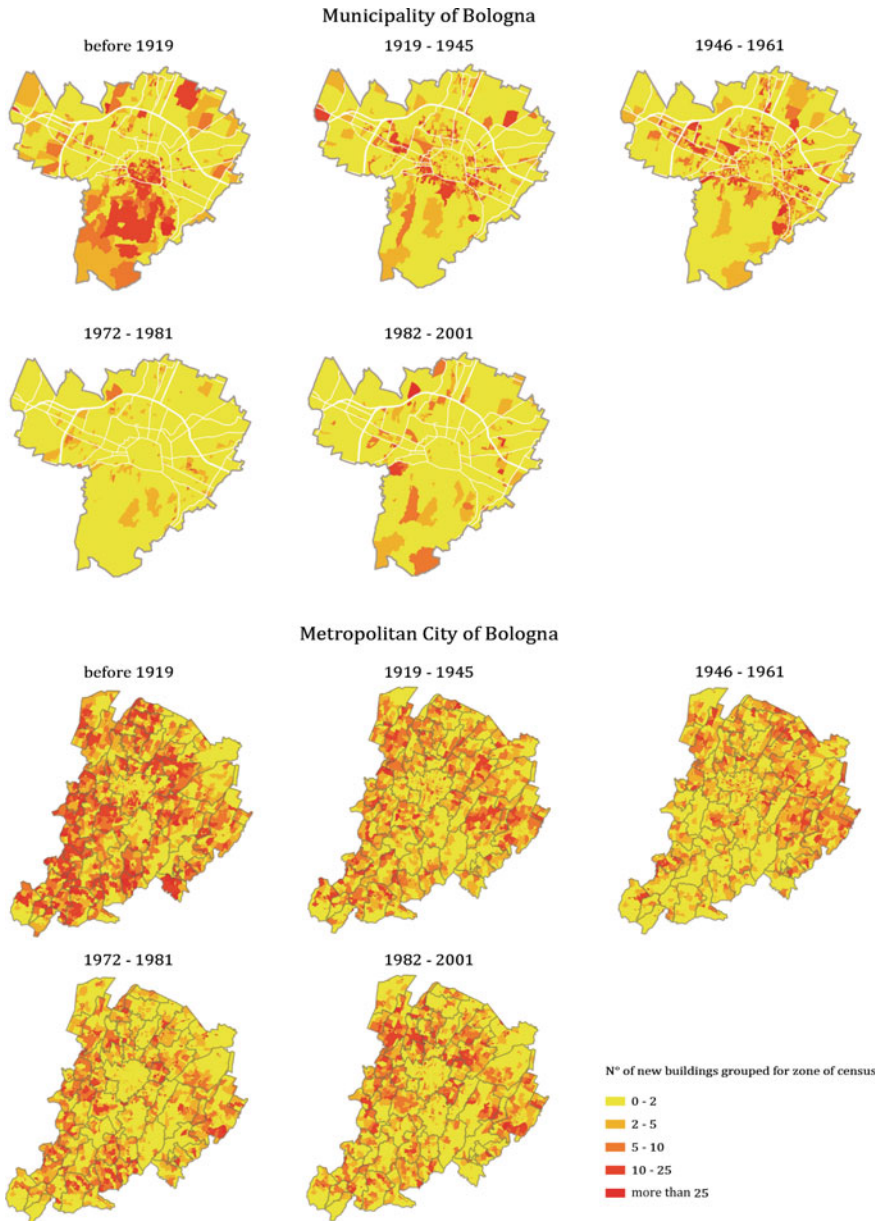
BLUE AP develop six pilot actions: (i) Include adaptation measures in the City's Building Code, so that incentives for adaptation to more efficient management of climate change effects may be explicitly foreseen; (ii) Define guidelines for infrastructures at risk, to improve infrastructural reactions during extreme meteorological events; (iii) Launch a green roofs campaign. The Bologna Municipality plans, together with the other project partners and stakeholders and through info points and other communication tools, to promote the spreading of green roofs; (iv) Improve the rainwater harvesting capacity of waterproof areas. To transform paved surfaces, for example a parking place, with less waterproof materials helps draining rainwater, limiting and slowing them down into the drainage system and thereby diminishing flooding risks; (v) Collect rain waters. Rainwater, when collected, may be a resource: filtered and conserved they may be utilized in different ways, from WC drainage to the irrigation of green areas; (vi) Promote insurance schemes, by informing companies and citizens about the opportunities offered though public/private partnerships by insurance policies against extreme climate events.

Every action aims to build resilient communities to raise awareness about the risks associated with climate change.

Built environment is also interested in the action plan for sustainable energy that wishes to reduce CO_2 emission by 20 % in 2020.

It is a collaboration between public agencies and private companies. With an investment of 25 million of Euros, the municipality and Enel Sole company, draw up energy improvement and integrated management of street's lighting and traffic lights. The plan promotes both energy efficiency and a better streets lighting's system through the use of an intelligent control that permit to save 40 % of energy.

We would also like to refer to other interesting projects relating to the efficient management of infrastructural system such as water, electricity, gas, waste, and quality of air, such as PM10 (powders with aerodynamic diameters less than 10 μm), NO2/NOx (nitrogen dioxides and oxides), O3 (ozone) and C6H6 (benzene), noise, in particular traffic and airport noise, and greenhouse effect.

Municipality of Bologna

before 1919   1919 - 1945   1946 - 1961

1972 - 1981   1982 - 2001

Metropolitan City of Bologna

before 1919   1919 - 1945   1946 - 1961

1972 - 1981   1982 - 2001

N° of new buildings grouped for zone of census

- 0 - 2
- 2 - 5
- 5 - 10
- 10 - 25
- more than 25

Fig. 23.26 Urbanization of Bologna and its metropolitan area. *Source* Atlante del consumo di suolo, a cura di P. Bonora, Baskerville, Bologna 2013

23.4.1.6 Health and Welfare

This is another important point of the smart plan for Bologna. Local government consider this goal as primary for several reasons. Facing an aging population, it is an opportunity to innovate the health sector, create a more efficient and qualitative service, and become a driving force for innovating also other sectors. For this effort local government sought cooperation of private companies and national agencies.

The goal is to realize a whole plan for the metropolitan area. First action is to reinforce the technological and managerial structure of "Sant'Orsola" General Hospital. It will increase its research program and its cooperation with other sanitary organizations, transforming the hospital in a high specialized environment with international reputation. Similar plans will be developed for the Ospedale Maggiore and for the IRCCS Neuroscience Centre. The plan provides a budget to reorganize the logistics and the organizational architecture and enforcement structures in the ICT framework. In particularly, part of the budget will be used to develop an international center for neurophysiologic research, genetically determined disease and rare disease.

In term of social welfare and health the plan provides the creation of small sociosanitary houses to facilitate assistance, especially for the elderly people.

Particularly emphasis is devoted to the role of ICT in welfare and sanitary assistance. Therefore a ICT sanitary district has been planned, able to develop research for e-health and support for people with disabilities. It creates a lot of content that specifically deals with issues relating to the elderly.

23.4.1.7 Education and Technical Training

Finally, for improving new job opportunities a reinforcement of education and technical skills has been planned. A metropolitan network, will be creating a link between educational structures and labor market.

The plan pays attention also to youngsters. It aims at renovating the educational systems through a metropolitan educational model able to create a whole network of education with schools, libraries, private educational institutes, voluntary social groups, etc. The goal is to reinforce the educational system and the social capital.

We may add that Bologna and in general Emilia Romagna Region have a very good school system. In face of the reduction of enrollment in primary school, reflecting the birth rate drop, there is a growth in terms of people with high school diploma and a degree. Unfortunately, the level of production of specialization in ICT remains constant at both the municipality and the regional level (Fig. 23.27).

In additions to the seven actions of the Smart City Plan for Bologna it is relevant to address the role of geographic information systems for the metropolitan city of Bologna.
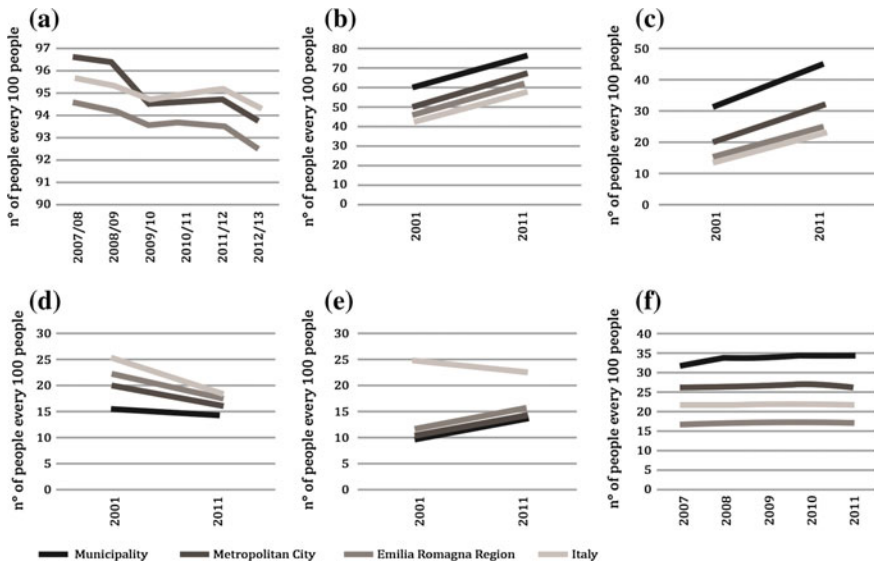
Fig. 23.27 **a** Enrollment to primary schools, per 100 children, 4 and 5 years old; **b** People with high school diploma, per 100 persons; **c** People with a degree every 100 persons; **d** Early school leaving, per 100 persons; **e** People not in education, employment or training; **f** Level of production of specialization in ICT, per 100 workers, between city, metropolitan area, region and Italy. *Source* Urbes Report 2015. Dipartimento Programmazione Settore Statistica del Comune di Bologna

23.4.1.8 Geographic Information Systems

The municipality of Bologna owns a relevant territorial data banks since 1996, and since 2000 the municipality has also set up a data warehouse where data coming from different sources and information subsystems are grouped and integrated, and can be accessed via territorial key [48]. This enables the exchange, the comparison and the evaluation of data using a territorial approach.

GIS are powerful instruments for collecting and processing useful information in order to support choices and planning. Further, Internet is radically changing GIS availability. Internet allows to shift from a hierarchical access reserved to skilled technicians to an open model which allows direct access and participation of citizens and makes them protagonists of the planning process.

The system architecture of Bologna GIS is based on a set of integrated application programs which [48].

- enables the territorial and cartographical data banks of municipality to run and be updated;
- enables the managerial data available in the municipal information system to be correlated with territory;
- enables access and processing of information to users by intranet and/or internet connections.

As said, main goal of municipality has been to facilitate citizen access to the information. For this, innovative instruments have been made available, such as new cartographies and orthophotographs [49].

Particularly interesting is the "Cartographic Forum," based on Web–GIS application and a Web forum.

Goal of this system is to help the citizen participating in the decision process.

In addition, an internet 3D navigable model has been developed from the Web–GIS. Thanks to this, it is possible to navigate flight simulator, having a realistic vision of the city and of the landscape [50].

The system offers to the users the possibility to see and know their city from a different point of view, through an approach more involving and interactive than traditional maps.

We can add to the model thematic layers, for example the map of hospitals, monuments, museums, and city services. This is the highest level of integration between GIS and data banks and 3D model.

These services are in continuous enrichment and they are available also as offline multimedia.

23.5   Sociopolitical Change, and the Role and Use of ICT

This paragraph analyses social and political transformations facilitated by the use of ICT, in the last decade about Bologna. Several social groups and their transformation according to Bologna as smart city will be addressed.

### 23.5.1   Community-Based Organizations

Bologna invested a consistent amount of resources to implement a well-working system of subsidiary, where increasing social cohesion and reorganising a number of services through the use of ICT played a crucial role. The purpose is to have several networks of relations and more shared visions. To do so, the optimum is a mix of an active third sector (non-profit sector), responsive public institutions, and private companies, which produce tangible and relational assets and a process of dynamic generation of tools and social capital.

The third sector plays a crucial role in this mix; however it is highly susceptible of variations about both quantity and influence. Number of involved actors, effective power, activity on the field and related presence across time, linkage with other sectors, are all variables that make difficult to engage with the third sector effectively, especially by the public administration, which in turn is rarely stable enough on long period of time to carry out an effective program of engagement and development.

Despite such difficulties, the governance of Bologna succeeded in establishing a good relation with the Third Sector that produced significant effects.

Accordingly, with the last census of the third sector [51], in the Municipality of Bologna, at the December 31, 2011, there were 2.868 active non-profit institutions of which 2218 using volunteers, with a total of 44,362 volunteers, 1 every 8.3 inhabitants, where the Italian ratio was 1 every 12.5. The metropolitan city of Bologna has 5694 active non-profit institutions, 4589 of them using volunteers. With a total of 86,748 volunteers, it holds the first position among the 9 provincial administrative territories in Emilia Romagna Region for number of volunteers [51]. Emilia Romagna is the fourth region in Italy for amount of volunteers and has 25,116 non-profit institutions.

At a first glance, the Fig. 23.28 shows as the wider sector of activity of non-profit institutions is about culture, sports and leisure. Second is the education
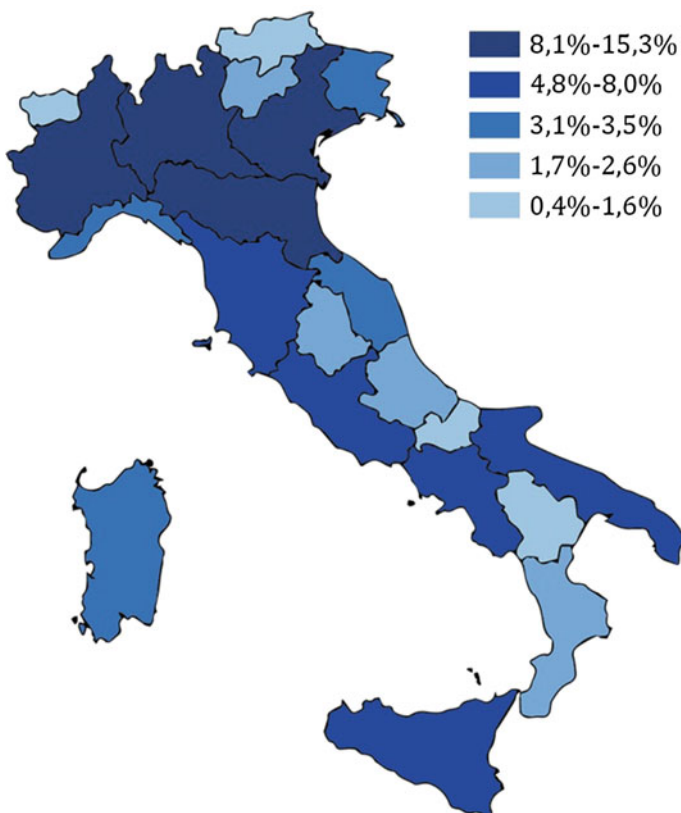
Fig. 23.28 Percentage of non-profit institution by region in 2011. *Source* ISTAT. 2012. 9° Censimento industria, servizi 2011. *La rilevazione sulle istituzioni non profit: un settore in crescita*. http://www.istat.it/en/files/2013/07/05-Scheda-Non-Profit_DEF.pdf. Accessed 10 June 2015
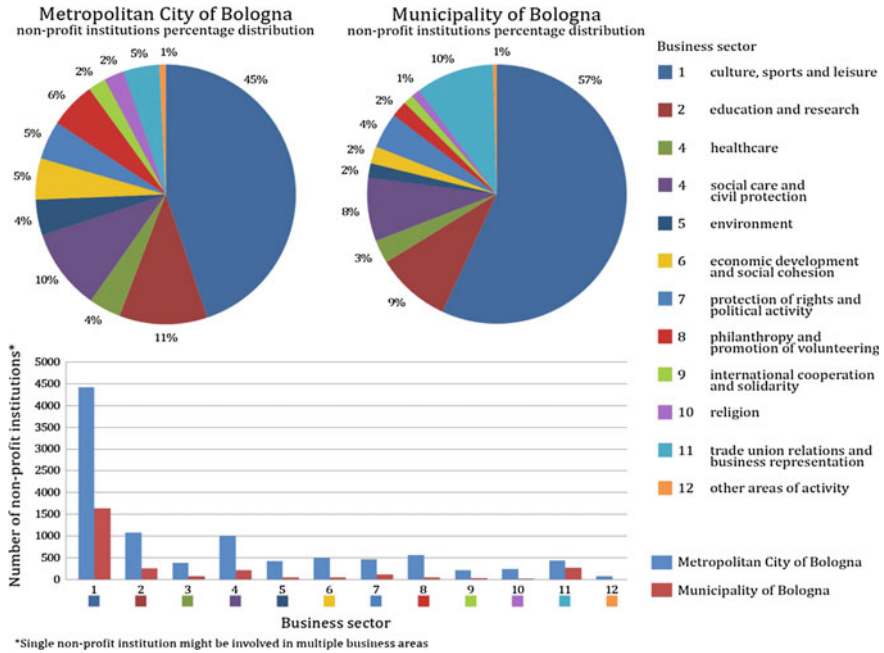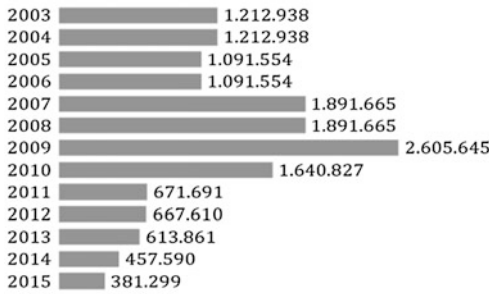
Fig. 23.29 Percentage distributions and number of non-profit institutions about the Metropolitan City, and Municipality of Bologna. *Source* Graphic restitution based on data from http://censimentoindustriaeservizi.istat.it. Accessed 15 Sept 2015

and research sector, followed by social care activities. Generally, the weight of each sector is similar in both the metropolitan city and the Municipality of Bologna. However, the pie charts in Fig. 23.29 show that the sector of trade unions and business is the double in the municipality area compared to the whole metropolitan area. Further, more than a half of institutions are concentrated in the municipality as the bar chart below shows. This means that Bologna is the center of reference of the regional economic activities. Significant is also that the first sector represents, in the sole municipality, more than one-third of the entire number of relative institutions, as shown in the bar chart.

Every year, since ten years, "*Volontassociate*", a feast of civic cooperation (http://volontassociate.volabo.it) take place in Bologna. It is a whole day thought up for all the involved energies about the Common Good. The initiative stems from the desire of non-profit organizations to create new opportunities to promote their values and their activities. They meet each other in several places all around the Bologna's territory.

It is evident that Bologna is particularly rich of volunteer associations and experiences of social cooperation. In fact in Bologna, there also exist a Voluntary Service Centre—*VolaBo*—which supports and qualifies the volunteers and the culture of solidarity within the metropolitan area by offering free services for

Special fund for voluntary work destined to VolaBO (€)

Year	Amount
2003	1.212.938
2004	1.212.938
2005	1.091.554
2006	1.091.554
2007	1.891.665
2008	1.891.665
2009	2.605.645
2010	1.640.827
2011	671.691
2012	667.610
2013	613.861
2014	457.590
2015	381.299

Number of services and beneficiaries about VolaBO's activities

	2008	2009	2010	2011	2012	2013	2014
beneficiaries	1.308	1.135	1.245	1.465	1.706	1.657	1.951
services	3.705	4.160	4.471	5.305	4.077	4.357	5.368

Fig. 23.30 Economic dimension and activities of VolaBO from 2008 to 2014. *Source* VolaBO. 2015. Report sociale 2014

voluntary organizations. The center is managed by an association and offers the following services: secretarial, technical and logistical support (in particular space and equipment), information and documentation, legal and administrative and advisory, training and innovation, orientation to volunteer, promotion of a culture of solidarity and volunteering for the young generation, territorial animation, social planning (www.volabo.it).

Bologna has been affected by the crisis that hit Italy in recent years and that has led to a drastic reduction in economic resources. The Centre for Voluntary Service has seen a progressive reduction of such resources from 2010 to nowadays (Fig. 23.30). Even the national agreement "*Acri-Volontariato*" of 2010, which fixed the resources for the five years from 2011 to 2015, has been revised with a reduction in available resources [52]. Having seen this trend, VolaBO decided to carry on its activity also by looking for adjunctive resources by a special national fund [53].

In 2011, the total amount of non-profit institutions income in the municipality of Bologna was € 948,773,376 and expenditures were € 882,580,081, while, in the metropolitan city the total amount of incomes was € 1,273,426,665 and expenditures were € 1,188,833,288 [51]. The sole municipality of Bologna covers 74.5 and 74.23 %, respectively, of the total amount of incomes and expenditures of the whole metropolitan city, about non-profit institutions.

23.5.2 Cooperation Between Citizens and Administration

Non-profit organizations find in public institutions, private firms, and citizens a significant sensitivity in building relationships that help to identify objectives, actions, and paths toward a common vision. In such a framework, the social capital generates highest standards of trust, especially in those who act.

From more than 10 years, the role of the third sector is widely recognized by the Municipality of Bologna, and nowadays, the duty of promoting and improving it is carried on by the governmental institution of the Metropolitan City of Bologna.

The Statute of the Metropolitan City of Bologna promotes the principle of citizen participation, as individuals or associations, giving value to local knowledge and resources. It pledges maximum transparency about administrative activities, and sets its actions to the principles of impartiality, equity, efficiency and effectiveness [54].

In order to accomplish that principle, several indications are listed in the Statute. Some are following:

- The metropolitan city supports and enhances the participatory tools already activated by the municipalities;
- Special regulations govern the forms of consultation and participation of the population in policy making and monitoring of their implementation. For this purpose they can adopt simplified procedures and information technology. The statute also disciplines the citizen consultation by referendum;
- Citizens, as individuals or associations, can submit to the metropolitan institution instances, petitions, and proposals to promote interventions.

To pursue the aim of cooperation it has been set a project called *Collaborare è Bologna* (Collaborating is Bologna) which works as framework for several initiatives [55]. It is ideated by the Municipality of Bologna and managed with the collaboration of the *Urban Center Bologna* (www.urbancenterbologna.it), to promote the culture of collaboration, continually seeking community involvement to make information, technologies, resources, space, knowledge and skills, more accessible. It is articulated into sub-projects, designed and built by listening and cooperation of citizens and associations. The project is based on the *Regulation on collaborative forms between citizens and Administration* [56].

In May 2014, the Municipality of Bologna approved the regulation on collaborative forms concerning the care and the regeneration of urban common goods. Interventions proposed from citizens and co-designed with the municipality are regulated by specific agreements, *Patti di Collaborazione* (Collaboration Pacts), which explain in detail terms of the agreements such as what and how to do, and with which fund. There are admitted proposals about collaboration for the care and regeneration of assets, non-material goods, and digital goods, that the citizens and the administration recognize as functional for the health of the community and individuals [56]. It is possible to present all proposals through the platform *Iperbole2020*.

Following examples show how the third sector has been involved since 2012, when Bologna decided to implement the Bologna Smart City platform.

23.5.2.1 Contrast and Prevention of Graphic Vandalism

The municipality, through announcements, involves social cooperatives, such as No Tags Bologna, on clean-up projects of graffiti from walls. Citizen groups are supported by the municipality through agreements of collaboration, equipment and materials [55].

23.5.2.2 Shared Care of Open Spaces

Bologna has more than 542,000 m^2 of parks, squares, and gardens, a complex system of public places but with different issues. This high variety makes extremely difficult to take care of it for a centralized institution of limited economic and human resources as the municipality is.

In order to solve the problem properly and valorise such spaces, the municipality started a program of partnership with local organizations, which on voluntary base take care of "their" space, deciding the best way to do so accordingly with local inhabitants [55].

23.5.2.3 Case Zanardi

It is a low-cost welfare network, based on social spaces and projects, realized by associations, cooperatives, and educational institutions to support people with hardships. It is a product of the involvement of more than 100 organizations of the third sector, the university, and other educational institutions, that provide support about knowledge, necessary goods (social markets), basic services, and job seeking [55].

23.5.2.4 Reducing Digital Divide

Since 2013, *Associazioni Riunite*—network of social associations—launched the project "*Sportello Informatico per il Cittadino*" (Digital help desk for the citizen) with the aim of reducing digital divide among Bologna's citizens. All activities, such as basic courses on information technology or the use of software, are free. Actually there are seven "digital points" and in 2015 six municipalities had their digital point. Main users are Italians, Moroccan, Bangladeshi and other 45 nationality [57].

From the private side, many start-ups were born with the aim of providing services for people and their networks by relying on their active involvement. The

municipality launched a call for proposal of € 100,000, especially dedicated to realize and develop the objectives and actions proposed in the Local Digital Agenda (see Sect. 20.2) [27].

23.5.2.5 SO-UP

SO-UP is a co-working project born with the purpose of implementing practices of managing similar to a cooperative, which is based on people aggregation. In particular, the project intends to focus on community rather than profit, where the social process and the informal collaboration are the focus to support start-ups by providing low cost services of high technological value [58].

23.5.2.6 BazzAPP

BazzAPP creates new modality of relation between citizens, the city, and its public and private infrastructures through a system based on two elements [58].

- the *BazzAPP*, temporary mobile app that represents the "bazze," local jargon for bargain, which institutions, organizations, and private firms put on "the market" for interested users;
- the *BazaaR*, a platform which spreads the "bazze" to users at the correct place and time, also through augmented reality.

23.5.2.7 Im-Possible Living

Project dedicated to the management of neglected buildings present on the territory [58]. Through participative process, that use a website and an app, it allows to:

- visualize a map of all mapped buildings;
- signal other buildings by filling an online form;
- propose ideas for such buildings by a free user account.

23.5.3 Political Structure and Organization

The impact of technology on the Italian public local governments is basically positive [59]. However, in 2012 only 17.4 % of Italian Municipalities were equipped with a special office dedicated to ICT, where the data about small municipalities (<5000 inhabitants) are of 6 municipalities every 100 [59]. Small municipalities represent the 70 % on the total of Italians Municipalities. Data show a gap, in terms of ICT, inside the administrative systems of small Italian

Municipalities. Moreover, this gap regards also internal employees in terms of skills, capability, and education. Only 20 % of Italian Municipalities organized a course about ICT in 2012, and 6.3 % of the employees attended a courses in 2011. ICT functions are managed by internal staff in 7 administrations out of 10, while about nine out of 10 resort to private providers [59]. In 2011, spending on ICT by Italian local governments amounted to about 0.7 % of their total expenses, and the average ICT spending per inhabitant is € 28 [59].

As part of the plan for Bologna Smart City, particular attention has been posed on the administrative system. Bologna pinpointed and implemented several actions and strategies to renovate itself, and many of them regard the use of ICT in the government of the city. Some of the most significant, for the topic of this chapter, are highlighted here.

23.5.3.1 Toward a Smart Governance

In 2011, the Municipality of Bologna started a process of dematerialization such a goal—a cultural change for the public administration staff. To pursue such goal an internal formative program was organized. The process of dematerialization is articulated in three levels of intervention: immediate interventions (every three months), intermediate interventions (every eighteen months), and medium period interventions which is about to expect results within 3–5 years. Also revisions and reassessment of all processes were taken in consideration [27].

For example, to facilitate the reduction of paper and the conversion to the digital, the municipality launched the BYOD project (Bring Your Own Device), which aim to utilize personal devices—not bought by the municipality—like tablets and smart phones of last generation. The employee brings its device, and the Administration makes available a number of services like e-mail management services, WiFi connectivity, fully equipped meeting rooms to allow the holding of meetings and the generation of digital documents.

23.5.3.2 Institutional Communication

In the period 2011–2013, the Bologna's Administration decided to develop a communication plan that aimed to define the institutional communication strategy, also for optimizing economic and professional resources already present inside the administration. The main action was to establish a central newsroom, and put out of service all the other communicative functions inside the departments of the municipality, and at the same time, a concentration of related economic resources [27].

Regarding online instruments, the following actions were undertaken in 2012–2013:

- publications and sharing of an internal social media policy;
- formative courses about social media, carried out by community managers internal to the Administration;

- guideline about uses and graphics;
- opening of new thematic channel.

In 2012 the municipality counted on 22 presences on Facebook and 12 on Twitter, in terms of accounts and pages dedicated to general or specific topics. Particular attention is posed on the communication strategy in cases of Big Event and Emergencies. That is because in the 2011–2012 the managing of information during crisis represented a model of resilience about promptness and quality of the information. For example, during the big earthquake in Emilia Romagna in 2012 the twitter account of *Iperbole* received more than 1700 retweet. Also, during the snow emergency, citizens used the hashtag #boneve (meaning Bologna Snow) for 3000 times, and 50,000 visits in one day have been counted at the online page containing the Mayor's ordinance about the closure of schools [27].

23.5.3.3 Bologna Open Data

One of the most significant actions of the municipality was the publication online of its database allowing free access.

In 2011 the municipality decided to start a census of its assets, information, and data with the aim of publishing them in an open access platform (http://dati.comune.bologna.it). It happened in April 2012. It is noteworthy that several citizens spontaneously asked to collaborate at the project, and they helped in the development of the platform, connected applications, and graphics of released data sets [27].

Significant next steps of "Bologna Open Data" will be:

- an active role of the administration in the involvement of other institutions about the publications of data;
- the promotion of hackathon (an event in which computer programmers and others involved in software development and hardware development, collaborate intensively on software projects) and contest dedicated to the invention of apps and innovative solutions;
- the opening of a blog dedicated to the communications of the administrative balance sheet;

Nowadays, the Open Data gate is a metropolitan point of reference, available for all subjects which produce qualitative data during their activities. A 360° opened gate that gives and draws contributions from other subjects—private, public, and from civil society—with an interoperability purpose among different data sources.

23.5.3.4 Digital Services

At regional level, the FedERa service (https://federa.lepida.it) has a crucial role in releasing credentials for personal digital identity. Promoted by the Emilia Romagna Region The FedERa project allows the Region's users to have a federate validation

through which they can access to several online services provided by all public institutions in the Emilia Romagna Region. Signed users have access to all services through a unique digital identity, recognized by all institutions [60].

Before that, there were several different systems of authentication, usually one for each service that they need, services provided by different institutions. Instead of that, users of FedERa can do different things, benefit from different services, on different platforms by using only one credential. On the other side, institutions can provide services without requesting new accreditations, with benefits in terms of less bureaucracy, use of resources, redundancy of data and relative management.

23.5.4 A Metropolitan Vision

Main purposes of the Metropolitan City of Bologna are the pursuit of a more advanced level of sustainable development, and the implementation of necessary institutional requisites to perform a function of active propulsion within the territory of Emilia Romagna Region. The Statute of the Metropolitan City was approved on December 23, 2014, as result of a public consultation, where citizens and stakeholders produced 500 proposals, observations and advices useful for the reduction of the statute (www.cittametropolitana.bo.it).

According with the statute, the new metropolitan city has two significant functions that go toward a simplified and organized governance. One is the coordination of activities of all municipalities. The second is a full collaboration with other local and regional institutions, avoiding in this way overlapping of functions and apparatus [54].

High consideration is given to the ICT in the new metropolitan administrative dimension. In fact, the statute provides an article about digital citizenship which specifically states the following:

1. All citizens have equal right of access to the Internet, on equal terms, in technologically appropriate conditions, that remove all obstacles of economic, social and territorial kind. The metropolitan city is committed to developing appropriate projects to ensure the exercise of this right;
2. Data produced by the Metropolitan City of Bologna are made universally available as open data;
3. The metropolitan city is committed to give priority in using free software or open source.
4. The metropolitan city, in order to organize the dissemination of homogeneous and shared information technology procedures on territories that compose it, promotes and coordinates systems of computerization in the metropolitan areas;
5. The metropolitan city for the above described purposes, assures wide resort to consultation forms, and participative online-based modalities, promoting the elaboration and the development of forms of digital democracy.

23.5.5   E-Government

Another crucial point about Bologna Smart City is the process of modernization of the administrative system. A digital administration helps to govern the processes of technological development. The new ICT allows to develop high-speed network infrastructures (broadband) on which make to travel innovative services tailored to users. The users of public administration can access services in different ways, but also the institutions themselves, for culture, size, and economic resources may be able to provide services at different levels of technology.

In 2010, in order to pursue the policy and strategies of e-government and ICT in the metropolitan area, the Metropolitan City of Bologna created the *Ufficio Comune Federato* (Mucipality Federated Office) for e-government [61].

Already before the establishment of the metropolitan city, the institutions promoted processes of e-government through several activities such as the project, funded by the State and co-financed by all the Institutions of the territory, about the development of the *Piano Telematico dell'Emilia Romagna* (Telematic Plan of Emilia Romagna Region), which led to the implementation of the Community Network Emilia-Romagna—CNER (network of the public institutions of Emilia Romagna Region) [62] which was relevant to encourage the development of innovative online services for the simplification of internal processes, and to improve services for citizens and businesses.

23.6   Conclusion

The chapter has investigated the metropolitan area of Bologna, Italy. Our goal was to understand how and what changes smart economy in smart cities brings to social, cultural development and ecological management. More in particular, research has tried to understand some interrelated questions, such as (i) identify the key factors and their role in making smart economy in smart cities; (ii) understanding the inter-linkages between smart economy in smart cities and social development, cultural preservation, heritage conservation, and ecological management.

Smart economy is characterized by: (i) innovation and new approach to economic activities; (ii) capacity to generate entrepreneurship; (iii) aptitude of the city to create new economic imaging, branding and trademark; (iv) productivity of labor and capital; (v) labor market flexibility; (vi) international embeddedness; (vii) transformations led by economy in the transformation of smart city.

Our study shows that the metropolitan city of Bologna has a good economy as its levels of per capita income at € 34,000 are well above the EU27 (European Union of 27 states) averages of € 24,500. However, there is an obvious weakness in the quality of governmental policies and practices that appears to be hindering innovation in the region.

According to the Regional Innovation Scoreboard 2014 [63], the metropolitan area is an "innovation followers" area. This is a discrete position in Europe and a leader position in Italy.

As illustrated, Bologna is the regional capital of Emilia Romagna, a region that aims to increase the competitiveness of the service sector and to turn it into a real leader of service innovation in Southern Europe and also into one of the main innovation actors at European level. Thus Emilia Romagna policy-makers intend to reinforce the service sector and the proactive integration of services into the manufacturing sector and so boost the region's competitiveness and its capacity to face the societal challenges of the future.

Regional economy show strong entrepreneurial activities with many start-ups mostly located in clusters, and regional assets and baseline with strong manufacturing sector, such as automobile, food production, ceramics.

There are, however, several challenges that the region of Emilia Romagna has to face, as suggested by ESIC's report 2014. Particularly, the ESIC study identifies some key challenges [64], such as the size of the start-ups that remain small and the fact that the smallest service companies are highly dependent on the region's manufacturing sector. The market for services is fragmented with numerous micro-enterprises that provide low-value added services to local manufacturing firms. On average, a service firm in Emilia Romagna employs the equivalent of only 3.5 workers. Only a few services companies in these complementary industries have managed to move up the value chain to provide innovative services to clients beyond Emilia Romagna itself. The region remains a net importer of business services and productivity and wages in the services sector are relatively low compared with those in manufacturing. There is no services cluster in the region with the exception of a tourism cluster situated on the Adriatic coast [64].

Emilia Romagna is currently not providing the best possible environment for innovation, as it is performing at a below average level in four of the five dimensions of structural indicators. The only exception is in 'innovation and business model generation' within the region. In particular, its levels of high-tech patent applications and of innovators collaborating with others are very poor. However, in business R&D expenditure and employment in strong clusters, the region is performing very well.

About the metropolitan area of Bologna the result can be summarized as follows.

The entrepreneurial activities have many start-ups, high share of small and very small businesses, wide-spread entrepreneurial attitude.

Many start-ups remain small and are highly dependent on large manufacturing companies

In terms of knowledge development and transfer we have identified as strengths/assets the fact that sharing of GDP spent on research and development has risen sharply, and a high number of patent applications. On the opposite side, the weaknesses/challenges concern the low number of high-tech patents, and the share of employees with higher education still lower than comparable regions and EU27.

Innovation and business model generation show an assets with strong local demand for innovative services from an internationalized manufacturing base.

Several challenges have been identified, such as the fact that many services are characterized by very low barriers to entry, which has increased pressure on wages and makes the development of brands and a competitive market position difficult due to the relatively high labor costs in Italy.

The outsourcing is a good starting point for developing the services sector. Where delocalization of the area's manufacturing firms occurs, such outsourcing might help in keeping part of the value added of the manufacturing sector in the metropolitan area.

Another important challenge concerns the weaknesses of employment in service innovation intensive industries compared to Italy and EU27. In the area of IT, metropolitan area does not have large companies that could attract investment or become the focus for the development of a cluster. Also before the crisis, there was less of a need for smaller companies to develop their client bases and engage in innovation due to the benign competitive environment. With this environment now gone, some companies are struggling and others are adapting.

Financing innovation and growth has an asset with high share of private R&D expenditure although there are weaknesses about the significant fluctuations in R&D over time with a particularly marked effect in the first years of the economic crisis.

As with for the regional economy, collaboration and networking show a strong asset of clusters in manufacturing demanding services, strong demand for services from manufacturing, network of universities and research institutions, although there is a weakness about the dependency of service companies on manufacturing companies.

The metropolitan area is part of the high-technology regional network created with the aim to boost the supply of qualified industrial research, increasing synergies between regional universities and research centers. The Network stimulates the development of a critical mass of high level industrial research and of more efficient method for the transfer of new technologies from the research system to the industrial system. In the intentions of the policy maker the network combines the expertise of several research institutions in centers of excellence whose aim is to promote the shift of production systems, districts and value chains toward a greater technological dynamism and a stronger commitment in R&D.

As innovation policy instruments at present, the metropolitan government is developing a strategy along two dimensions: development of high technology network, and stimulation of demand for innovation. These two dimensions are integrated by some measures addressing the upgrading of the regional industrial system and other actions addressing human capital development, innovation awareness and mentoring.

In term of *Innovation Policy Governance* [64] the metropolitan government in cooperation with the regional government is doing several efforts to plan actions and opportunities for innovation. Innovation policy revolves around an early acknowledgment of the importance of the implementation of the high-technology network, a very ambitious initiative that is turning one of the most industrialized

regions in Europe into a knowledge economy, strengthening linkages between industry and research institutions and fostering business innovation activity [65]

In the near future the metropolitan government aims to gradually increase the level of specialization of competencies available in the high-technology network in order to better respond to innovation needs. The regional administration needs to continue to rationalize the network, conjugating demand-based self-sustainability to a technology-push approach, promoting the identification of technologies that are becoming relevant in the international scenario but that are not yet used in Emilia Romagna because of some technological lock-ins.

The metropolitan administration needs to continue to invest in the upgrading of the regional industrial base stimulating demand for innovation. There is a large base of potential innovators that must be made aware of the necessity to innovate and the opportunity offered by the Network to meet industry needs. It is especially necessary to increase demand for innovation supporting firms' absorptive capacity. The employment of graduates is still low, and without an effective upgrading of the human capital it will be much harder to stimulate demand for innovation.

The territory has a long tradition about third sector, and regional legislation [66] supports non-profit organizations with several benefits, such as fiscal benefit, use of public buildings, and the possibility of establishing memorandum of understanding with public bodies for social promotion.

Bologna is developing a strategy in order to build strong relations between "social world" and the governance of the city by using ICT [27].

Actually it emerges that the ICT is being used as a tool to highlight and release the potential of this sector, with good results [55, 58]. These results are also due to the parallel e-government process of modernization of the municipality. Relying on a e-government strategy, which made efficient the administrative processes, was crucial to get the collaboration of social organizations. In fact the use of ICT allowed to solve many problems linked to the high complexity of third sector. For example, people engagement is just the first step and the chance of a proper engagement is based, before all, on credibility. A good government might be enough to make an administration credible, but to guarantee effectiveness in working on projects and producing results on the long run it is crucial to have efficient tools, and a feedback process which take into account the role and responses of citizens, like in the case of *Iperbole2020* [43]. The ICT if utilized properly can do the job. The case of Bologna seems to confirm that, awarding the city a position among the best cases in Europe [32]. Bologna case shows that when e-government and ICT share the same path they can have positive effects also on social field. The aspect that emerged more is that ICT helps the smart city process because of its capability to act strongly on the field, with the result of raising up local microeconomies spread on a very wide territory and related to non-profit organization [55]. When such organizations are many and form a strong network, like in the case of Bologna, there is the potentiality to act on great energies and leading them, by the use of ICT, in support of the whole city, with large benefit in terms of economy and social capital.

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