

CONNECTED CITIES

Smart Safety

How new digital technologies can
make our cities safer

The European House – AMBROSETTI

The European House – Ambrosetti is a professional Group, operating since 1965, which support companies in the integrated and synergic management of the four critical aspects of value-creating processes: Seeing, Planning, Achieving and Optimising.

For over 50 years The European House – Ambrosetti has been working alongside Italian businesses and each year provides consulting to about 1,000 clients, including more than one hundred strategic scenarios and studies aimed at Italian and European institutions and companies.

For the sixth consecutive year, The European House - Ambrosetti has been nominated - in the category “Best Private Think Tanks” - 1st Think Tank in Italy, among the top 10 in Europe and in the first 100 independent on 6.846 globally in the edition 2018 of the “Global Go To Think Tanks Report” of the University of Pennsylvania.

Hitachi Social Innovation

The Internet of Things (IoT) is creating new opportunities to integrate industrial and social ecosystems by combining the operational infrastructure and sophisticated IT solutions. Major sectors and services, such as transport, safety, energy and health are undergoing transformations that will lead improvements to all stakeholders involved. Such improvements will affect businesses as such as public administrations and will be related to customer and citizens centric developments.

At Hitachi, the activity in the field of digital transformation is defined as “Social Innovation” and is described as the use of technology and new business models to bring about positive changes in people’s lives and in society, creating shared value.

The aim of Hitachi’s Social Innovation Business is to develop novel solutions through a process of collaborative creation with citizens, municipalities, businesses and other public and private actors, to deploy both IT and OT (Operational Technology) and new business models capable to bring real positive changes to the lives of individuals and societies, creating shared value.

Such positive impact can be particularly effective within urban spaces. Cities’ services and related infrastructures are already experiencing transformational changes that will deliver massive customer-centric improvements and vast levels of integration, bringing meaningful benefits for citizens and society as a whole.

To have a broader view on Hitachi’s Social Innovation activities and to share our vision of a human-centric digital future, please visit <http://social-innovation.hitachi.eu/>

Contents

Section: 01 Introduction	04
Section: 02 Connected cities and safety scenario in Italy	08
Section: 03 Emerging trends	14
Section: 04 Issue and open questions	16
Section: 05 Technologies	23
Section: 06 Priorities for connected cities development and deployment in Italy	28
Appendix: Hitachi solutions for Smart Safety	30



01 | Introduction

The Connected Cities initiative, launched by Hitachi and The European House - Ambrosetti, is part of the broader framework of activities related to the **Hitachi Social Innovation activities** and aims to design the most effective strategies to address the major challenges for Italian communities, cities and territories.

The subject of the initiative concerns the digital transformation and integration of services within Italian urban spaces, placing the citizen at the centre of increasingly intelligent and connected cities, with particular attention to the themes of safety, mobility, energy and water services.

The study has benefitted from the following **methodological pillars**:

- **Interviews** with high level experts and stakeholders involved in urban development, including: municipalities, civil servants and public administration officers and authorities, main Italian cities' Digital Transformation Officers, private companies including digital providers and integrators, utilities, local public transport agencies, citizens' associations, technological leaders and experts, and start-ups.
- **Qualitative High – Level survey** conducted on a sample of about 150 qualified experts and stakeholders, from business, public administration and academia.
- **Own statistical analysis** based on information collected through major international databases and relevant sources.

The main output are two studies, dealing with the implications, priorities, and future opportunities related to digital technologies' inception and their support for the creation of proper **Connected Cities**.

As part of the project, this paper deals with the topic of **Smart Safety**, one of the most pressing issues for the present and, notably, for the future of Italian urban spaces. In fact, urban spaces are today experiencing an unprecedented **pressure to transform** themselves and evolve, undergoing metamorphosis that on one hand are driven by citizens' needs and on the other affect citizens' and communities' behaviours and expectations.

The relevance of safety-related topics is confirmed by the results of the survey: **73% of respondents agree that the issue of public security is felt as increasingly crucial by citizens and local communities**, declaring that such topic will guide and influence their choices and programs as stakeholders of future Connected Cities.

Smart Safety is a wide definition that encompasses multiple areas of intervention and a plurality of actors and stakeholders. It refers to the way technologies and advancements in operational and organisational models enabled by digitisation contribute to new paradigms of citizens' safety (including health, mobility, safe workplace, reliable infrastructures, ...).

It is based on and enabled by the diffusion of technologies and infrastructures that allow the gathering of an unprecedented amount of data. Such technologies are rewriting the very concept of safety, creating a "smart safety" environment in which the **individual is at the same time user and contributor**.

Smart Safety interests several different places. This study focuses on "**Social Spaces**", comprising not only public spaces, but also those private places experiencing public usage (including airports, train stations, metro, public squares, malls, ...).

Thanks to technology's evolutions, **cities have become more connected, more monitored, more digitalised**. A constant flux of data runs within social spaces, growing every day. Such a major modification impacts on each aspect of space management and citizens' life, satisfying old safety needs and creating new ones.

In this moment - perceived by many as a time of radical transformation in urban areas and in their planning - this study **frames and investigates the real magnitude of such processes**, discussing reasonable future scenario and goals together with the priorities to achieve them.

To do so, a set of analysis backs the definition of main trends and relevant challenges, with the aim to understand how new technologies and organisational models can provide effective "Smart Safety" solutions putting **citizens and their needs at the core**.

The document wants to **support decision makers** of Italian citizens and to accompany them in their digital transformation, investigating how safety-related topics are transforming through time and how innovative technologies are essential to manage them within the framework of a proper Connected City.

The structure of this paper is conceived accordingly:

- Chapter 2 investigates the main scenario drivers that are reshaping urban space;
- Chapter 3 analyses future trends;
- Chapter 4 discusses the most pressing issues and challenges;
- Chapter 5 describes which innovative technological solutions could be exploited to address such issues and challenges;
- Chapter 6 summarise the priorities for all the stakeholders involved.

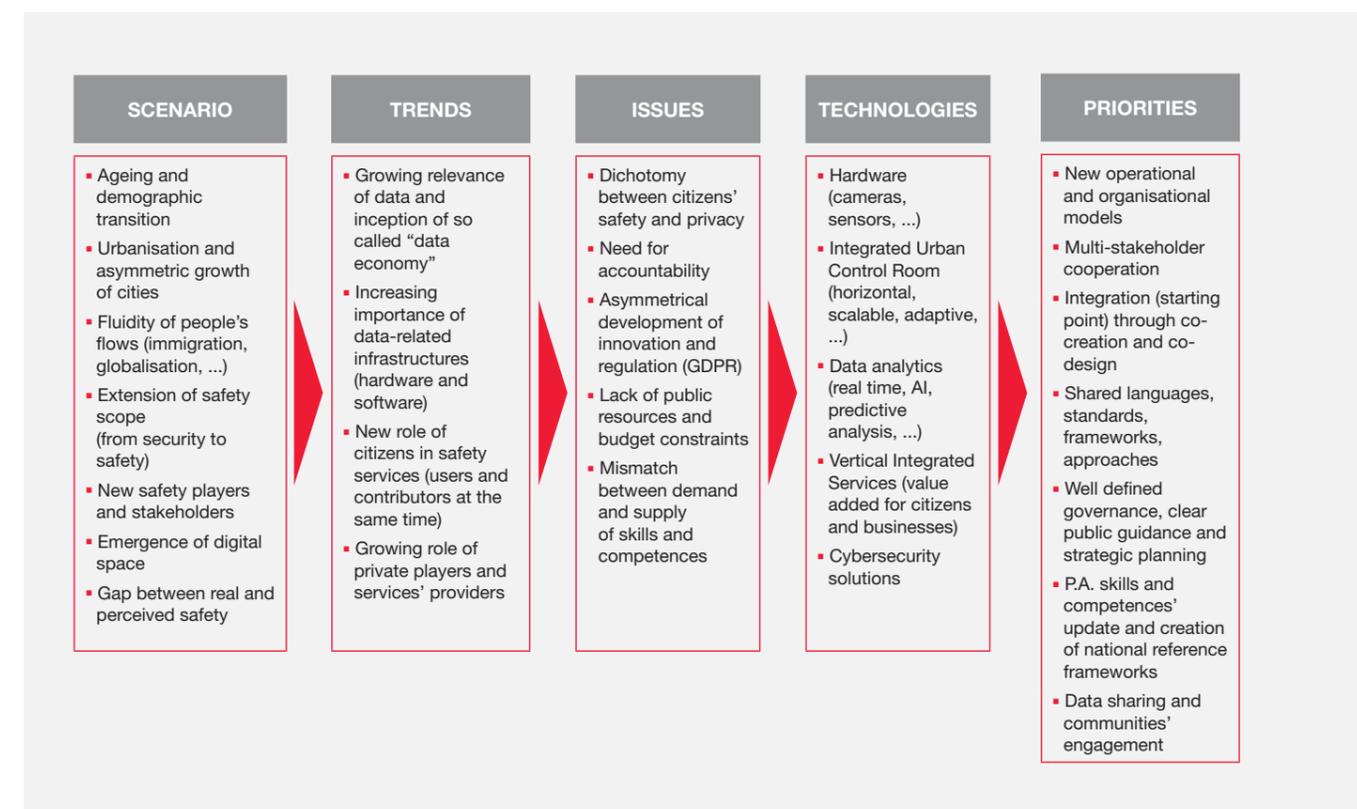


Figure 1. Logical flow of the study. Source: The European House – Ambrosetti, 2019

Key points of the study


01 Connected Cities

As technological developments promise to reshape and transform urban areas, Safety remains a core issue for those stakeholders involved in urban planning, in the development of Italian cities and in the management of urban services. As highlighted by the results of the survey **73% of respondents agree that the issue of public security is felt as increasingly crucial by citizens and local communities**, declaring that such topic will guide and influence their choices and programs as stakeholders of future Connected Cities.


02 Urbanisation

In addition, core features of safety are evolving within a **rapidly changing scenario**. Demographic transformations and ageing of Italian population are reshaping safety needs and exigencies. Cities' expansion (urbanisation) produces asymmetric growth, adding pressure on peripheries, generating both urban voids and densely populated areas. Fluidity of people's flows increases (tourists, commuters, migrants, ...), adding risks and stressing the need of a renewed safety paradigm within Italian urban areas.


03 Perimeter of Safety

In parallel, the very **perimeter of Safety is expanding**: while security remains key, citizens get increasingly aware of new issues and include them in their definition of safety, transforming their needs accordingly (e.g. infrastructural safety, environmental safety, health, ...). New actors get involved in safety provision and new spaces emerge (digital space and data safety). Finally, a growing gap between perception and reality increases the relevance of perceived safety.


04 Digital Transformation

As well as several other sectors, safety-related services are into the initial stages of the so-called "digital transformation". This is mainly enabled by data (collection, accumulation, storage, analysis, ...) within the frame of the emerging **data economy**. It also implies the growing relevance of new infrastructures and technologies (data centre, 5G, interconnectors, ...), new skills and competences (data analysis, cybersecurity, ...), and new actors (including private ones).


05 Smart Citizens

The transformation of cities into Connected Cities and the provision of so-called Smart Safety, based on citizens' data, turns citizens into smart citizens: they become **users and contributors** of such services at the same time. Individuals become key nodes within the digitalised urban network. At the same time, they are also one of the most vulnerable links in the digital urban chain, affecting cybersecurity. For these reasons, their inclusion since the very beginning of a Connected City's design is crucial.


06 Smart Safety

In such scenario, data-based Smart Safety brings several issues and implications. The most relevant one is related to personal data usage: a **trade-off between safety and citizens' privacy emerges** as more effective safety services require increasingly pervasive amounts of personal data. The discussion on personal data treatment has captured the attention of public opinion, and the social awareness about the value of private information is growing. Hence, **accountability** becomes a mandatory requirement for each digital integrated platform, in order to construct an inclusive system where each actor (citizens, public sector, utilities and safety provider) has visibility on the modality of data usage.


07 GDPR

In this evolving framework, **regulation plays a central role**. The normative development does not always promote innovation creating a conducive environment, nor provides the best balance between citizens protection and services' provision. General Data Protection Regulation (GDPR), the latest disposition enacted by European Commission, introduces a strict set of requirements for those who collect, store and manage private data. The regulation therefore creates the need for a digital architecture capable of being compliant with such requirements.


08 Urban Control Room

Technologies today available promise to solve several of the issues arising, also allowing the creation of efficient and effective Connected Cities, capable to deliver innovative Smart Safety services that put new communities' and citizens' needs at the core. To do so, integration of all actors involved in urban planning, development and management is key.

This integration can be driven by the creation of a **horizontal platform**, the so-called Urban Control Room, which collects, stores and analyses data gathered from different sources (urban antennas, services providers, citizens...). Under public control, such platform transforms raw data into meaningful information, analysis, metrics and KPIs, delivering them to vertical services providers, creating effective integrated services


09 Artificial Intelligence

Together with the Control Room, other technologies can support the creation of state-of-the-art Smart Safety, overcoming existing constraints (scarce skills and competences, decreasing public budgets, ...). Among the others, meters, sensors and antennas from several sources allow the collection of useful data. Analytics' software based on Artificial Intelligence allow **real time analysis**, supplying worthwhile information to law enforcers and other services' providers. Predictive analysis is also possible, while cybersecurity becomes a prerequisite (both in hardware and software) in such an integrated system.

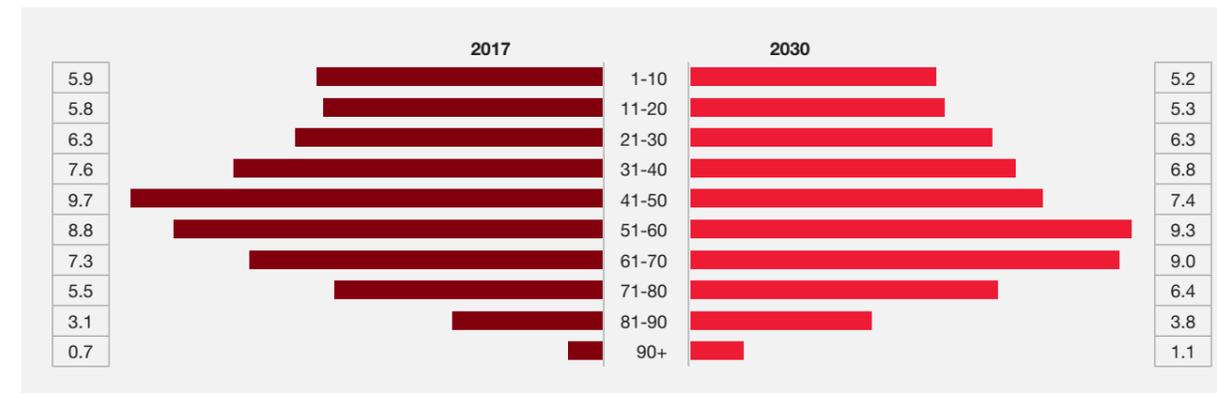

10 Integration

To achieve the abovementioned results, **integration is the core feature**. All stakeholders should collaborate to create the horizontal platform and to feed it with meaningful data, enabling smart, vertical services. New operational and organisational models are required, together with new competences and skills in all levels of Public Administration. **Co-design and co-development** of technologies, infrastructures and services are crucial to enable effective integration, and should be pursued since the very beginning, together with clear governance and strategic approach. Finally, citizens and communities must be involved, not marginally, but at the core of such processes.



02 | Connected cities and safety scenario in Italy

Figure 2. Demographic structure by age class in Italy (million people), 2017 and 2030.
Source: The European House – Ambrosetti elaboration on Istat and UN population prospects data, 2019



“Smart Safety” paradigm applied to Italian cities lies within a context of major transformations, currently affecting Italian society and started during the past decades. >

Among the others, several trends have had relevant impact on public safety in urban areas. They include the reshaping of urban population, both in terms of demographic structure and in terms of needs, the birth of the so-called data economy and the increasing gap between real and perceived security.

Each of these transformations affects safety context and requires new solutions to be addressed. First and foremost, such trends have to be understood by urban and national decision makers and by all those stakeholders involved in urban planning and urban development decisions and activities.

For this reason, the present chapter will frame the reference scenario for Smart Safety in Italian cities, investigating how the safety demand has evolved during the last years.

The first trend that can be identified refers to changes in population’s composition, as ageing, migration and urbanisation phenomena have transformed urban areas demography, bringing new priorities and needs in terms of safety.

Italian population is progressively ageing, a trend that began over 30 years ago and that is expected to continue in the future, as it is highlighted by a comparison between the present demographic structure in Italy vis a vis its projection to 2030:

- In 1980, the average age in Italy was 35.4 years, in 2000 it was 40.9 years, in 2018 it was 44.7 years. The trend is projected to continue due to a progressively increasing life expectancy and to a decline in the natality rate¹: the expected average age in 2030 is 47.1 years.²
- The consequence of such ageing process is the growth in the share of over-65 years old population on total Italian population (it grew from 12.1% in 1980 to 17.0% in 2000, to 21.4% in 2018 and it is projected to further increase to 25.3% in 2030).

Ageing affects safety needs. As an example, a research conducted in USA³ has shown how, although older adults compose approximately 11% of the population, they account for approximately 23% of accidental deaths, while most of safety risks affecting older citizens are faced while moving, both considering transport (public and private) and walking.⁴ Such concerns require a more in-depth and distributed monitoring, putting the focus on prevention and requiring, at the same time, capability of quick response. Investments to put in place a profound redesign of cities towards the creation of an elder-friendly urban ecosystem (infrastructures, vehicles, buildings, public spaces, ...) have also to be considered.

The progressive ageing of Italian population is accompanied by a steady path towards urbanisation. This is not a recent trend – it began more than 50 years ago – but it is slowly but constantly modifying the structure of cities and the expectations of citizens in terms of safety. Major impact is on how urban spaces should be thought and designed:

- The two largest Italian cities (Rome and Milan) accounted, in 2018, by 7% of the total Italian population.⁵ They accounted by 6.5% just five years ago (even without considering their metropolitan area). In general, the population of the ten biggest cities rose by 6.5% from 2012 to 2018, in front of a general growth of national population averaging 1.8%.

Table 1. Population in the ten biggest Italian cities (inhabitants), 2012 and 2018.
Source: The European House – Ambrosetti elaboration on Istat data, 2019

	2012	2018	% Change
Rome	2,614,263	2,872,800	+ 9.9 %
Milan	1,240,173	1,366,180	+ 10.2 %
Naples	961,106	966,144	+0.5 %
Turin	869,312	882,523	+ 1.5 %
Palermo	656,829	668,405	+ 1.8 %
Genoa	584,644	580,097	- 0.8 %
Bologna	371,151	389,261	+ 4.9 %
Florence	357,318	380,948	+ 6.6 %
Bari	315,408	323,370	+ 2.5 %
Catania	293,104	311,620	+ 6.3 %
Italy	59,394,207	60,483,973	+ 1.8 %
Metropolitan cities	9,097,140	9,572,515	+ 5.2 %
Others	50,297,067	50,911,458	+ 1.2 %

¹ Moreover, in 2017 the demographic balance – the difference between births and deaths – has been negative.

² Source: Istat and UN Population Prospects, 2019.

³ Evolve Resources for Basic Geriatric Nursing, 6th Edition, Patricia A. Williams, RN, MSN, CCRN.

⁴ The fatality rate for drivers over age 85 is nine times higher than for drivers 25 to 69 years of age; the speed of walk of people older than 65 is almost half compared to the average speed for a younger person

⁵ In Italy, more than 9.5 million people live in the metropolitan cities. Of these, the estimate is that more than a third live in peripheries where the economic hardship is most felt.

- In parallel, many Italian cities are experiencing a **rapid growth of peripheries**, whose population is increasing at a very rapid pace. Such growth is usually inorganic and puts a lot of pressure on municipal administrations, which must face both the overcrowding of some areas and the appearance of the so called “urban voids”. Such coexistence of urban fractures and congested areas risks to undermine urban safety and the way it is managed to the core.

Pressure on safety is also brought by **increased fluidity in people’s movements and flows**.

- **Migrations** are on the rise. While there is no “migration emergency”⁶ the lack of a structured plan of management and integration in Italian cities creates an environment, which poses new menaces for safety of both migrants and residents, especially in urban areas’ peripheries and so called “urban voids”.
- **Ordinary flows** are also on the rise due to globalisation and growing interconnectedness of different geographies. As an example, between 2012-2018 the volume of tourists visiting Italy has increased by 10.5%, reaching more than 420.6 million of tourist in the last year. In the 10 biggest cities mentioned above the rate of growth of tourist is 20.2%, namely more than 96 million of tourist in the last year.⁷

Such fluidity brings much **diverse safety needs** coming from increasingly heterogeneous sources and makes urban geometries change rapidly in a difficult way to predict. These phenomena also require more complex and flexible monitoring (both of urban society and spaces).

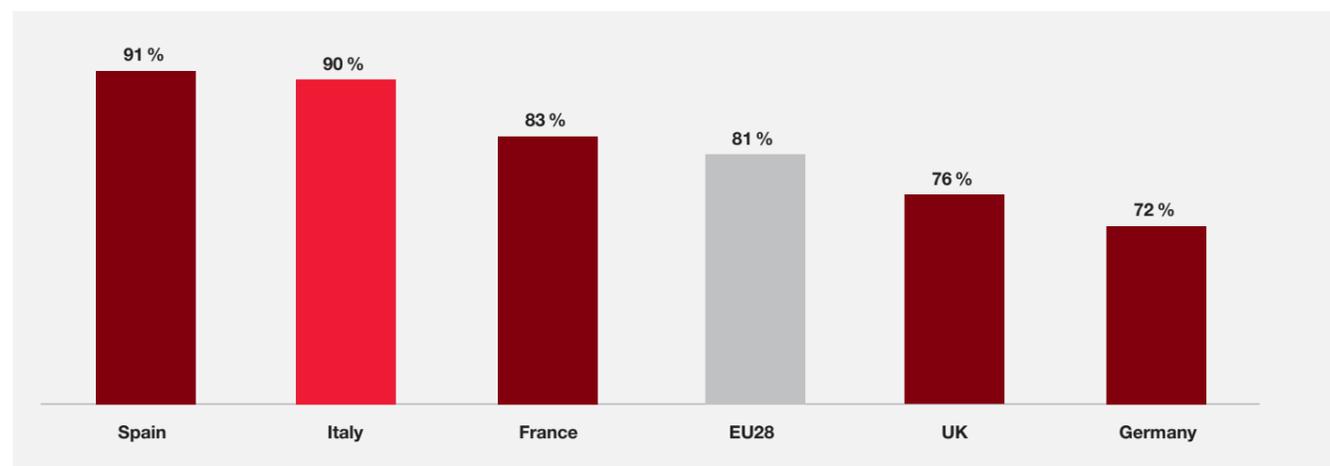
In conclusion, this combination of ageing, increased urban flows and urbanisation is drastically reshaping the structure of Social Spaces with reference to Smart Safety, putting **increased pressure** on both urban areas and those stakeholders involved in city planning, trying to provide adequate levels of safety to citizens.

The relevance of safety-related issues is confirmed by the results of the survey: 73% of respondents agree that the issue of public security is felt to be increasingly central by citizens, hence it will guide respondents’ choices and future programs. Results of the survey confirm that growing stress on social spaces is one of major concerns related to safety, as Figure 4 shows.

A second trend concerns **evolving safety needs** as the very perimeter of “urban safety” stretches, comprising **additional ambits** other than security (strictly related to criminality, violence, terrorism, ...). These ambits become equally, or even more important in everyday citizens’ life, while they are also far more difficult to ensure effectively:

- Citizens demand of different and extended forms of protection, while **perception of safety** gets increasingly relevant together with the actual one.

Figure 3. Percentage of population who believes that environmental issues have a direct effect on their daily life and health (percentage), 2017. Source: The European House – Ambrosetti elaboration on Eurobarometer data, 2019



⁶ In Italy there are around 4 million of registered immigrants, 6.7% with respect to total population, versus 9.9% in Austria, 8.5% in France, 8% in Germany and 11.6% in Sweden. Illegal immigrants are estimated to be below 1% of total population.

⁷ Source: The European House - Ambrosetti elaboration on Istat data, 2019.

- **New digital and virtual spaces** are emerging aside traditional ones. Old spaces and new ones influence each other’s safety.

In detail, extension of urban safety perimeter encompasses issues such as **environment, health and infrastructure obsolescence**:

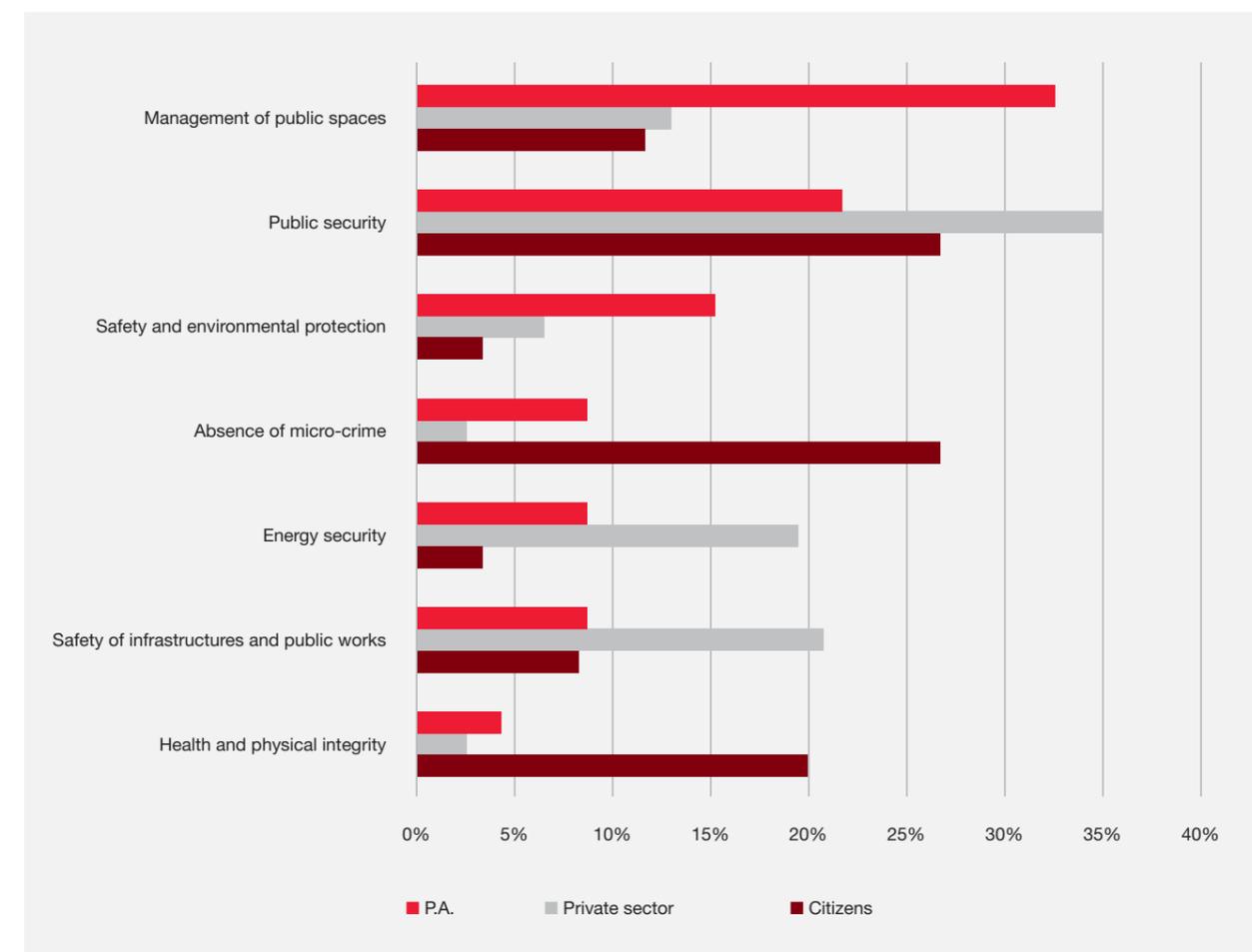
- Earthquakes, flooding, heat waves and damages due to intense wind threaten the safety of individuals as, in 2016, there have been 20,629 fatalities due to **extreme weather and climate related events** in Italy.⁸
- In Italy there are around 45,000 bridges and tunnels. Of these, around 11.000 (25% of them) need regular

surveillance and maintenance. There are as well more than 2 million of dwelling in mediocre or very bad conservation status.⁹

- **Air pollution** is responsible each year in Italy for about 30,000 deaths from fine particulate matter alone (PM 2.5), equal to 7% of all deaths (excluding accidents). In terms of months of life lost, this means that the pollution shortens the life of each Italian by an average of 10 months; 14 for those living in the North, 6.6 for the inhabitants of the Centre and 5.7 for the South and islands.¹⁰

The survey’s results confirm such plurality of needs as the ranking of safety priorities varies with respect to the respondent, highlighting the broadness of urban safety definition and concept.

Figure 4. Answer to the question: “Which aspects do you consider to be an integral part of the concept of security for citizens?” by respondent (percentage on total), 2019. Source: The European House – Ambrosetti elaboration on survey’s result, 2019.



⁸ Source: The European House - Ambrosetti elaboration on European Environment Agency data, 2019.

⁹ Source: The European House - Ambrosetti elaboration on Istat and Scenari Immobiliari data, 2019.

¹⁰ Source: The European House - Ambrosetti elaboration on Ministry of Health data, 2019.

In parallel, also the spectrum of the subjects involved in urban safety organisation and management is growing. In the last few years, the **safety management has become a responsibility of a plurality of actors**, involving both institutional actors at different levels – supranational (EU), national and local – and private actors.

Civil society and individuals have acquired an important role too, as they are increasingly involved in the decision-making process. The spread of responsibilities and the creation of a multi-centric management structure could potentially create a problem of overlapping and segmentation of information. However, if properly addressed, it could provide a more efficient, responsive and inclusive safety management system.¹¹

Beside traditional spaces, **new spaces emerge** thanks to innovations and technologic progresses. Digital data have become a valuable asset by themselves. The extraction, storage and usage of data also create new jobs and new companies, requiring new infrastructures, new investments, and new competences, enabling as well new business models. In other words, data are creating an economy by themselves, **a data-economy** where the value is represented by information.

At the same time, increasingly pervasive digitisation and mounting relevance of digital technologies have brought to the emergence of a new, unprecedented space: the so called **“Digital Space”**. As well as physical space, Digital Space requires attention to individual and collective safety:

- As data’s pervasiveness, frequency of collection and sources increase, the **size and depth of embedded information increases as well**. Smart appliances, wearable technologies, sensors for industrial use, connected applications, advanced payment tools and electronic public administration registers are just few examples of data sources other than smart phones and computers, generating an ever-growing amount of information.
- **Global data dimension is expected to reach the cumulative size of 44 zettabytes** (44 trillion GB) by 2020, ten times the current size.¹² Data economy

value is expected to surpass €100 billion by 2020 (double than Japan, half the US).

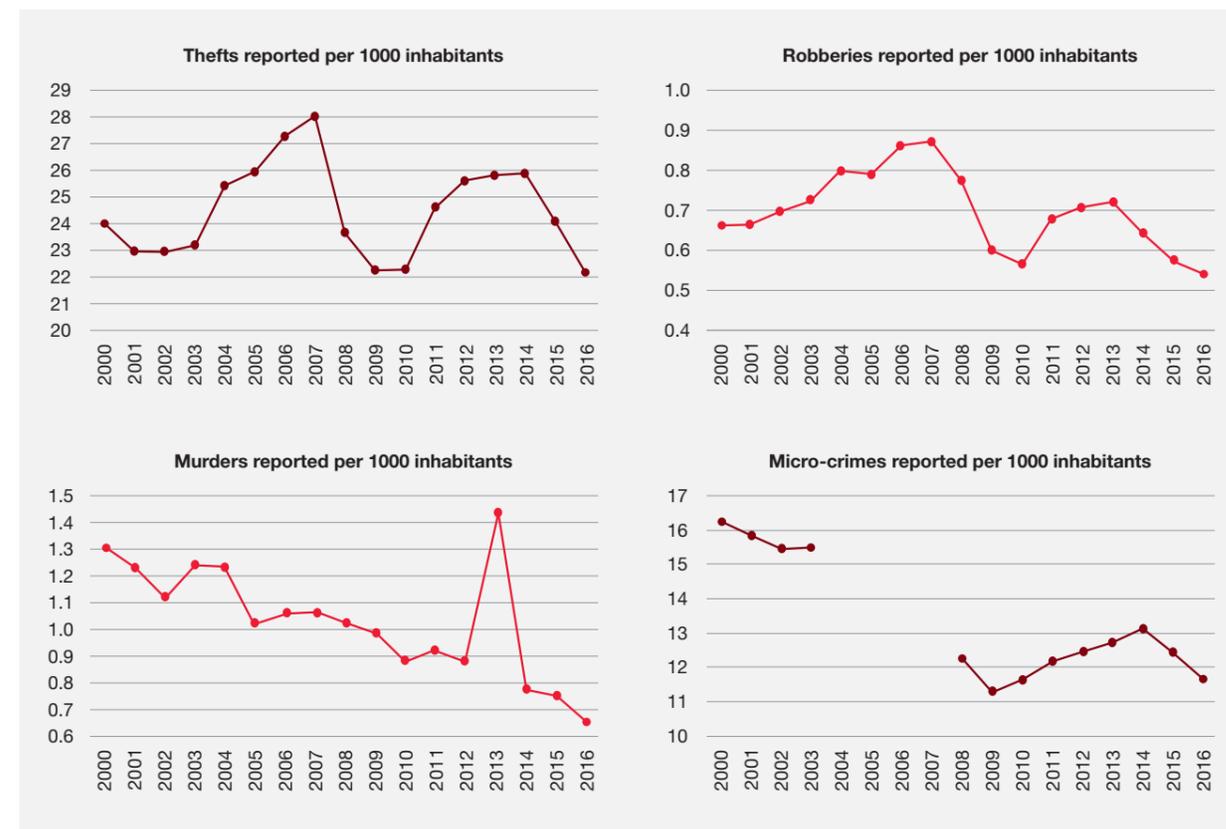
- **Data economy in Italy is worth €28.4 billion**, with a weight on the GDP of 1.5%. Such weight is forecasted to reach between 2 and 3.5% of GDP in 2020. In 2021, data traffic will be 1.8 times higher than in 2018, with a growth rate of 23% per year.
- In Italy, **over 10,000 cyber-attacks have occurred in the past year**. 76% of these attacks are database theft. Clusit report highlights how 61% of cyber-attacks are perpetrated using trivial attack techniques, such as SQLi, DDoS, Known Vulnerabilities, Phishing, and Simple Malware. Nonetheless, these attacks are effective, due to a lack of adequate investment and digital protections.¹³
- In 2017 the market for information security solutions in Italy reached a value of **€1.09 billion**, up 12% compared to 2016. However, 78% of such investment are made by private large firms only.

Importance of Digital Spaces is hence clear, as well as the importance of ensuring its safety to effectively protect individuals and citizens. To do so, strong **cooperation** between private players, ICT companies, regulators, Public Administration, law enforcement players, and of course citizens is pivotal.

Digital spaces’ safety also requires measures and decisions covering a wide spectrum of complex topics (such as privacy protection, cyber security defence, data preservation and data transmission, ...) that can have serious effects on physical spaces too, creating a **sybiotic relationship** that has to be clear to all stakeholders involved in ensuring citizens safety in Italian cities.

In parallel – and counterintuitively – the availability of so many information, together with the growing relevance of digital platforms (still immature in their role of media), brings a bias of public perception. Fake news phenomena are spreading, while the **gap between real and perceived safety** represent a new, challenging issue that has to be addressed. In fact, despite a constantly decrease in many criminality indicators, Italian citizens declare to feel less secure than in the past.

Figure 5. Main criminality indicators (reported crime per 1,000 inhabitants), 2000-2016 (data for Micro-crime reported for 2004 to 2007 are not available). Source: The European House – Ambrosetti elaboration on Istat data, 2019



- Despite these evidences, the **“Perceived criminal risk”** (an indicator elaborated by the National Institute for Statistics, computed as the numbers of families experiencing a high or low level of distress at risk of crime in the area where they live out of total households) has grown from 30.6 in 2000 to 38.9 in 2016.
- Eurobarometer highlights how **37% of Italian believe that they occur in an information which misrepresent reality** or is even false on a daily basis, and fake news is perceived to be a problem for 90% of the population.
- Surprisingly, only **25% of the population declare to be not enough confident in their ability to properly discriminate between true and fake news**: the remaining majority is convinced that they will be able to identify fake news.

- According to Perils of Perception 2017 - a survey exploring the **difference between factual data and perception** designed by Ipsos - 49% of the population believes that the homicide rate was higher in 2015 with respect to 2000, and 35% believes that it was equal. In reality, there has been a sharp decline in murder rate in the last two decades.

All these elements together design a scenario where safety becomes an **increasingly complex issue**, whose management and organisation within urban spaces benefit from innovation, but also get stressed by digitisation. For this reason, the following chapter will try to clarify those main trends arising from “Smart Safety” scenario, in order to provide a knowledge base for decision makers and stakeholders of Italian cities.

¹¹ The evolution of the organisation structure necessary for the management of smart safety and the integration of public and private entities will be discussed in chapter 4.

¹² Source: European Commission - “Press release, Data in the EU: Strong Commission commitment to increase data availability and promote data sharing in healthcare”, Brussels, 25 April 2018.

¹³ Source: Clusit report on safety in Italy, 2018.

03 | Emerging trends

As complexity grows, **new trends** require specific attention. The purpose of this chapter is to identify relevant trends connected to “Smart Safety” paradigm, together with the underlying implications. The goal is to support decision makers in designing future urban development strategies.

A first element refers to the **growing importance of data**. They are today a fully-fledged asset (as well as oil, water, human capital, ...) for both private players and policy makers, decision makers and citizens. Such consideration has peculiar implications for safety:

- Sensitive data, and underlying information, affirms today as the main enabler for **Smart Safety** services development.
- The level of safety that cities will be able to provide will increasingly rely on magnitude and **depth** of available citizens’ data (direct correlation).
- Speed of data collection’s process and the capability to rapidly turn them into usable **KPIs and information** will be crucial too. Law enforcers as well as other safety providers and city managers involved in the definition of long-term urban strategies require valuable information, analysis and KPIs instead of large amounts of disaggregated micro-data.

As a consequence, several **needs** are affirming:

- Capability to **collect** data from several sources, during different timings, in a very capillary

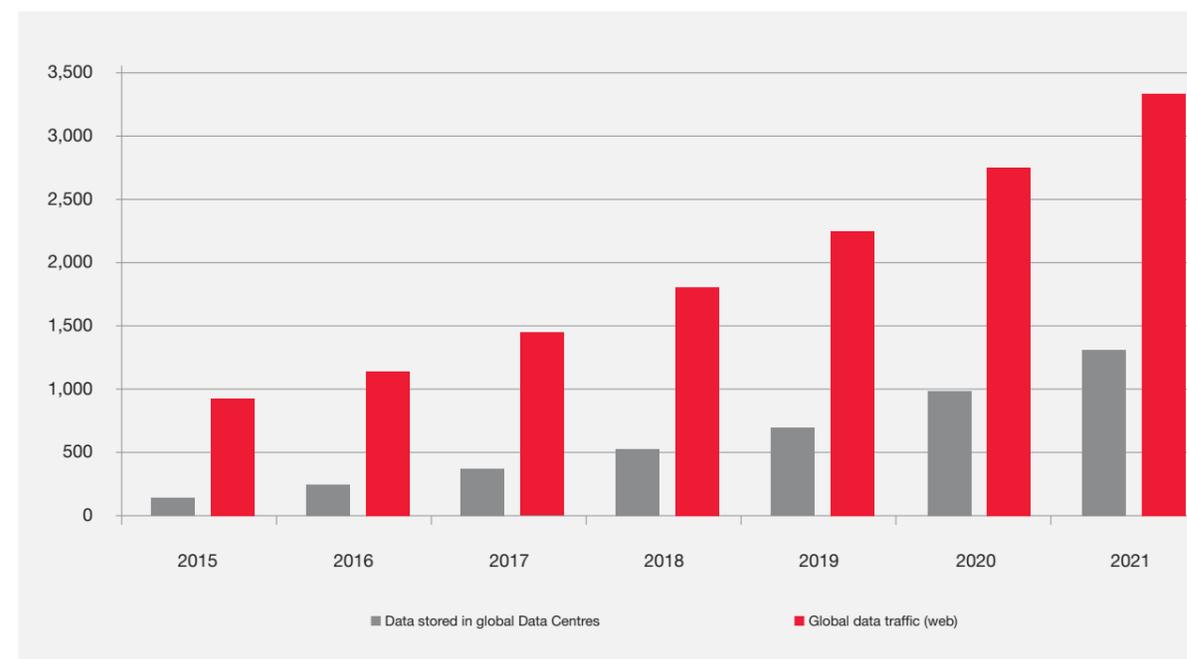
and pervasive way that results compliant with everchanging privacy and data regulation.

- Data **aggregation** and their **transformation** in valuable information, KPIs, analysis and evidences.
- **Data storage and protection** granting data integrity and preventing abuses.

To satisfy such needs, **hardware solutions and software solutions** are required. As data grow, underlying infrastructures have to grow accordingly.

- Software capable to **extract value** from growing amounts of data will be extremely valuable. They have to react in real-time to inputs, granting immediate response.
- On hardware side, industrial **data centres** will become strategic assets. Infrastructure supporting highly-digitalised systems will be crucial too (cables, connectors, satellites and telecommunications networks).
- As infrastructures evolve, the system must be ready to support them. In 2014, the last year for which data are available, **US data centres used 2% of the electrical energy consumed in that country**. Worldwide, data centres used about 0.9% of the total electrical energy consumption, but the figure is expected to exceed 5% by 2025. The environmental impact is also significant: emissions of CO₂ by the world’s data centres amounts to 2% of the global total: a share equal to that of air transportation.¹⁴

Figure 6. Forecast of growth in data traffic and volume of data stored in global data centres (millions of terabytes), 2015-2021. Source: The European House – Ambrosetti elaboration on Cisco data, 2019



Within this context, the **role of citizens** in urban safety environment is on the rise:

- As data importance grows, citizens become safety **users and contributors** at the same time.
- Citizens **drive the extension of security concept**, adding soft dimensions related to safety that are more than ever perceived of paramount importance.
- **Citizens’ needs, expectations and minimum standards related to safety** are also growing. Capillary diffusion of smartphones and connectivity make individuals constantly aware of what happens near them. Nowadays, the quickest way to know what is happening is reading Twitter. Acceleration and fragmentation of information’s journey implies that individuals are constantly informed of each safety problem that may occur to them, is it real or just perceived.

- Citizens become **key nodes** in the overall smart safety framework. They must be educated as in digital spaces the “infection of a single node” risks generating repercussions at the level of the urban system and beyond. The robustness of a digital system is measured on the basis of its weakest link.

Together with citizens’ involvement, also **private players’ role** in urban safety provision becomes central:

- **Many Social Spaces are privately managed** (for instance malls and stadiums). Since the demographic trends mentioned above contribute to change the consumers habits and structures, the consequences are a transformation of private sector safety duties.
- Moreover, private actors are increasingly involved in citizens’ **data collection process**. Such data, even if not strictly related to safety, has to be put together with all publicly managed data (transport, energy, water, health, ...) to provide KPIs, information and analysis that are used for Smart Safety services.

¹⁴ Source: “Geopolitics of Digital Age”, The European House – Ambrosetti, 2018

04 | Issue and open questions

Abovementioned trends pose unprecedented **challenges to safety services' management**. This is especially true in the broader context of Italian society and urban areas' digital transformation. Such challenges are related to different aspects, but they are also intertwined and connected. The purpose of this chapter is to present a brief description of such challenges, together with their main implications.

First of all, a **dichotomy between safety and privacy** emerges.

- On one side, increasing pervasiveness of data measurement and collection allows more **effective solutions and valuable services**, together with targeted and timely answers by authority and law enforcement.
- On the other side, collection of such personal data and information put **citizens' privacy at risk**, especially because effective Smart Safety services require the sharing of such information within multi-stakeholder platforms.¹⁵ Ethical aspects also emerge.

Importance of this issue is highlighted also by survey's results. 76% of respondent at our survey declare that their efforts and investments will be mainly dedicated to finding the best **balance in the privacy/security trade off**.

Data collection and usage amplify a question that is present in every economic sector: the value creation process usually generates an issue whether to allocate the **ownership** of such value. In data economy, the value is generated by personal information, questioning how the value should be redistributed.

When discussing safety, the redistribution of such value should imply an **agreement between citizens and data collectors**: the collector gathers data and, in exchange, provides safety-related services which generate a plus value for individuals. Since it is impossible to quantify such a value in a monetary fashion, there is an unstable balance between the minimum amount of data required to ensure a proper safe environment, and the over extraction of information which may invade privacy.

The **need to find an optimal balance between safety and privacy** is urgent and compulsory:

- There is a mounting concern about data treatment, and the social awareness about the importance of data is growing. Moreover, the public opinion could be biased by the data collection for commercial only purposes carried out by web companies and other private subjects. Hence the **importance of private data usage** is emerging as a key topic, even if the process is still in its early stage.
- Citizens grow **aware of the value of their personal information and data**. 70% of Italian population think that computer, smartphone or tablet providers should give them regular software updates to protect their information; 68% think that the default settings of browser should stop their information from being shared; only 5% affirm that is acceptable for companies to share their personal information without their permission, if this helps them to provide them with new services (27% say that is acceptable to some extent).¹⁶

- On this issue, regulation is still moving its initial steps towards a more protective system with respect to individuals. On 25 May 2018, the GDPR regulation entered into force. GDPR (see Box 1) redefines the normative framework in which data collectors and

analysers operate, establishing a very precise regime on transparency of data management. In general, the affirming trend seems the following: there will always be more data available for security purpose, and there will also always be more exigencies for accountability.

GDPR REQUIREMENTS FOR PRIVATE DATA USAGE

The main regulatory development is represented by General Data Protection Regulation (GDPR), approved by European Commission on 25/05/2018.

GDPR states that "The protection of natural persons in relation to the processing of personal data is a fundamental right" (Article 1). The Regulation shifts the focus of the legislation from the protection of the data to the responsibility of the controllers. In particular, GDPR establish the following points:

- *The right for citizens to an easier access to information about their data and the purposes and methods of processing them: an individual could ask to each private organisation which of its data it owns and how them are used; a Subject Access Request (SAR) must be fulfil within one month.*
- *The institutionalisation of the right to be forgotten (referred to as the right to erasure in the Regulation) as provided for by the European Court of Justice, which will make it possible to request and obtain the removal of data when the public interest in the information is no longer present.*
- *The obligation for companies to notify serious breaches of citizens' data.*
- *Administrative sanctions of up to 4% of the total turnover of companies in the event of violations of the rules.*

Individuals have the right to exercise opposition to treatment of their data in whole or in part, obtain cancellation, obtain updating or rectification, obtain access, obtain conversion to anonymous form and obtain blocking or limitation of treatment.

The European regulation provides for several proactive obligations for those who collect, store and use data, in order to demonstrate the concrete and not merely formal adoption of the regulation itself. In this context, the preparation and updating of documentation is essential, as it indicates the correct implementation of the rules:

- *Documentation proving the processing operations carried out (register of processing operations; impact assessment, non-EU data transfer);*
- *Documentation attesting to the respect of the rights of the interested parties (information, consent forms);*
- *Documentation on the division of roles and responsibilities (contracts and appointments of external managers and appointees; internal procedures, etc...);*
- *Documentation attesting to the security measures implemented.*

¹⁵ Such technology will be discussed in chapter 5, "Technologies".

¹⁶ Source: The European House - Ambrosetti elaboration on Eurobarometer, 2019.

Urban managers and stakeholders, together with national and supranational regulators, have hence to create a **balanced system**, maximising overall safety of the system and safeguarding the minimum accepted level of citizens' privacy. Usage of data, the limitations to which data collectors must be subjected and the way data should be gathered, stocked, preserved, and used remain a key issue that must be solved through cooperation and co-decision of all actors in the system.

Crucial is also the definition of **which subject should control data**: could public administration be both data user and privacy guarantor? The issue becomes even more challenging if data collectors are private subjects, which may use data both for safety service provision and commercial purposes. Technologies and regulation should hence provide solutions able to balance the trade-off between the legitimate interest of private data collectors and citizens' privacy rights.

Finally, it is important to stress the concept of **accountability** within this equation. The stream of data must not be monodirectional – from bottom to top, from person to data collector – but bidirectional. The information collected must be redistributed in a clear and transparent way towards the population, creating a cooperative environment where individuals can understand the improvements generated by their data and recognise the value they are receiving for what they surrender.

A second challenge connected to privacy protection - as well as to regulation of data usage - comes from **asymmetrical development of innovation and regulation**:

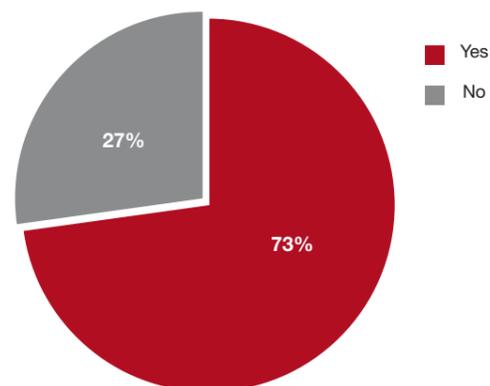
- **Digital transformation happens fast** and brings rapid and disruptive changes to traditional sectors and services (including safety).
- Adjustments in the **regulatory framework are way slower** than digital innovations' impacts. Besides, regulating the digital space requires a different set of tools and policies, completely new in comparison to those used to regulate physical spaces.

Moreover, the normative development does not always contribute to create an environment conducive to innovation, nor provides the best balance between citizens protection and services' provision, since it may impose **excessive bureaucratic constraints**.

Regulation such as **GDPR** risks to pose challenges by itself, not only to industry and technology players, but also to local public administrations, service providers, and other stakeholders involved in urban safety, compromising the overall effectiveness of the Smart Safety paradigm.

- 75% of European multinational (with more than 75,000 employees) have planned an investment of at least 5 million euros to adapt to GDPR with the hiring of at least 2 or 3 full-time employees dedicated to privacy issues.
- In Italy, an overall investment of €2 billion for Italian firms is due to comply with GDPR requirements.¹⁷
- Survey confirms the difficulties of urban stakeholders to be fully compliant to the GDPR normative. The main concern expressed by respondents to our survey regards data usage, since the majority fears that GDPR may impose limitations to data exploit. Another major concern regards the integration of data collected from different sources, since it may create an issue of data ownership and responsibility.¹⁸

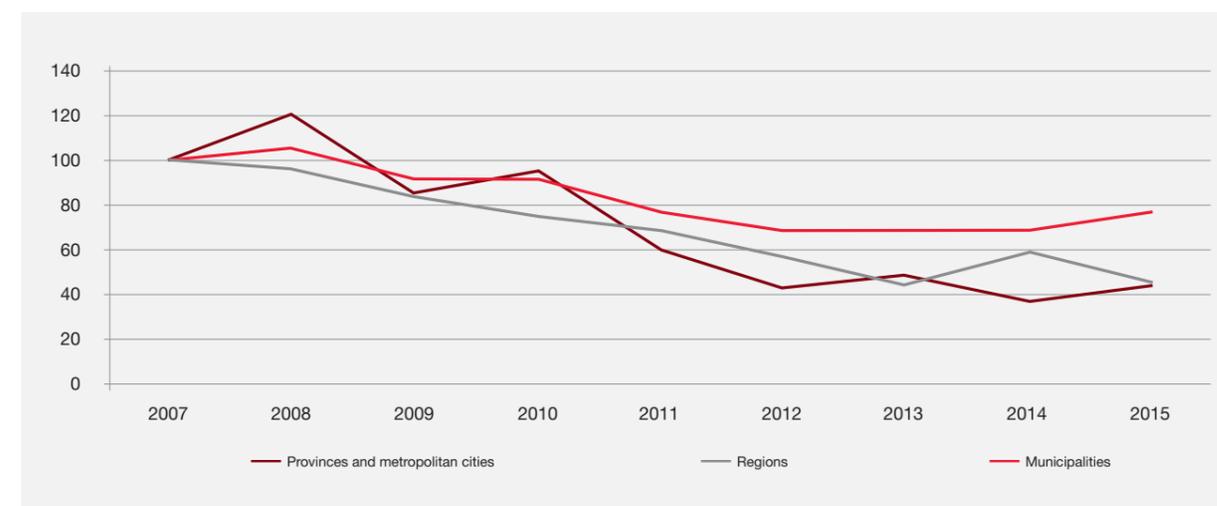
Figure 7. Answer to the question: "Do you perceive as a strategic requirement innovative solution allowing to manage data in a GDPR-compliant way?", 2019. Source: The European House – Ambrosetti elaboration on survey's result, 2019



To solve this fracture between regulation and innovation, cooperation, co-creation and **dialogue between stakeholders is key**. The involvement of technology providers could contribute to the discussion and the definition of the new regulatory framework, since they can offer a unique point of view with respect to the feasibility of legal demand and the optimal way to achieve goals. Moreover, the involvement of technological players could enhance the strength of normative prescriptions, since there would be a "practical" point of view since the beginning of the process.¹⁹

Digital transformation also requires investments for new infrastructures and new software, as well as personnel training costs to create the competencies necessary to exploit the digital safety solutions.

Figure 8. Expenditure for construction, purchase and maintenance per entity (reference year 2007 = 100), 2007 and 2015 (last available data). Source: The European House – Ambrosetti elaboration on Istat data, 2019



It appears quite clear that the public administration cannot bear the full cost of the digital transformation unless it reduces other types of expenditure, which could not be feasible for political and technical difficulties. Budget constraint in particular affects

However, the context in which these trends are evolving is characterised by a **general lack of public resources**:

- Both at national and local level, public administration faces issue in balancing the needs of the population and the cost to fulfil it.
- The public administration expenditure for investment has been reduced by around 10 percentage point from 2001 (€37,605 million) to 2017 (€33,937 million) in Italy.
- There is a consistent share of public administration balance which has to be allocated for social expenditure (pension and welfare) that is not elastic – and it is projected to grow, due to the demographic change described above.²⁰
- Italian municipalities and local entities are facing budget constraints as well, which has provoked a decline in investments as the following chart shows.

the three requirements necessary to fully develop a Smart Safety environment: **hardware installation and maintenance; data analysis software; staff training and insertion of new professional figures.**²¹

¹⁷ Source: The European House – Ambrosetti elaboration on Confesercenti data, 2019.

¹⁸ As previously mentioned, GDPR poses a series of duties for those who collect and manage data and may create difficulties when different organisations must share data for common purposes (as an integrated Smart Safety system).

¹⁹ There is sometimes a gap between the regulatory prescriptions and their technological feasibility. For instance, the so-called "Right to erasure" (also known as "right to be forgotten"), which is a basic human right, poses non-trivial implementation issues in an era dominated by social media and widespread of information online.

²⁰ Social expenditure accounted for €203,108 million in 2001 (36.4% of total current expenditures) and for €342,072 million in 2017 (44.2% of total current expenditures). Source: The European House – Ambrosetti on Istat and Minister of Economy and Finance data, 2019.

²¹ These topics will be discussed more in-depth in the following section of the present paper.

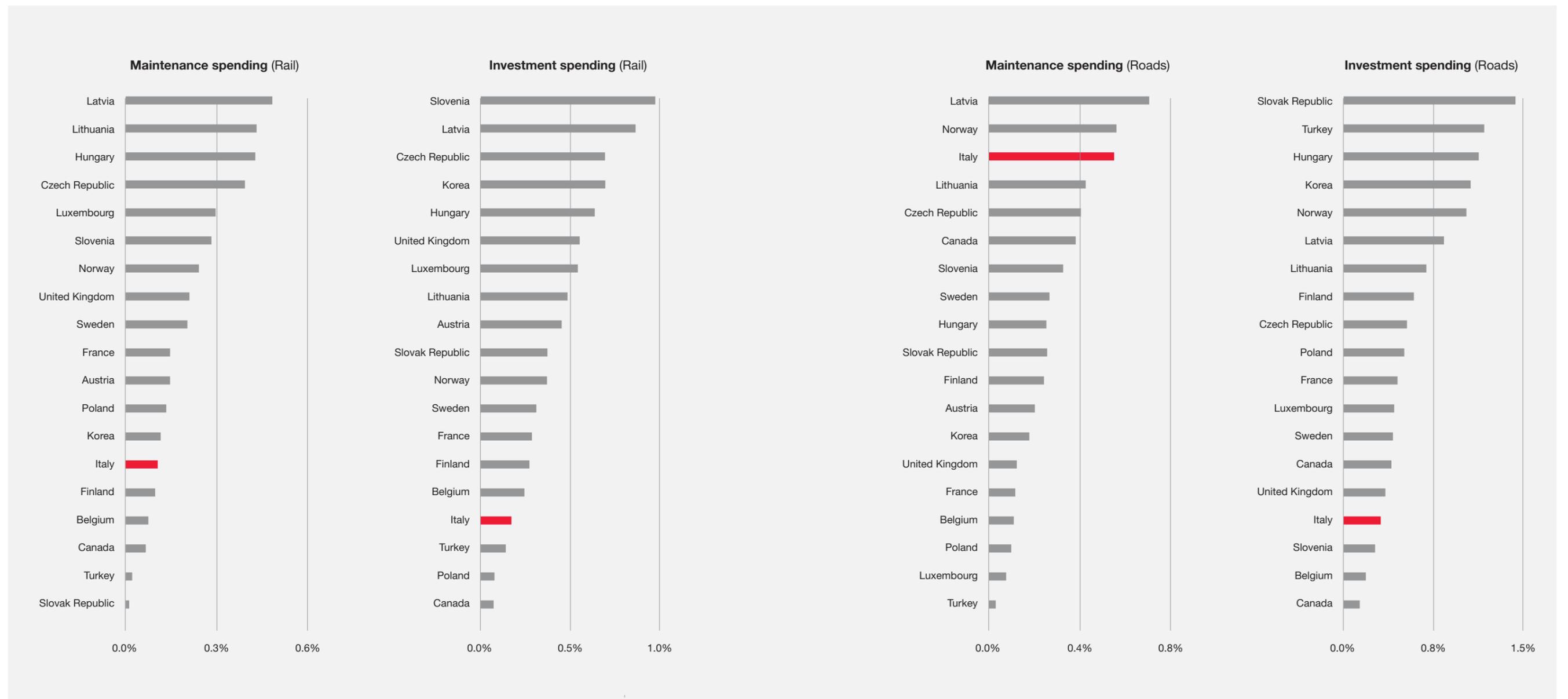
Such budget constraint affects each aspect of safety. A compelling issue regards **mobility infrastructure**, which do not always meet the needs of citizens in terms of usability and safety. The public expenditure allocated in such field is dedicated mainly to

maintenance rather than smart innovation and investment. The safety of such infrastructures is a compelling issue, since the reshaping of cities is rising the mobility demand. Mobility infrastructures are therefore one of the areas in which the issue of security is most felt.

Figure 9 conveys the expenditure for maintenance and for investment for rail (page 20) and for roads (below), in terms of GDP percentage. For a better understanding, Italian data are compared to a selected bunch of OECD countries. As graphs show, Italy **expenditures for investments are below average both for roads**

and rail. The cost of roads maintenance, on the other hand, requires a substantial part of resources. Figures 9 conveys the symptomatic difficulty of innovating and tells how the country prefers constant maintenance and “plugging hole” with respect to structural innovation.

Figure 9: Maintenance and investment spending for rail (figure above) and roads (figure below) in developed economies, (percentage of national GDP), 2015.
Source: The European House – Ambrosetti elaboration on OECD data, 2019



Moreover, Italian public sector does not lack financial resources only, but skills and competences too. Italian municipalities and Public Administration at all levels lack adequate competences in data related activities (management, protection, analysis), ICT and digitalisation. **Chronical mismatch between demand and supply of adequate skills and competencies in the IT sector** is a paramount issue in public sector, but also a negative element for the overall Italian economy:

- Right now, Italian firms declare to face difficulties in covering 30% of vacancies since there are not enough potential workers with an adequate set of **digital skills**.
- In general, there is a lack of IT competencies: in Italy, **university graduates majored in ICT are only 1.1% on the total** (lowest share among OECD countries), while 13.5% is graduated in STEM (Science, Technology, Engineering and Mathematics) disciplines, in comparison with the average of OECD countries, 19.1%.²²
- The **average age of civil servants is 50.34 years**²³, with a predominance of legal and administrative profiles.
- 43% of EU workers have experienced significant **changes in the technologies used to carry out their work** in the last five years and 47% have experienced changes in the way they organise or perform their tasks.
- Despite this drastic transformation of necessary skill, **education expenditure is steadily decreasing**.

An even more worrying fact concerns post-graduate education, the so-called lifelong learning: a survey conducted by the OECD in 2016 shows that only 25% of Italian workers have attended a training or refresher course in the last year.

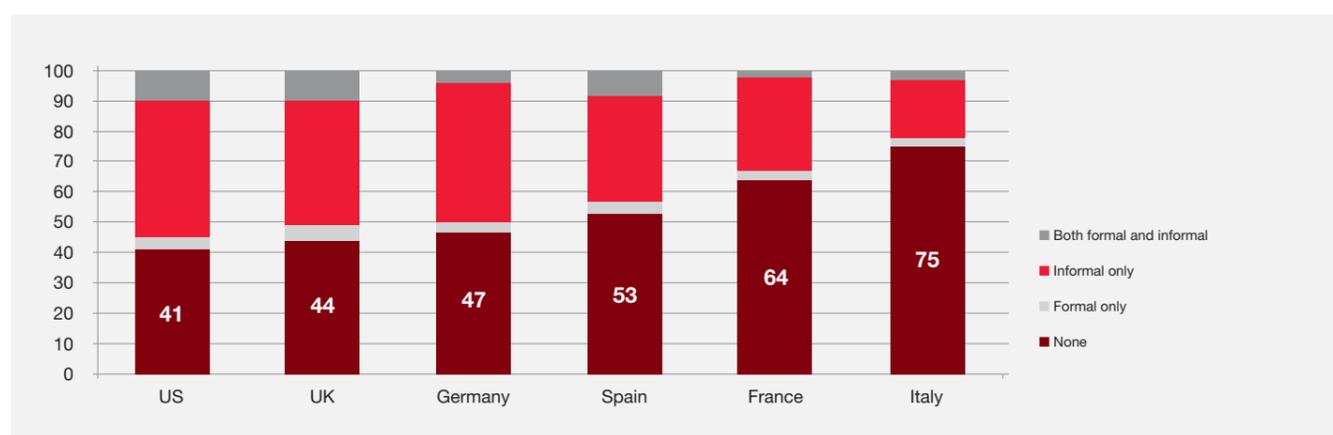
Such issues (budget constraints and human capital scarcity) underlines the importance of a **deep and constructive integration** of all the stakeholders involved in urban development, especially between public and private sector.

In this context, integration between the public and private sectors can also help to reduce costs and **share the budget burden**, offering value added solutions coming from integration and useful for all actors involved in a win-win cooperative model.

On the other side, the presence of a multiplicity of actors, and the growing need of cooperation between such actors pose a challenge by itself. The spread of responsibilities and the creation of a multi-centric management structure could potentially create a **problem of overlapping and segmentation of information**, adding to privacy and data management concerns.

For this reason, cooperation and integration between all stakeholders involved in urban planning and management has to start **since the very initial phase** of “Smart Safety” concepts, strategies and infrastructures’ (hardware and software) development. This is the most effective way to ensure adequate levels of integration, cooperation and co-development.

Figure 10. Lifelong learning, (percentage of workers participating in training course in the last year), 2015. Source: The European House – Ambrosetti elaboration on OECD data, 2019



²² Source: The European House – Ambrosetti elaboration on OECD data, 2019.

²³ Source: The European House – Ambrosetti elaboration on State Accounting data, 2019.

05 | Technologies

As described in the previous chapter, major issues and challenges connected to “Smart Safety” deployment in Italian urban areas can be overcome through the **cooperation of all the stakeholders involved** in urban planning, development and management.

Technologies, in this sense, can act as a major enabler of cooperation, allowing meaningful and effective co-creation practices and delivering common frameworks. Technological solutions can also support the transition towards “smart services” that put citizens at the core, providing the **building blocks of “Smart Safety” services**, capable to satisfy new needs and requests of population.

However, to do so, single technologies, digital tools or ICT innovations are not enough. The risk is to burn limited resources to develop and deploy scarcely useful items or vertically-limited services with inadequate impact. Smart Safety paradigm does not require a simple upgrade of the instrumentation or the use of more sophisticated technologies: these are a necessary element, but not sufficient.

A Connected City does not just rely on cutting-edge “technological gadgets” but on **horizontal integration, vertical deepness and new organisational and operational models** enabled by digital revolution. Only through such approach is possible to exploit the value resulting from the interconnection of multiple data sources.

As pointed out by survey’s results, the true value of data resides in the possibility of utilising them for

different purposes, in order to exponentially multiply the possibilities of analysis and service’s opportunities.

Given so, the first technological element required to create a proper “Connected City” should be the so called **“Integrated Platform”**. It constitutes the framework within the several actors involved (individuals, P.A., private players such technology providers or utilities) provide, collect, distribute and use data from (and to) citizens and the city.

This platform is essential as it responds to a crucial need. It provides shared and recognised standards, rules and the technological perimeter that enable **flows of data between different actors involved**. This function requires a technological integration of a variety of software allowing the dialogue between all the players participating to Smart Safety services.

Moreover, the platform should be conceived in order to collect raw data (input) and to distribute to single users (namely providers of vertical services such as utilities and law enforcers) **useful KPIs, analysis and information** (output).

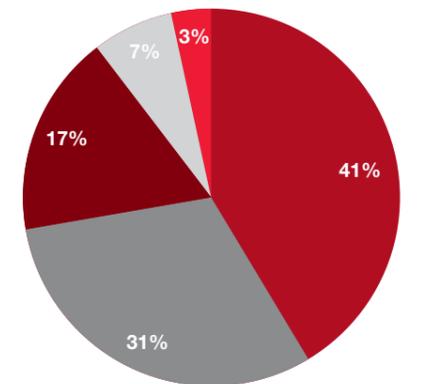
As an example, data collected by a traffic camera (e.g. the traffic intensity) could be useful not only to players involved in individual urban mobility, but also for lighting management body, municipal police, public transportation company, firefighters, ambulances, and so on. Each subject, however, is interested in a different nuance of such a data: while ambulances are

interested in real time situation (for example they are interested in knowing which is the route that minimises travel time), public transportation company may be interested in the forecast of traffic congestion during the day in order to design the most efficient schedule.

- Monitoring trains, metros, and stations through such integrated mix of sensors and analytics allow to predict, avoid and manage the most common safety problems in these critical public spaces (e.g. loss of objects and people, accidents due to overcrowding, serious security threats, ...). In addition, the same data on people flows can be used to make the service more efficient, for example by increasing the frequency of trips during peak hours and avoid overcrowding. Finally, inception of autonomous driving technologies and integrated mobility services in public and private mobility positively affects safety (together with mobility).

It is now clear that data could be used in valuable fashions for a plurality of scopes, also very different from the initial purpose for which they have been gathered. Furthermore, such data can be analysed in several manners for several objectives. Survey's results recognise the possibility of data integration and development of value-added services as the key outcome from data collection.

Figure 11. Answer to the question: "Where does the real value of the data collected in the city lie?" (percentage of respondent). Source: The European House – Ambrosetti elaboration on survey's result, 2019



- Sell them to third parties (in accordance with the rules)
- Benefit in an integrated way for different scopes
- Real-time availability
- Store and use them in a safe and compliant manner
- Analyse them ex post

A centralised and integrated platform (hereafter "Control Room") developed as mentioned above is crucial to allow systemic collection and usage of different data, providing the horizontal framework and ensuring a proper flow of KPIs and information to (and between) all the subjects involved. It is hence the necessary, **enabling technology to deploy a truly Connected City**.

A Control Room is also an indispensable platform to **overcome privacy-related issues**, especially considering **regulatory constraint** coming from GDPR, that establishes a strict set of rules and duties for data collector. Such Control Room allow to balance safety and privacy needs, because it provides a centralised platform, managed by Public Administration at urban level, in charge of ensuring compliance with such set of rules.

It is important to stress out that a Control Room does not imply a centralisation of citizens' data usage, but of their storage, protection and analysis. Data collection can be either assigned to this platform or to single service providers (utilities), technological players or antennas within the city. The most important point, however, is that **thanks to such a Control Room data from multiple sources can be shared in a privacy-compliant way**: they can be stocked and processed, while only KPIs, aggregated analysis and strategical information can be shared to other vertical players, safeguarding sensitive personal data.

Once developed in such a collaborative way, Control Room becomes the central technological hub for Smart Services and Smart Safety, taking the burden of regulation compliance and fostering **cooperative behaviour** towards transparency and standardisation, that is key for its functioning. It also provides a virtual space where data could be aggregated, analysed and then shared, adding value to overall urban environment.

Such an urban Control Room will also become the guarantor of system's safety: it must ensure control on virtual space, prevent abuses and avoid privacy violations. Moreover, it must assure **data security and cybersecurity** (both individually, privately or publicly). To do so, cutting edge design and technological implementation must guarantee cybersecurity over

time, even considering everchanging digital menaces and the relevance of every single node that the platform integrates, including citizens and human operators and organisational models.

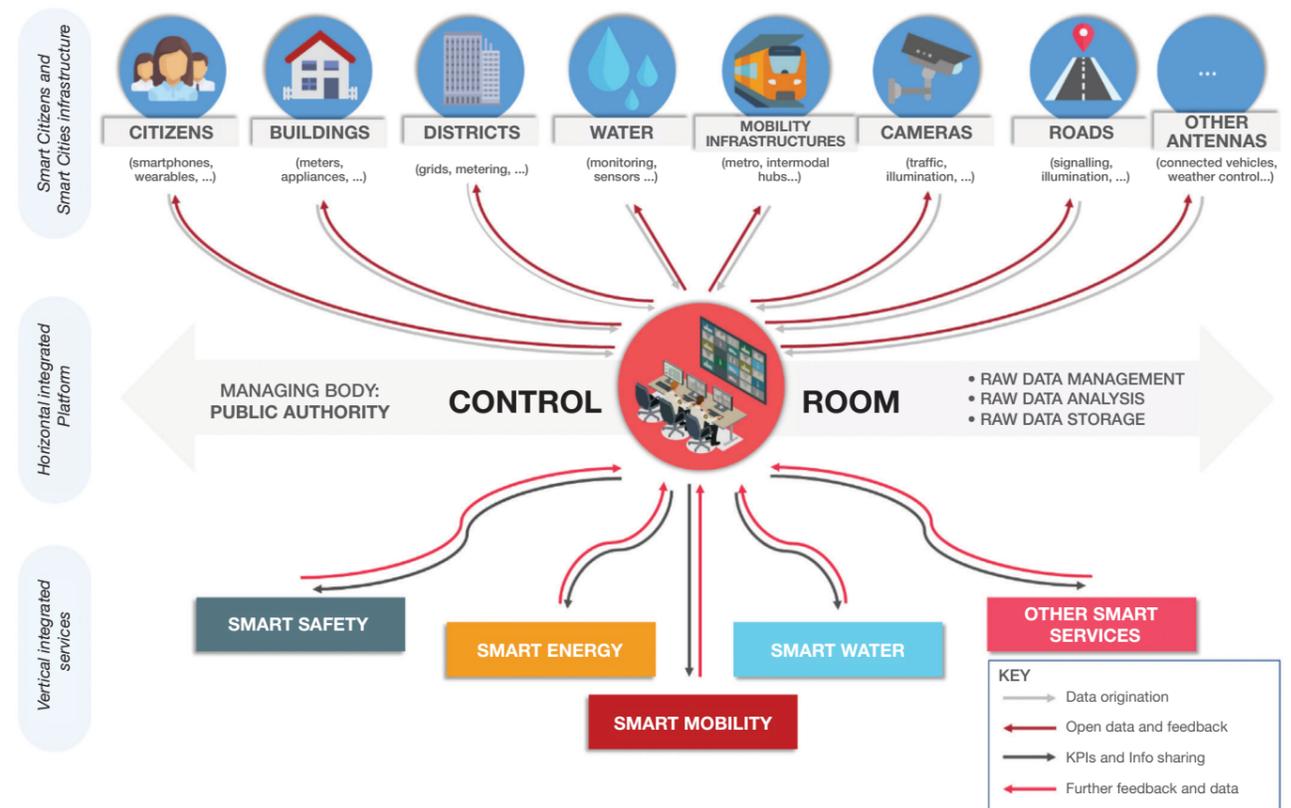
Thanks to integration, common standards and acknowledged practices, Urban Control Room could also improve the opportunity provided by **data accumulation and multiple sources integration**, enabling scale economies, rationalisation and cost reduction, without affecting quality of services provided and the possibility to have personalised solutions with tailor made outcomes.

- Such platforms are already available, providing integrated services capable to effectively satisfy multiple needs. For instance, **Public law enforcement authorities** can already benefit from vertical platforms that sustain them through the

whole course of investigation. It allows to collect all the relevant evidences; to analyse it automating low value-added processes such as audio transcripts and video analysis; to use a secure, scalable platform to enable chain-of-custody and compliant sharing with criminal justice staff and prosecutors; to construct a fully scalable database that allows ex post evaluation and data extractions. Such platform is also designed to ensure both an adaptive, integrated and easy-to-use system and to protect data itself through time.

The importance of an integrated Control Room with the abovementioned features is still **not fully acknowledge** by public authorities taking part to the survey: despite the relative majority (47% of respondents) considers it an investment priority in the coming years, a not indifferent proportion of respondent is not aware of the potential benefits or does not consider it a priority in the near future.

Figure 12. Functioning of the Integrated Control Room (illustrative). Source: The European House - Ambrosetti elaboration on interviews and survey results, 2019



Moreover, to avoid infrastructural (hardware and software) legacy, such platform should be designed to be **adaptive and scalable**, in order to build an instrument able to provide solutions for those problem that may emerge in a following moment and to host future tools and architectures. The pace of urban transformation, as discussed in the previous sections, keep generating new safety needs and creates new challenges. These challenges can be tackled only with technologies that can be improved as fast as the social spaces transform.

Not only safety needs change fast, but also regulatory requirements. It is the case of GDPR-like normative processes, increasingly requiring a “**disclosure policy**” **not only while collecting data**, but also during the elaboration process. To this, role of citizens’ association, privacy guarantees, and increasing awareness of individuals on their digital rights adds.

In this direction, within the co-development framework enabled by “Control Room”, it is possible to elaborate useful “**Ethical Checklist**”, controlling and minimising the ethical repercussion of data collection²⁴, through the monitoring of aspects such as:

- **Transparency**, the individual’s ability to know and control which of their data is stored and how it is used;
- **Accountability**, the ability of a data provider to check that data is being used correctly according to pre-established rules; to ensure comprehensibility and interpretability of results;
- **Fairness**, namely the non-discrimination or non-polarisation (bias) of results (e.g. with an ethically incorrect prioritisation);
- **Trustability**, a guarantee of the quality of the source in terms of the origin of the data it makes available, its authenticity (e.g. by using metadata);
- **Data quality**, mainly precision, accuracy, completeness, correctness, timeliness of updating.

Furthermore, technologies that could provide form of **data anonymisation** can be integrated and updated over time, in order to extract all the information needed while maximising the citizens’ privacy, which is the key issue emerged from surveys. To do so, smart technologies are essential, since they can be used to collect **all and only the data necessary** for the scope of analysis.

- For instance, a monitoring camera whose purpose is to control flows of people and monitor overcrowding dangers (in places such as metropolitan or train stations, event venues, ...) could use process of **anonymisation** (so-called avatarisation, namely the transformation of taped people into avatar, such that it is possible to monitor movements, but it is not possible to recognise faces or identities).

Another advantage coming from the combination of such integrated platforms, data sharing tools, Smart Technologies and analytical solutions, is to allow municipalities and other actors to **share data in real time**. It is a key feature when addressing safety.

- It is possible to create a platform to display in **real time** information and statistics on environmental issues, overcrowding phenomena, micro criminality statistics, and other information relevant for citizens.

Such information can be made available to citizens (also in real time via apps). In this way, Urban Control Rooms can lead to the formation of **grassroots initiatives** and will help to highlight the benefits for the community arising from the collection and strategic use of their data.

Moreover, the diffusion of targeted information could prevent or defuse the formation of biased opinions, helping in **diminishing the gap between real and perceived safety**. The constant interconnection allowed by integrated “Control Rooms” creates the possibility of sharing data with citizens via open platforms, engaging them and promoting healthy social spaces without the constant fear of exaggerated threats.

Moreover, the amount of available data requires adequate technologies to analyse it, extracting **relevant information in real time**.

- **Artificial Intelligence (A.I.)** solutions can identify autonomously and in real time issues and menaces, bringing them to the attention of human operator, whose tasks will no longer be to monitor, but to choose the course of action to deal with the emergency, adding value to their job.
- Otherwise, as too many data are available today (and growing), humans’ response without A.I. support would be too slow and not focused, or simply impossible. The absence of an automated and quick data analysis system - capable of **extracting relevant information** and removing white noise - would put in jeopardy the opportunities provided by Smart Safety.
- The most striking example in this respect is video surveillance: the absence of a **video analysis platform** would allow only mild real time surveillance (unless a huge number of operators are employed to constantly monitor, which is neither feasible nor useful) and ex post evaluation.
- Such features are already exploitable: **Video Analysis technology**, integrated with facial recognition databases, allows the **identification of selected subjects in real time** on video feed and the possibility to provide immediate alert.

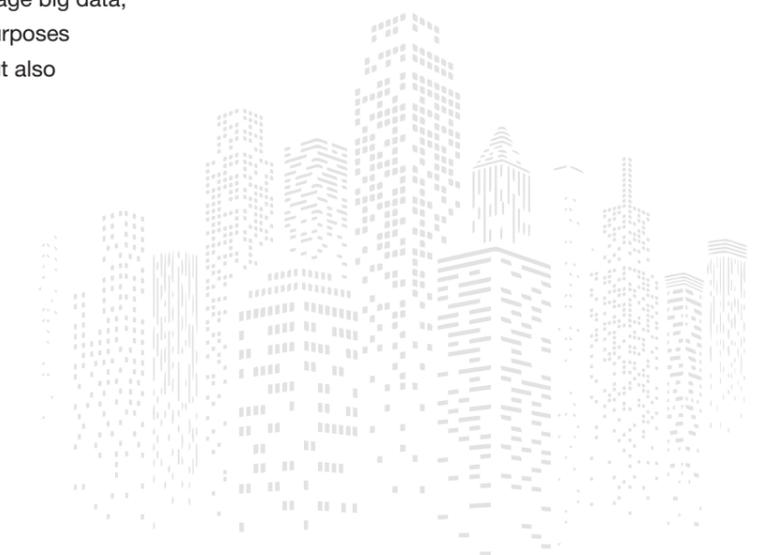
Data-analysis solutions capable to manage big data, on the contrary, can be used for safety purposes not only in a real time analysis fashion, but also

for **predictive analysis**, a valuable feature when addressing safety. In fact, with the adequate number of data points is possible to extract those trends which are not immediately identifiable and to find behaviour patterns. This information is crucial for services efficiency gains, which are essential both to reduce costs and energy waste and to ensure a better service, based on the needs of citizens.

Predictive crime analytics tool allows officers to integrate existing crime data with other sources (social media, antennas...) in order to predict what crimes will be committed in each area of the city.

Finally, technologies make possible to **overcome resistance of private players** to participate to such integrated efforts. The cost of losing sole-control of own data is balanced by:

- The fact that only agreed KPIs and information will be shared to competitors (not raw or sensitive data);
- The possibility to increase the safety of their clients or to provide them **value added integrated services** (health monitoring, elderly monitoring, insurances, ...), without compromising citizens’ privacy;
- The availability for themselves of information and value-added services, perceived as extremely useful (e.g. geo-based offerings, smart marketing, ...).



²⁴ See L. Tanca, P. Atzeni, D. Azzalini, I. Bartolini, L. Cabibbo, L. Calderoni, P. Ciaccia, V. Crescenzi, J. C. De Martin, S. Fenoglio, D. Firmani, S. Greco, F. Isgrò, D. Maio, D. Martinenghi, M. Matera, P. Meriardo, C. Molinaro, M. Patella, R. Prevete, E. Quintarelli, A. Santangelo, A. Tagarelli, G. Tamburrini, R. Torlone, Ethics-aware Data Governance (Vision Paper) – SEBD 2018, 49, Castellaneta Marina, 2018.

06 | Priorities for connected cities development and deployment in Italy

Technologies that are today available would potentially allow to overcome major criticalities and issues related to Smart Safety service provision within Italian cities. Together with technologies, however, **innovative operational and organisational models** are required to create a proper Connected City, putting citizens and communities at the core of valuable and integrated services.

As illustrated in the previous chapters, the main enabling element for the development and deployment of urban Control Rooms is **integration**. It can be achieved only through a real cooperation of all stakeholders involved in urban planning, development and management. Such cooperation should begin in the very initial phases of the creation of a connected city.

To deliver integrated and valuable services and to get the most from a scalable urban Control Room, its architecture should be **co-designed and co-developed with the cooperation of multiple actors** including Public Administration, utilities, other service providers, technology providers and integrators, funding agencies and, of course, citizens and communities. To achieve interoperability (that is the foundation of an integrated Control Room) shared standards, approaches and languages should be defined and agreed since the beginning.

In this sense, a priority is **training of civil servants and public managers** to update the basket of competences today available, as Public Administrations have a crucial role in the creation of Connected Cities. For this reason, a strong discontinuity is also needed in the way municipal

projects are developed and run. Cooperation between different branches and departments (also with other local and national levels) is required. Moreover, a cultural change is key, towards a greater drive to innovate.

Within an integrated urban Control Room, Public Administration will have to manage tenders, lead the co-design processes, carry out data collection, management and analysis and then share information.

Technical staff must be competent, fit for purpose and capable to make smart contract development. Lack of competences, on the contrary, risk to leave the imitative to single utilities or technology integrators, that provide technological gadgets that are useless (or less valuable and effective) compared to a system of integrated vertical services enabled by horizontal platform. Statistical departments within municipalities should also be empowered.

Governance of a Connected City is pivotal and should be defined since the beginning. It should clearly define political and technical roles, including those in charge of strategical development, architectural and infrastructures management, and data protection.

At **national level**, technical frameworks and annexes should be developed, to provide local administrations with adequate guidance, formalised guidelines and standardised models. Such documents should be compliant with international regulation and targets, also encompassing best practices at national and international level.

Cooperation should also apply between public administrations and stakeholders of different cities. While an adequate level of personalisation of architectures and digital solutions is required - given the fact that each city has specific features and needs - common solutions, standards and technological framework between different Italian cities (or international ones) could lead to **lower costs and possibility of licensing**.

Public Administration is hence crucial, it must **lead dialogue and co-design**, providing guidance and clear requests to other players (utilities, technology providers, integrators, communities, ...), set standards, regulations, targets and priorities since the very beginning. This allows scalability and avoids technological lock in of specific companies or players. It also defines modalities to collect and share data. It provides central intermediation.

However, Connected Cities are not based on centralised processes, but on **horizontal, decentralised and integrated models**. For this reason, all stakeholders should play their part. Dialogue, co-design and co-development is a priority as well. It should include multiple companies: technology providers deploying the horizontal architecture (Urban Control Room), but also technology providers for vertical services and utilities.

A single company cannot build a Connected City. Cooperation is the key. Private players should accept to put own data into the system, reassured by public control of the horizontal architecture and incentivised by the possibility to offer integrated services and to receive valuable information in turn. **Communities and citizens** must participate in co-design, also through new participation channels. They must receive useful data, KPIs and metrics, that transform individuals in prosumers and pro-users of public services, involving them in the co-development of services. Transparency also increase accountability of the overall system.

Finally, **research institutions** (e.g. ENEA) and **funding agencies** must take an active part too. Financing schemes can be extremely effective in incentivising dialogue and co-design of a Connected City, playing a far more effective role than legislation. Through

financing schemes, they should incentivise public-private partnerships, open innovation, networking with research institutions and start-ups, guaranteeing cooperation, integration, transparency, and interoperability.

In conclusion, most of the technologies required to create a Connected City are today available. They are constantly evolving and improving. However scalable architectures can be conceived to plug in additional data sources and new software and hardware solutions over next years. As of today, the priority is to **develop innovative organisational and operational models, based on digitisation and co-creation**, including all stakeholders involved in the planning, development and management of cities and urban services.

This is a prerequisite that should **urgently become a priority for Italian decision makers**: without putting in place the operational framework and the mindset for cooperation, it is impossible to create a proper “Connected City” delivering smart services to own citizens. On the contrary, a fragmented and uncoordinated approach risks to put the focus on single solutions or “technological gadgets”, that fail to take the most out of digital progresses or, even worse, waste public resources delaying or affecting the capability of urban system to deploy a well-developed Connected City.

Appendix

Hitachi solutions for Smart Safety

In the field of Smart Safety technologies, Hitachi has already developed and implemented innovative solutions capable to enable the integration paradigm outlined in the paper. Such solutions effectively help and support Public Administrations, social space managers and individuals to provide **advanced and comprehensive smart safety services**. Innovative cameras and sensors, real time and predictive analytics, integrated control platforms effectively help city managers and law enforcers to guarantee citizens with a level of safety that **matches with higher requirements and paradigm's extension** in the digital age. **Trains, metros, trams, stations** become spaces where danger can be prevented, but also where it becomes possible to identify lost objects or person, to manage crowding and inform passengers in real time, offering a broader safety service. It also becomes possible to **monitor infrastructures** and act promptly. Such concrete solutions match technological advancements and co-development models with the central idea behind Social Innovation: **finding solutions not for one person or organisation, but for all of society**. Among the others, examples of concrete Smart Safety solutions include:

CASE STUDY:

Integration of public and private systems delivers the safest environment in Washington D.C.

Since 2009 the collaboration between Hitachi and Washington D.C. Metropolitan Police Department has provided an integrated Smart Safety system in order to manage a critical area and deliver the safest environment to over 700.000 residents. Hitachi Visualisation Suite provided a single security interface that allowed to integrate a wide array of systems, including Computer Aided Dispatch (CAD), Records Management Systems (RMS), License Plate Recognition (LPR), Gunshot Detection, multiple video management systems, and individual cameras from private entities (1500).

<https://www.hitachivantara.com/en-us/products/iot-operations-intelligence/video-analytics.html>

CASE STUDY:

Artificial Intelligence supports Las Vegas in delivering service level that people expect from government

Exploiting the integration of a wide array of technological solution (Hitachi Smart Cameras, Hitachi Edge Gateway, Hitachi Video Analytics (HVA) for analytics, Hitachi Visualisation Suite (HVS) for visualisation, and Pentaho for data integration), Hitachi has built an "Innovation District" in downtown Las Vegas, delivering advanced, integrated and interconnected multimodal modes of transportation, physical safety, and city services.

<http://social-innovation.hitachi.us/think-ahead/smart-spaces/las-vegas-iot/index.html>

CASE STUDY:



Integrated technologies contribute to safe and secure usage of airport by passengers

Integration of artificial intelligence (AI) into existing video feeds and video surveillance systems allows the Vienna International Airport to monitor hours of footage in a short time, allowing lost luggage's identification and tracking the owner, to search for missing person such as children. The system provides complete anonymisation of video data, since it acquires the physical traits of a person without capturing his or her face in detail.

<http://social-innovation.hitachi/it/topics/all-in-the-sky/>

CASE STUDY:

Innovative Motion Sensors help to provide safer environment both at home and in commercial locations

The 3D LiDAR (TOF) Motion Sensor is able to calculate the size, shape and position of people and objects and tracking movement, reporting on individual action, movement trends, and unusual situations in commercial and public spaces that may pose a potential threat. Moreover, the sensors deliver actionable information while preserving anonymity and privacy. The 3D LiDAR Motion Sensors has found applications both in ensuring safety in Public Spaces and at domestic level: the sensors can prevent shoplifting, monitor posture and movements of vulnerable individuals and alert family members in case of falls, injuries or other domestic accidents.

<http://social-innovation.hitachi/eu/topics/3d-lidar-tof-motion-sensor/>

CASE STUDY:

A Smart, Real Time Governance Centre has been realised in a 53 million citizens' state thanks to co-creation

Hitachi has provided the Andhra Pradesh state in India with a dashboard that provides a real-time snapshot of the performance of various departments across the government. The dashboard aggregates data from more than 30 government departments (with over 300 reporting agencies, providing almost 750 services) allowing to communicate with each other. Thanks to co-creation, data related to transportation, emergency response, agriculture, safety, and other public services and programs are analysed in an integrated manner providing a single view of truth and allowing informed decisions.

<https://insights.hitachiconsulting.com/post/102enqc/under-the-hood-a-peek-into-the-real-time-governance-system>

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Hitachi Europe Ltd.

Whitebrook Park, Lower Cookham Road, Maidenhead, Berkshire, SL6 8YA
Tel: +44 (0) 1628 585000 Fax: +44 (0) 1628 585373