IEREK PRESS
Academic Research Community

2020

Online ISSN: 2537-0162
Print ISSN: 2537-0154

ARChive

Vol 5. Issue #1 (2021):

Urban and Environmental Studies

Available online at WWW.ierek.com/press

IEREK PRESS

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Academic Research Community
http://www.press.ierek.com
ARChive
CrossMark
ISSN (Print: 2537-0154, online: 2537-0162)
International Journal on:
The Academic Research Community Publication
DOI: 10.21625/archive.v5i1.809

Soil liberation in the multimodal city

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Abstract

New mobility does not just mean technological innovation, but also a change in lifestyles, modes of transport and services, ways of doing business and governance of the common good, represented by urban space and service infrastructures. Just as the car shaped the city of the 20th century with all its distortions, the new mobility systems of the current millennium could redefine the use of urban space with a new, more balanced footprint. The new mobility could drastically reduce the total number of vehicles in circulation (with their interchange and continuous use) and free up large areas of the city, for example parking spaces, which could be used for other purposes, and car service areas, which could be used as widespread freight delivery hubs.

In this scenario, motorway service stations would become more similar to interports, exchange points serving not only travelers but also and primarily segments of metropolitan areas, small cities and territorial areas of influence, creating a system of "cells" of relevance.

Today, therefore, there is growing awareness that new mobility also requires a different approach to the city and its design, given that the electrical infrastructure contributes to the (re)definition of urban space.

For this reason, cities must change their approach and make use of technology to understand where and how to intervene, with the primary objective of restituting the space taken up by the streets, which were designed for cars, to citizens and their expanded needs. New electric, as well as connected, shared and multimodal mobility is in fact an integral part of the new cities being built.

More consolidated cities will also obtain substantial benefits: a case study applied to the entire urban area of Florence demonstrates the potential of this revolution which is already underway.

Keywords

New mobility; Logistics; Multimodal; Urban transformation; Infrastructures; Florence;

1. Movement spaces

From a historical perspective, all communication innovations have drastically altered the organization of space (Caccia, 2009), which has always led to new urban configurations, so it is likely that the new intercommunication methods being employed in the city will ultimately reconfigure it. We are triumphing over an increasingly rapid epochal revolution of the whole system of the territorial mobility of people and things: the use of drones to deliver mail and parcels (last mile) will greatly reduce traffic on the ground, which is increasingly congested by e-commerce, and it may become possible to interface with autonomous private vehicles (auto-delivery) (AA.VV., 2017).

Urban growth has always been promoted by the development of transport, so much so that today they are both reaching exhaustion point. Cities have become very large and rely heavily on rail transport to facilitate movement

given the expanses covered. If the morphology of cities is a direct consequence of the transport technologies available at the time they were developed (Ventura, 1996), we can associate walled cities with movements on foot and horseback, radio-centric cities with rail transport, and widespread cities with the availability of cars. Generally speaking, the downtown area of a metropolis is currently 2/3 occupied by streets and parking lots and to some extent this degrades it (Zardini, 2003).

Territorial urban settlements in fact follow the footprint of the communication system prevalent at the time. We need only think of the changes in the urban landscape induced by lifts and subways in the last century to also imagine how today's technology is altering the concept of space, and people can now no longer consider themselves isolated from a physical obstacle or by distances that take too long to cover. (Figure 1 & 2)

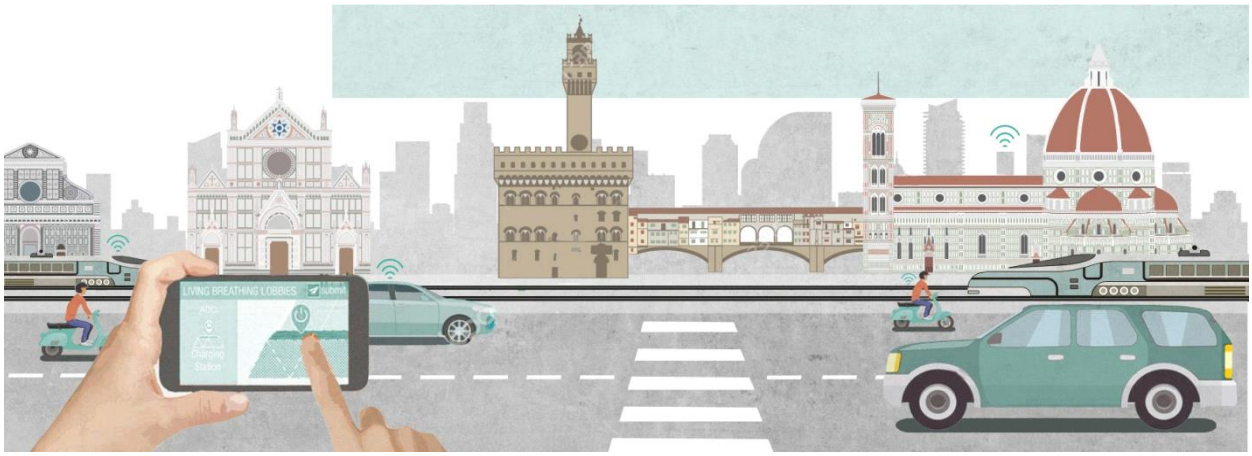

Figure 1. Irene Ponticelli, Florenze Smart City, Florence School of Architecture, 2020

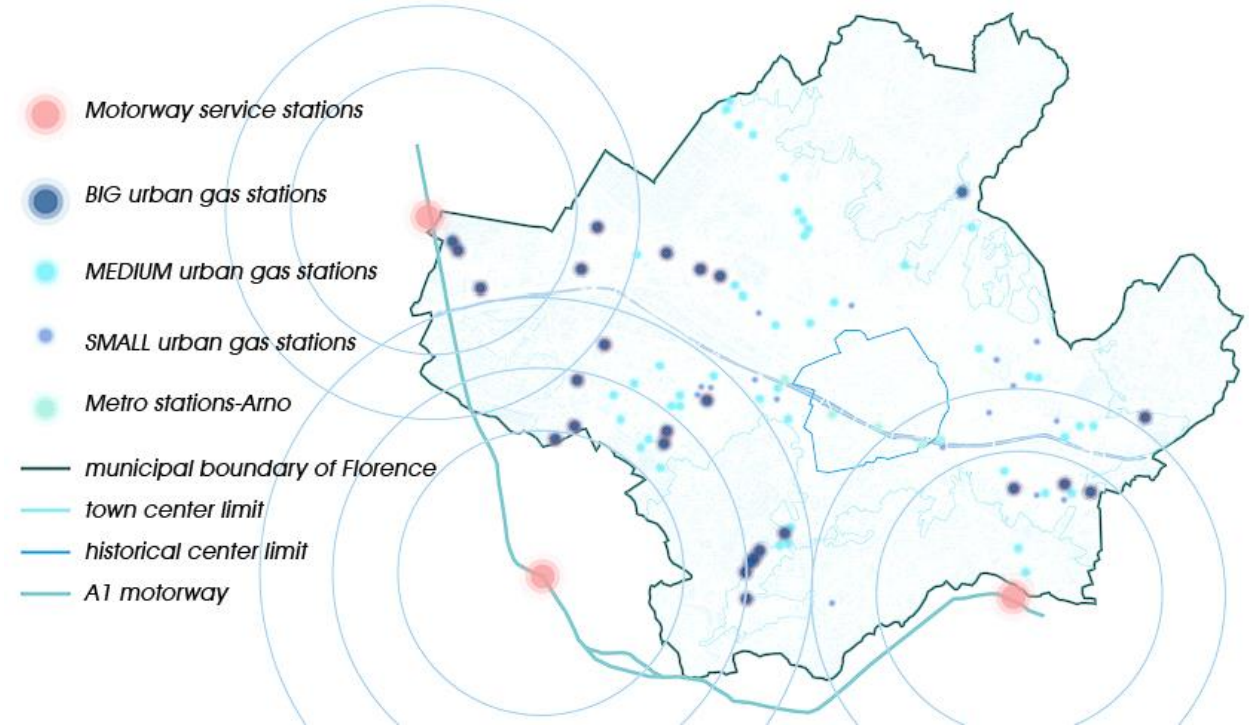

Figure 2. Existing and newly planned fuel service stations in the municipality of Florence, Florence School of Architecture, 2020

Since urbanity coincides with mobility, it is also true that meeting up and living do not represent the very essence of the city, which is rather represented by human accessibility to things, people and information, served by the available forms of transport. If all this no longer creates limits and it has become possible to meet anywhere, and in any case "virtually," and we can reach anything by staying right where we are, then urbanity dissolves into a situation of widespread "peripheralization" (Ratti, 2017) The consolidation of transport and communication systems increasingly via air and less overland suggests that we should review land use together with spatial rarefaction: this process can be associated, in consolidated cities as well as others, with a form of the "liberalization" of soils and of open and

public space. Thus, new forms of transport and communication tend to progressively release people from the need to concentrate in limited spaces.

The reduced need for physical proximity to access, consume and participate takes away from the city, since it is no longer seen as a program of rationalization and an overall manifestation of social relations. The communication systems are designed to expand the space and reduce the times, tending to zero the space as a function of (real) time. Freedom from the constraints of distance makes the model centered on material translations unnecessary, undermined by a homogeneous universe of information. The concept of proximity, on which cities were founded, is now no longer based on the concept of physical distance, but rather on accessibility, seen as a location factor that acts over time rather than space, also supplanting the development of the polarities that attempted to reorganize the settlement systems, overlapping the traditional centralizing polarities (Indovina, 2017). (Figure 3)

Figure 3 Historical and future evolution of urban fuel service stations, Irene Ponticelli, Florence School of Architecture, 2020

2. Widespread accessibility

Over the course of this pandemic we have discovered that much of the frenetic movement that has suffocated cities and vast territories is perhaps superfluous and not entirely necessary, and that the technologies we already have can help us live better lives if they are set up to assist us. Therefore, the hypothesis of a more "static" city is emerging, where people will move around less and goods and items will have to find alternative ways of reaching us. Much of the anthropized scenario for more than a century has been geared towards enabling people to move around more and more quickly, and especially autonomously, using roads, parking lots, service stations, and so on, distributed in a widespread manner (De Matteis, 2018). The ongoing process implies that to a large extent it will have to be reoriented to serve people and service providers who have discovered that they can move around much less and in other ways (Mossetti, 2018). The city can be reborn by reversing the suffocation factor that has characterized the recent era, gaining urban spaces that are already present but used for other purposes.

Today, therefore, there is growing awareness that new mobility also requires a different approach to the city and its design, given that the electrical infrastructure contributes to the (re)definition of urban space (Ferlenga, 2012). New electric, as well as connected, shared and multimodal mobility is in fact part of the new (smart) cities being built.

Instead, we must imagine adaptive scenarios for existing cities that are consolidated and have adapted to the traditional combustion vehicle system. (Figure 4)

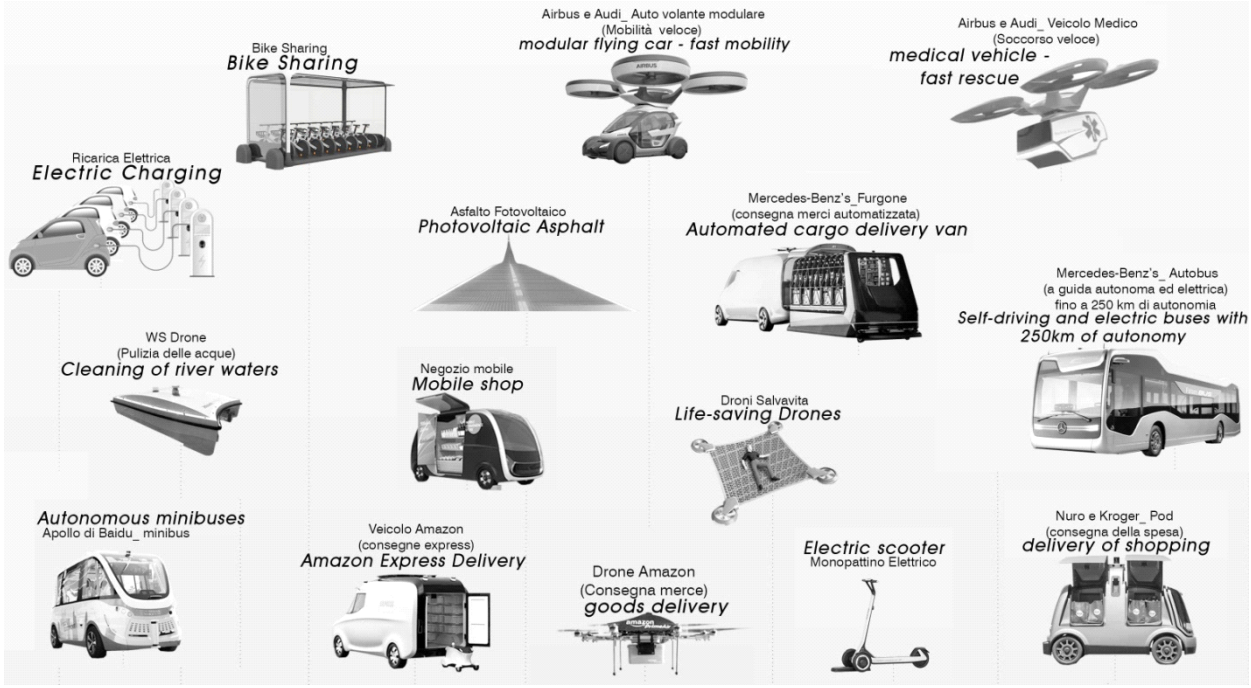

Figure 4 Smart Mobility systems, Florence School of Architecture, 2020

A study conducted in July 2019 by the BCG concluded that "up to 80% of the fuel-retail network as currently constituted may be unprofitable in about 15 years" (Boston Consulting Group, 2019).

Car manufacturers have been trying to take remedial action for some time by imagining the installation of new refueling points, powered by electricity or hydrogen, more often designed for the parking areas of workplaces or shopping centres, but they do not represent a real novelty in terms of urban services. These logics could even lead to the complete "dissolution" of the refueling service as it could be achieved more conveniently by "induction" in any equipped parking area (but it is also being tested in special dedicated road lanes) or through the use of special robots (an advanced solution conceived by Volkswagen) that would find vehicles in parking lots and then recharge them in full autonomy. Therefore, in these radical scenarios it is imperative to come up with alternative functions that could be offered at automobile service stations to ensure their survival, and to think of new or unused settlement spaces, such as road junctions for example.

In the international scenario, it is obviously above all the large oil companies who are most threatened by these potential closures and thus seek a "necessary" conversion to new energy sources. It is therefore a question of changing the traditional "locations" where customers in transit can refuel their car into "destination points," namely places where customers' needs can be met by offering a wider range of integrated services that intercept current and green trends. However, these scenarios still remain very much visions in the wake of simple updates to the current systems without actually implementing functions that would truly place them on the road to alternative urban mobility.

What instead do projects to transform parts of the city into a "smart" projection involve, such as the Metrogramma proposal for Milan Future city, which partly re-proposes the New York experience for the Broadway axis. In the USA, the joint attempt by Reebok and Gensler is interesting: they were perhaps the first to grasp the enormous potential of the common gas station, with the "Get Pumped" project, which the global architecture firm and fitness brand have been developing since 2018 with a plan to redo the state service station as we know it, integrating it with gyms. Equally interesting are the projects Uber commissioned from large international architectural firms to create intermodal hubs, especially for the use of taxi-drones.

A tangible evolution of the service station has been developed by British sustainable energy company GRIDSERVE for 100 new stations in the UK, conceived for the electric age: designed in collaboration with ARUP, the stations will

aim to charge electric vehicles while offering cafes, supermarkets, airport-style lounges with high-speed Internet and educational centres for exploring electric vehicle solutions.

In 2015, Combo Competitions held a competition called "Rethink Refueling" asking participants to reimagine the ubiquitous gas station that could be easily recognized regardless of its location, while still maintaining visibility. Four years later, GoArchitect followed suit with a design competition entitled "Gas Station of the Future."

All these studies focus on new proposals for service stations in renewed and/or more profitable urban areas (such as shopping centres), therefore of large dimensions, but none have considered the strategic value of existing locations that are better integrated into the city fabric. In fact, the small size and network of points of sale scattered throughout the territory represents a problem as it does not help economies of scale and investments and jeopardizes the existence of these familiar places for motorists, which once provided an opportunity to stop and rest. It is therefore necessary to come up with alternative services that can be offered at micro-urban scale and accordingly to a much wider range of users than just travelers, reducing their number or streamlining them, with some of them becoming completely free of road traffic, transforming into hubs or port-drones.

The service station will perhaps also become a place where people can recharge, taking advantage of the time "lost" while refueling the car: restaurant services could be available, as is the case now, but there could also be special relaxation rooms, gyms and innovative wellness treatments, or health monitoring through screenings, and smart-working stations with Internet and printing facilities (mobility hub). Before arriving at the service station, customers could select their station and any services, activities, treatments and menus they require and pre-order through the car's integrated computer system.

The now certain and immediate abandonment of propulsion systems based on fossil fuels in favor of renewable energies will mean that traffic becomes practically "non-polluting," almost silent and discreet, compatible with the environment from which it has often been segregated. In addition, automatic driving will optimize the approach and parking of vehicles in a programmed way and limit the occupation of the ground, allowing more space for collective use and for people to meet (E.R.T.R.A.C., 2012).

Vehicles powered by renewable energies, most likely only electricity, will require "charging" stations that employ different methods and take different amounts of time. They will certainly be fewer in number but the time spent there will still be short (induction or photovoltaic systems will charge vehicles during journeys or stops, and interchangeable batteries can be replaced) (Wyman, 2017). As a result, the technical areas of road service stations, already widespread throughout the country, will have to be streamlined by serving less vehicle traffic, but they can become hubs for exchange, car sharing or drone taxi services, or even sorting areas for heavy vehicles and the final delivery point for drones or private vehicles with automatic guidance as "bellboys" (Walsh, 2019).

In this scenario, urban service stations spread over the vast territory will become more like interports, exchange points serving not only travelers but also and above all parts of built-up areas and small cities, creating a system of "cells" pertaining to the new intermodal logistics. The performance of drones can ultimately offer a significant contribution to the optimization of the entire logistics chain, in the last mile, in the management of warehouses and urban distribution, as well as in the penetrating diffusion of many services (medicine delivery, assistance, surveillance...). Efforts should also be made to make the best use of alternative flow channels for diversified movements: not only the soil, therefore, but also an aerial layer and waterways, for micro-navigation but also as a resource for urban flight corridors. With an extended view of the possibilities of travel, it is clear that the existing road network will be decongested and suited to more "constructive" roles.

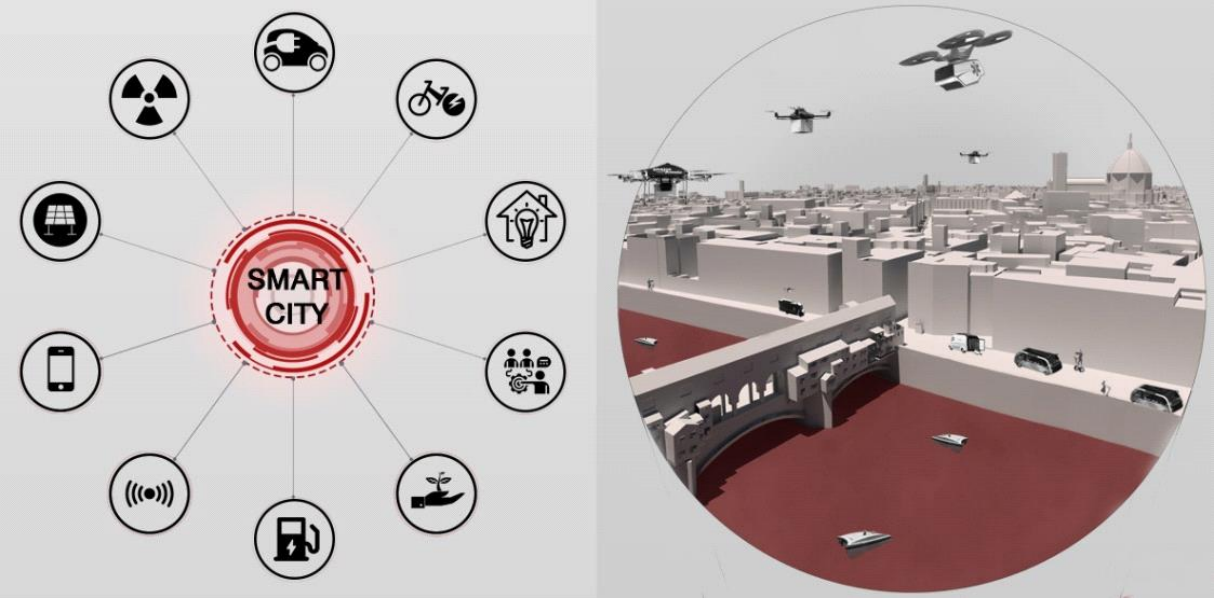

Figure 5 Simone Saporito, Florenze Smart City, Florence School of Architecture, 2020

3. Florenze smart city

This vision can help solve the problems of the congested accessibility of larger historical centres as well as the isolation of the more impervious and abandoned traditional villages. In practice, it should be possible to bridge the contrast in accessibility to urban places that makes the evolutionary difference. Ultimately, these are new functions that require an unprecedented architectural interpretation and new spatial functionalities that can redefine the roles of many parts of the city, deformed or adapted to other uses that are about to be abandoned and must be replaced. It is an architectural and urban scenario still to be imagined (Zanirato, 2012).

Applying all these new technological resources to the existing city will certainly be the challenge of the future: building new cities or parts of them in the name of the technological footprint is certainly easier (for the countries that can afford it) than applying them to existing and highly historicized cities. It is precisely the fabrics and experiences of the oldest cities that have suffered the most from all the effects induced by the motor mobility of the last century, and therefore the benefits expected from smart possibilities should have greater prominence.

In the application of the Florentine case, three distinct interconnected and interscalar employment scenarios can be hypothesized: the highway/ring road, the urban fuel service areas, the city crossing of the Arno river. To complete the work to upgrade the Florence motorway link, three new service areas are planned, which are next to the only one in Campi Bisenzio. They can be seen as an innovative articulation of the services offered mainly to travelers passing through (with electric and automated cars) together with the possibility of sorting many goods destined for the city (breaking the load) and letting them continue to their destination in a targeted manner with autonomous means. There are currently several dozen urban fuel service stations (around 90) in the Florentine municipal area, some of which have already been closed and abandoned for some time (on Via Senese, for instance), which will necessarily have to be converted into new mobility systems and at the same time their widespread diffusion taken advantage of so that they can be used for various neighborhood-scale services, starting with e-commerce (specific loads sorted on the highway could be brought here). Finally, the course of the Arno could be used to quickly penetrate the most historical fabric of the city, by water or with overflights, to move tourists and goods without interfering with the delicacy of the historical-monumental density. (Figures 2,5-9)

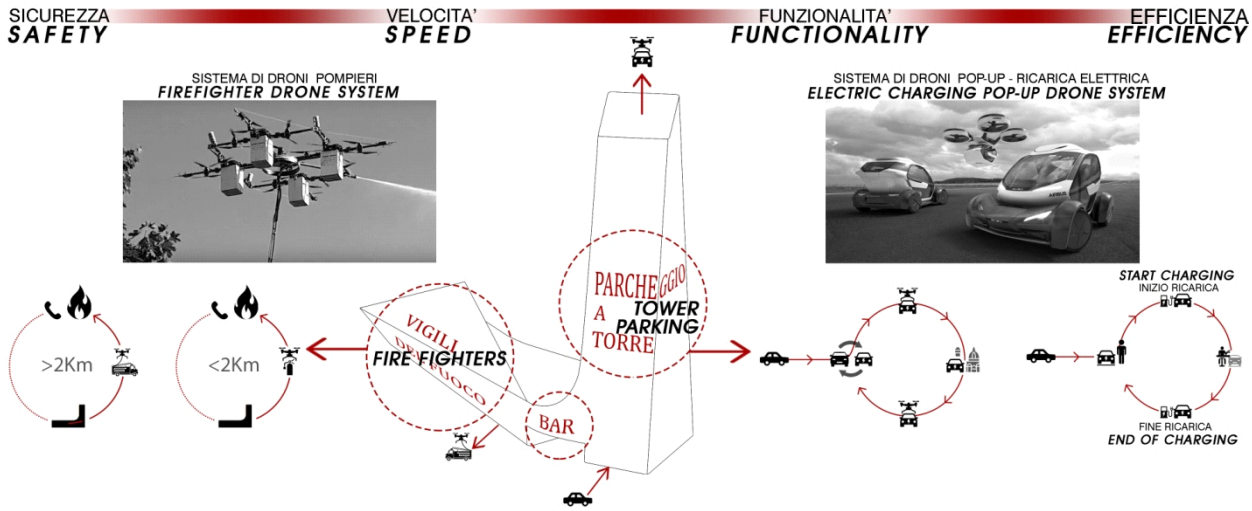

Figure 6 Simone Saporito, Florenze Smart City, Florence School of Architecture, 2020

A very interesting proposal is based on the fire safety services of cities: a service station located on the Florentine Lungarno (Via E. De Nicola) is integrated with fire station services, using the "corridor" of the river to quickly reach the "alarmed" areas with drones, carry out real-time reconnaissance to inform and organize rescue operations and start automatic shutdown operations, drawing water on the spot (also by carrying "rescue nets" to altitude). By exploiting the same urban penetration axis, it is possible to imagine the use of taxi-drones or delivery systems, simply flying over the "surface of water" which is otherwise not navigable and not at all exploited for urban services. (Figures 5,6)

Indeed, the indiscriminate overflight of urban areas and "sensitive" parts of them is a very thorny issue (no-fly zone) for obvious reasons of general safety and airspace governance (there are even those who consider the use of urban sewage networks as a solution for the movement of small vehicles to reach every point of the city, almost entirely via underground passages). The dissemination of fuel service areas plays an undoubtedly strategic role in activating new policies for the prevention/management of territorial security, as they could potentially become valid alert and emergency intervention points (for health, i.e. life-saving medicines, defebrillators, fire prevention, plumbing, earthquakes, public order, etc.). Accordingly, depending on the level of risk pertaining to each settlement area, the service areas could be specifically equipped with appropriate basic and/or special emergency equipment.

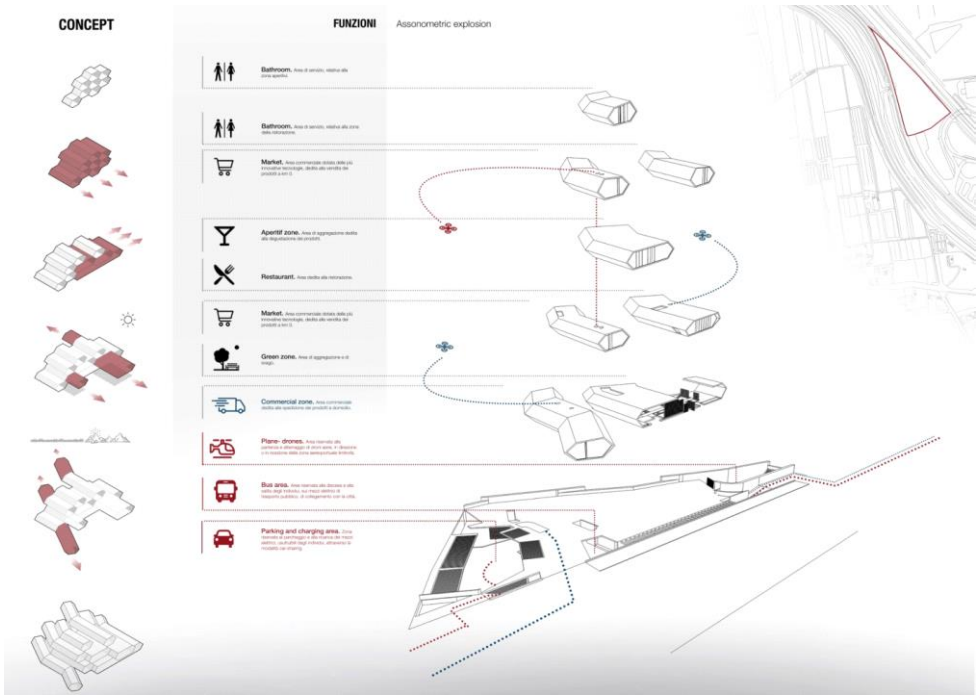

Figure 7 Gherardo Selvatici, Florenze Smart City, Florence School of Architecture, 2020

Instead, the more peripheral service stations (Ponte dell'Indiano viaduct) could be exploited as collectors of agricultural products grown nearby and distributed by automatic means in the nearest quadrant of the city, thereby turning an evident point of territorial friction into a mediator of needs between agricultural and urban life, in short, a wide-ranging exchange point. Once again there is the conception of the greater mobility of vehicles and goods compared with the relative static nature of people, where needs can be met even without physical movement, all by exploiting the strategic positions of the stations and their consequent suitability. (Figures 7,8)

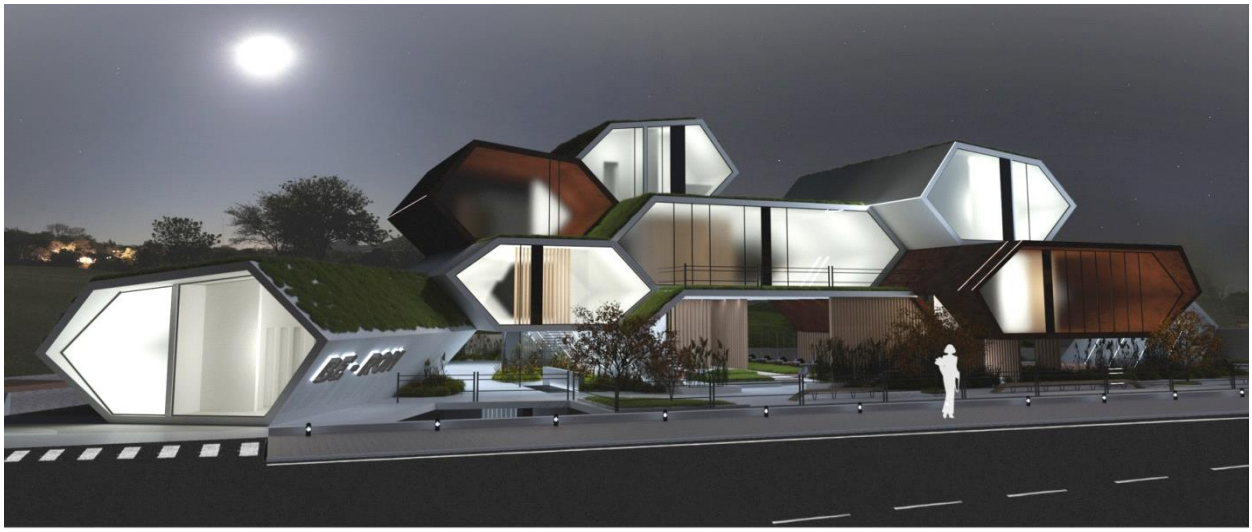

Figure 8 Gherardo Selvatici, Florenze Smart City, Florence School of Architecture, 2020

In practice, the road must be considered not only in terms of its longitudinal extension but also its transversal dimension, its depth, and therefore the involvement of the territory crossed, urbanized and otherwise. In this context, road service stations, with their precise dimensions, along a simple linear path, play a pivotal role in a large anthropized area. Thus the "station" can truly become an enlarged service "area," an interpreter of the vocations and needs of a place of belonging, therefore "belonging" to a specific part of the territory in a sensitive way (diffusion of products at km0, traffic, waste abandonment, microclimate monitoring and air-water quality ...).

Figure 9.1 Martina Roncolini and 9.2 Grata Viola, Florenze Smart City, Florence School of Architecture, 2020

The on-site conservation of stations located much more internally within the urban fabric, which are therefore smaller but strategically important as they are closer to the central historical areas, will necessarily have to become more specialized in addition to providing refueling facilities, probably focusing on logistics/short-range deliveries, benefiting from inherent population density. They can thus develop in height with the normal propensity towards the sky and new carriers, at the same time exploiting “panoramic” positions for catering activities (area near Campo di Marte, Figure 9.1), or using the tops of buildings to “get closer” to the new modes of air transport (Lungarno De Nicola, Figure 9.2) and finally directly borrowing some typical “airport” miniature spatial modalities (Via della Rondinella, Figure 10).

Figure 10 Carla Tufo, Florenze Smart City, Florence School of Architecture, 2020

4. Conclusion

It seems clear that the types of services offered lead to projects in which the height of the buildings plays an inevitable role, transforming them from accessory and utilitarian presences into real architecture. Leaving aside their forms and constructions, it is above all their roles and functions that mark an epochal transition in the rethinking of these urban "infrastructures," which from being designed for private traffic can become extended services for large swaths and settled areas, thus strengthening their role and contribution to the smart city. The services that the new service stations can offer, the implicit link with urban mobility systems and the consequent network diffusion make these installations the ideal cornerstones of an "intelligent" city which must absolutely not be renounced in the face of the changes that will bring about crisis if not properly thought out.

In these design simulations, cities can be reviewed starting with their voids to obtain widespread accessibility seen as a new urban value within everyone's reach. Moving from the city of the automobile to the city of "programmed" mobility represents a necessary rebalancing for every urban and historical organization, to increase efficiency and operating safety in a more homogeneous way. The evolution of the current mobility systems will therefore lead to a further radical change in city life towards a greater sharing of spaces and services, a "socialization" of coexistence which remains the underlying reason for them.

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