Current trends and targets of water outlets in public space

As discussed in the first part of the study, many cities have gradually let fountains fall into disrepair, due to public cutbacks and progressive underutilization, worsening public distrust in municipal water. However, new iterations of contemporary drinking fountains have emerged in the past few years.

About the new generation of water fountains, Peter Gleick, the author of “Bottled and Sold: The Story Behind Our Obsession with Bottled Water”, positively pronounced himself about **water-bottle-filling stations** like those made by Globaltap. On the contrary, Scott Francisco, the founder of a social-benefit design consultancy called Pilot Projects Design Collective and promoter of 100 Fountains Initiative, is not so enthusiastic of their utilitarian design. In his interview for the Landscape Architecture Magazine (Schuler, 2015), Francisco declared that “Some of these bottle-filler fountains (…) **just feel dead, and dumb. They’re not sexy.** They’re not speaking to me in a cultural way.” He said that people need “poetic, compelling, practical solutions that become part of who we are”. Scott Francisco expressed his preference for **more iconic solutions**, like the Benson Bubbler, the bronze fountain with four basins designed in Portland and previously described in the chapter dedicated to the evolution of drinking fountain though history. Benson Bubbler has become part of the culture and, for this reason, people take an extra care of this piece of urban equipment.

Vittorio Magnago Lampugnani dedicated a chapter of his recent book “Urban fragments. Small Objects that tell about the cities” (2021) to drinking fountains and their evolution through history. After he outlined the current crisis affecting this basic amenity, he argues that **modern water kiosks** – the ones providing potable filtered water, still or sparkling, represents a **missed opportunity** in the iterative design process of public drinking fountains: the aesthetic potential of these water stations in his opinion have been completely neglected, with no positive gain, for the neighborhood where they are located, in quality and identity.

Positive examples of contemporary and improved versions of fountains exist, though.

This chapter looks at several worldwide case studies and initiatives that can inform the research work in the **redesign of a street element** dispensing drinking water. Understanding previous design experiments is important since I can learn from the processes those projects followed, their urban distribution and public appreciation, and avoid wasting a great deal of time in creating something that has similar precedents, successful or not.

As the main purpose of this work is to rehabilitate the image of drinking fountain through the design of an innovative urban service, most of the gathered information focuses on qualitative data on innovative fountains and refill stations by different cities. Special highlights are provided for the design of the selected fixtures, their user interface and urban placement. A major challenge faced during best practices exploration was the **lack of quantitative data** like water stations’ measures, manufacturing costs and the approximate number of elements installed at each target area. Another challenge appears on the research of mode of installation of the street furniture, and its maintenance policy.

The identified case studies are briefly described hereafter, grouped into four categories; the most relevant elements – those particularly suitable for large-scale production or closer to the research design brief – are collected and evaluated in a **typological comparison matrix**.

Figure n. 133
Bas-relief drinking fountain in the courtyard of the Rathaus. Basel, Switerland, 2021. Photo by Ilaria Fabbri

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The following report collects and examines worldwide examples of contemporary urban objects, selected, primarily through internet research, based on three main criteria:

- best practices should include one or more outlets dispensing drinking water – so ornamental fountains with non-potable water are not taken into account;
- only completed projects are considered, despite web research returns graphic visualizations and intriguing design proposals. The aim of this choice is to get a sense of tangible issues and public use of the appointed cases;
- I looked for appreciable elements of novelty, in terms of design, or the use of technology or the process the project followed.

The four categories in which I grouped the selected best practices are:

1) Urban place making with drinking water
Tišina, Slovenia: the flow and remembrance; Banyoles, Spain: Old Town Refurbishment

2) Artist-designed urban objects
Minneapolis, Minnesota: drinking fountains as public art project; London, England: Tropism well; London, England: Tiffany across the water; Glasgow, Scotland: Design Exhibition Scotland prototype fountains.

3) “Stoop and drink” fountains at every corner
New York: Fire hydrant project; Pamplona, Spain: Tana by Mangado; Paris, France: O' Claire, Arceau; Melbourne, Victoria: Bent leaf drinking fountain by Draffin.

4) Advanced bottle fillers
Lisbon, Portugal: EPAL Bebedouros; Miami, Woosh station; London, England: Thames Water project; Dublin, Ireland: Meetpet station; Hong Kong, Well 井; Denver, Colorado: Instream water; Rimini, Italy: Aqua alma point

Figure n. 134
Overview of provision of contemporary public drinking fountains in major cities.

URBAN PLACE MAKING WITH DRINKING WATER

1. Tišina, Slovenia: The flow and remembrance
What: In the small Slovenian village of Tišina, Skupaj architects designed in 2013 a tiny yet suggestive spot in memory of two local priests, reinventing and combining bench and water outlet around an existing multi-stemmed tree by the church, where one of the priests used to rest. Both elements are made of pale yellow coloured concrete. The bench has a polygonal perimeter, and stays on hidden support, that lend it a levitating character. The fountain is crafted in the shape of a cylinder, with a simple push button faucet; the water is not collected in a drainage but freely flows over the concrete shaft and draws small rivers before they dry off.
A chronogram commemorating the priests is engraved in the bronze plate on the bench. Another small bronze plaque is fixed to the top of the cylindrical drinking fountain with line from the scripture in Slovenian language: ‘I will give unto him that is athirst of the fountain of the water of life freely’ (Rev 21:6).
Water mineral contents might colour the surface of the fountain with time and usage.
How much did it cost: 15.000 euros
Strengths of the project: Suggestive small intervention that offers a quiet place to stop under the shade of the tree, drink the water and contemplate the words from the scripture. The project creates a sense of place with simple materials and technology.
Weaknesses of the project: No water drain for excess water: wetted areas may impact hygiene perception.

2. Banyoles, Spain: old town refurbishment
What: In this project by Miàs Architects, water, including potable one, becomes once again the protagonist in the life of a medieval town gradually invaded by cars. The refurbishment uncovers intermittently the old drainage canals and reincorporate them into a sequence of open spaces, small squares and narrow streets that now only pedestrians can access. Lacustrine travertine, the same stone of Banyoles’ traditional architecture, is used to pave public spaces and channel water. A complete continuity between façade and pavements resulted from this design choice. A few existing elements were actually restored, since they play a significant role in the project: a stone fountain in Plaça de la Font, cast iron fountains in Plaça dels Estudis and Plaça del Teatre, stone arches of the original canal in Carrer Abeuradors and large blocks of stone, reused for paving Plaça Maior. New pieces of urban furniture, such as benches, bike racks and a contemporary basin for “stoop and drink” have been specifically designed for this project, like wooden trunks or scrap iron, traces of drifts in the “liquid” floor.

How much did it cost: 4.000.000 euros for phases since 2008
Strengths of the project: it builds a new sense of landscape rediscovering old town’s resources and its connection with water; it combines handcraft techniques with contemporary industrialised processes.
Weaknesses of the project: local travertine is the base material for covering, folding and opening the floor; it would have been inspiring an attempt to use it in a contemporary way also for dispensing potable water.

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Figure n. 135, 136, 137
The flow and remembrance, by Skupaj arhitekti d.o.o. Pictures retrieved from https://landezine-award.com/the-flow-and-remembrance-drinking-fountain-and-the-bench/

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Figure n. 138, 139
New details were added to give back the original purpose of old urban furniture dispensing water. Ph by Adrià Goula

Figure n. 140
In Plaça del Teatre, the new ground floor follows the wall lines of a demolished theatre that previously occupied the area.

Figure n. 141
Recovered fountain and canal pond in Plaça dels Estudis. Ph by Adrià Goula.

ARTIST-DESIGNED URBAN OBJECTS

1. Minneapolis, Minnesota: drinking fountains public art project

What: The long-term friendship between Minneapolis mayor Rybeck and Sandy Spieler, a theater artist whose work focuses on water quality, in 2008 led to the idea of using artist-designed drinking fountains to promote the city's tap water over bottled water and celebrate the city's rooted connection to the water of nearby lakes and rivers. The City Council initially looked for appropriate sites by considering their visibility and accessibility, their proximity to main public venues and gathering places, but also to municipal water sources. Prevailing economic reasons, however, encourage administrators to seek private partners who would agree to install the artefact on their plot, next to public ways such as pedestrian corridors or bike trails, and provide daily and ongoing maintenance.

The Public Art Advisory Panel received 38 entries from local artists, selected 10 proposals but only four were finally realized due to media controversy on budget funding, coming from the city's "Art in Public Places Program", added in 1992 to Minneapolis Improvement Program.

The five fountains-sculptures are very different from one another in terms of shape, material, dimension and water delivery; they are inspired variously by Native American myths, water molecules, and natural elements; the artefact from sculpture Andrew MacGuffie, a giant blue arrow with a bottle filler and dog bowl, particularly stands out and calls attention to itself and to the place with its bold form and color (Ivanov, 2015). Each piece of street furniture has a small label posted nearby with the artwork title and a QR code that smartphone users can scan to hear an audio recording of the artist talking about the work.

Despite their different appearance and original design, the fountains have fairly standard mechanisms for delivering and draining the water away, so more easily replaceable, but unfortunately not frost-proof, so they are usually turn off in colder months.

How Much Did it Cost: The city gave $500,000 for the project—$50,000 per fountain, but only four fountains were actually funded by Municipality. A fifth fountain, whose cost is unknown, was built by a private developer.

Strengths of the project: The initiative is a good example of public-private partnership focusing on street equipment with artistic value: Minneapolis Municipality paid for the realization of the four fountains, and maintains the water functionality, while local business or organization that offered is land as location, is responsible for the day-to-day and annual maintenance of the fountain. Moreover, this ground-breaking art project raises the bar on modern drinking fountains, and other municipalities got later inspired from.

Weaknesses of the project: firstly, only a handful of building owners partnered the initiative, so the fountains were merely built where the city could find a willing participant, and not in most desirable locations with the highest potential impact; secondly, they are conceived as iconic but isolated objects, and it does not seem they are able to create a dependable network with other simper water outlet throughout the city.

Finally, the lack of implementation and management plans regarding street furniture and public art: in fact, this exciting experiment was completely abandoned by mayor Rybeck's the successor.

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Figure n. 142, 143, 144
"Tilted Bowl Fountain," designed by Seitu Jones, 2011, installed in a redeveloped urban streetscape;
"Water of the Dodem Spirits", Peter Morales, 2009, along a strip mall boulevard; "Calamus", by Andrew MacGuffie, 2011.
Photos by Jossie Ivanon, Minneapolis, 2015.

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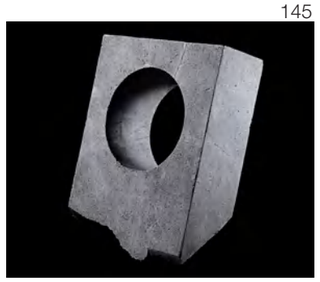

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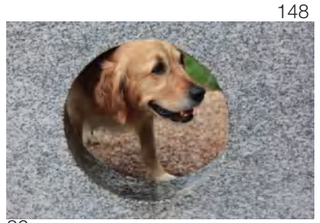

2. London, England: Tiffany—Across the Water

What: Many of the drinking fountains found throughout London's parks have gradually fallen into disrepair and are in need of refurbishment or replacement. To address this issue, in June 2010 Tiffany & Co. Foundation & The Royal Parks Foundation launched the initiative called "Tiffany – Across the Water", a detailed fountain restoration programme in London Royal Parks with the objective to improve the visitor experience and encourage sustainability.

This project focuses on the 43 existing drinking fountains within the city's eight Royal Parks, rather than on the construction of new drinking fountains in new locations; to replace those water points that would have been hardly restored, the Royal Parks Foundation hosted a nationwide design competition, in partnership with The Royal Institute of British Architects, to find "The Ultimate Drinking Fountain" that would have been installed and also served as a model for other urban parks around the world. Entrants were judged on aesthetics, robustness for life in a public park, ease of maintenance and installation, sustainability and environmental impact and affordability.

"Watering Holes" is one of the winning design proposals against another 150 submissions from 26 countries, designed by Robin Monotti Architects with Mark Titman.

It is a sculptural 800kg Cornish granite slab with three polished holes catering for adults, children, wheelchair users and pets, at three suitable heights, that greatly resembles an ancient sundial dating back to 3rd century BC, a unique slab with a cylinder hollowed out of its centre, excavated from a Greek settlement named Ai Khanoum in Central Asia. The chamfered holes allow the experience of a sense of immersion while drinking, as the user's face is framed for other viewers to see. These playful experiences are redolent of both the seaside face frames where photos are taken on holidays, and of the wishing wells in which one places one's head.

To the lower side of each circular hole is the mouth of a water jet that is controlled by a respective stainless steel button set in the brushed steel plates on the sides of the granite slab. When one of the buttons is pressed, the water flows down the corresponding circular cut; and the circle's chamfer prevents any splashing to reach the person drinking. Having reached the lower section of the circle, the water flows down the face of the fountain to be collected in a trough at the bottom through which the water is drained. An anti-graffiti sealant is applied to the face to ease maintenance and give the surface water-proof properties.

The design process included a "dog consultation phase" to ensure that the urban object would have been suitable for all users. In 2011 dogs have been trying out a polystyrene prototype of "Watering Holes", tested in Hyde Park.

The design was tweaked after feedback from pet owners and the Watering Holes was completed in 2012.

How Much Did it Cost: $1.25 Million was designated to run the design competition and restore or replace the 43 existing drinking fountains within the Royal Parks, as well as the creation of a stunning new water fountain in St James's Park and restoration of The Italian Gardens in Kensington Gardens. Celebrating its 10th Anniversary, the Tiffany & Co Foundation provided a $1.25 Million grant to fund the project.

Strengths of the project: Watering Holes combines urban service with iconic sculpture, which is monolithic and robust; the three holes connect the user with both the stone material and the action of drinking, in a playful experience, broadly accessible and quite intuitive.

Weaknesses of the project: High costs. The project was actually made possible thanks to the generous gift from The Tiffany & Co. Foundation; actually, only one example of "Watering Holes" fountain has been built and is now installed in The Green Park, London. The Middle-height hole is not suitable for bottle refill, as the water jet is too low; remote monitoring for maintenance scheduling and usage data.

3. Glasgow, Scotland: Design Exhibition Scotland prototype fountains

Design Exhibition Scotland is a pioneering project launched in Glasgow in 2018 that celebrates, supports showcases original design ideas with the expressed aim of introducing outstanding objects for everyday use to a wide public audience. Among the different artistic and design trends, DES has been investigating on drinking fountains since the founder Susanna Beaumont recognises the compelling reasons to revive and update the design of this basic urban service to provide free drinking water when we are out and about and help reducing single use plastics.

For 2019 edition, DES has commissioned three prototype drinking fountains; the first one is designed by Tania Kovats, a circular and free-standing element covered in hand-mad, tin-glazed earthenware tiles, that the artist painted in a watery blue colour. The second proposal for a contemporary drinking fountain comes from Bad Furniture, the collaborative practice of Glasgow-based artists Laura Aldridge and James Rigler; they crafted both an indoor and an outdoor solution, but all of them feature a ceramic circle frame in bold colours where the water source is located and users should insert their reusable bottle, and a decorated backdrop made of sheet aluminium.

In early 2020 DES also invited Mirrl group to develop a drinking fountain, suitable for indoor and outdoor locations as well. The designer teams from Glasgow carefully considered accessibility, form and function and the importance of catching the eye and adding a well-designed object to our everyday landscape, they

collaborated with Ibrox-based Neptune Fabrications on the inner workings and metal parts, with the aim to ensure the highest hygiene standards, ease of installation and maintenance, and most effective technical solutions. The team cladded the fountain with their tough and distinctive surface material with a resin finish which they called "mirrl", after the old Scot's word meaning a speckled, marbled or variegated appearance. The designers have previously crafted this innovative covering into furniture, bar tops and kitchen units over the last few years. The fountain is named after William Dixon who founded the Govanhill ironworks in the early 19th century and who gave his name to Dixon Avenue, where Mirrl have their workshop. The first Dixon prototype was tested in early 2021 in Queen's Park, Glasgow, thanks to Inhouse events and was moved later on to London, outside South Kensington tube, on the occasion of London Design Festival - Brompton Design District in 2021. Dixon fountain will be shown again from march 2022 at the exhibition "Plastics: Remaking Our World" at Vitra Design Museum.

Strengths of the project: the initiative from DES recaptures the spirit of older fountains, celebrating free drinking water in the urban environment, and draws attention on these small monuments in Contemporary Art Discourse.

Weakness of the project: Lack of data about usability experience with the elements and little innovation in the way water is delivered.

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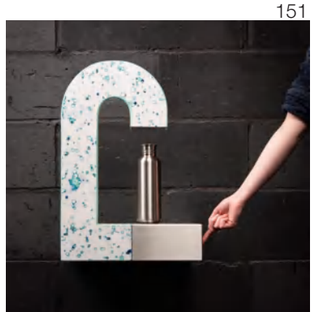

Figure n. 145
A third century sundial, measuring 44.6 x 34.3cm, from Gymnase in Ai Khanoum, Afghanistan, was an important source of inspiration for “Watering Holes” fountain. Photo by Thierry Ollivier, Musée Guimet, Paris. Getty Images

Figure n. 146
Watering holes, located near the Bomber Command Memorial in The Green Park.

Figure n. 147
Child drinking from the fountain by Robin Monotti Architects and Mark Titman.

Figure n. 148
The fountain also accommodates dogs, who can drink cool, fresh water from the lower hole. Retrieved from https://www.royalparks.org.uk/parks/green-park/things-to-see-and-do/memorials,-fountains-and-statues/watering-holes

Figure n. 149
WELL, 2021, by Tania Kovats installed at Fruitmarket. Photo by Ruth Clark

Figure n. 150
Bad Furniture Proposal for a drinking fountain with trough (outdoors), 2019. A botanical drawing is digitally printed on to the fountain’s aluminium backdrop. The fountain is linked directly by a pipe to mains water. Fresh cool water is then released by pressing a small button and delivered via a spout set within the orange ceramic circle. On the ground sits a semi-circular drinking trough for thirsty dogs. 255 x 110 x 50 cm.

Figure n. 151
DIXON fountain wall mounted version, with distinctive Mirrl’s surface and an aluminium and stainless steel chassis manufactured by Neptune Fabrications of Ibrox.
Image by Johnny Barrington.

4. London, England: Tropism well

What: London design studio Poietic, founded by Richard Harvey and Keivor Stainer, designed and developed the Tropism Well, a sort of interactive sculpture with the aim to raise awareness on frequently ignored water fountains and transform the basic piece of furniture into a careful waiter who recognizes approaching guests and pours with precision measured amount of liquid for them in their vessel without any overflow.
The first version of Tropism well, designed in 2011, employed a linear actuator to bend the neck, but the movement jerks like a robot. Then the group realized the weight of the water could be used to achieve a more natural bowing motion.
Poietic studio tested the first prototype in Brockwell Park in Brixton, where it obtained an extremely positive public’s response for its fascinating humanized movements; the team gradually worked at further iteration.
The final model is almost 3 metres tall, with a base of stacked wooden discs, likewise a spine of a creature, a stainless steel neck joined with a transparent pipe, and a glass carafe on the end; when pouring liquid its total length is around 2,50 metres.
Tropism Well is built entirely by hand.
It uses a camera facial recognition software and ultrasonic sensors to detect the presence of a thirsty person. Once approached, it gracefully bows towards the guest; as the weight at the top increases, the Well further bends its neck, pouring water if the sensor installed on the carafe detects a waiting receptacle, regardless the user’s height, so even little children can successfully enjoy the service.
In order to widen the offer, the installation is equipped with an insulated canister able to keeps cocktails cool or mulled wine warm as well.
Currently there isn’t any concrete plans to have this object installed as an outdoor permanent fixture in parks, but can be rented in festivals and events as a special host as it encourages conversation: amazed guests are expected to respond to this elegant drinks pourer as if it were a living thing. The installation not only draws in visitors, but forces them to consider the act of taking water and how water is distributed in public spaces (Pham, 2011).

How Much does it cost: nearly 21.000 euro before VAT and local taxes.
It is also available for hire worldwide, packed in a single flight case.

Strengths of the project: Tropism Well gives a bit of humanized personality and a playful component to an ordinary object, brings people together and engage them in a daily healthy action.
The grater innovation lays in its experience making: it creates a meaningful micro experience transforming a sip of water in a special gift.

Weakness of the project: Little capacity (12 litres) makes the fountain unsuitable for automatic installation in the public spaces, as it is not even connected to the municipal water.
The sophisticated technology equipment and handmade structure make the element highly susceptible to vandalism.

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Figure n. 152, 153
Tropism well Testing stage with the community at Brockwell Park, London, in 2011
Photo retrieved from https://harveyandjohn.com/work/tropism-well-mk1/

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Figure n. 154
One of the O' Claire fountain, with its slanted jet flowing out the iconic ring. Retrieved from https://www.cecileplanchais.com/en/my-product/fontaines-oclaire-ville-de-paris/

Figure n. 155
Little boy drinking from the side tap of the fountain, in Place de la République in Paris.
Retrieved from https://www.apc-paris.com/actualite/changement-climatique-a-paris-quels-impacts-sur-leau

BASIC "STOOP AND DRINK" FOUNTAINS AT EVERY CORNER

1. Paris, France: O' Claire, Arceau

What: in 2000, the Municipality of Paris started looking for contemporary models of drinking fountains to encourage residents and tourists to enjoy local tap water and further enrich the Capital outdoor equipment: the so-called Millennial fountains, a series of slim drinking totems in the shape of vertical poles, which can be easily moved according to temporary outdoor events, the sculpted human figures of "Les Poings D'eau" by Pascale Marthine dispensing potable water, the sparkling water kiosks, and the O'Claire drinking fountains.
The last ones are iconic urban elements conceived by the sculptor and designer Cécile Planchais and realized by the foundry GHM, highly qualified in aluminium casting techniques. The most distinctive feature of this fountain is a curved ring at the top of a columnar body, where the water source is located; it is worth noting that this circular shape reminds the vowel "O", that in the French language sounds like the word "eau", water. The ergonomic design of this street element makes users drink, standing up, embracing the ring and facing the surrounding landscape.
O' Claire has a cast-iron structure in a tapered cylindrical shape, measuring 1,20 metre from the ground to the highest point; the body is covered in moulded aluminium, assembled in factory with invisible junction and colourless anodization.
The fountain comes in two versions: the one providing a vertical jet at the top, whose control button is fixed at the cylindrical body, and a second model with a downward aced jet that flows out a stainless brass water outlet on the upper part of the ring; in both cases, the nozzles provides a water flow of 0,15 litres per second, adjustable on site.
A stainless steel, timed flow tap can be added on the side of the fountain by request, and dispensed 3 litres per minute. The metal plate at the base allows an unobtrusive anchoring at the group, with the possibility to have small slits on it, in order to drain excess water from the optional side tap.
After the design and manufacturing process, the first fountain of this kind has been installed in 2012 in Place de la République; four years later, the participatory initiative started by Ms Hidalgo, the mayor of Paris, favourably voted for the development of this object throughout the city, and it is currently adopted in all districts: 320 fountains of this type are currently installed throughout Paris, according to the manufacturer and local archive.
O' Claire fountain has also been successfully distributed elsewhere in France and abroad since 2012, so that the water provider Eau de Paris renamed it "Arceau" to refer the models located within the French capital.
Strengths of the project: Recognizable aesthetic that also brings innovation to the way a "stoop and drink" fountain delivers water, if compared to standard and up-and-running models of arced spigot with metal mouthguard.
Weakness of the project: The later tap is the only one accessible water outlet for children or people with disabilities; beside, it is also an optional feature, and when not installed at all, the fountain is not accessible to people of small stature or with limited bending abilities.

2. Pamplona, Spain: Tana by Francisco Patxi Mangado

What: Tana is a simple yet elegant stoop and drink fountain designed in 2000 by the Spanish architect Francisco Patxi Mangado as one of the amenities in the courtyard of Pamplona Congress Hall, also built by him. The name comes from the last part of the Italian word "fontana" which actually means "fountain". Tana features an L-shaped body made from cast aluminium, with a black polyurethane paint finish, forged effect. Both sides of the L measures 1,10 metres in length, and 28 centimetres in width. The lower part, at the ground level, consists of a water collection grating, while the vertical body houses the spout, a stainless steel nozzle which creates a downward arc toward the drainage, all the mechanisms and the circular control button on the rear side, where also the inspection hatch is located.
The geometry ensures a comfortable access also for users in wheelchairs with, when appropriate floor surface and clear floor space for lateral approach are granted.
How much does it cost: 1520 euros, installation excluded.
Strengths of the project: essential, smooth urban element with contemporary lines that can fit very different locations. Given the simplicity of this basic service, moderate maintenance costs are expected in the long run.
Weakness of the project: Not self-standing, it requires a concrete ground basement, zinc-plated steel bolts
and stainless steel screws for anchoring to the paving.

3. Melbourne, Victoria: Bent leaf drinking fountain by Draffin

What: in 2014 Victorian Health Promotion Foundation (Vic Health) started "Water Initiative", aimed at promoting water consumption over sugary beverages, particularly common in Victorians drinking habits, and major cause of overweight and dental decay. One of the main actions of the programme deals with the improvement of drinking water access and the installation of contemporary fountains at strategic and busy locations. Draffin manufacturer specifically realized a new water station, the Bent Leaf Drinking Fountain, with an arced spout, a bottle filling tap and an optional self-filling dog bowl. It is made from a 316 Marine grade stainless steel with electro polished finish, so the fountain is highly resistant to corrosion and suitable for the most extreme environments. The city of Melbourne in collaboration with Vic Health installed 60 Bent Leaf fountains, at regular intervals along major pedestrians or bike trails and other civic places, with special attention to their accessibility from all directions.
An interactive geolocated map shows the nearest fountain and its type – whether equipped with dog bowl, bottle refill or both.
How Much does it cost: about 3200 euros, taxes and freight excluded.
Strengths of the project: the initiative shows how investing in drinking fountains can have a positive impact on public health, individual finances, and even waste diversion.
Weakness of the project: it requires a sub-surface mount and bolt to a concrete footing, using supplied galvanised steel rag cage and bolts.
Despite being extremely tough, stainless steel gets easily dirty due to water limestone, and this could affect hygiene perception; moreover, a natural patina of scratches and stains will always occur on highly polished surfaces, so minor repolishing might be required over the long haul.

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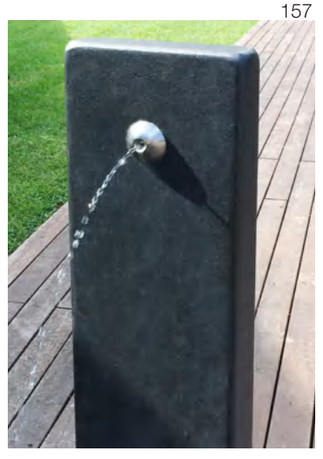

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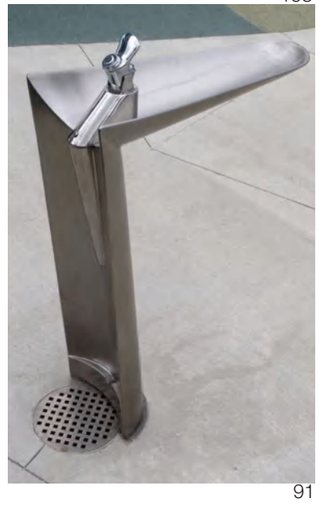

Figure n. 156
The L-shaped Tana fountain. The picture, despite coming from the producer, shows an unfavourable positioning that limits lateral approach to only one side of the element. Retrieved from https://www.escofet.com/en/products/urban-life/fountains/tana

Figure n. 157
Tana fountain dispenses free potable water from a stainless steel nozzle located on a vertical surface, that creates a long downward arc. Retrieved from https://www.escofet.com/en/products/urban-life/fountains/tana

Figure n. 158
The Bent Leaf drinking fountain, originally designed for the city of Melbourne, features a curved stainless steel construction that channels excess water down to a large drain at ground level. Sid bottle refill tap and a self-filling dog bowl can be added by request.
Retrieved from https://draffin.com.au/product/bent-leaf-drinking-fountain/

Figure n. 159
Hydrant on Tap model in use. Photo © Tei Carpenter/Christopher Woebken

Figure n. 160
Hydrants for All with two persons using it simultaneously. Photo © Tei Carpenter/Christopher Woebken

Figure n. 161
A dog drinking from the lowest bowl of the *Hydrants for All* design version. Photo © Tei Carpenter/Christopher Woebken

Figure n. 162
A dog drinking from the lowest bowl of the *Hydrants for All* design version. Photo © Tei Carpenter/Christopher Woebken.
Retrieved from https://urbanomnibus.net/2019/01/new-public-water/

4. New York city, NY: New Public Hydrant

What: in 2011, the advocacy group New Yorkers for Parks gave the city's drinking fountains a D grade, the lowest grade of any park feature. The problem is not tap water quality, but accessing it: water fountains often unusable because of insufficient pressure, missing parts, or structural damage, and, more generally, few and far between.
New Public Hydrant emerged out of a discussion with the Department of Environmental Protection in New York about redesigning portable water stations launched with "Water on the Go" program, and make them more welcoming to the public, easier to understand, and simpler to use (Carpenter et al., 2019). New Public Hydrant project also aims to reinvent fire hydrants, that are ubiquitous and dispenses the same water that feeds residential taps, but cannot be fully opened as they are, due to the water pressure of the network.
A design team headed by Tei Carpenter and Christopher Woebken responded to the Water Futures call curated by Jane Withers Studio Brooklyn creative hub A/D/O; the year-long programme started in spring 2018 and hosted a series of symposia, workshops, exhibitions, events, and a design challenge that asked applicants to investigate and propose new and innovative ways of approaching drinking water and reinvigorating its relationship with citizens. Designers combined standard plumbing parts, painted in blue, and realized 1:1 intervention that transform city's fire hydrants into public drinking fountains or showers. The design proposal came in three different versions; the first one, Hydrants for All, aims to accommodate humans, pets and birds simultaneously. The lowest basin is for thirsty dogs, cats, and other animals at the ground level; at mid-level there is a couple of facing drinking fountains with upward water spigots for adults and children; finally, the top vessel forms a small bird bath. A continuous vertical pipe and four shut-off valves connect these three levels.
Hydrant on Tap is the second version and consists of a gooseneck head and long handle for reusable bottle refills. The third solutions, Hydration Space, is an immersive microclimate with sprinkler that shoots water upwards, in which visitors can relax, play and cool down underneath an adjustable water canopy.
All three of these interventions would feature shutoff valves, to avoid wasting water when not in use.
The designers consider they three prototypes as the first step towards a more articulated process of iterations and solutions to extend the functions of existing water infrastructure; additional versions could include, for instance, a micro-hydropower station recharging phones and other portable devices, or a water collector for bees to support local pollinator life.
Strengths of the project: the proposal brings attention to overlooked infrastructural elements in the city, only occasionally used during moments of crisis, that are transformed, through a low-cost and low impact design intervention, into something useful in everyday life.
Weakness of the project: despite being actually prototyped for the exhibition of Water Futures research programme, New Public Hydrant's solutions remain, for now, a conceptual project, not developed into a citywide initiative yet. Moreover, exposed plumbing fixtures are prone to vandalism and can crack, break, or even burst in extreme weather, with consequences on water quality and temperature.

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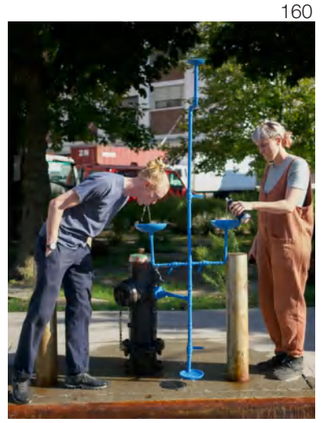

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Figure n. 163
A four-legged user of the new drinking fountain in Avenida da Liberdade, Lisbon.
Photo by Daniel Rocha.
Retrieved from https://www.publico.pt/2020/01/27/local/noticia/lisboa-volta-bebedouros-ate-caes-bebem-1901873

Figure n. 164
Detail picture of the bottle filling tap and its intuitive infographic.
Photo by Inês Félix.
Retrieved from https://www.timeout.pt/lisboa/pt/noticias/lisboa-vai-ter-200-bebedouros-modernos-e-inclusivos-ate-2021

ADVANCED BOTTLE FILLERS

1. Lisbon, Portugal: EPAL Bebedouros

What: The new water fountain in Lisbon, inaugurated on January 27 2020 along Avenida da Liberdade in Lisbon, marks the beginning of the project “Bebedouros de Lisboa” that, in the design intents, will allow free access to quality water, for children, adults and people with reduced mobility, also providing water for pets hygienically and safely. The initiative “Bebedouros de Lisboa” takes place within the scope of European Green Capital 2020, a contribution in the city commitment of being cleaner and more sustainable. This project is the result of a partnership between CML, EPAL (Grupos Aguas de Portugal) and GEOTA (Study Group on Spatial Planning and Environment), which will contribute to reducing waste from single use plastic bottles, valuing water as a scarce and universal resource and improving well-being and quality citizens' lives. In the first phase, 30 drinking fountains are planned for Lisbon, mainly in green areas and at major public venues, but the goal is to reach 200 urban elements in the next years, in open and closed spaces throughout the city.
The new water station, designed by architect António Braga in the shape of a dark-grey column, features both a drinking fountain and a tap for bottle refill, encouraging the reduction pf plastics; close to the ground, a metallic bowl supplies water to pets, too. Push buttons, tap and pet basin are made of stainless steel; a white, simple, infographic stands out against the dark painted surface.
Despite the objective of being widely accessible, local citizens and designers expressed some doubts about the real accessibility of the piece of urban equipment, because of the height of the control buttons and the excessive closeness of the spigot with its upward jet to the partition, which detracts from the overall comfort of the “stoop and drink” fountain.
EPAL also developed a geo-located app that displays drinking fountains locations in a map, and where locals and tourist can buy the reusable bottle specifically designed in the frame of this project; in addition, with H_2O quality app, municipal water parameters like calcium, magnesium, chlorine, hardness and pH, and the different stages of control, are available for consultation.
How Much does it cost: The initiative involved an investment to EPAL of around 400000 euros, which means 2000 for each water station, excluded long-term maintenance, that Lisbon City Council is in charge of.
Strengths of the project: The initiative raised awareness on the importance of a proactive and contemporary water management policy, particularly important in tourist and busy sites. Interestingly, the installation of new models came along with the plan of restauration of some of the most iconic fountains already existing in the city.
As regards to the piece of street furniture, the simple multipurpose design caters for humans’ and pets’ daily hydration need, and its dark tone can fit seamlessly in almost any urban environment.
Weakness of the project: Based on local users and reported experience, the accessibility of the system should be improved. The lack of sensors and water meter curbs the possibility for public administrators to get useful insights from the project, like the number of real active users of new “Bebedouros de Lisboa”.

2. Rimini, Italy: Aqua Alma Point

What: Aqua Alma point is a bottle refill station designed and produced by Cosmetal, an Italian business part of Celli Group, a leading company in the construction of beverage dispensers. This product, officially presented on 18 October 2019 at the Host Trade Fair in Milan, can dispense different types of water, cold or at room temperature, still or sparkling, and with several flavour options that enrich the drinking water experience (added minerals, rosy/lemony/mint/lavender after taste). Users can create customized combinations in terms of flavours and level of sparkling in the desired quantity, from a glass to a litre. The machine works with different payment system, from coins to touchless car reader, but the refill experience is at its best when using the dedicated App, that manages profiles, preferences and recipes, and allows customers to check their hydration level and find the nearest Aqua Alma Point. When the app profile is paired with Aqua Alma Smart bottle, with QR code from smartphone to bottle, and with NFC technology from bottle to machine, the system recognizes users, displays promos and suggestions according to the past dispensing preferences, thanks to a 12-inch touchscreen, accessible to wheelchair users, too. The dispensing compartment can house different water bottles in standard sizes, and it is equipped with sanitization LEDs, to ensure the highest hygiene levels.
Aqua Alma points are cloud-connected and constantly monitored, both for maintenance scheduling and commercial purpose.
Strengths of the project: even if indoor workspace is actually Aqua Alma Point’s main channel, the manufacturer is developing “green Building project” dedicated to residential units. The dedicated app can raise awareness about personal need to drink more water and encourage positive challenges in self-hydration and environmental friendly behaviour, with the possibility to share personal performance on social media.
Weaknesses of the project: bulky design with only one operating side, not weatherproof, so unsuitable for outdoor location; the dispensing process, despite being technologically advanced, appears unintuitive and time-consuming, and requires two hands to be properly operated.

3. Hong Kong: Well 井

What: Well井 is a smart water station developed by the Hong Kong based company Urban Spring to encourage residents and tourists to bring their own bottle with them and help reducing the consumption of single-use plastic bottled water. It comes in the shape of a slim column, painted in black, with a colour block indentation where to rest the bottle and refill.
More than 200 stations are actually installed throughout Honk Kong within public venues, like retail districts and small shops, schools and sport centres).
Strengths of the project: The most interesting feature is the network of services and rewards set up for users. Local businesses involved with the initiative provide Well井 smart water stations at their location, and promote the refill culture; members of Well井 community (so everyone with the related QR reusable bottle) can refill it for free and are rewarded with special offers for healthy products or experiences.
Weaknesses of the project: The station is only suitable for indoor environments or covered, whether-protected areas.

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Figure n. 165
Aqua Alma Point station under a canopy within a residential unit. It is not suitable for outdoor locations, but it can effectively help reducing plastic waste and simplifying drinking water collection at household level.

Figure n. 166
Well井 iconic water dispenser with bright turquoise color block.

Figure n. 167
Discount voucher on selected items and services at local business.

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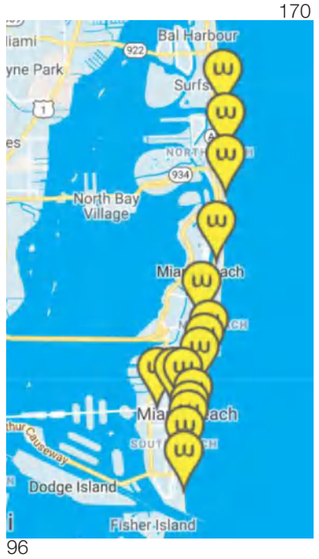

4. Miami, Woosh bottle service

What: On February 15th 2018, Greater Miami Convention & Visitors Bureau (GMCVB) inaugurated the first of 25 water stations in Miami Beach, a pilot project from Woosh, a startup founded in 2010 in Tel Aviv developing smart solutions to reduce the consumption of disposable plastic bottles in out-of-home context. Each Woosh station dispenses chilled, purified water at a fraction of the price of bottled water, and a bottle rinsing service: the Israeli group strongly emphasizes the need to keep personal reusable bottle perfectly clean, and introduces an innovative function that thoroughly sanitize any vessel and removes impurities in 10 seconds with a patented ozone enriched water jet. The urban version is about 1,70 metre in height, rounded-square in section, and gets thinner in the upper half, featuring a water window, to refill and rinse the bottle. Water enters the Woosh station from the city water main, is purified and chilled; the water is also spun automatically every 10 minutes to keep it fresh.

The touch-screen of the top let people choose the size of their container, for a "pay as you go" pricing, with a debit or credit card; alternatively, by purchasing a pre-pay package, users get free bonus and a faster and easier access: as members, they receive a small keychain sensor to login when they refill their bottle and their account is updated after every usage.

The Woosh Water Stations tracks the frequency of use, and displays to each member the positive impact on the environment in terms of reducing plastic waste and carbon emissions by using a reusable bottle, as well as how many all Woosh users have collectively avoided. Therefore, the stations can be used by anyone, but the system works best when users join the network and become members (Tackett, 2013), since it provides a social reward and incentive for people to hydrate and reduce plastic waste. The screen can also display health and environmental tips, city messages and promotional advertisement through which municipalities could recover the expense of the machine and maintenance.

Miami is the first city in the world to use this water station on a large scale, in a concessionaire type of agreement (the 25 stations have been installed and maintained by Woosh Water. Others pilot are expected to follow.

How Much does it cost: The cost to build each pilot machine, at the beginning of Woosh activity, was about $22,000, but it is reasonable to assume that it should be chaper with a larger distribution.

Strenghts of the project: Woosh features a recognizable design and a pleasant matching set of accessories (bottles, fobs, chip keychain…).The bottle rinsing option is the first of its kind in an outdoor water station, an additional nudge to take advantage of tap water and avoid single-use plastic bottles. Data collection on users' behavioural patterns and remote monitoring allows service provider and public administration a precise management of its infrastructure.

Weaknesses of the project: The touchscreen interface: "pay per fill" option is inaccessible to visually impaired users and looks outdated if compared to contemporary smartphone-based solutions; the refill point and the screens are at too high a level to be reached by people with physical disabilities, and the rinsing system prevents an advisable single-hand operation. Woosh membership and bonus are potentially interesting but not connected to other urban services.

5. London, England: Thames Water project

What: to reduce plastic waste and encourage more people to drink tap water, Mayors of London have set up several initiatives in the last years; Thames Water Project is the biggest single-use plastic reduction initiative of any UK city, started in October 2018 from the collaboration between Greater London Authority and Thames Water Ltd, a large private utility company responsible for the public water supply and waste water treatment in most of Greater London, the counties nearest to the capital, and some other parts of England. The initiative aims to install 100 drinking fountains at key areas across the capital, including Camden, Greenwich and Southwark, where thousands of workers and tourists walk by every day. The appointed 100 locations are visible spots in busy and easily-accessible public spaces, like subway stations, retail districts, open air markets, green areas and playgrounds.

Early in 2018, MIW Water Cooler Experts successfully bid for and were awarded the contract for the realization of the water points, a customization of a standard product from Elkay-Halsey catalogue (the outdoor bottle filler pedestal, in a non-filtered and non-refrigerated version). The final model developed for Thames Water Project is tougher, safer and more accessible than the basic one, and more easily noticeable in the streetscape for anyone wanting to fill up thanks to a giant distinctive blue water droplet at the top.

Municipality and Thames Water cover the cost of the fountains and their installation, while they will be owned, maintained and cleaned for 25 years by Thames Water.

According to most recent Sadiq Khan's declaration concerning this topic (December 20 2021), 90 drinking fountains are now in place and open for public use across 21 boroughs and the City of London; Greater London Authority is currently on track to deliver at least 60 more by the end of 2022.

In addition, the London Plan- the statutory spatial development strategy for the Greater London – calls for free drinking water fountains in appropriate locations in new or redeveloped public realm, with management and maintenance secured and agreed at the planning stage.

To further support thirsty passengers carrying their own bottle, London Mayor's Office partnered with City to Sea to deliver the Refill London campaign, providing over 4,300 refill points across the city, up from approximately 200 when the programme started in March 2018.

How Much does it cost: GLA and Thames Water Utility invested 5 million pounds in the project (2,5 million each); this sum will cover sites arrangement, tailored redesign of catalogue standard refill stations, the installation, scheduled sanitation visits and aftersales service for 25 years from Thames Water. Just as a reference, the cost of a basic pedestal filling station from Halsey Taylor brand, non-filtered and non-refrigerated but freeze resistant is about 9000 euros.

Strengths of the project: The project sets up a reliable network of water source in busy areas and tries to make drinking fountain again a recognizable and widespread element of street landscape, likewise other piece of street furniture.

Weakness of the project: There is no explicit attempt to connect water stations to other urban services, neither in terms of positioning nor functional integration of "non water" features into the sturdy design of the refill points.

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Figure n. 168
Urban placement of a pilot Woosh station in Israel, design by Yuri Movshovich.
Picture retrieved from https://www.yurimovshovich.com/portfolio/woosh/

Figure n. 169
Focus on Woosh water window where the nozzle for the refill and the rinsing system are located. Customers can take a limited range of bottles or cups of their own, given that the room between the two water sources hardly accommodates vessels of more than one litre in capacity.
Retrieved from https://i2d.co.il/story/woosh-water/

Figure n. 170
The 25 Woosh stations in Miami pilot project, in the fountain-locator map at the company website.
https://i2d.co.il/story/woosh-water/

Figure n. 171
One of the "Drinking Fountains for London" refill stations, a project started in 2018 from the collaboration of Thames Water and Greater London authority, aimed to install 100 drinking fountains across UK capital.

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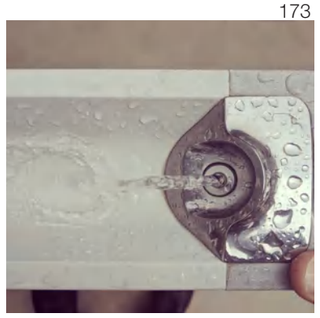

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6. Dublin, Ireland: MeetPat contactless station

What: Eurostat statistics about waste generation and recycling rates across EU member states for 2018, showed that Ireland is producing the highest volume of plastic waste per person, while having the fourth worst recycling rate for the material (Murray, 2021). Several projects have been set up across the country to promote the use of personal flasks instead of disposable bottles for daily hydration, along with earnest plans to increase the number of urban refill points in every city.

In this framework, MeetPat products has entered European market of water stations for the first time, being already appreciated across Sydney and Melbourne, with more than 200 units used on a daily basis and real-time monitored since 2018.

MeetPat is an Australian-based company developing portable and permanent water stations and drinking fountains with iconic design and innovative features. The word PAT is tap backwards, as the company's goal is encouraging people to "meet" the tap. MeetPat production range includes portable, X system and permanent versions. The portable refill station, particularly suitable for pop-up events, is lightweight and stows away into a durable bag that carries all the unit's accessories; a single person can set up and assembly it. The plastic base can be filled with water for additional stability. Units can be used individually or linked together to create a versatile water wall and hydration station. The X system is a semi-portable, interconnecting, large event based system, a hybrid between the portable and permanent versions. Multiple units are connected together on a metal flooring with ramps, with enclosed tamper proof plumbing.

The permanent version in designed for public outdoor places and includes water fountain, bottle refill station and all-in-one unit, at three different heights. A further version is the 1500mm-high bottle refill station with chilled water, available in outdoor, weatherproof IP rated construction as well as an indoor, undercover variant.

Permanent units are fitted with a remote monitoring technology and software: connected to the Lora network, the IoT metering system provides live park and unit usage data, usage behaviour analysis, sustainability reporting, maintenance scheduling and fault reporting. MeetPat products are specially designed for wheelchair users and children, and equipped with an optional recessed dog bowl that pet owner may activates with the X foot pedal and cannot be knocked over.

In summer 2020, Fingal Country Council installed the first smart contactless drinking fountain in Europe, and other nine ones have followed, to tackle plastic waste in the safest way even during the pandemic. Recent Irish installations of MeetPat stations are located at Dublin Zoo (4 units), within the University area, at Malahide Castle, Howth and other busy districts, for a total number of 30 refill stations in Dublin and nearby areas.

Strengths of the project: an iconic, sleek design – winner of IF design award 2020 – suitable for very different urban environments, with completely removable and replaceable graphics panels, also serving as branding space.

Weakness of the project: despite the sophisticated remote monitoring system, there is no connection with other urban services throughout the city and the dedicated dashboard serves only water stations' data; Also, the thoughtful design of all other components doesn't include the chiller enclosure, which appears just placed against the unit.

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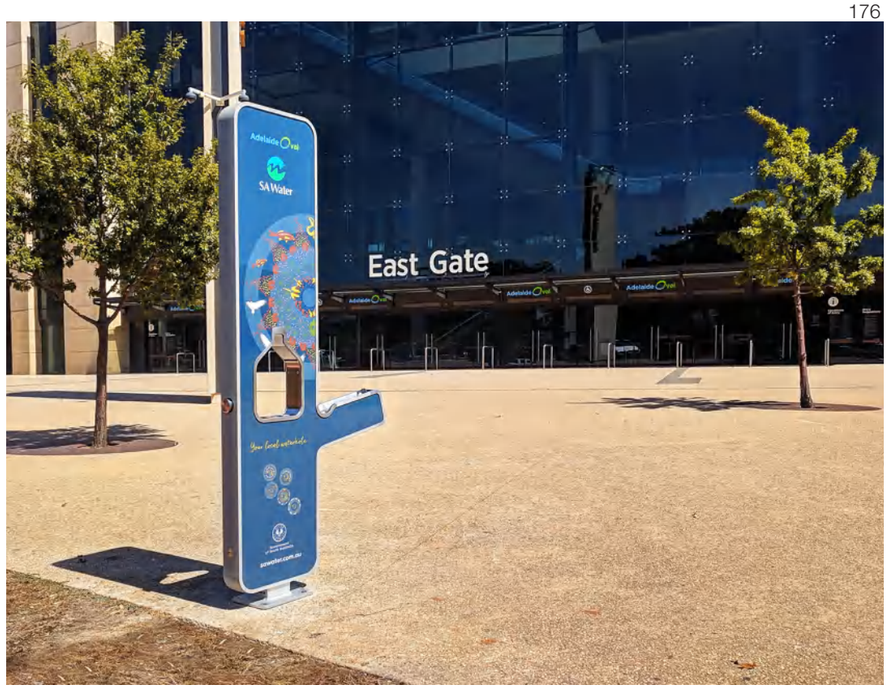

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Figure n. 172
South Albury Active Space completed in October 2019 includes a new outdoor basketball court, contemporary fitness equipment, an upgraded beach volleyball pitch, seating, shaded areas and a MeetPat permanent station, all-in-one version, combining both bottle refill station and drinking fountain, with a dog bowl at ground level.

Figure n. 173
Detail of the drinking fountain nozzle, whose design improves hygiene, limits cross contamination and makes fresh water accessible to people of all ages and physical abilities.

Figure n. 174
Detail of the dispenser window, accessible from both sides, and the special bottle rest that allows single handed operation.

Figure n. 175
One of the three MeetPat stations installed in Palma de Mallorca in January 2020. The one in the picture is located at Mercat Pere Garau, a popular public venue.

Figure n. 176
In 2019, 4 MeetPat water stations were installed in Adelaide; the one in the picture is located at the entrance of Adelaide Oval, East Gate, one of the most attractive sporting grounds in the world.

Figure n. 177
"The One" MeetPat station installed in a public space in Albury; lighting up the top of the fountain at night with a solar powered, remote monitoring system, the piece of urban furnishing provides greater accessibility and wayfinding in the streetscape.

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Figure n. 178
An Instream water station located outside in an office district; however, current refill locator only reports indoor positioning.

Figure n. 179
Detail picture on the dispensing head of the station. To work properly, the Instream bottle should be placed exactly onto the NFC reader embedded in the machine.

Figure n. 180
Transferring fund and dispensing preferences from the Instream app to the bottle through NFC sensors.

7. Denver, Colorado: Instream water

What: Instream Water is a Denver based start-up focused on developing tangible solutions to curb single-use plastic water bottles use. The group developed technology advanced refill stations where people can get filtered water with their reusable bottle for between $0.01-$0.03 per ounce – about $0.34-$1.00 per litre, depending on water type (room temperature, ice cold, or sparkling).

The cylindrical water refill point is 198 centimetres tall, with a diameter of 76 centimetres and a metal envelope. The manufacturer claims that the service is weatherproof and can be installed in any public space, but actually the refill station locator only mentions indoor or covered positioning.

To use the station, users need to download the app, create an account, load money and transfer the account balance directly onto their smart boot or band, whose encrypted NFC tag ensures information protection. Both the Instream smart bottle and smart band have embedded NFC tags that can store account balances and dispensing preferences.

Through the app, customers can also choose fully filtered ambient, chilled or sparkling water and transfer dispensing preferences to the microchip in the smart bottle; water type and the expected volume may be changed using the touchscreen display. The bottle has to be placed under the dispensing head in the proper orientation toward the NFC reader, paying attention that the decal on the bottle touches the decal on the back of the fill platform, without any space in between. Once the water is dispensed, the personal account will be automatically debited by the transaction amount, and the new balance will be transferred to the smart band and will appear on the app.

Debit/credit card reader and NFC sensors for contactless payment with the smartphone are also available for early and occasional adopters without their own smart bottle or band.

Instream Water app tracks the amount of water each single user has dispensed, and displays how many single-use plastic bottles have been saved from the waste stream. Fully IoT connected, refill stations are remotely monitored in terms of usage, performance and maintenance scheduling. Leak detector includes an automatic shut-down valve in any case of water quality issues.

On August 2020 Instream Water company prepared smart bands for every incoming student at Regis University to help them stay hydrated.

Strenghts of the project: The app includes several preferences such as notification when the user comes near an Instream Water Kiosk and users can display a detailed visualisation of the number of plastic bottles they saved from waste stream (daily, weekly and per year). To meet customers' desire to use their favourite water bottle, smart band can fit different vessels, getting the same effortless transaction feature as the Instream smart bottle.

Weakness of the project: Because of its dimensions, it is an unwieldy urban element, extremely tall, that creates unsafe blind spots in urban environment. Moreover, it presents an unintuitive dispensing system, requiring step-by-step instructions on how to dispense water and match smart bottle and band technology with the dedicated app; in general terms, these flaws determined a reduced accessibility for protected classes of users (people using wheelchair, children, visually impaired).

CONCLUSIONS

Investigation on contemporary trends and products gave the research useful insights and directions to make a proposition for a new urban service providing drinking water.

Among the examined examples, the most relevant ones – those urban objects more likely to be produced in large number, or particularly closer to the research design brief – are collected and evaluated in a **typological comparison matrix**. This audit tool encompasses **five main topics**: user experience, that considers accessibility and hygiene perception; the interface, dealing with technology equipment; the water system, addressing mouthfeel and type of spouts; urban placement; construction and management, that includes susceptibility to vandalism and installation issues.

A specific score has been given to each criterion, measuring the expected success or failure of each example, or its adherence to an appointed requirement. MeetPat the One, a bottle refill station and drinking fountain, result the highest-ranking solution, followed by Well井 and Instream water station, that are fairly competitive in terms of digital interface and water system but are both unsuitable for permanent, outdoor location.

The observation of best practices and the scores assigned to each product highlight emerging evidences that will be taken into account during the subsequent design phase:

- **Develop connection with other services.** The collected best practices are significant examples, but none of them introduces drinking fountain in a health-driven network of other services in the city. Tap water remains an urban amenity isolated in itself. Only Well井 partially does, with the involvement of local businesses and development of membership rewards.
- **Consider both poetry and production.** In the design of a new water station, accommodate both the challenge to make this urban element iconic again, and large-scale production requirements.
- **Take into account capacities and ages of specific users.** Maintain accessibility of all service functions for people of diverse physical abilities.
- **Leverage technology** for a better user experience and tailored maintenance thanks to the possibility of remote monitoring.
- **Improve water infrastructure.** Beyond the features of the single object, the number of drinking fountains made available, and their location, are crucial aspects.
- **Create public-private partnership** to sponsor and maintain the station. Customizable covers or digital screens might also serve as advertising and branding space to promote company messages or public initiatives.
- **Encourage healthy rewarding challenges** among the cluster of users. Rewarding approach should go beyond the bare achievement of personal hydration targets: a correct personal water intake and a healthy lifestyle might be included in a wider multichannel system providing tangible rewards and benefits to the most sustainable and savvy users.

These considerations offer useful hints for the next phase of the research, dedicated to define a contemporary urban element providing drinking water in public spaces; the aim is to go overcome a catalogue standard solution, and to conceive something original, able to enhance outdoor urban life.

	whoosh water station	meetpat “the one”	Halsey Taylor Outdoor THAMES WATER PROJECT	EPAL bebedouro Lisboa	Instream Water	Acqua Alma point	Well井	Watering Hole	Bent Leaf Melbourne	Tropism well
USER EXPERIENCE										
wide accessibility	0,5	1	1	0,5	0,5	0,5	0,5	1	1	1
ease of use	0,5	1	1	0,5	0,5	0	1	0,5	1	0,5
single hand refill	0	1	1	1	1	0	1	0	0	1
perception of hygiene	1	1	1	1	1	1	1	0,5	1	0,5
INTERFACE										
free access	0	1	1	1	0	0	1	1	1	1
pre-paid packages	1	0	0	0	0	1	0	0	0	0
pay-as-you-go	1	0	0	0	1	1	0	0	0	0
app based	1	0,5	0	0	1	1	1	0	0	0
opportunity for advertising screen	0	1	0	0	0,5	0,5	0	0	0	0
geo-located	1	1	1	0,5	1	1	1	0,5	1	0
rewarding system	0	0	0	0	0	1	1	0	0	0
connected to other urban services	0	0	0	0	0	0	1	0	0	0
WATER SYSTEM										
bottle filling faucet	1	1	1	1	1	1	1	0,5	1	1
bubbler	0	1	0	1	0	0	0	1	1	0
dog bowl	0	0,5	0	1	0	0	0	1	0,5	0
water treatment	1	0,5	0	0	1	1	1	0	0	0
chilled water	1	0,5	0	0	1	1	0	0	0	0
flavoured/sparkling water	0	0	0	0	1	1	0	0	0	0
coordinated accessories (bottle,fob)	1	0	0	1	1	1	1	0	0	0
URBAN PLACEMENT										
visual impact	1	1	1	1	0,5	0	1	1	1	1
customizable shell	0	1	0	0	0	0	0,5	0	0	0
suitable for outdoor location	1	1	1	1	0	0	1	1	1	0,5
self-standing without foundation	0,5	0,5	0,5	0	1	1	1	0	0	1
properly lighted in the dark	0	1	0	0	0	0	0	0	0	0
CONSTRUCTION and MANAGEMENT										
robustness and vandal proof	0,5	1	1	1	0	0	0	1	1	0
ease of installation	0,5	1	0,5	0,5	1	0,5	1	0	0,5	0
simplicity of fixing options	0,5	1	0,5	0,5	0	0,5	0,5	0	1	0
remotely monitored	1	1	0,5	0	1	1	1	0	0	0
modularly extensible services	0	0,5	0	0	0	0	0	0	0	0
suitable for large-scale production	1	1	1	1	1	0,5	1	0	1	0
TOTAL	15,5	21	13	13,5	16	15,5	17,5	9	13	7,5

Table n. 2
Typological evaluation matrix of the collected best practices.

- meets the criterion (1)
- somewhat meets the criterion (0,5)
- does not meet the criterion (0)

User research and urban placement studies

User research and urban placement studies are carried out before the design of the multifunctional fountain begins, and their outcomes are integrated throughout the concept and the development of the product.
The investigation phase starts reviewing the outcomes of the national and international surveys about public perception of the municipal water system and public water fountains.

SAFETY AND TASTE

There is a pervasive perception that bottled water is safer, healthier and taster than tap water **(1)**, even though municipal water system in Italy, and many other European countries, is actually good to drink, and tested to much higher standards.

In the investigative report n. 359 published in June 2021, Altroconsumo reported the results of an extensive analysis on tap water quality in Italy. The **samples** came **from 35 drinking fountains** collected in January and February 2020 from as many different Italian cities (Ancona, Aosta, Bari, Bologna, Bolzano, Brescia, Cagliari, Campobasso, Caserta, Catania, Ferrara, Firenze, Frosinone, Genova, Latina, Livorno, Milano, Napoli, Novara, Palermo, Parma, Pavia, Perugia, Pescara, Potenza, Reggio Calabria, Roma, Salerno, Taranto, Torino, Trento, Trieste, Udine, Venezia, Verona). Taking samples from public fountains appeared the most effective way to assess municipal water quality, because directly depending on the aqueduct, with no underground system, pipes or domestic faucets and valves likely to influence the results.
Water samples were analysed for 400 parameters, like hardness, total amount of dissolved solids, nitrate, sodium, solvents, heavy metals and other: all but one resulted completely free of harmful substances, including new contaminants such as Pfas and Legionella, or abundantly within legal limits. Out of a total of 35 drinking fountains, only the sample from Palermo was negatively rated, due to the presence of disinfection by-products exceeding the health-based limits.

Conversely, there is a growing body of evidence to suggest that bacteriological quality of tap water may be greater than bottled mineral water, and the latter can even have detrimental effects on human health in the long run.
One study found that many brands of bottled water were deficient of essential minerals such as magnesium, potassium and calcium (Mahajan et al., 2006). Another study, comparing inorganic components in bottled water and Italian tap water (Cidu et al., 2011), found that 20% of the bottled water samples had concentrations of chlorine, fluoride, nitrate and other harmful compounds that exceeded the World Health Organisation guidelines.
Furthermore, **health risks** are not limited to the quality of the water, but are also related to **plastic containers**, and to storage condition, too. Harmful chemicals, such as bisphenol A (BPA), benzyl butyl phthalate (BBP), di-n-butyl phthalate (DBP) and di (2-ethylhexyl) phthalate (DEHP), can be released from the PET bottle into the drinking water; according to Hassan et al. (2020), BPA and Phtalates can leach out into the surroundings by delicate changes in the environment, like temperature, pH and pressure alterations. Yousefi et al. (2019) also studied PET bottled water exposed to

Figure n. 181
Dubrovnik, Onofrio Fountain surrounded by public seating. Ph by Jorg Muller.

(1)
This general attitude is reported both in national and international surveys, like the previously cited statistics on Italian lifestyle, including tap water perception, disclosed every year by ISTAT, and academic research.
A widespread mistrust in municipal water is reported outside Europe, too: for example, Anisha Patel, public health researcher at the University of California, San Francisco, in 2014 found high level of believe that the water dispensed from drinking fountain at school is unsafe to drink (especially among low income students), and a correlation between that belief and lower total water consumption.

Figure n. 182
How safe is it to drink tap water from a public fountain? How safe is to drink bottled water? The conundrum of public health concern and international studies results.

(2) 2021 data of this biennial survey are nevertheless more promising: 82,7% of Italian population reported to have drunk tap water in the last 12 months, with a growth rate of more than 5% over 2020, and certainly pandemic played a role: 13,5% of people interviewed declared that during Covid-19 restrictions they more frequently choose to drink tap water rather than mineral one.

sunlight and as well as Surhio et al. (2017) verified an increase in DBP concentration.
As a result, several local and regional governments have been taking various actions to reduce health risks, and tightened up bottled water storage requirements. In Italy, for instance, with the sentence 39037/18 published on August 28 2018, storing bottled water in direct sunlight is criminally relevant for any retailer.
In this contradictory framework, bottled water is aggressively marketed with suggestive and dubious health claims (Francisco et al., 2012), and public drinking fountains are often a sad symbol of distrust in public infrastructure, but is worth questioning about their respective quality.

However, drinking water should be **more than safe**, not merely potable; its **palatability** is another decisive aspect affecting customers' choices and perceptions. Along with mostly unfounded concerns of microbiological contamination, reluctance to drink tap water is also based on the preconceived idea that its taste is bad.
According to a national investigation conducted in 2018 By Acqua Italia on a sample of 2000 people, perceived unpleasant tastes is one of the main reasons why one-third of Italian citizens never drinks municipal water **(2)**. To be palatable, drinking water should be dispensed at desirable temperature, free from objectionable tastes, odours, colours and turbidity. One of the most common complaints about tap water mouthfeel involves chlorine, which is an essential disinfectant used around the world; chlorine, however, is highly volatile, and letting water sit in a container for few minutes, especially if inside refrigerator, will remove much of its taste.
Interestingly, on the occasion of the World Water Day 2018 (March 22nd) Milano Bicocca University and Legambiente Lombardy Region ran a "**water blind-test competition**" in several Italian public squares, challenging citizens to distinguish tap water from mineral one. Participants were given 4 different cups: two filled with mineral water (plain and sparkle) and the other two filled with municipal water collected from local drinking fountains, with the addition of carbon dioxide under pressure to one of them.
At the end of water tests, people were asked to recognize tap water and, in most cases, consumers failed, in particular if carbonated. A similar blind water test was also run in 2017 in Cadiz by Progrifo Campaign, promoting the responsible consumption of tap water.
Again, the local operator Padania Acque challenged the local community in 2018, inventing the water brand VAND ("water" in Danish), which was in reality tap water, and put it to the test in the streets of the Province of Cremona. The reactions: it's **fresh, delicate, light, tasty.** A great astonishment when participants were told that water came from nearby drinking fountains.

These examples represent a **powerful** – yet **involuntary**, so even more significant – vote of confidence to tap water, a particularly meaningful result with Italy being Europe's largest consumer of bottled water.
Tap water challenges prove that, without chlorine perception, municipal and mineral water are barely distinguishable from one another. We can conclude that customers 'choices in the supply chain of drinking water have extremely ephemeral foundations, since much of our taste preferences really are in our heads.

ON-SITE OBSERVATIONS AND INTERVIEWS

After examining the main literature about tap water perception, **extensive field observations** have been conducted to directly get insights into most common fountains **locations, usage patterns and people's attitude** towards drinking water points. While there is considerable literature addressing drinking fountains availability in schools, there is less on the prevalence and usage of this basic convenience in urban public places: a survey conducted in 2013 in North Carolina (Bruton et al, 2014), two pilot studies, in California and in New Zealand (Arvery & Smith, 2018; Thomson & Wilson, 2018), along with Josselyn Ivanov's master thesis at MIT, discussing the access to water on exercise trails, are the most relevant researches I found on this side.
To provide a case study, I surveyed all publically mapped fountains in the city centre of Ferrara, and assessed their urban surroundings, their quality and conditions, along with the number of fountain goers during each on-site inspection. This part of the research also aims to **develop a simple tool for data collection and evaluation of public drinking fountains**, that could be easily extended to other pieces of street furnishing.

METHOD
The sampling frame was a **list of 88 public drinking fountains** published by the Province of Ferrara in the fifth volume of "Ecoidea Guide. Ferrara almost free. Beautiful and generous" (Environmental Department of Ferrara Province, 2009). This list includes drinking fountains in squares, parks, sporting facilities and public walkways, from the ones in the centre to the country suburbs. I cross-checked all the 88 addresses (10 of them were repeated of wrong) with the **37 fountains locations within Ferrara city centre** displayed on the interactive crowd sourcing map available on Fontanelle.org.
With this data collation and cross-referencing, the total number of accessible drinking fountain in the Municipality of Ferrara resulted to be 82.
Firstly, the fountains' addresses were distributed on a simplified figure-ground drawing of the city of Ferrara, in order to visualise the effective distribution over neighbourhoods, and detect eventual deficiencies in their spacing.
As Ivanov reasonably noted (2015), the optimal spacing for drinking fountains for users with different physical abilities, moving at various speeds, might be a function of time, not of distance. Bikers travel much faster than joggers or average walkers, so they may need to quench their thirst at further distances than those going on foot. Given that fluid replacement during outdoor activity depends on the intensity and duration of exercise, environmental conditions such as temperature and humidity (Singh, 2003), but also personal fitness, age, gender, etc, in this research I will **assume that provision of water should occur every 15 minutes**, according to the broadly recognized rule-of-thumb for athletes to consume about 200-300ml of fluid every quarter hour during exercise.
In this context, seven users engaged in different levels of physical exercise were defined: a slow walker (or an elderly person as well as a small child); an average walker; a person walking at brisk pace; a light jogger; an advanced runner; a casual biker, performing a moderate physical activity, and a quicker cyclist engaged in a more intense ride.

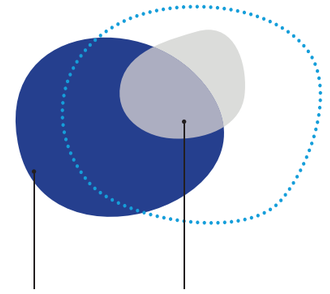


Figure n. 183
Sampling frame for the assessment of publically accessible fountains in the Municipality of Ferrara

Table n. 3
Correlation between different types of physical exercise, travelling speed, and the distance covered by each user in fifteen minutes, a convenient time lapse for fluid replacement, applicable to several outdoor activities and average users.

3

USER	TRAVELLING SPEED	DISTANCE COVERED IN 15 MINUTES
Slow walker, senior, small child	2,5 km/h	0,625 km
		
Average walker	4 km/h	1,00 km
		
Brisk walking person	6 km/h	1,50 km/h
		
Jogger	8 km/h	2,00 km
		
Advanced runner	10 km/h	2,50 km
		
Casual biker	15 km/h	3,75 km
		
Quick cyclist, commuter	20 km/h	5,00 km
		

Seven different travelling speeds were associated to each physical activity level, and their **covered distance in 15 minutes** – just an estimate of a convenient span of time for fluid replacement during physical activity – were calculated.

After these urban-scale considerations, the study involved systematic outdoor inspections by solo observer, i.e. the PhD Candidate, visiting a selection of the publically accessible fountains in Ferrara city centre, assessing the location in terms of attractiveness, eventual incivilities and availability of nearby public facilities, and evaluating drinking fountains functionality and usage.
Each surveyed fountain was photographed for each of the following aspects:

- From a distance of 20–30 metres and from between 5–10 metres, to gather locational information of the surroundings.

- Close up to show any specific aspects of the fountain, such as eventual side taps or dog bowls, drainage system and kind of surface at the base.

- A set of detail photographs of the spigot and the water stream at full power, to assess nozzle's condition and the water flow at full power.

All of the taps were tested. Notes were taken on any features of the fountains or their context that might affect the usage. A short description of type of users during the on-site observation is included in the assessment tool elaborated for this research. In addition, some randomly selected passers-by were briefly interviewed: this stage of the research led to informal conversations about their drinking habits, sustainability commitment, engagement in physical activity and general perception of the target area and public fountains.

This field work was performed between July and September 2020, and between September 2021 and December 2021.

CROSS-CHECKED ADDRESSES OF ACCESSIBLE DRINKING FOUNTAINS IN FERRARA MUNICIPALITY

Centre

1. Corso Giovecca 148 – at Pareschi Park
2. Via delle Erbe
3. Corso Porta Mare 1, Massari Park
4. Via Renata di Francia, next n. 56
5. Piazza Ariostea 1 (at the corner with Corso Porta Mare)
6. Via Luigi Borsari, next n. 4c
7. Corso Porta Mare n. 167, at the corner with Rampari di Belfiore
8. Piazzetta sant'Anna (along Corso Giovecca)
9. Piazza della Repubblica
10. Viale Cavour n. 3 (in front of public green area)
11. Via Colomba n. 8
12. Piazza Trento Trieste n. 5
13. Via Scandiana 27 (near Schifanoia Palace)
14. Via Camposabbionario 36B
15. Via Rampari S. Paolo 7
16. Via dei Baluardi next Via Quartieri
17. Via Piangipane in front of n. 6, at the beginning of the Walls path
18. Via Kennedy, crossing Via Donatori del Sangue
19. Via Daniello Bartoli, in front of n. 6
20. Via Marco Polo n.3 (crossing Via San Maurelio)
21. Via Alfonso I d'Este (Montagnone park)

Doro – Arianuova – Borgo Punta – Barco Neighbourhoods

22. Via Azzo Novello along ancient Walls
23. Via Riccardo Bacchelli (Municipal swimming pools area)
24. Viale Orlando Furioso next n. 88 (green area near Scientific School Roiti)
25. Via della Canapa next n. 20 (Sport centre)
26. Via Olimpia Morata, crossing via Costanza Monti Perticari
27. Viale XXV Aprile, n. 26, within green area, next bus stop
28. Viale XXV Aprile, n. 43, within green area
29. Via Fulvio Testi, n. 52, next Bocciodromo la Ferrarese
30. Via Alessandro Volta, in front of n. 61. Doro school green area
31. Via Costanza Monti Perticari, in front of Monti Perticari green area
32. Piazza Emilia, side via Casazza

Giardino Neighbourhood

33. Via del Lavoro
34. Skyscraper gardens, viale Cavour crossing Viale della Costituzione
35. Viale Belvedere 2 A, at the corner with Corso Porta Po (next sport equipment)
36. Via Mura di Porta Po 41 (within ancient Walls landscaping)
37. Parco Mirco Ferrari- Piazzale Giordano Bruno (near grisù Factory)
38. Via Cavour, in front of n. 236
39. Via Ludovico Ticchioni, in front of n. 82 (Baluardo green area)
40. Via della Fortezza 22-30
41. Piazza XXIV maggio, next via Pasubio (historic acqueduct)

Via Bologna neighbourhood

42. Via Grillenzoni (in front of Tumiati Primary school, hippodrome area)
43. Barlaam public gardens, next via Vasco Zappaterra
44. Piazza dei Poeti – Viale Krasnodar
45. Via Luigi Passega near n.2
46. Via Andrea Franchi Bononi (in Bondi park, in front of neighbourhood kindergarten)
47. Via Pellegrina at the corner with via Ravenna, in front of a small sacred place

Quacchio neighbourhood

48. Via Ungheria n. 10, at Via Ungheria Park, Quacchio neighbourhood
49. Via Vene di Bellocchio, next via Valle Fossa di Porto

Suburbs

50. Via del Fiorino – at the corner with via Bentivoglio (Fiorino Park, in Pontelagoscuro)
51. Via della Crispa, in front of the church (Focomorto district)
52. Via Ponte Nuovo (Contrapò district)
53. Via Bova, n. 104 (Borgo Sacchi district)
54. Piazza Boari, n.14/A (Marrara di Ferrara district)
55. Via Raspi at the corner with via Ponte Assa (Villanova di Ferrara)
56. Via Ducentola crossing via Comacchio (Quartesana)
57. Via del Platano (in front of n. 67, Parasacco district)
58. Via Diamantina (in front of n. 16, IPERTOSANO shopping mall)
59. Via Palantone (Porporana district)
60. Via Martelli 300, Former Elementary school area (Ravalle)
61. Via Bondeno, n. 117 (Porotto-Cassana)
62. Piazza Cappellini at the corner with via Massafiscaglia
63. Via Coronella in front of the school
64. Via dei Prati at the corner with via Argenta (Monestirolo district)
65. Via Rocca crossing via Zambotta (Codinsù area, Monestirolo)
66. Via del Poggetto (Poggetto sanctuary)
67. Via Acquedotto (Pescara district, at the border with Veneto Region)
68. Via Civetta crossing via Catena (Borgo fondo Reno district)
69. Via Fruttidoro at the corner with via Bologna (Montalbano di Ferrara)
70. Via Cervella in front of n. 190 (San Bartolomeo in Bosco)
71. Via Cascina, Spinazzino district
72. Via Raffaello crossing via Pontegradella (Baura district)
73. Via Pioppa in front of n. 232 (Pontegradella)
74. Via Chiesa at the corner with Piazza Berlinguer (San Martino)
75. Via Bardocchia crossing Via Rabbiosa (Bertoni Sport Centre)
76. Via Poggio Renatico
77. Via Montessori, green area in Gaibanella – Sant'Egidio
78. Via Todeschi, Cassana neighbourhood
79. Via Massafiscaglia, after n. 277
80. Via Alberello crossing via Massafiscaglia
81. Via Medelana near n. 58 (Correggi neighbourhood)
82. Via Ponte Assa, at the corner with Via Oppietto (Villanova district)

Figure n. 184
Figure ground drawing of Ferrara city centre, displaying the locations of public drinking fountains (retrieved and cross-checked from the Environmental Department of Ferrara Province and a crowd sourcing online list), and the radius covered by different users in 15 minutes, a reasonable span of time for water intake during physical activity.

The analysis of fountain distribution reveals that water access thins out in the eastern part of Ferrara; it seems desirable for the city to assure a dependable network of this basic service especially where the elderly and other vulnerable population are expected to walk to.

Street: 43, Viale XXV Aprile
Date of observation: October 5
Observation start time: 9:30
Observation end time: 9:45
Current weather condition: Partially cloudy

aspect	rating	scaling	notes
context			
How attractive is the area overall?	1 **2** 3	NATE	
Rate the condition of the landscaping	1 2 **3**	PEX	
Sources of shade	**yes** no		**trees**/buildings/shelters/other:
Rate the appeal of audible sounds in the area	1 2 **3**	PEX	water/**birds**/traffic/construction noise/**voices**/music/ other:
Rate the appeal of the smells in the area	1 **2** 3	PEX	smoke/food/air pollution odor/other:
Public facilities in close proximity, at sight distance	1 **2** 3	NOAL	school/gym/community centre/church/**shops**/other:
incivilities			
Dog refuse	**1** 2 3	NOAL	
Overflowing trashcan/waste containers	1 **2** 3	NOAL	
Perceived public negligence	**1** 2 3	NOAL	
Any evidence of vandalism (graffiti, litter etc...)	**1** 2 3	NOAL	
drinking fountains			
Visibility from the nearest road	1 **2** 3	PEX	
Operational	**yes** no		always on/button/pedal/ turn hose bibb handle/**tee**
Condition	1 **2** 3	PEX	the water jet is too strong
Downward water jet / Bottle refiller	**yes** no		
Upward water jet / stoop and drink only	yes **no**		
Dog bowl	yes **no**		
Water taste	1 **2** 3	PEX	temperature/filtration
Filtration	yes **no**		
Accessibility to children/people with disabilities	1 2 **3**	PEX	consider water height, spout shape and ground
Paved surface at the base	**yes** no		
Hard path to reach the fountain	**yes** no		
Lighting	yes **no**		Public lighting too far from
Seating availability within 50 metres	**yes** no		
Other urban amenities in close proximity	1 **2** 3	NOAL	**bike racks**/exercise stations/play equipment/ **waste containers**/restrooms/ **bus stop**/ other
Fountain goers during observation, and nature of fountain use	**yes** no		2. Two guys in their 20s, one of whom used the fountin to refill his plastic bottles. Sporty woman, early 40s with a white poodle, looking down for a dog bowl; she takes one of the plastic container from the ground, gives it a wash and fill it for her dog.

Street: 26, Viale XXV Aprile
Date of observation: October 5
Observation start time: 9:45
Observation end time: 10:10
Current weather condition: Partially cloudy

aspect	rating	scaling	notes
context			
How attractive is the area overall?	1 **2** 3	NATE	
Rate the condition of the landscaping	1 2 **3**	PEX	
Sources of shade	**yes** no		**trees**/buildings/shelters/other:
Rate the appeal of audible sounds in the area	1 2 **3**	PEX	water/**birds**/traffic/construction noise/**voices**/music/ other:
Rate the appeal of the smells in the area	1 **2** 3	PEX	smoke/food/air pollution odor/other:
Public facilities in close proximity, at sight distance	1 **2** 3	NOAL	school/gym/community centre/church/**shops**/other:
incivilities			
Dog refuse	**1** 2 3	NOAL	
Overflowing trashcan/waste containers	**1** 2 3	NOAL	
Perceived public negligence	1 **2** 3	NOAL	Broken surface at the base of the fountain
Any evidence of vandalism (graffiti, litter etc...)	1 **2** 3	NOAL	
drinking fountains			
Visibility from the nearest road	1 **2** 3	PEX	
Operational	**yes** no		always on/button/pedal/ turn hose bibb handle/**tee**
Condition	**1** 2 3	PEX	Weak water flow. Pleasant cold water
Downward water jet / Bottle refiller	**yes** no		
Upward water jet / stoop and drink only	yes **no**		
Dog bowl	yes **no**		
Water taste	1 **2** 3	PEX	temperature/filtration
Filtration	yes **no**		
Accessibility to children/people with disabilities	1 2 **3**	PEX	consider water height, spout shape and ground
Paved surface at the base	**yes** no		
Hard path to reach the fountain	**yes** no		
Lighting	**yes** no		Nearby public lighting
Seating availability within 50 metres	**yes** no		
Other urban amenities in close proximity	1 **2** 3	NOAL	bike racks/exercise stations/play equipment/ waste containers/restrooms/ **bus stop**/ **trash can**
Fountain goers during observation, and nature of fountain use	**yes** no		A grandfather in a grey t-shirt with a grandaughter about 4 year old sit at the nearby bench. The child looks with eager interest at her Ipad. None of them use the fountain.

PEX scaling
1 2 3
poor fair excellent

NATE scaling
1 2 3
not at all somewhat extremely

NOAL scaling
1 2 3
none at all some a lot

Street: Viale Belvedere
Date of observation: October 5
Observation start time: 10:30
Observation end time: 10:45
Current weather condition: Partially cloudy

aspect	rating	scaling	notes
context			
How attractive is the area overall?	1 2 **3**	NATE	
Rate the condition of the landscaping	1 2 **3**	PEX	
Sources of shade	**yes** no		**trees**/buildings/shelters/other:
Rate the appeal of audible sounds in the area	**1** 2 3	PEX	water/birds/**traffic**/**construction noise**/voices/music/ other:
Rate the appeal of the smells in the area	1 **2** 3	PEX	smoke/**food**/**air pollution odor**/other:
Public facilities in close proximity, at sight distance	1 2 **3**	NOAL	school/gym/**bar**/church/**shops**/**news stand**
incivilities			
Dog refuse	**1** 2 3	NOAL	
Overflowing trashcan/waste containers	**1** 2 3	NOAL	
Perceived public negligence	**1** 2 3	NOAL	
Any evidence of vandalism (graffiti, litter etc...)	**1** 2 3	NOAL	
drinking fountains			
Visibility from the nearest road	1 2 **3**	PEX	
Operational	**yes** no		always on/button/pedal/ turn hose bibb handle/**tee**
Condition	1 **2** 3	PEX	the surface at the base is damaged, drainage issue
Downward water jet / Bottle refiller	**yes** no		
Upward water jet / stoop and drink only	yes **no**		
Dog bowl	yes **no**		
Water taste	1 **2** 3	PEX	Semi-cold. Water stream is very strong and splashing
Filtration	yes **no**		
Accessibility to children/people with disabilities	1 **2** 3	PEX	consider water height, spout shape and ground
Paved surface at the base	**yes** no		present but damaged
Hard path to reach the fountain	**yes** no		
Lighting	**yes** no		Public lighting
Seating availability within 50 metres	yes **no**		
Other urban amenities in close proximity	1 **2** 3	NOAL	**bike racks**/**exercise stations**/play equipment/ waste containers/restrooms/ bus stop/ **trash can**
Fountain goers during observation, and nature of fountain use	**yes** no		A group of 4 urban walkers, three women and a man, early 70s, wearing gym clothes. All carry their own bottle of water. Two of them just look at the fountain while bringing back their bikes from the rack close by. A 20-year-old female jogger in a yellow hoodie.

Street: 3, Corso Porta Mare
Date of observation: October 5
Observation start time: 12:55
Observation end time: 13:20
Current weather condition: Mostly sunny

aspect	rating	scaling	notes
context			
How attractive is the area overall?	1 2 **3**	NATE	
Rate the condition of the landscaping	1 2 **3**	PEX	
Sources of shade	**yes** no		**trees**/buildings/shelters/other:
Rate the appeal of audible sounds in the area	1 2 **3**	PEX	**water**/**birds**/traffic/construction noise/**voices**/music/ other:
Rate the appeal of the smells in the area	1 **2** 3	PEX	smoke/food/air pollution odor/other:
Public facilities in close proximity, at sight distance	**1** 2 3	NOAL	school/gym/church/shops/**museum**/**botanical garden**
incivilities			
Dog refuse	**1** 2 3	NOAL	
Overflowing trashcan/waste containers	**1** 2 3	NOAL	
Perceived public negligence	**1** 2 3	NOAL	
Any evidence of vandalism (graffiti, litter etc...)	**1** 2 3	NOAL	
drinking fountains			
Visibility from the nearest road	1 **2** 3	PEX	
Operational	**yes** no		**always on**/button/pedal/turn hose bibb handle/tee
Condition	1 **2** 3	PEX	nozzle discouloration, biofilm on the stoned basin
Downward water jet / Bottle refiller	**yes** no		
Upward water jet / stoop and drink only	yes **no**		
Dog bowl	yes **no**		
Water taste	1 **2** 3	PEX	semi-cold water with with slightly mineral taste
Filtration	yes **no**		
Accessibility to children/people with disabilities	**1** 2 3	PEX	the step made of stone makes the spout not accessible
Paved surface at the base	**yes** no		damaged
Hard path to reach the fountain	**yes** no		
Lighting	**yes** no		public lighting
Seating availability within 50 metres	**yes** no		
Other urban amenities in close proximity	1 **2** 3	NOAL	**bike racks**/exercise stations/play equipment/ waste containers/restrooms/ **bus stop**/ **trash can**
Fountain goers during observation, and nature of fountain use	**yes** no		Guy, early 30s, playing with jugglers, washes his hands, not drinks from it. Woman on a mountain bike refills two small plastic bottles and put them in her pink back pack. Teenage boy with a red t shirt, in a hurry, holding an empty disposable bottle.

Table n. 4, 5, 6, 7
The drinking fountain assessment tool for field observation in the city centre of Ferrara, crafted by the author.
Examples of four filled forms from the extensive on-site inspection.

RESULTS

The 82 publically accessible fountains represent a ratio of **one fountain per 1609 people** in Ferrara Municipality area, for an estimated 131935 populations on January 1st 2021 (Ferrara Province, 2021).

Examining the distribution of water outlets in Ferrara historic centre, or in its close proximity, it appears that drinking fountains should be implemented especially in the eastern part of the city, with particular reference to **Ferrara city Walls**.
This former defensive brickwork, which encircles the old town for nine kilometres almost without interruption, is actually the main sport infrastructure of the city, followed everyday by thousands of footers and bikers, either on the embankment or below in the moat. In the last few years the number of walkers has grown over runners, and this is particularly interesting on a social level, as the range of people visiting this exceptional circuit, frequently called “the heroes of the Walls” at local level, is broadening (Borgogni & Farinella, 2017): from families with little children, to the elderly, from people with physical disabilities to migrants, like Muslim women jogging in hijab. In this virtuous context, which should be taken as a model by all public policies fighting sedentary lifestyle, it may be desirable for the city of Ferrara to install more drinking water points, combined with seating and other conveniences along the ancient walls – or very close to the path – in order to make this exceptional infrastructure even more enjoyable, inclusive and safer.

On-site observations allowed to investigate the surroundings and the facilities nearby the fountains, and figure out how the context affects urban objects functionality and usage patterns. Taking pictures of the locations was also helpful in the **comprehension of the scale** of public drinking points within in urban background, and the importance of **making small things matter.** With the assessment tool that I personally crafted, site inspection was relatively quick, taking around 15 minutes to conduct for each location. Field observation was nevertheless limited to a **selection of 49 drinking fountains** in Ferrara city centre or its close proximity.

These fountains were fairly accurately placed on the city centre territory, in relation to their closeness to well-matching urban facilities, such as public parks, children playgrounds but also bus stops. Only 20% of the surveyed water points had benches within 50 metres. Some fountains were not visible from the nearest road, and when they were, some were still relatively obscured.
The basic quality of these fountains was fairly good, without clear evidence of vandalism; nearly all the surveyed spouts worked in delivering water, even though none of them featured additional taps likewise upward jet for stoop and drink, or integrated bowls for providing water for dogs. Small provisional plastic containers were found at the ground of four surveyed fountains, revealing a keenly felt necessity for a designated area for watering pets.
The visited fountains appeared to be averagely well maintained, albeit with the exception of grass growing out of one, and damaged surface at the base of three of them; five ones also displayed drainage issues.

Of the 40 working fountains, nearly all delivered a smooth non-turbulent stream (with a rare exception in streets Daniello Bartoli, XXIV May Square and Cavour Boulevard), with the water jet being adequately powered to create some distance from the metal structure.
A potential concern, however, was the discolouration around the nozzle of the fountain’s water spout, that may discourage some people from using the service; this and the poor water flow in two cases, suggests the need for either improvements in fountain design or a more optimal cleaning schedule by the Public Administration.

INSIGHTS FROM USER OBSERVATIONS AND INTERVIEWS

During fountains’ assessment, **informal interviews** were run in order to **find trends**, **identify common patterns** and create models of distinct, archetypical users, which can help decide when a common need can be met by a common view or when distinct views are necessary (Amann, 2009).
On-site interviews involved students, office employees, runners, parents with sons, elderly and frail people, randomly selected among fountain goers, or simply passers-by during observations. Residents I consulted were almost equally spilt between fountains’ detractors and enthusiasts, but over whether or not they admitted they were unlikely to use them.

An important lesson learnt is that there is a **common prejudice** that public **fountains usually do not work**.
People just think it’s unlikely to see or find an operating drinking fountain in parks, playgrounds and outdoor spaces in general, so they use to carry their reusable flasks with no expectation of refilling them on the way, or, when running out of water, simply buy bottled drinks in their disposable plastic packages.
In the city centre of Ferrara, drinking fountains are usually placed with reasonable logic regarding nearby synergistic facilities and amenities, and are in general moderate conditions; however, when installed in secluded urban spots, with little human presence, people can hardly recognize them, so they decreasingly use and forget them over time. Therefore, we can conclude that **poor visibility** and **unsuitable location** played an important role in the dismissal process and disappearance of this basic service.

Public concerns over **municipal water quality** and the **hygiene** of the fixture appeared to be quite common among interviewed city dwellers, both in people who do and don’t use the fountains. Many passers-by also mentioned **improper use** of water outlet, like dogs and birds drinking from them, as a major deterrent.
With regards to downwards water jet, and the possibility to refill a personal canteen in out-of-home context, a couple of persons dissented and declared of being **annoyed by carrying a reusable bottle** all day, especially while running. Low accessibility of water outlets (in terms of height, position and mounting surface) along with a general **discomfort in use**, in particular the fear of being splashed while drinking, emerged as tangible barriers for some inhabitants’ likelihood to use public fountains.
Some citizens expressed **distaste towards tap water**, referring to both flavour and

temperature in hot weather. A few of them also confessed their bottled water brand loyalty.
Through field observations and natural conversations with passers-by and fountain goers, I was able to collect real-life examples, common trends and issues that different users may face in relation to small urban services, in particular minor water outlets. Outlining **behavioural patterns** helped in generating goal-driven user data, checking the trajectory of the project and crafting user personas, a valuable insight into the requirements of an innovative, multifunctional urban object.

In conclusion, for many people I talked to, public water is clean and pristine; others, however, are less trusting, and they imagine contaminated water and fixture that may make them or their children sick. The conundrum is that in some cases tap water quality may be even greater than mineral one, especially when not properly bottled or stored, and it is far more sustainable and cheaper.
The effect of advertising by bottled water companies emerged to be particularly strong, too. Most mineral water brands are promoted in the same manner as health products and beauty items, with emotional slogans and claims like “Clean inside, beauty outside”, “I am what I drink”, “An ultimate elixir of life”, “Bottled at the source, untouched by man”. The access to purified waters and thermal springs has been a status symbol for centuries; today the wellness movement is responsible for a collective spurning of alcohol and promoting a more fervent interest in “luxury” water than ever (Matei, 2019). As a result, the association of this market with wellbeing makes bottled water particularly appealing for those actively engaged in fitness and healthy lifestyles.
Pro-tap water campaigns, in this context, would be more effective by embracing positive messages about **how health-enhancing tap water can be**.

Undoubtedly, ensuring safe and tasty water from public fountains also requires consistent **cleaning routine maintenance**, eventual **replacement** of old plumbing systems and the **upgrade** of outdated models with contemporary water dispensers, equipped with filters and chillers. These efforts, combined with careful, **strategic location**, communications on the results of regular water testing, and information on where to find high-quality drinking fountains (Phurisamban & Gleick, 2017), can help overcome the stigma of using public fountains and transform public distrust into a positive commitment in sharing and respecting public resources.

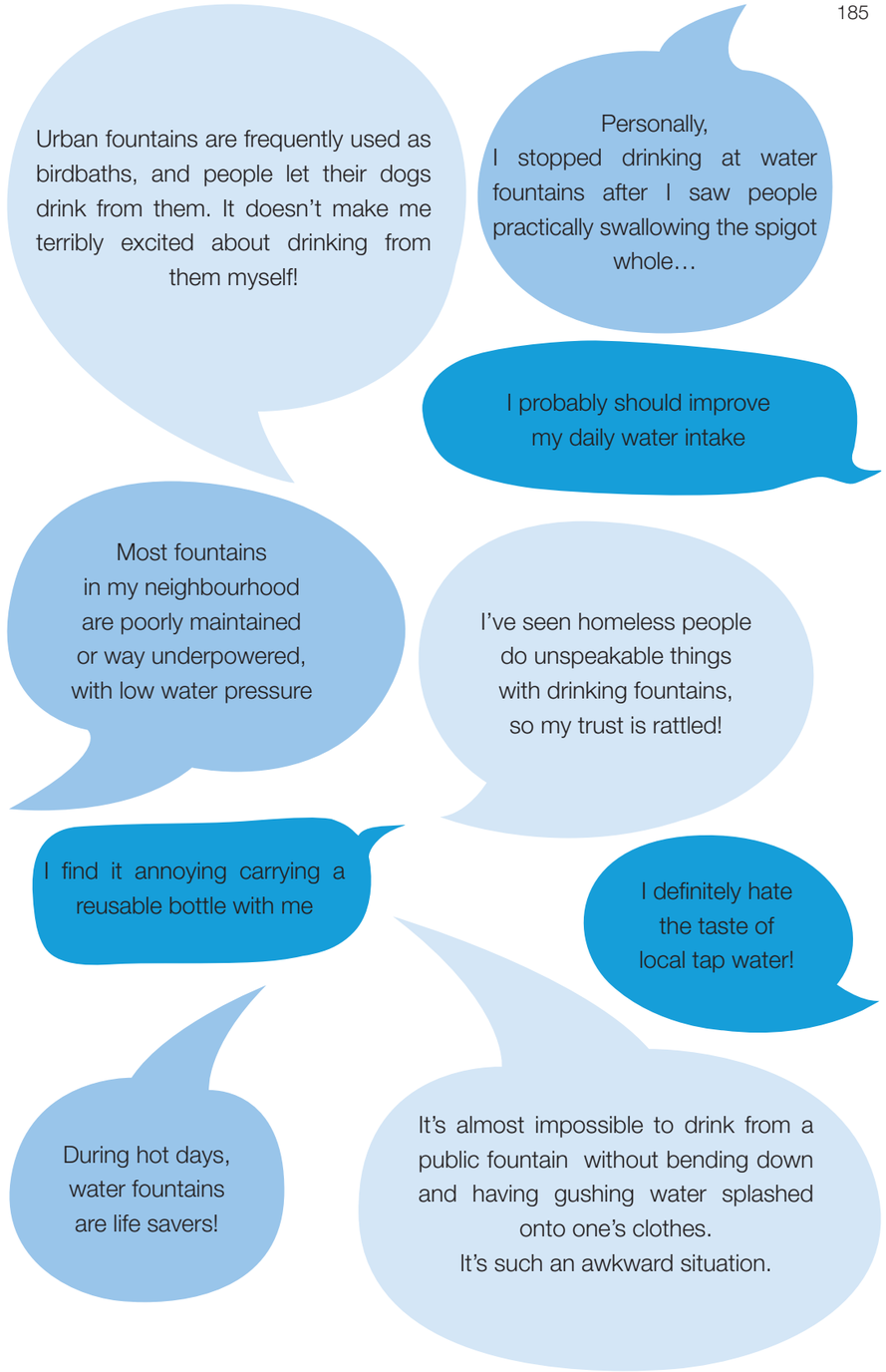


Figure n. 185
a concise overview of the outcomes of the primary interviews with end users

The behaviour patterns outlined through natural conversations with passers-by and fountain goers in Ferrara city centre are clustered into distinct user personas, which can help identifying project's requirements and checking its trajectory.

NOAH, 14 years old.
Noah is a young extroverted boy attending the third year of middle school in a small town near Modena. He is a lazy student and occasionally skips school and go to the nearby park with his best friend, sharing a Pepsi can in the grass and listening to music from their smartphones. As his parents work all day, Noah uses to spend his afternoon at his uncle's house: his aunt Mary helps Noah with the homework, and, in turn, Noah teaches her basic computer skills.

goals

get a pass-mark on next math test
convince his parents to buy him an electric scooter
have a great play in the next Dungeon and Dragons online match

frustrations

smartphone out of power
upcoming dentist appointment for pulling a rotten tooth out of mouth

ELENA, 35 years old.
Elena is a Public Relation Manager based in Bologna who frequently travels for work to major cities within Italy to attend networking and media events. She likes to be prepared and organized and uses her smartphone even for her grocery shopping. She enjoys being active and tries to stay away from fat food products, sugary drinks and salt.

goals

make connection with new people everyday
promote her events as much as possible
eat healthy fresh food

frustrations

miss pilates Wednesday class
loose wifi connection
no time to prepare ahead her meals for the week

SAMUEL, 56 years old.
Samuel is a doctor working for the Local Health Authority, responsible for the service of food safety and hygiene. He lives in a hilltop house with his daughter nearby Faenza. Despite his working commitments, Samuel loves riding his bike in the nature during the weekend; his biking route is often "fountain to fountain", as even the smallest village in the countryside he visits has a fresh water outlet, usually near the church, town square or in a landscape focal point. He recently bought an electric mountain bike to enjoy longer trips in the Apennine.

goals

reduce stress levels at work
discover new routes that fit his training needs
involve his daughter in biking

frustrations

get stuck in a traffic jam every morning
dismissed drinking fountain along his cycling routes

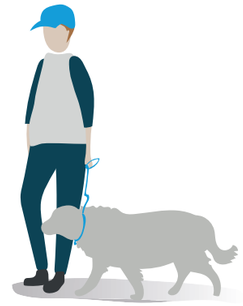
MATTIA, 22 years old.
Mattia is a third-year design student that moved from Sassari to Ferrara when started his University career. He loves living with his new flatmates, but he misses the seaside and his home town's good air quality. He is disappointed by Po valley pollution and always tries to move around in the most sustainable way, by bike or using public transport.
He deeply cares about animal rights and spares his free time to volunteer at the municipal dog shelter and to promote pet adoption. Twice a day he walks rescue dogs giving them a little exercise for a few minutes.

goals

save money on supermarket
be more and more sustainable everyday
create designs promoting animal adoption

frustrations

Po Valley bad air quality
the amount of plastic waste from his flatmates



LEO, 40 years old.
Leo is a former project manager at Ferrari company who lives in Modena with his wife and their Australian Shepherd. In 2008 he discovered to be affected by ALS. Leo's slow declining mobility requires a wheelchair; when outride, he uses an electric scooter that gives him back a bit of control over his life, with the possibility to move around on his own and go shopping again. After diagnosed with ALS, he started an Instagram profile documenting his daily life and spreading awareness about the importance of fully accessible urban facilities.

goals

do some housework on his own (like waste collection and grocery shop)
spend more time outside all alone

frustrations

people that usually refers at mobility scooters "as senior aids"
rely heavily on others for personal care assistance
lack of charging points in the pubic space

TERESA, 83 years old.
Teresa is a retired seamstress living in a semidetached house in Ravenna, next to her daughter's apartment.
She is quite independent and still goes for grocery shopping on her own twice a week, except for heavy purchases, like bottled water packs, so her daughter Silvia picks them up for her.
After an episode of kidney stone, her doctor recommends Teresa to increase her daily water intake, even if she do not feel thirsty.

goals

drink more
storage local and seasonal food product in her kitchen every week

frustrations

need to write things down to remember them
lack of benches to have a short break during daily walk
stay at home during the hottest hours

Figure n. 187
Marching band around the fountain at Ulm Cathedral Square.

Concept of an urban service promoting health

As widely highlighted in the first part of this research, drinking fountains represent a great **public health opportunity**, but they are often overlooked, even mistrusted, and chronically underfunded. To show off their full potential in addressing current health challenges, tap water outlets should be reinvented according to modern-day consumers' expectations and annoyances, current standards and practices, also leveraging technology, and placed with extra care in the urban environment.

The investigation of innovative services supporting healthy environments and community wellbeing also represent for contemporary **local utilities** a promising area of research where to **extend their consolidated business**, with expected revenues and positive assets.
For instance, S2A, an Italian society composed of prime level companies working within ecological and agro industrial fields, when this research started was already developing a digital App monitoring citizens' health conditions: using their smartphone, consumers would send their real time biometric data to primary care professionals, who provide recommendations and coaching for health and wellness based on the unique data streams delivered from the citizens themselves and release a Health Passport.

Hera Group spa, leading Italian company operating in environmental, energy and water services, since 2018 came up with the interest of developing a **prototype** of multifunctional piece of outdoor furnishings dispensing potable water, in line with the goals of **circular economy**, able to reduce plastic waste, encourage sustainable behaviour and catalyze distinct urban services. In light of the above, a University-Industry research started, with the involvement of professor Gabriele Lelli as scientific coordinator, and the PhD candidate Ilaria Fabbri.
This specific research project comes after other several studies in agreement with Hera Group, that, since 2015, produced design patents and innovation counts, presented by the authors at International conferences and published on Scientific Journals dealing with smart cities, green ICT systems, innovative design.

The next part of the study focuses on the design criteria I came across with in the process of reinventing public water fountains as an innovative urban interface promoting healthy and sustainable actions.

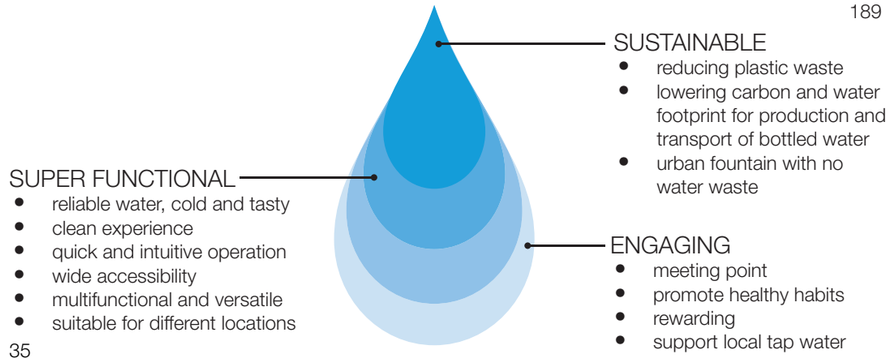


Figure n. 188
Well and Truly Untitled, solid cast glass, 2009-2010. Installation, "Roni Horn. Well and Truly", Kunsthaus Bregenz, Austria, 2010 © Kunsthaus Bregenz, Roni Horn. Photograph: Stefan Altenburger Photography, Zürich.
An artwork inspiring the design concept of the urban service.

Figure n. 189
Model of common patterns among different needs.

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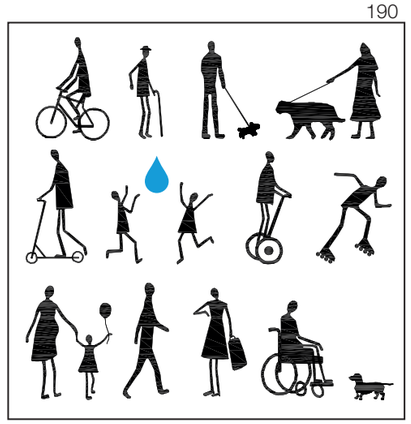
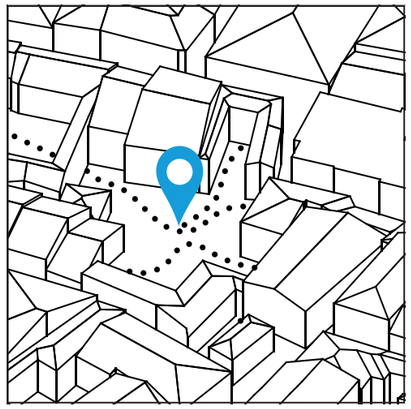
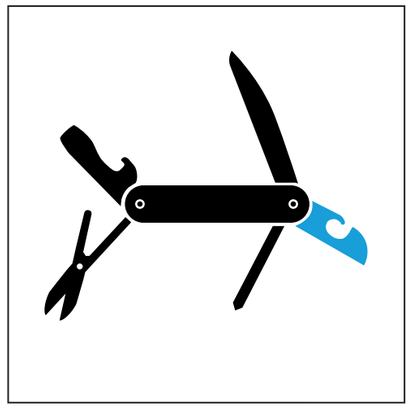
1. Providing sensory pleasure



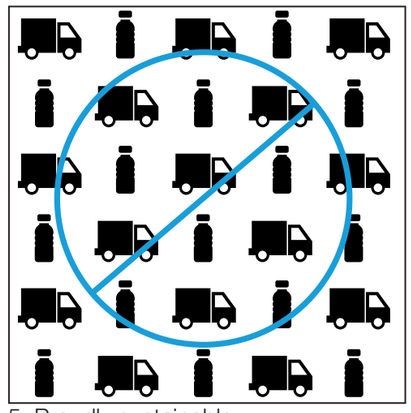
2. Welcoming



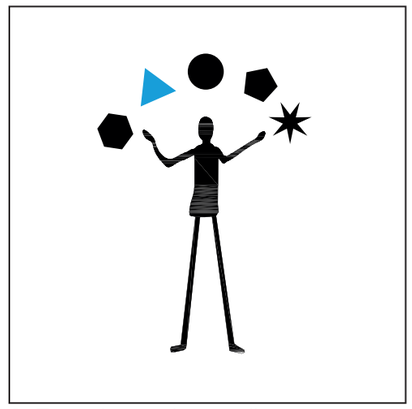
3. Connected to the neighbourhood



4. One-stop service
(integrating a variety of urban amenities)



5. Proudly sustainable



6. Engaging and rewarding

Figure n. 190
Diagrams depicting the six criteria I identified to approach the design of a contemporary urban element providing potable water in public spaces.

DESIGN CRITERIA FOR A NEW URBAN ELEMENT DISPENSING WATER

The design of the experimental multifunctional street furniture capitalizes the outcomes of water stations' typological analysis and the results of the investigation phase involving stakeholders and end users. After a systematic review of national and international surveys about people's drinking habits and extensive real life observations in public spaces, 6 principles to get the most desirable experience at public drinking fountain have been highlighted.

1) Providing sensory pleasure
2) Welcoming
3) Well-placed and connected to the neighbourhood
4) One-stop service (Integrating a variety of urban amenities)
5) Proudly sustainable
6) Engaging and rewarding

PROVIDING SENSORY PLEASURE

Ensuring drinking fountains appear clean is crucial to increase public confidence in municipal water and encourage citizens to rediscover outdoor water outlets.
The skin of urban element is the first interface between user and service: finding the right envelope is determinant to successfully attract thirsty users.
What kind of shapes and surfaces can **best inspire cleanliness, purity and freshness**?
This investigation intentionally leads my research to the boundaries of architecture and design practice, and brings about contemporary artists' field of exploration.
Just as an example, water, its mutability and reflections, have been essential elements for the American artist Roni Horn: in the mid-1990s she started to produce cast-glass sculptures in the form of a low straight-sided dishes, looking like solidified water, with sanded sides (obtained from contact with the mould during casting) and glossy tops, which dip slightly, reflect their surroundings, and invite viewers to gaze into the optically pristine interior of the sculpture, as if looking down on a body of water through an aqueous oculus.
These artefacts, that I appreciated on show at Beyeler Foundation, Basel, in 2016, and later on at Punta della Dogana in Venice in 2019 as part of the exhibition "Place and signs", have been a powerful source of inspiration in this phase of the research about the water station's envelope, along with other contemporary works belonging to very different artist production (from Olafur Eliasson to Ai Wei Wei, just to name a couple).

Pleasant and enjoyable sensory experience while drinking at the fountain means, above all, a provision of **tasty** water – even though the taste of water is something very hard to describe, and the debate over it spans thousands of years. Flavour is a multi-sensory construct that encompasses a broad range of sensory information: the **texture, temperature, smell and visual appearance** of both the liquid and its dispenser play into one's perception of drink's flavour.
The research project seeks to include all these intertwined aspects, looking at contemporary art, again. For instance, the exhibition "*Amuse-bouche*" held at the Tinguely Museum in Basel from February 19th to July 26th in 2020, was a critical source

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Figure n. 191
Ice Watch London,©Olafur Eliasson, Tate Modern, December 2018. Photo by Nia Shaw.

Figure n. 192
Big Bang Fountain, © Olafur Eliasson
Tate Modern, London
Photo by Anders Sune Berg.
Water, dyed blue, is pumped up in quick bursts. A strobe light catches the water jets at the apex of their trajectory, freezing them in the globular form they take at the instant before they are pulled down by gravity. Rather than experiencing the entire arc of the water, viewers can only glimpse the final moment of each burst's upward motion, a mesmerising series of abstract forms.

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Figure n. 193
Lunch, Farah Al Qasimi, inkjet print, 120x74 cm, 2018.

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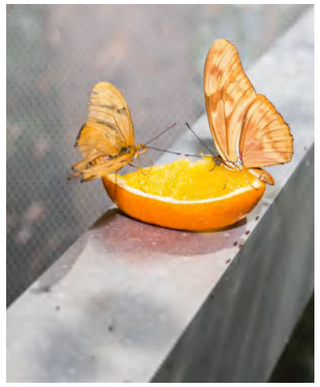

Figure n. 194
Butterfly Garden (detail), Farah Al Qasimi, inkjet print, 27 x 37 inches.

The Emirati photographer Al Qasimi has a visual language made of colourful and intriguing images, often questioning social customs and conventions, ideas around consumption and consumerism, postcolonial structures of power, taste and gender in the Gulf Arab states. Farah Al Qasimi is one of the 45 artists selected for the exhibition "*Amuse-bouche. The Taste of Art*" at Museum Tinguely exploring our sense of taste as a dimension of aesthetic perception.

of inspiration. With contributions from biochemistry, psychology, ethnology, literature, cultural studies and the culinary arts, this art experiment focuses on the effect of taste on the human experience (Baecker et al., 2020).
The exhibition poses various questions concerning our many fields of taste-related experience, that can be asked in turn to the novelty-seeking designer working at a contemporary public water dispenser: how do we perceive specific nuances of taste and what influence them? Can artworks address the sense of taste even without direct physical contact to the viewer? Can gustatory experiences be described and translated into pictures?
Taste preferences are also linked to personal memories, feelings and moments. Designing experiences **involving all senses** is becoming quite common, for example, at high-end restaurants, where chefs increasingly take advantage from the collaboration with visual artists, sound designers, product designers and virtual reality experts in order to influence and control consumers' **taste experience**.

In the same manner as the cited works of art, or advertising as well, the developed prototype aims to influence users' sensory experience in a positive way that instills trust and promotes adoption; moreover, it has the wider scope to intensively serve the neighborhood on a daily basis, so it has to be inspiring while simultaneously being tough, tamper proof, weather resistant, while containing installation and maintenance costs.
A **curvaceous, shiny, reflective, smooth and semi-transparent** surface can lend a feeling of refreshment; these effects can be achieved using glass, which lends itself to a wide array of design possibilities, and, at the same time, in terms of safety and robustness it is reliable to be used in public space. **Colour and texture** are other important features influencing sight and touch, and even able to evoke feelings without direct physical contact. These reflections have been further developed during the prototype stage, with the help of several material samples, before the manufacturing process started.

Along with exterior materials, the shape and connection of each component play a fundamental role in contributing to the **perceived hygiene** of the station and simplifying its maintenance; a better user experience and adoption may certainly result from an easier cleanability.

For an all-round positive sensory experience, the adoption of both filtration and refrigeration systems is taken into account from the beginning of the design process, to ensure the system really delivers delicious, ultra-purified and best tasting water with perfect mouthfeel; from a design prospect, this choice implies considering how to integrate the physical bulk of technical components into the overall structure.
Pristine and refreshing, it's how water from every fountain should taste.

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Figure n. 195
Melting Selves, © Franticek Klossner. Rolex Learning Center EPFL, Lausanne, Switzerland, 2013.

The Bern-based Swiss artist frequently focuses on our contemporary self-image as humans using icy sculptures of personal portraits for indoor or outdoor "infinite performances."
This impressive bust of ice initially becomes covered with a velvety layer of frost before it gradually begins to melt and drip off. This physical process occurs in what for the viewer is amazing slowness, which in turn demands one's awareness. The waiting time becomes part of the performative concept.
Retrieved from https://www.franticek.com/cv/en/

Figure n. 196
Bubble of Twenty Five, © Ai Weiwei, Galleria Continua, San Gimignano, Italy 2008. Photo by Ela Bialkowska.

The Chinese conceptual artist, architect, activist, antiques collector and designer Ai Weiwei experiments a lot with traditional materials. For the installation Bubble of Twenty Five (2008) he uses porcelain to realize 25 dark blue drops of 50 x ø 75cm each, reflecting the surrounding landscape at Galleria Continua, as well as Oil Spills (2006), blown-up blots of oil that allude to the theme of consumerism.

Figure n. 197
Air Burial, © Roni Horn, Ekebergparken, Oslo, 2020. Photo by Uli Holz.

Air Burial is a permanent open air installation in Ekebergparken Sculpture Park that consists of a group of cylindrical glass sculptures developed by the artist since the 1990s.
The peculiar manufacturing process gives the artworks a characteristic expression of a translucent exterior and a transparent, seemingly liquid interior.

WELCOMING

Beside the specific goal related to the rediscovery of public drinking fountains, this project aims to contribute towards the improvement of urban services' accessibility to a wider target of users, including children, elderly, people with disabilities.

In Italy, urban accessibility is fully regulated since 1996, with D.P.R number 503, providing a national legal framework about eliminating or overcoming architectural barrier in buildings and public spaces, and urban services as well; the article number 9 specifically concerns street furniture. However, there is a big room for making everyday urban objects really inclusive; when applied at all, **technical fulfilment** of the norms often prevails over matters of **real inclusion**. Dedicated ramps, low-level openings or control buttons paired with corresponding elements at standard heights often turn out to be marginalising rather than welcoming products and spaces.
Even worse, in everyday practice, local bids for pieces of street furniture rarely highlight mandatory requirements in terms of accessibility, as it happens, for instance, in supplying contemporary household waste containers. Since 2015, several Italian utilities operating in environmental services tested a range of trash receptacles with lever handle "volumetric drum" on the top, recognizing users' identity and fixing the quote of 15 litres per delivery. Accessibility is even penalized with such measuring cup than it was with standard foot operated waste containers: the cap lever is too high and its functionality unintuitive for a wide range of users (Fabbri et al., 2021), making it difficult for them to participate in diligent waste sorting commitment.

A **lack of accessibility** to basic urban services is something regarding some **modern examples** of drinking fountains too. Bebedouros de Lisboa, placed in three dozen of the busiest points in the city as a symbol of the sustainable revolution started with the initiative "Lisbon European Green Capital 2020", claims to be made for children, adults, people with reduced mobility and animals. Nevertheless, several articles published since January 2020 highlight some criticalities of the new water equipment; Helena Galvão Soares (2020), for instance, argues that the button activating the bottle filling faucet is too high for children or users on a wheelchair, being about 1,50 metres in height; the spout of the drinking fountain is considered to be equally unhandy and extremely uncomfortable because of its excessive closeness to the partition. **Traditional stone drinking fountains** in Lisbon, according to Galvão Soares, are simpler and more functional in their design, even though many of them don't work or need to be tuned in flow and water drainage.

Leading US-based manufacturers of outdoor drinking fountains (Elkay, Most dependable fountains, Halsey Taylor, Haws and Murdock), which export their product worldwide, all offer **similar barrier-free pedestal fixtures**, with generally one nozzle and its rounded basin compliant with American Disabilities Act (knee clearance of at least 685 mm and water jet no higher than 915 mm), combined with another taller water source, requiring less bending by standing adults (Ivanov, 2015). All of them are made of powder-coated steel for maximum durability, very much alike in shapes and aesthetic, **plain and barely utilitarian.**

Figure n. 198, 199
Drinking fountains with varied height access, especially if flagged with coarse signage, sometimes turn out to be more vilifying than really inclusive. The same goes for other categories of urban objects, like waste containers with dedicated opening.
Picture retrieved from https://nonsoloarredo.com/product/arredo-urbano/arredo-urbano-design/fontane-da-esterno/minus-accessibile
https://www.denia.com/gd-pide-que-se-instalen-contenedores-accesibles-para-personas-con-diversidad-funcional/

Figure n. 200
The first prototype of "Bebedouro de Lisboa", one of the symbols of the initiative "Lisbon European Green Capital 2020", claims to be extremely accessible, but several design issues emerged.
Photo by Melissa Vieira

Figure n. 201
Traditional fountain on Avenida da Liberdade, Lisbon, with vertical upward jet, metal mouth guard and stone basin, in its simplicity, it is more functional than contemporary models. With a spout at 80 cm from the ground and an easy press lever, anyone can use it, people on wheelchair included. For small children there is even a stone block beside the fountain that works as a step.
Photo by Melissa Vieira

This research project gives central priority to include frail citizens, trying to go beyond mere application of barrier-free regulations, and seeks to solve anthropometrics issues from the beginning, in order to have only **one accessible-for-all delivery of service** and control panel, where **difference between disability and "normality" would not be noticeable**, and where beauty would not be smothered by practicality.
In its geometry, dimension and ergonomics, the proposed urban service strives to accommodate the broadest possible range of consumers, people with different heights and physical conditions (related to age, disability, injury, etc.). Since the most restrictive condition in terms of service accessibility to users with mobility impairments is represented by an individual using a wheelchair, dimensional analysis started from this specific user. Reach ranges for wheeled mobility users have been published in academic journals and texts, and government standards for accessibility (such as the U.S. ADA guidelines). A variety of approaches have been used to characterize reaching abilities and turning space: primary Italian design handbooks (Zaffagnini, 1981, Di Sivo et al, 1987) pinpoint the maximum lateral reaching zone of an adult using a wheelchair at 1450 mm from the ground; other parameters, similar yet more limiting, can be found in accessibility design standards from United States, Canada and Australia; for instance, Australian Institute of Architect sets at 1350 mm from the floor the side reach limit to highest shelves for wheelchair users (Access For All - The Human Factor Poster, 2011), while several local Canadian access design standards fix the maximum high side reach allowed at 1370 mm from the floor, if the clear space allows parallel approach to an object. Again, Americans with Disabilities Act requirements specify a threshold value of 1220 mm when reaching to a target located at the anterior-most point and 1370 mm above the finish floor for side approach.

Particularly interesting, the anthropometry database of manual chair, powered chair and scooter users that the Center for Inclusive Design and Environmental Access at Buffalo University developed as part of the Anthropometry of Wheeled Mobility (AWM) Project (Steinfeld et al., 2010).
The IDeA centre argued that current available data on reach for wheeled mobility users do not provide designers with dimensional information for the optimal placement or locations for controls and devices in order to maximize accessibility or depict the impact of reach heights and distances on the level of accessibility; moreover, design guidelines adopt a very simplified model of reaching ability and turning spaces required by wheeled mobility users, and are outdated too, while, in recent decades, technological advancements in wheeled mobility device has changed considerably, with increased diversity in the equipment's sizes and shapes, as well as user demographics.
Researchers from IDeA centre extensively sampled different reaching and moving abilities and measured the most appropriated heights for locating objects and operable parts, the minimum turning space and clear floor area required for comfortable movements. Findings were summarized in the form of graphical charts, that turned out to be extremely useful to determine the percentage of wheeled mobility users
expected to reach target location in space for a given height from the floor and offset distance from the reference point. These values have been carefully taken into account during all the subsequent design phases.

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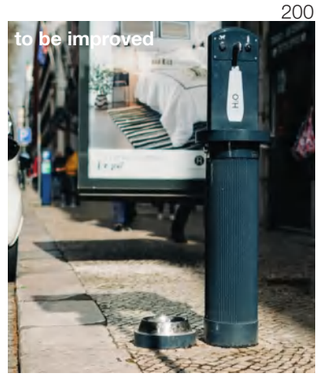

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CHILDREN

Bottle rests and operating mechanism placed within the above mentioned accessible reach ranges could also be easily used by **six-year-old children**, people of short stature or with other mobility impairments such as arthritis. Children Vertical grip reach ranges have been verified on Building Accessibility Handbook 2020 - Illustrated Commentary on Accessibility Requirements British Columbia Building Code 2018 and among the anthropometric data of infants, children, and youths to age 18 collected by Snyder et al. (1977).

Several scientific surveys show that drinking fountains and water features are among the outdoor amenities that children prefer the most. For instance, Antonio Borgogni published in Paesaggio Urbano Journal (2002) the findings of a local survey in which fountain stands out as the second most desired item in a garden according to the youngest citizens. It is up to the designer to intercept these needs and develop feasible intervention incorporating appreciable element of novelty and playfulness, beyond the mere dimensional accessibility to little users. The proposed service intends to take on this challenge, too.

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CHILDREN'S PREFERRED OUTDOOR AMENITIES

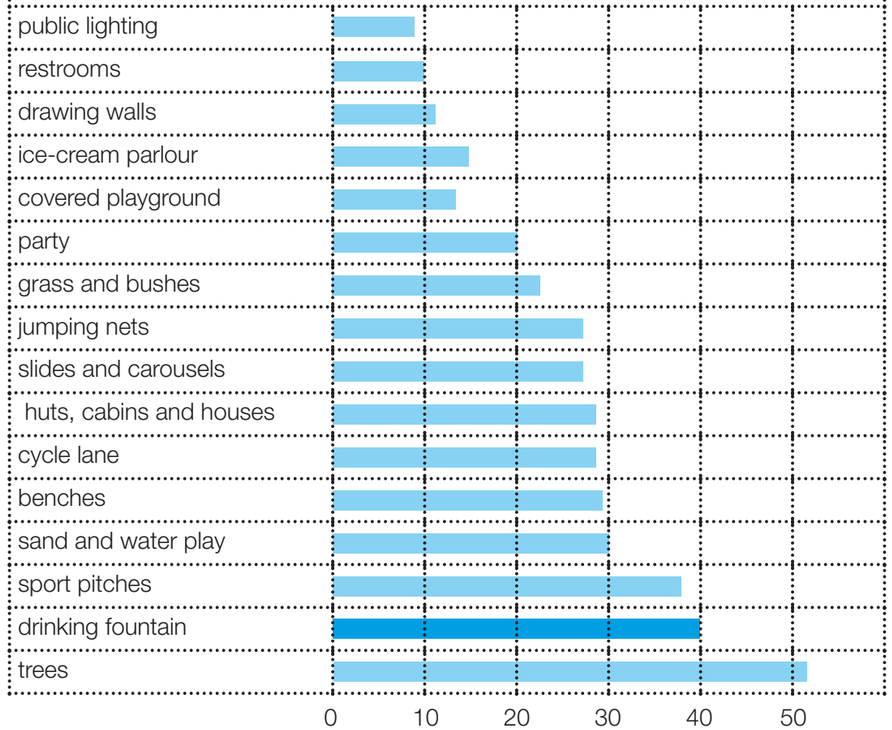

Table n. 8
List of garden features that children express to love the most in scientific surveys.
Retrieved from Borgogni, A, (2002). Poter giocare. Dagli spazi di gioco in città a città da giocare. Paesaggio Urbano 1(2), 15.

OTHER INCLUSIVE FEATURES

The objective of creating a welcoming and user friendly urban service raises questions about the appropriateness of **watering birds and pets** at the station.

From one hand, **dog walking** is an opportunity for a bout of daily physical activity, thus highly recommended, also for the elderly; on the other hand, it should be considered that a growing number of **local ordinances** in Italy and abroad actually prevents dog owners to let their pet use public drinking outlets, since a dog jumping up and drinking from humans' water faucet is a major source of disgust for many potential users of public fountains. Providing a separated, ground level small drinking though would limit this established and unpleasant practice from some dog owners and, at the same time, would support dog walking.

A major design challenge was found in the accommodation of both human and animal water spouts in the same urban objects.

Accessibility also means the flexibility to refill user's favourite **bottle - whatever size** - and preferably with **one hand**, for an easier operation of people carrying bags, holding canes or crutches, with reach or balance limitations.

A truly welcoming urban service should be also easy to use, **quick and intuitive**. Buttons for water supply should be therefore high-raised and pleasant to the touch, and not require too much pressure to activate.

Finally, accessibility shall involve the **surrounding area**, including hard surface at the base, with a sufficient slip resistance, and no steps to reach the operable parts, properly lightened in the dark.

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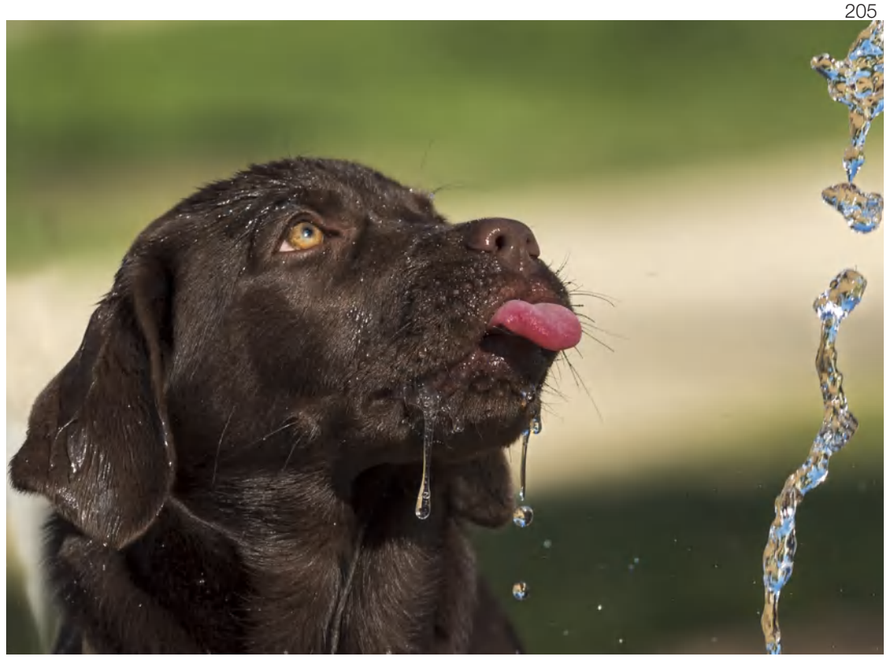

Figure n. 202
Little boy playing at drinking fountain in Central Park, New York.
Photo by Armstrong Roberts, 1950s

Traditional drinking fountains sometimes feature step stools making them accessible to children by themselves.

Figure n. 203
Estudio cabeza solves the issues of providing accessible water in public space transforming a basic urban convenience into an original play object.
Chafariz fountain, with its lateral steps and grab holes, allow children to safely climb and drink.
Retrieved from https://estudiocabeza.com/en/chafariz-drinking-fountain/

Figure n. 204
The smallest portable (and kid-friendly) drinking fountain, suitable for children from 2 years old, designed by Meetpat, when asked to customized their product for Cammeray Children's Centre in Australia.
The water station also features small details for a greater engagement of little users, like a custom lever tap and the graphics, a re-elaborated versions of drawings by kids attending the Community Centre itself.
Retrieved from https://www.meetpat.com.au/design/cammeray-childrens-centre/

Figure n. 205
Moka the dog taking her first drink at the fountain.
Photo © Riccardo Calcagni.

At this stage of the research, in light of the anthropometric data I gathered from different sources, I created a graphic illustration that summarises dimensional constraints I will face in the later design project for a new drinking fountain.
The scheme shows the relationship and the interaction between users with different ages and physical abilities and water station, and in particular the specific positions people are supposed to assume with their body to be able to refill their bottle. The drawing also displays how dogs of different breeds relate to the station, and various sizes and shapes of vessels are compares side by side, to determine necessary the most suitable dimensions.

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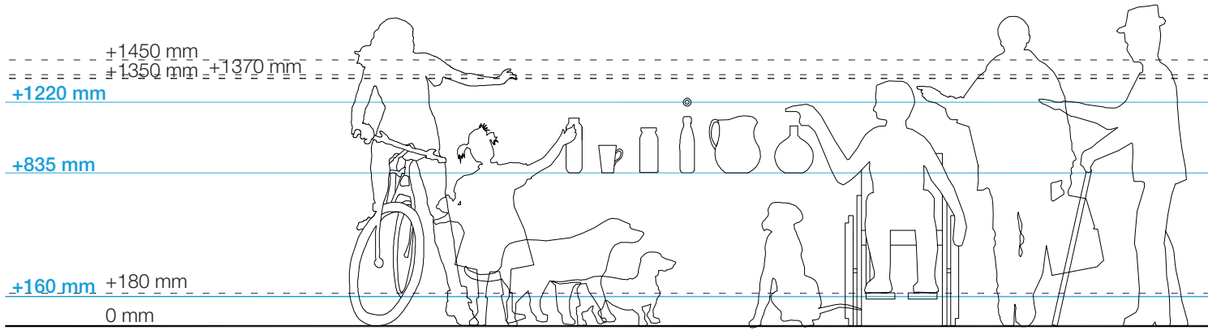

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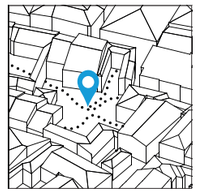
Figure n. 206
Functional reach capability scheme.
160 mm: project dog bowl
180 mm: ADA fixtures dog bowl
835 mm: project bottle rest
1220 mm: project operation buttons
1350 mm: side reach limit, (Australian Access For All - The Human Factor Poster, 2011)
1370 mm: side reach limit, Canada access design standard
1450 mm: side reach limit, Zaffagnini, 1981, Di Sivo et al, 1987)

Figure n. 207
It is a matter of height!
Jason Moore gets a drink of water with a little help from his brother in Washington Park. Photo by Richard Wood was published in the Aug. 19, 1985, Milwaukee Sentinel.

Figure n. 208
A boy gives a dog a boost at bubbler.. Photo by Harris Nowell was published in the Aug. 28, 1938, Milwaukee Journal's photo section.

WELL-PLACED AND CONNECTED TO THE NEIGHBOURHOOD



In this section I will explore the crucial relationship between a small urban object for daily use and the built environment; during my research investigation and literature review about public drinking fountains, throughout history and contemporary trends, I have come up with three distinct and correlated aspects to be considered for successfully siting and designing a contemporary piece of urban furniture that dispenses potable water:

1) WHERE?
Urban placement of each single element, in relation to city fabric and functions;

2) HOW MANY?
Network among different elements throughout the territory;

3) WHOSE?
Rooted in community identity thanks to specific design features.

1) WHERE?
Traditional drinking fountains used to be placed in **prominent locations** within the urban fabric: in the main square, along busy sidewalks, in a snug and verdant spot at the park… **Views** were also carefully considered; over the centuries, public fountains have marked landscape focal points along trade and pilgrimage routes, walking and cycling pathways, serving as informal gathering place and refreshing stage where wayfarers and local residents could have a rest and get a sip of water in stunning locations. Conversely, it is not rare to come across newer examples of water outlets that have been unthoughtfully located in the city, in concealed, gloomy, unattractive corners.
Street furnishings in general should be highly visible in well-lit and easily accessible areas, where people gather or pass by, to increase the opportunity of being used and deter vandalism; even more so, citizens should be able to clearly see and hear when a potable water source is nearby, otherwise it will gradually become **useless** in a very real sense: not actually used and usable.
A correct urban placement is therefore decisive to maximize the potential public benefits of the smart urban fixture that is proposed with this research.

Parks are the most obvious and common location for drinking fountains, as well as sport pitches, outdoor gyms and multi-use games areas, in particular those without adjacent changing facilities and indoor water sources. To best support sport people's hydration needs, **running, walking and cycling paths** are advisable locations, too, where distinctive urban elements can also serve as incremental distance markers, helping people to judge the distance they have covered.
In the built environment, fountains should be at **strategic junction** in the urban fabric, instead of be clustered with rusty bike racks, hydrants, phone boots or other pieces of forgotten infrastructure.

In relation to main **public venues**, school entrances, civic spaces and neighbourhood play areas are convenient locations to install the proposed urban service, as it could create more opportunities for children to drink water instead of flavoured, sweet drinks, at least when out of home. Facilities such as drinking fountains, water refilling stations and benches are particularly advisable in **office districts** too, along walking routes, as recommended by New York Active Design Guidelines (2010) in order to "…provide reasons for taking a walk within the workplace and offer refreshment and support during physical activity. Seating in landscaped areas can also offer sensory stimulation and lunchtime distraction from workplace stress". (Active design guidelines, p. 85).
Placing a reliable source of fresh water between a retirement residence (or neighbourhoods with **higher percentage of seniors**) and grocery shops, as well as community vegetable gardens, can also be considered an optimal choice of location. Firstly, the drinking fountain would enhance personal hydration for older individuals, at greater risk of suffering from heat waves; secondly, as the prototype intends to integrate several urban elements including benches, largely utilised by the elderly for a mental break as much as a bodily break (Barron, 2015), siting **near vulnerable population** would facilitate relaxation and allow different level of engagement and conversation.
In these settings, drinking fountains are likely to be particularly worthwhile.

Within the above mentioned favourable places, it is possible to pinpoint the exact location where to install an urban object dispensing potable water, with the following criteria:

- It should be positioned near municipal water supply and greywater pit, preferably within 5 metres.

- The prototype of multifunctional fountain that is going to be designed will require electricity to power the chiller, sensors and digital devices; therefore, its proximity to electrical points should also be verified.

- Civic works during installation and maintenance operations should not affect ordinary traffic circulation or emergency access.

- A paved path to the water station and hard standing area should be granted.

- The minimum recommended size for the location, as well as the clear floor space required by different users (manual chair and scooter users, dog owners, maintaining technicians...) highly depends on geometry and features of the deployed urban element. The research section dedicated to the design will display this point in detail.

- North facing or shaded areas are desirable choices, to prevent hot fixtures and water, chiller overload and user discomfort.

- The presence of trees has an ambivalent role in relation to drinking water: they provide shade, which is a welcomed boundary condition when taking a rest in hot weather, but, at the same time, drop leaves that can clog drainage and cause uncared-for appearance. So, their proximity to water points should be carefully evaluated case by case.

- Smelly, filthy or dusty urban corners should be avoided, likewise the ones nearby trash containers and public restroom. Preventing **cross contamination** is the main logical reason, but it is also worth considering that urban placement can also indirectly **influence perceived hygiene**. Drinking fountains are frequently placed near public restrooms: while this could make sense for cost saving measures, it may associate drinking fountains with a disgusting and unclean place in users' minds, and, as a consequence, the service could appear dirtier than it might actually be.

Proximity with other urban services throughout the built environment, tightly linked to the last point, is an urban placement criterion of special importance.
Next research section, called "One-stop service" specifically investigates how different urban amenities match together, and seeks to identify the most desirable combinations to further develop into the design proposal.
Besides urban centres, facilitating access to water in **remote areas** would be important as well; in rural and mountain areas pubic fountains are even more connected to the patrimonial identity, and their improvement, and somewhere the redesign, could address both environmental questions and touristic needs, since such initiatives could effectively valorise village, natural landscape and hiking trails (European Association of Public Water Operators, 2019). However, this doctoral thesis specifically focuses on the **built environment** of small or medium-sized cities providing drinkable tap water, with social and welfare average conditions and without particular environmental or economic challenges.

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GOOD AND BAD LOCATIONS

Figure n. 209
The good one: a cast iron drinking fountain in a prominent corner in Comacchio, Italy. A widespread provision of potable water in tourist, bike friendly districts as such is particularly advisable, since out-of-towners might be most likely to buy bottled water then when they are in their own environment.
Photo by Gabriele Castellari.

Figure n. 210
The bad one: a rusty drinking fountain barely separated from public chemical bathroom in Castelfranco Emilia.
Photo by Ilaria Fabbri, Castelfranco Emilia, 2020

Figure n. 211
Another frequent undesirable wrong location of drinking fountains, next unsightly overflowing trash can.
Photo by Ilaria Fabbri, Ferrara, 2021

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Figure n. 212
Traditionally, fountains stood out at the heart of the community displaying their shimmering water. Frisanco, a picturesque village of 600 people in Friuli Venezia Giulia Region, is an emblematic example, with its steel fountain with a rectangular stone basin in the middle of the tiny square. Photo by Eraldo Brunettin, 2015

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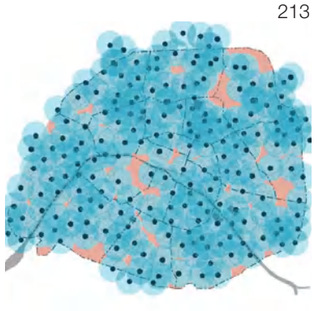

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Figure n. 213
Every Parisian lives within a radius of 250 metres from a public school; with OASIS project, each schoolyard has the potential to become a shaded and cool retreat, also equipped with drinking fountains, for the whole community during hottest days.
Retrieved from https://uia-initiative.eu/fr/node/1398

Figure n. 214
One of the transformed schoolyard, with the introduction of greenery, pervious pavement and a simple, stainless steel fountain in a central, visible position. At Ecole Merlin.
©Ville de Paris, photo by Marie Konstantinovitch

2) HOW MANY?
Frequently overlooked and poorly maintained as single objects, quite marginalized from the current smartization of public amenities if compared for example to benches, waste containers and streetlights, providing an adequate network of public drinking fountains is even less considered in citywide projects.
The overall system of public water availability is probably as important as well-designed, carefully placed and regularly maintained pieces of street furniture; it is quite obvious that, in out-of-home context, no one would depend on drinking fountains if they are seldom available, thus citizens would keep on buying bottled water, regardless of who, among them, is more sustainable and is carrying a reusable bottle, if empty.
Beside the quality of the street object itself, **designing the fountain network** with common, recognizable aesthetic, would also help thirsty walkers to look for a specific element in the urban landscape, and this can also positively impact public spaces character and overall urban coherence.
An increased access to water is an international priority, set by the UN's Sustainable Development Goal number 6, a citizens' priority, with the first-ever successful European Citizens' Initiative Right2Water, and a EU priority, as part of the revision of the Drinking Water Directive; but what could an adequate amount of water points be, averagely, in a local precinct?
Are fountains mandatory in, or nearby, public buildings, hospitals, schools, workplaces or gyms?
In Italy, city plans have extremely detailed documentations prescribing when and how to create carparks, while there is no comparable standard for installing drinking fountains. As they represent a valuable public health opportunity, as largely pointed out in the first part of this research, Public Administrations should impose minimum mandatory requirements for drinking fountains and extend access to malls, parks, playgrounds and other gathering public spaces.
In most States of America, places of assembly are required to have adequate drinking water sources, so their provision is **based on buildings' function**. International Code Council, and specifically the Plumbing Code Section 403.1 –adopted by several States and some Australian offices – also states the number of water fountains in an **occupancy**, and requires one drinking water station for every 100-1.000 people depending on the classification and function of the space (International Plumbing Code, 2018). In hospitals, for instance, at least one water fountain per 100 people is required. It is worth noting that mainly **specialised buildings and spaces** are taken into account by these regulations, with little recommendation for everyday outdoor spaces, like walking routes, neighbourhood playgrounds and local streets. However, because of loopholes in code enforcement laws in each state, builders purposely don't include fountains at **sport venues**: this lack, consequently, brings in huge profits for owners, selling bottled water at a markup (Galloway, 2011).
An emblematic example of this shameful trend is the football stadium at Central Florida University opened in 2007 without fountains at all; as already discussed in the first part of the research, since carrying bottled water wasn't allowed into the stadium for security reasons and concessionaires quickly ran out their stock, by the end of the very first game at the stadium, 18 people went to the hospital and another 60 were treated for heat-related problems. After the match, a group of concerned students organized into a group called The Knights for Free Water, asking for the introduction of free drinking fountains in the stadium.
Drinking water access is frequently overlooked and inadequately low also in **educational facilities**. A study carried out by Patel et al. (2014), involving more than hundred schools in California, highlighted that, even among building codes regarding the number of water access points required per a given number of students, there is great variability among states. For example, although Massachusetts has a building code of **1 fountain per 75 students**, in California, schools must have **1 fountain per 150 people**. Even worse, these amenities are typically located around bathrooms, or other not recommended sites, and the school administrators themselves expressed distrust towards water quality dispended by their own fountains. Similarly, New Zealand schools are required to provide at least 1 **water fountain for every 60 students** (Ministry of Education, 2021).
Providing more water fountains in or nearby educational facilities is one of the main actions of OASIS project, within the scope of Paris Resilient Strategy. The overall concept of OASIS is to transform schoolyards into healthier and greener spaces for children, as priority users, while also providing an accessible "cool island" for the whole community after school time and at weekends, especially during heatwaves. Considering that each Parisian lives within a **radius of 250 metres** from a public school (including the "collèges", middle schools managed by the City), in the project intention every neighbourhood would acquire a cool and shaded spot, with direct access to drinking water.

Another project that connects the availability of water sources in public spaces with urban distances is the Call to Action from London Child Obesity Taskforce (2019). According to the document, citizens should always be no further than 100 m from free, fresh, tasty drinking water when they are in high streets, civic spaces and public buildings. The indicated 100-metre radius encompasses either public drinking fountains and free tap availability at cafes, shops and businesses, but the expected number of water access points is impressive nonetheless, if we consider that one of the **highest concentration** is **Zürich**'s, where, on a Municipal area of 87,88 km^2, there are 1224 fountains, and most of them are also unique works of art. The reason for this outstanding density of decorated fountains dates back when each stone mason apprentice had to sculpt a statue in order to pass the master exam (Burkhard, 2020).
Other European initiatives suggest a connection between the **number of population** and public fountains: Aguas de Cádiz, for instance, in 2017 started an important citywide project aimed at increasing free access to drinking water from every day public spaces; beside the design and installation in several units of a contemporary model of stoop and drink fountain, named "modelo Cadiz", the programme intends to reach a ratio of **one water access point per 1.000 inhabitants**, identified as the most desirable proportion (Aguas de Cadiz, 2021).

In light of the above mentioned international guidelines and standards, the amount of water access points is generally based on **building's function**, **expected number of occupants**, and, in fewer cases, on **number of population** of the appointed local

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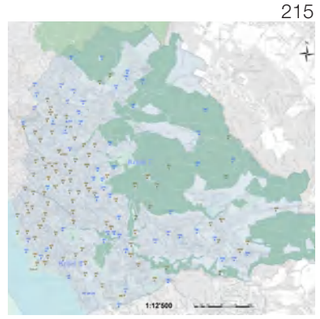

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Figure n. 215
Wth its 1200 fountains, Zürich is one of the cities with the largest number of fountains in the world. Most of them are refined sculpture works of art and tell amusing stories about their neighbourhood. Tourists can also get detailed tours around water points throughout the municipal territory.
The map shows fountains locations in districts 7 and 8, but other guides are also available.

Retrieved from https://www.stadt-zuerich.ch/dib/de/index/wasserversorgung/publikationen---broschueren.html?q=brunnen&q_topic=&q_org=%28all%29&q_dy=&q_type=publication#resultStart

Figure n. 216
Waldgeist vom Lyren, Kreis n. 9.
A granite wall fountain on the Lyren reservoir, made in 1975 by sculptor Werner Weber. Photo by André Siegenthaler / Discover Nature.

Figure n. 217
Columnar fountain in Lenggstrasse-Russenweb, Kreis n. 8. Photo by André Siegenthaler / Discover Nature.

Figure n. 218
“Hund” fountain in Glattalstrasse, kreis n. 11.
The fountain consists of a funnel-shaped trough in granite with an attached pedestal on which the bronze cast figure of a large, mastiff-like dog sits with its ears laid back. This dog serves as a gargoyle. It was made by Hans Markwalder, while the fountain trough was made by the sculptor Luigi Zanini.
Photo by André Siegenthaler / Discover Nature.

Table n. 9
A correlation between the number and type of water access points and the Municipal area of several cities.
The distribution of the proposed service is supposed to be comparable to water kiosks’, despite the significant difference between the two.

precinct. Some researches also suggest the most **appropriate distance** between water sources in central public spaces with relatively high foot traffic.
Another way to determine the optimal spacing for drinking fountains may have to do with **travelling speed** and potential users’ mode of transport; as Ivanov observed (2015), bikers travel much faster than joggers or average walkers, so they may need to quench their thirst at further distances than those going on foot, assuming that fluid replacement always occurs every 15 minutes during any kind of outdoor activities – a broadly recognized rule-of-thumb for active people. This last method to quantify the most desirable amount of drinking water outlets throughout a territory is particularly interesting: through on-site observations it would be possible to determine, by approximation, the typical and most prevailing user of a certain area, whether slow walker senior, jogger or bike commuter, for instance, and, consequently, the distance covered by that user in fifteen minutes. Therefore, the distribution map of water points would not be rigid, but tailored on predominant users’ habits and needs.

While these reflections are suitable to identify an adequate diffusion of water access points in general, it is worth remembering that the aim of this research is to propose, develop and prototype a **totally new piece of street furniture** that extends the basic service of supplying potable water in public space, and catalyse different urban functions. Given the complexity and the supposed investment for manufacturing equipment, assembly and installation, the distribution of such urban elements might certainly be different, and sparser, than basic-line drinking fountains.
Just as a reference, the current spread of **water kiosks**, which dispense filtered still or carbonated water, may be closer to the expected distribution of the envisioned urban services. Later on, the extent to which they differ in functions, design, accessibility and public health potential will be better explained.
Concomitant to the distribution of the proposed urban service, the potential **refurbishments of existing drinking fountains** should be considered, including any repair of old pipe connections to remove associated lead pollution threat; this joint action will help re-establish a reliable network of water points at local level, as long as an adequate spacing between them would be granted.

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	Rome	**Milan**	**Turin**	**Ferrara**	**Paris**	**Cádiz**
Municipality area (km²)	1287,4	181,7	130,1	405,1	105,4	12,3
Inhabitants	2 770226	1 372160	852223	131935	2 175601	114244
Total number of water points	3 066	790	813	82	1200	120
Local/iconic drinking fountains	"Nasoni"	"Vedovelle"	"Torèt"	"Acquedotto Ferrara"	Wallace and Bornes	Modelo Cádiz
Number of local/iconic drinking fountains	2 500	584	719	4	129	75
Number of water kiosks	27	47	15	1	17	2
Water points/km²	2,38	4,35	6,25	0,20	11,38	9,76
Water kiosks/km²	0,02	0,26	0,11	0,0025	0,16	0,16
Water points/1000 inhabitants	1,1	0,57	0,95	0,62	0,55	1,05

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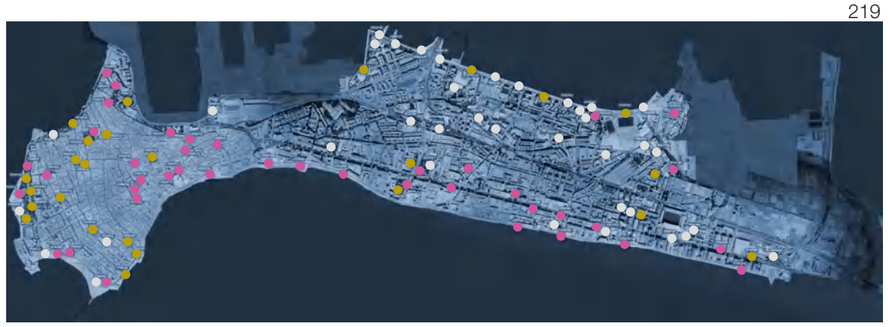

Figure n. 219
Cádiz map showing the current network of public fountains, after the analysis and installations from Agua de Cádiz.
Retrieved and adapted from https://www.aguasdecadiz.es/wp-content/uploads/2021/10/Libro_FPAP_web.pdf

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Figure n. 220
Contemporary stone model of “stop and drink” fountain, named after “modelo Cádiz”. The design is inspired by material and shape from local heritage, and has been installed in 75 units across the city of Cadiz by the local water provider. The current (March 2021) overall number of functioning public water outlets, including traditional and historic models, is 102, but the aim of the project carried out by Municipality and Aguas de Cádiz is a ratio of one water point per 1.000 inhabitants.

One of the fountains, installed at Alameda Apodaca Garden.
Retrieved from https://www.aguasdecadiz.es/wp-content/uploads/2021/10/Libro_FPAP_web.pdf

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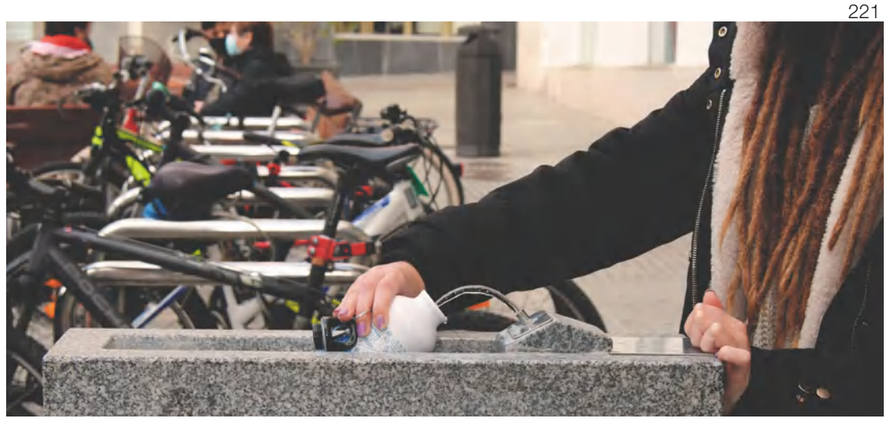

Figure n. 221
Modelo Cádiz in Palillero square. The upward water jet can be used for "stoop and drink" and bottle filler as well. Retrieved from https://www.aguasdecadiz.es/wp-content/uploads/2021/10/Libro_FPAP_web.pdf

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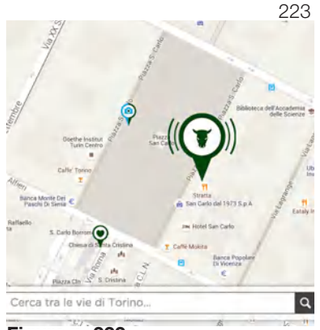

Figure n. 222
"Toret 2.0": Turin's iconic fountains have recently achieved a secondary role thanks to iBeacon technology. Using Bluetooth and the ILoveToret app, people will be able to access tourist information in the surrounding area, local news, traditional anecdotes, in addition to data on the quality of the drinking water.
This initiative is carried out by ILoveToret association, Turin Municipality, SMAT water provider with the technical partnership of the digital agency WEDOO, and effectively transforms local water sources into innovative neighbourhood guides.
Retrieved from http://byinnovation.eu/i-love-toret-a-torino-smartphone-dialogano-con-fontanelle/

Figure n. 223
The geolocated map displayed on the app ILoveToret allows to find out the nearest fountain, vote for it, and even "adopt it"with little contribution for its maintenance.

3) WHOSE?
Being a pleasant and functional urban object is not enough. A careful urban placement and a reliable network of drinking water points, although necessary, do not assure warm welcome and special care by hosting communities. Furthermore, top-down smart street furniture, and especially standard-catalogue "smart items", often lack tactile qualities and local colour, risk to be **perceived as foreign bodies** within the urban fabric and negatively impact public richness and texture on the long run.
Referring back to significant examples of minor water outlets from the past, "Toret" in Turin, "Vedovelle" in Milan, "Nasoni" in Rome, still in their simplicity, were able to represent a symbol for their city through time, **iconic objects of endearment** for local residents.
In 2009 the Municipality of Turin announced that dismissed Torets, the city iconic drinking fountains with the nozzle in the shape of a bull's head, would have been replaced with stone columnar water points, cheaper and easier to maintain; citizens raised in protest and founded the digital platform "ilovetoret". The interactive map on the website shows Toret locations, allows people to vote for them, to share posts, memories, and even "adopt" their favourite one. Together with water service provider, Toret promoters also created a task force aimed at funding necessary refurbishment.
Elsewhere, in Milan, a handful of traditional water fountains have been recently involved in a contemporary art project. Made of cast iron, painted in green and named after "Vedovelle" because of their continuous water flow reminiscent of the tears of a widow, they belong to the distinctive heritage of Milan since 1931; this typical urban element is also known as "Green Dragon" due to the shape of the faucet that reminds Dome's gargoyles. In 2018, in the framework of ArtLine public art program in the park of CityLife neighbourhood, the contemporary artist Serena Vestrucci redesigned ten faucets in the shape of several wild animals, obtained working on a wax model, consequently cast in bronze and galvanized in gold, in partnership with the local foundry Lamperti. As explained by the artist herself in a public interview (ArtLine Milano, 2018), this work aims to bring art back to a human proportion, through a quiet, non-spectacular, gesture dedicated to urban explorers who will approach their lips to drink. In addition, a fantasy book titled "Milano, la città dei Draghi Verdi", have been published in March 2019, conceived with and for children with the support of Italian writers and illustrators in order to promote the use of "magic" iconic water points and raise awareness to youth on wise use of public water precious resource.

These anecdotes confirm at what extent urban objects like drinking fountains, although comparatively small in scale, can be rooted in cultural identity and strongly represent a whole community, a meaningful **suggestion for successive design phase**. An innovative piece of street furniture should be able to talk to its community, express the territory uniqueness and give voice to public messages and initiatives.
As current drinking fountains are looking for new, fresh image, this is the chance to **experiment with playful, exciting components**, to introduce novelty features besides traditional elements. In terms of materials and shapes, since urban objects relate to both historical and more innovative contexts, custom solutions and local branding shall be possible. Distinctive geometry that simultaneously draw attention to the water outlet, provide a meeting point in public areas and contribute in creating a sense of place, in a contemporary way.

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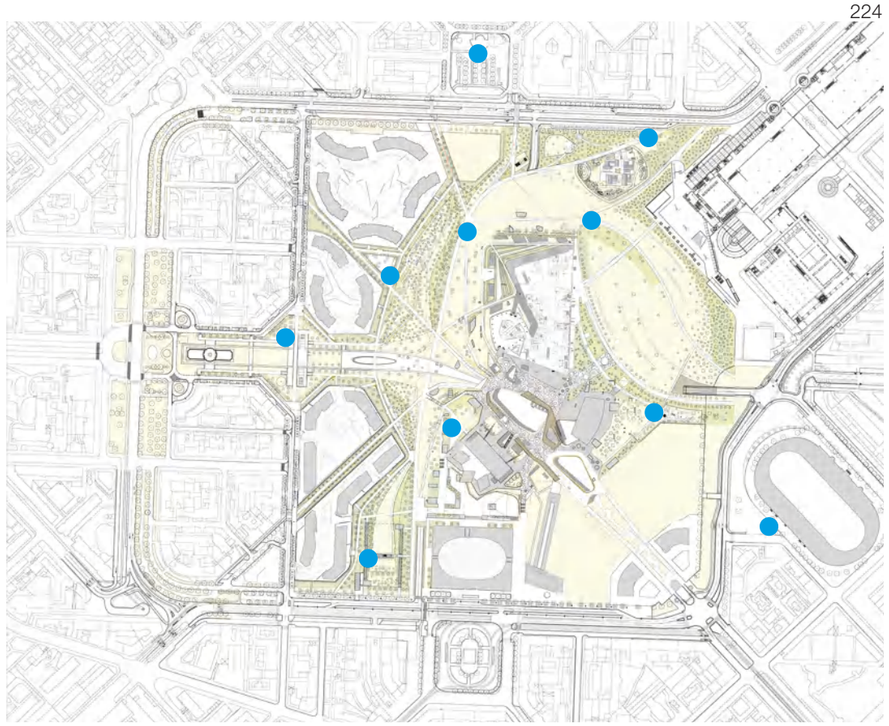

Figure n. 224
The location of reinterpreted drinking fountains in City Life Park, outdoor art museum.

Figure n. 225
Traditional "Vedovella", cast iron, green painted local fountain in Milan. Retrieved from https://passipermilano.com/2016/07/28/draghi-verdi-e-vedovelle-a-milano/

Figure n. 226
One of the revised fountain by artist Serena Vestrucci in City Life District, Milan.

Figure n. 227
Original dragon-shaped faucet of iconic fountains in Milan

Figure n. 228, 229
Rams, elephants, giraffes and mystery creatures replace traditional spigots through the contemporary art project of Serena Vestrucci.
Retrieved from https://serenavestrucci.com/VEDOVELLE-E-DRAGHI-VERDI

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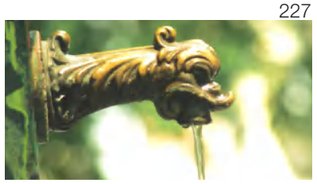

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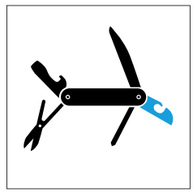

ONE-STOP SERVICE

Good street furniture has the ability to create an inspiring backstage for the social uses that unfold around it; being able to sit down, to pause or work outside with the laptop, to take a sip of cold water within a city landscape provides a more intimate contact with the place than just walking by. This common experience suggests that urban services can be **profitably used in combination**.
As drinking fountains are due for a reinvention, new design iterations could also successfully melt different urban amenities together, for a positive and reinforcing effect of well-matching street furniture and to stimulate social encounters.

A high number of small objects crowd public spaces in our cities: benches, lamp posts, public toilets, waste receptacles, billboards, hydrants, just to name a few. In describing the evolution of street furniture through history, Vittorio Magnago Lampugnani (2021) highlights how blurred the distinction between each element was at their origin: lamp posts were frequently used as road signs' support, some telephone booths also served as stamp distributors; there are also significant examples of **street lighting- benches integration**, like the whimsical model designed by Pere Falqués I Urpí, installed in 1906 along Passeig de Gràcia in Barcelona.
Moreover, the so-called **Litfaßsäule**, whose first model was installed in 1855 in Munzstraße in Berlin, was originally conceived as a cylindrical billposting, wrapped up with advertising, recessed at the base, to accommodate a public urinal or a drinking fountain.
On the other hand, monumental fountains frequently **have built-in features** serving as **sittable places, outdoor tables and shelves** all around: steps, ledges, stone parapets, low walls and other flat surfaces surrounding the water source have given people for centuries the freedom to sit up front, in the back, to the side, in the sun, or out of it (Project for Public Spaces, 2008). These solutions afford an infinity of possible gatherings, and the excellent sight lines make all the seating great for watching the theatre of the street.

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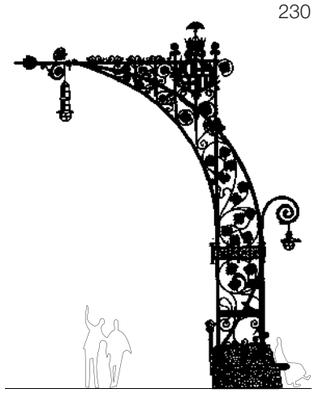

Figure n. 230
Street lighting and public seating together. Pere Falqués i Urpí, the bench-postlamp (Bancs-Fanals) along Passeig de Gràcia, Barcelona, 1906.

Today, refined **integration between different urban objects is less common**. New elements are rapidly spreading throughout the built environment, such as outdoor plugs for e-bikes and cars charging, colonizing traditional urban equipment, but, in general, design trend-oriented products, with sophisticated digital features, are making street furniture to look identical, whether in Milan, Paris, Miami or Tel Aviv, often lacking local identity.
The sidewalk installation designed in 2008 by Grimshaw Industrial Design for the Metropolitan Transportation Authority - New York City Transit is an interesting **example of synergistic design**.
The street furniture brings together public amenity – benches and bicycle parking – and raised grating for flood mitigation. Fabricated from high grade stainless steel, the prototype meets the Authority's demanding standards for durability and maintenance. The units, first installed in front of 151 West Broadway, then replicated at 15 locations, range in from 5 to 8 meters in length (Lee, 2018).

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Figure n. 231
Erns Litfaß, Litfaßsäule in its three version (pissoir, notice borard, drinking fountain). Berlin Lithographie, 1855

Figure n. 232
Bill post, a freestanding notice board designed by the Swdish firm NOLA, can be considered a contemporary evolution of th XX century Litfaßsäule. Crafted in the shape of a column, it integrates urban lighting at the top to properly illuminate notices and advertisements pinned beneath it. Photo source https://nola.se/en/products/bill-post-notice-board/

Figure n. 233
Grimshaw's design solution for West Broadway, Manhattan, incorporates subway flood prevention, benches and bike racks.

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As regards to fountains, and the most effective use in combination with other urban services, New York City Active Design Guidelines (2010), frequently mention drinking fountains and water refilling stations together with **benches, landscaping, lighting** and restrooms as the full outdoor set for appealing and supportive walking and bicycling routes. But, in design practice, drinking fountains, if available at all, are simply juxtaposed with other urban facilities, rarely combined with them to create a **brand new multifunctional object**.

Drinking fountains and mobility infrastructure, where people rest and wait, like bus stops or e-charging station, would be a natural pairing, even though it is not so frequently adopted in practice.
To the best of my knowledge, **Bus Shelter Blitz** project is the only current research that is piloting hydration stations at bus stops. Bus Shelter Blitz is a collaborative effort that involves the collective Climate Resolve, Investing in Place, Los Angeles City Hall Offices, private infrastructure contractors and community-based organizations for a comprehensive process of siting and installing much-needed amenities and repairs for people walking, rolling and waiting for transit (Meaney, 2019).
The project goal is to improve and increase transit ridership, especially among disadvantaged communities around Los Angeles, where the general lack of shade, especially at bus stops, couples with the rise of extreme heat days, with consequent health risks for citizens waiting for transit.
Since the beginning of the initiative, feedback from community members highlighted that local residents would have really appreciated having a hydration station at their sheltered bus stop, so Climate Resolve has worked alongside JC Decaux – French global player in street furniture industry to identify a range of possible shelter upgrades that could combine seating, shade and water source. These solutions, however elegant, do not contemplate any fusion between mobility infrastructure and drinking fountain.

Another meaningful attempt to merge different urban services, including water outlet, into a systematic urban equipment, is the one developed within the scope of **Smart Social Spaces Project**, a collaboration between Georges River Council (GRC), the University of New South Wales Sydney (UNSW), and Street Furniture Australia (SFA), the industry partner of the initiative.
The overall purpose of the project was to improve the amenity and user experience of public open spaces through the design and test of innovative street furniture. The Healthy Living Hardware Pole and the ChillOUT Hub were developed in the Smart Social Spaces Rounds 1 and 2 Grant projects respectively.
The **Healthy Living Hardware Pole**, installed in Olds Park, Penshurst, a suburb in southern Sydney, provides phone charging, power to brew a teapot and cook, water to drink and wash up outdoors, and shines a light at night; it offers a flexible architecture to accommodate elements such as solar panels, digital community boards and work surfaces. The Pole also includes public Wi-Fi, power and water meters, MAC address tracking and environmental sensors to measure which and how much amenities are being used.

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Figure n. 234
The spring water fountain on the corner of Enzenbühlstrasse 98 and Forchstrasse in Zürich, Kreis n. 8.
The fountain was moved to its current location in Enzenbühl in 1911, as no longer fitted the new traffic plans of the previous site in the city centre, at the intersection of Bleicherweg and Stockerstrasse. The system consists of a rectangular trough with top section and a surrounding wall with two lateral benches made of Jurassic limestone, overlooking the Zurich lake, the Zuriberg and the cemetery's gardens.
Photo by André Siegenthaler / Discover Nature.

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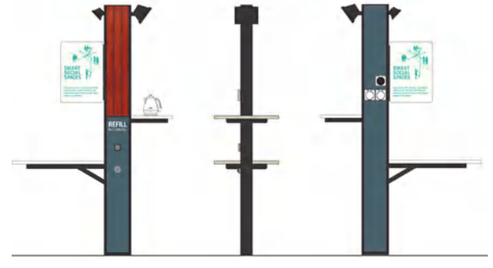


Figure n. 235
Rendering of potential hydration station configuration at bus shelters, as conceived by Climate Resolve and JC Decaux for Bus Shelter Blitz. Despite elegant lines and appropriate service combination, the different urban objects are simply juxtaposed, with no design integration.
Retrieved from https://www.climateresolve.org/climate-resolve-troubleshoots-to-pilot-hydration-stations-at-bus-stops/

Figure n. 236, 237
Drawings of the Healthy Living Hardware Pole, providing multiple services. Design by Dr Christian Tietz, industrial designer and researcher with UNSW.
The Smart Pole has been firstly installed in Olds Park, Penshurst, Sydney, for the Smart Social Spaces project.
Retrieved from https://streetfurniture.com/smart-city-partnership-wins-committee-for-sydney-award/

Learnings from Healthy Living Hardware Pole were applied to the subsequent prototype of Smart Social Spaces project, **ChillOUT Hub**, a smart open-air community space, for outdoor work and leisure. Each hub features sheltered seats and tables, smart drinking fountain, smart bins, lighting, public Wi-Fi, device charging and greenery. Cooling pavement paint contributes in mitigating heat island effect. Built-in smart technology monitors user numbers, utilities and microclimate.
ChillOUT Hub prototypes were installed in 2020 at three sites in the Georges River Council area including a busy streetscape in Kogarah, the town centre in Mortdale, and a suburban park in Hurstville. The experimental furniture has won the 2021 National Awards for Planning Excellence from the Planning Institute of Australia, in the section Best Planning Ideas – Small Project.

There are several advantages of combining different urban services into a singular, multifunctional object: users would be provided with a **flexible, one-stop piece of furnishings** with many possibilities, a reference point in the neighbourhood that makes time spent outdoor meaningful, easier and more comfortable. This advocated synergism would also balance the necessary investments deployed to install and manage urban equipment, both for Municipality and service providers. Therefore, I tried to identify the most significant matters to look for in future experiment of merging distinct urban elements:

Underlying utilities and technical infrastructure
From a building economy perspective, it is reasonable to create synergies with similar urban objects' technology and equipment. Sensors, data concentrators for remote monitoring, electrical connections and other underlying utilities could be productively shared by different physical elements when close together on the same, specialised floor area, or combined into a singular piece of furniture.

Usage affinity
This matter calls into questions whether two or more urban services are well matching, and especially in terms of hygienic and safety implications: for instance, even though both drinking fountain and public restroom share the connection to potable water mains and their juxtaposition might save costs, the first one should inspire a clean and pristine spot, while toilets are often smelly and holding tangible risks of cross contamination; therefore, their proximity or combination is not desirable, despite frequent in practice.

Urban concentration
The way in which urban amenities are spaced throughout the city highly depends on neighbourhood features, on the goals of the provider and the type of service. While there is a great number of guidelines about the optimal spacing of consecutive bus stops and a variety of standards are followed in various parts of the world, in relation to the population density and the type of housing, the best distribution of other ordinary amenities, such as drinking fountains, benches and waste containers, is less clearly classified. Generally, the ideal distance between users and household waste sorting areas should be in a range of 250-400 meters, similarly to the average spacing of bus stops and bike racks; the most correct distribution for other urban elements that cater to users with different physical abilities, thus moving at various speeds, like precisely drinking fountains and benches, might be better distributed in function of time, not of distance.
In order to rediscover public drinking fountains and devise a new kind of street furniture dispensing water, I found particularly interesting the analogies between a proper spacing of fountains and the general distribution of public seating, e-bike charging points and environmental sensors.

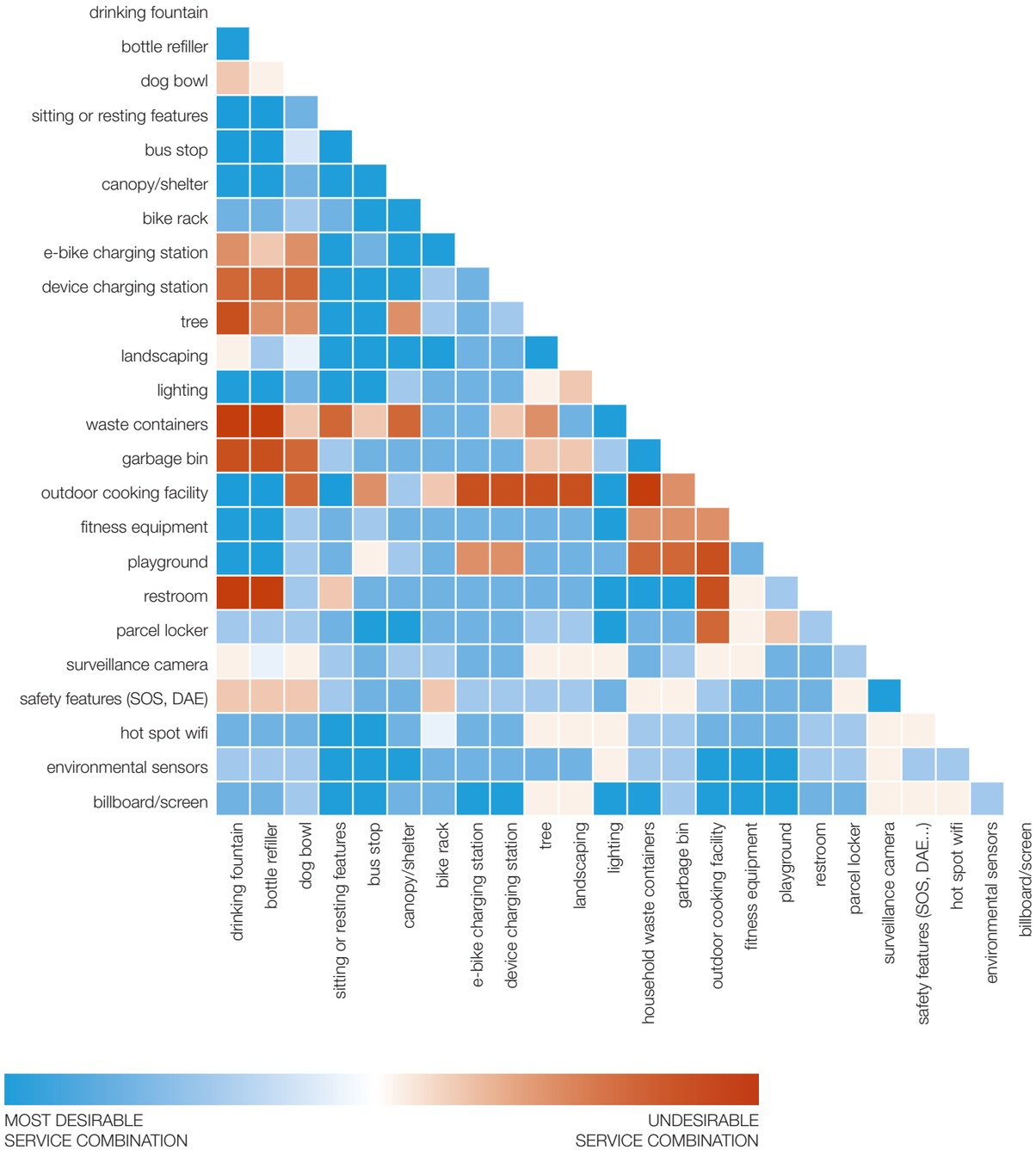
Street connection
Most urban amenities and facilities, despite addressing different functions, need to be clearly visible and easily accessible from public roads; however, some pieces of street furniture could occasionally require a minimum unobstructed floor space, or better serve their purpose if slightly set apart from high foot traffic.

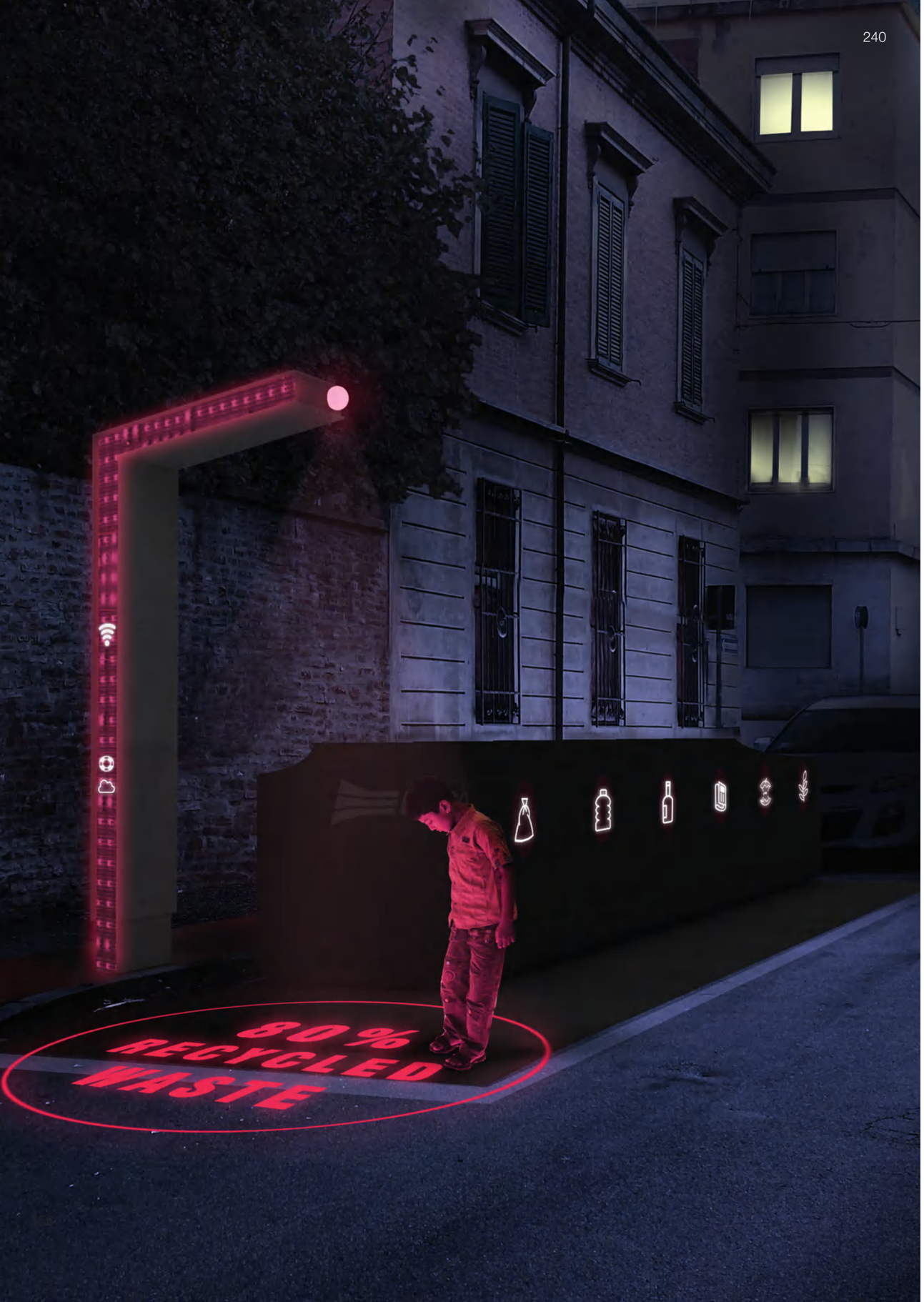
The results of this correlation analysis will be further developed in the design of a contemporary, multifunctional urban entity providing safe, tasty, plastic free water on the go.

Figure n. 238
ChillOUT Hub in Belgrave Street, Kogarah, Southern Sydney.
The demo site is a culturally diverse area with high density living, hospitals and health clinics all around, with Kogarah Station close by, and local library just in front of the hub.
This ChillOUT Hub offers a place to take a break along a busy thoroughfare, connecting the train station, hospital, library and offices. Employees may choose to work outdoors, connecting to Wi-Fi and plugging in laptops. The coloured cooling pavement paint will help in finding relief from heat.
Retrieved from https://www.planning.org.au/aboutpianew/2021-citations/best-planning-ideas---small-project-award

Figure n. 239
Example of service combination from the past, mentioned by Vittorio Magnago Lampugnani in his book " Significant trivialities - small things in urban space", 2021: telephone booth with postage stamp and postcard dispenser, Berlin 1928
Photo: Keystone-France / Gamma-Keystone via Getty Images

Table n. 10
In view of further design activity, I depicted the supposed affinity among different urban services in a Lower **Triangle Correlation matrix**. The most desirable combination resulted from the matrix will be considered in the conception and arrangement of a multifunctional piece of street furniture also dispensing potable water.





PROUDLY SUSTAINABLE

The environmental friendliness of public fountains over bottled water and the benefits that may derive from their extensive use have been reported and widely discussed in the first part of this study; tap water is supplied from local sources by local operators, it is not transported in trucks or imported from abroad, but moved directly through existing networks; it is therefore a short production and distribution chain, with a potential strong connection with the citizens at neighbourhood level. So, the sustainability of developing a supportive infrastructure for citizens carrying reusable water flasks instead of buying disposable water bottles, some of the biggest culprits of plastic pollution, is self-evident; however, the proposed service may also indirectly enhance environmental care in a subtler way, being itself a **sustainability indicator**.

For example, displaying the number of plastic bottles saved from landfill, or the CO_2 emissions avoided, even if not technically very precise, can **increase user engagement** in benefitting the environment and encourage virtuous behaviour even beyond personal commitments in reducing the reliance on plastic bottles.

Raising awareness on the quality of water through the display of the results of regular testing is extremely important towards **local residents** and **out-of-towners** as well; otherwise, hot, thirsty foreigners, not always properly informed about the quality of tap water in the places they visit, are most likely to buy disposable bottles of water when frequenting touristic areas.

Not only can the **communication** on real quality of municipal water contribute to rebuilding public trust and increasing consumption even among visitors, but it can also create a **sense of pride** in drinking local tap water, through the ownership of an iconic urban object, in which the community recognizes itself, and spontaneously takes an extra care of.

Pride may also lead to increase household diligence in **reducing water wastage**, an act of citizenship towards a valuable still limited resource.

MORE THAN WATER DISPENSER

The contribution of a contemporary drinking fountain in terms of sustainability is potentially much wider than the positive consequences deriving from the barest function of dispensing potable water. New, moderately affordable sensor technology can transform ordinary water points into innovative **environmental supervisors at neighbourhood scale** and become a centralizing spot of urban services supporting sustainable mobility and outdoor living, too.

If the system recognizes users and measures the amount water, power and broadband connection provided, but also local UV, temperature level and air quality, it is possible to record the usage trend of each station and its environmental conditions, and make them visible.

Individuals are usually affected by the way people surrounding them behave (OECD, 2017) and comparing the sustainability rates achieved by each urban district (in terms of carbon footprint reduction or plastic bottles saved, for instance) may trigger **positive competitions among communities.** Moreover, such sensing interfaces collecting data throughout the territory, would better inform Public Administration and local utilities, that, in turn, would more effectively manage their infrastructure.

As regard to projects that enhance virtuous competition among community members, a similar strategy was carried out in the frame of the research called "**Smart Waste**" – which the PhD Candidate was involved with as project manager – aimed at improving the design and the functionality of household waste containers. In that case, the proposed smart waste collection station, featuring a wide range of innovative solutions, was also equipped with a **digital projector**, able to cast on the street the recycling scores made by each community and real time feedbacks on waste collection. The outdoor digital projection, making **community efforts and performance in waste sorting visible to all,** was expected to **encourage positive competition** between neighbourhoods.

Figure n. 240
Outdoor digital projection embedded in the proposed smart waste collection station, display community sorting performance, and can encourage positive competition among different neighbourhoods.
Image credit: Smart Waste Research for Hera Group, 2016 - MSc associate prof. Gabriele Lelli, MSc Walter Nicolino and MSc PhD Candidate Ilaria Fabbri.

With these premises, the project developed with this research can contribute to the United Nations Sustainable Development Goals:

UNSDG #3: Ensure healthy lives and promote well-being for all at all ages

Target 3.4

By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

Target 3.9

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

UNSDG #4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Target 4.7

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

UNSDG #6: Ensure availability and sustainable management of water and sanitation for all

Target 6.3

By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

Target 6.b

Support and strengthen the participation of local communities in improving water and sanitation management

UNSDG #7: Ensure access to affordable, reliable, sustainable and modern energy for all

Target 7.1

By 2030, ensure universal access to affordable, reliable and modern energy services

UNSDG #11: Make cities and human settlements inclusive, safe, resilient and sustainable

Target 11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Target 11.7

By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older individuals and persons with disabilities

UNSDG #12: Ensure sustainable consumption and production patterns

Target 12.4

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

Target 12.5

By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Target 12.8

By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

UNSDG #13: Take urgent action to combat climate change and its impacts

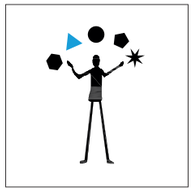
Target 13.3

Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

UNSDG #14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Target 14.1

By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.



System subscription
one-key-fit-all solution to access a broad range of services

Geolocated, easy to find services
Push proximity notifications and gentle reminders of healthy actions

Display of health goals achievement
Sustainability reporting: (e.g. single use bottles saved form landfill, CO2 emissions reduced)

ENGAGING AND REWARDING

Cities around the world are increasingly exploring how technology can improve the management of public spaces and facilities and enhance citizens' engagement in public life.
In Tel Aviv, for example, since 2013 every resident from the age of 13 has the possibility to subscribe to DigiTel platform and be connected to a personalised **interest-and-location-based digital communication network**, with daily updates. DigiTel card holders can easily share their needs with the Municipality, and receive discounts from local businesses. The service is now used by more than 60% of the city's eligible population and since its launch it effectively contributed in increasing local residents' participation in city life.

This completely new kind of urban experience inspired me some reflections about the possibility take advantage of IoT-enabled pieces of street furniture to engage citizens in sustainable and healthy life.
With the support of technology, ordinary urban objects can achieve a greater intelligence, recognize users' identity, record usage data and communicate with each other. In this way, urban amenities located in public spaces have a huge potential, especially due to their widespread diffusion throughout the local precinct.
Firstly, with relatively affordable technological equipment, contemporary water fountains can be **geolocated**, thus easy to find on the website of the city or via smartphone applications (many examples already exist, as extensively reported by Crawford & Phurisamban in 2017), improving access to this valuable public resource. The ideal fountain-locator app should include notification when users pass nearby the station, as a **gentle reminder** to increase water intake during the day.

Secondly, if the station had the ability to identify consumers and monitor usage, people would be able, in turn, to visualize their **contribution in reducing plastic waste**, the **individual health benefits** of choosing water over sugary drinks and the positive impact that drinking tap may have on finances.
The system could also encourage app-based **challenges** in the achievement of daily hydration targets and environmental friendly behavior, with the possibility to share personal performance on social media.

Even more interestingly, with the possibility of recording and understanding usage pattern, local utility may provide **incentives** for those citizens that are shifting towards a particularly healthy and sustainable lifestyle; this scheme could conveniently go beyond the use of the contemporary outdoor water station, and involve other elements from the service provider's asset: electricity, waste management, gas, public water etc.
In this way, for instance, a steady use of drinking fountain – and, consequently, individual decrease of plastic pollution – could be rewarded with waste tariff discount; conversely, a wiser use of water at household level could result in free access to sparkling water at outdoor kiosks, or citizens' commitment in curbing unnecessary energy consumption may give back premium rates for electric bike sharing service.

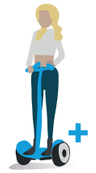
In the research intentions, the multifunctional units dispensing water are linked one another, and in network with other amenities and facilities throughout neighbourhood or at home (smart waste containers, bike sharing station, household power and water meters…), which simplify data transfer, the delivery of rewards, but also users' fruition, since they would be provided with **one-key-fit-all solution** to access a **broad range of services**.

The proposed initiative could also be extended **outside utility market**: service provider, in agreement with local businesses and shop keepers with proved sustainable ethics, can also offer discount vouchers concerning different fields: gym subscription, promotional purchase of sport apparel or healthy products at local grocery, as a recognition for citizens' effort in caring for the environment and their own health.

There is mounting evidence that **rewarding scheme** may generate a **positive norm** in the long term (OECD, 2017). Furthermore, Mont, Lehner and Heiskanen (2014) listed "stick and carrot" approach among the most effective behavioural levers to generate positive habits through material payoff to consumers' achievement.
To **avoid misuse** from cheat persons, who might devise to waste water at the smart station in order to gain extra "heathy points", a daily upper limit of the amount of dispensed of water could be set up; reasonably, the cap would correspond to each user's optimal hydration level, based on individual gender, weight, physical activity and other personal data requested at the subscription.

This envisioned system of urban services, interconnected one another and providing incentives, may convert demanding self-control practices (reduction of sugar intake, reliance on tap water rather than disposable bottles, careful waste sorting…) into positive moments of enjoyment and personal reward; on the other hand, local utilities could create an entirely **new dialogue with citizens**, and curb operational costs on the long run as a result of a more responsible use of resources and services.
With a particular reference to the piece of street furniture proposed in this research, with the introduction of a **large-scale, gamified, rewarding system**, city dwellers are expected to smoothly choose water over sugary drinks, be more active and environmental aware, highly motivated to embrace daily healthy habits.

In conclusion, the suggested health-driven network of urban services aims to create an environment where adopting a sustainable lifestyle, inclusive of the rediscovery of tap water, is not only enjoyable and attractive but also the reasonable and more convenient choice for citizens.



Rewarding schemes from service provider (dealing with electricity, waste management, gas, public water etc…)

Incentives for particularly healthy and sustainable citizens can be extended outside utility market
(e.g. discount vouchers at sport and recreation facilities or local groceries)

CONCLUSION

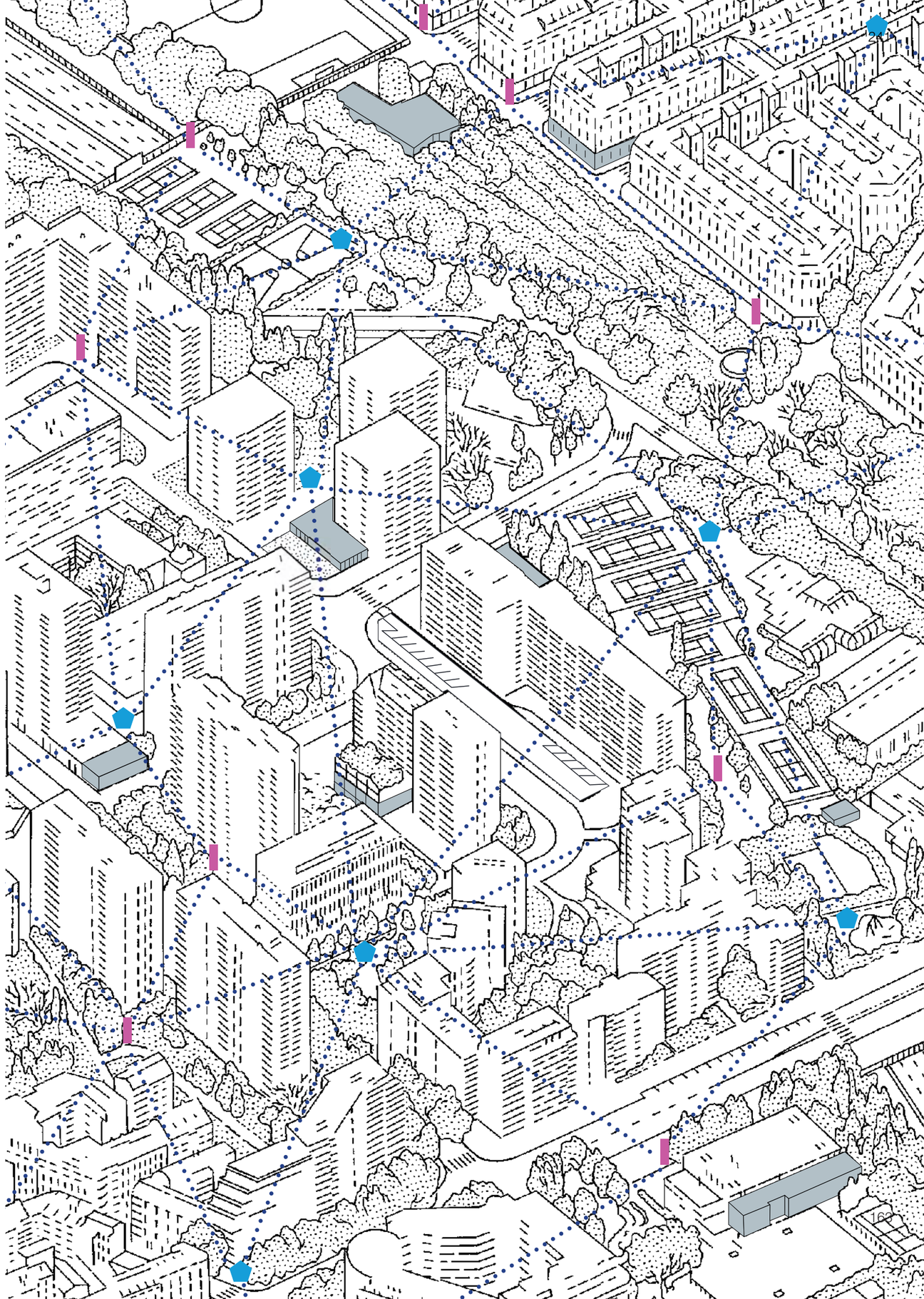
Giving fountain a **new, fresh image**, and reinventing a basic fixture as an original, multi-purpose urban object, shapes up to be an exciting challenge, both at urban and product design scales, involving public health, community perception and diversity.

As a result of the relentless decline of public investments in this basic urban convenience, people expect to come across boring drinking fountains, unadorned and barely utilitarian in their design and materials, secluded, in various states of disrepair, dispensing water of uncertain quality.
Sudden and iconic transformations of everyday objects and their physical environment can substantially affect individual decision-making, especially in contexts in which choices are made spontaneously, on the basis of automated mechanisms and habits (OECD, 2017), as it happens for other urban services, like household waste collection.
A **more considered placement** may positively impact street furniture perception and use. Public meeting points, neighbourhood retail districts, walking and exercise routes, schoolyards and playgrounds and other prominent, non-bathroom locations could represent an ideal range of possible locations for a contemporary urban service providing water, with an eye on the proximity of water supply and electrical points.

In this chapter I also highlighted the importance of designing or re-establishing a **reliable network** of urban elements dispensing water, easily spotted as part of a system and not conceived as isolated objects. Ubiquitous access to appealing, clearly visible and carefully arranged urban spots equipped with bottle filler can effectively promote consumption of tap water as the healthiest alternative, and spark public interest in totally new urban elements.
Beside optimal location, adequate network and regular inspection, a **recognizable aesthetic** in which local community can identify itself should be also considered in the design process.

Melting into the surrounding and at the same time being visible, iconic.
Responding to environmental features of different areas and being adaptable to local community needs and expectation.
Reinforcing collective memories and expressing contemporary group identity.
Converting self-control practices and healthy habits into positive moments of enjoyment and personal reward.

All these suggestions will flow into the subsequent design phase.



Physical entities of service provider that communicate each other in relation to usage
(smart waste containers, water stations, household electricity system…)

Sustainable mobility infrastructure
(electric bikes and cars charging points, bike sharing stations, bus stops)

Local businesses with proved sustainable/health ethics involved in the initiative
(Fitness clubs, local groceries, healthy restaurants…)

Figure n. 241
The envisioned network of rewarding services and facilities across the city, able to provide benefits to virtuous citizens.

Prototype design

The next part of the research is dedicated to the design and test of an innovative piece of street furniture delivering drinking water and other services for the city, with the aim to encourage personal hydration in out-of-home context, reduce reliance on Single-Use Plastics, but also promote the social and active use of public realm in a wider sense.
The ultimate goal of the product is to encourage healthy lifestyle and sustainability in key public spaces, where residents and tourists pass by, stroll and relax daily in large number.

ALTERNATIVE DESIGN CONCEPTS
After the definition of user needs and the design brief, alternative design solutions have been generated and evaluated within the project team, including Hera group members. We tried to craft as many as possible plausible variants, each one was developed through sketches, digital visualization in urban context and technical drawings for preliminary assessment of materials, structure and consequent development costs.
All the proposed design options are **self-standing**, with no need of foundation nor excavation works: the goal is to **simplify urban placement** and hold down future **installation costs**. A freestanding structure also allows greater flexibility of **relocation**, making the prototype particularly interesting to cater water at temporary public events, music festivals, sporting competitions and many other outdoor initiatives, often attended by large numbers of people especially in summer – the typical high season for outdoor activity. The shape of the plan, the height and base ballasts of each configuration are seized to guarantee an adequate – with precautionary allowances – static overturning angle in case of wind loads or other lateral impacts.

Earlier design solutions consist of vertical columns in several plan shapes and dimensions, with cylindrical or bell-shaped base, smart sensors on the top and minimum storage to accommodate a non-filtered and non-refrigerated system of water delivering.
Then, the design gradually evolved towards more articulated alternatives; the project challenges of reinventing public fountains using contemporary shapes and materials lead us to reflect upon the original role of water outlets in urban environment, a **gathering point** where to meet up and pause. Bringing back the association of drinking fountains with **public bench** where to seat down for a conversation or simply have a rest while drinking, emerged as an inspiring opportunity.
Curvaceous shapes were considered more suitable for the proposed piece of urban furnishing than other layouts with straight lines, a safer choice for the public realm, and more effective in creating a calming urban spot and expressing freshness and health.
The alternative design solutions share the common choice of developing an urban object covered in glass, still differently from one another. **Glass panels** are among the most **sustainable, durable and functional** materials to be placed in highly trafficked area, which can meet precise **safety requirements** and be recycled endlessly without any loss in purity or quality. The variety of surface effects, colours and textures offered by glass also allows to explore almost infinite design solutions of contemporary aesthetic.
To manage curvy lines, we considered **glass bending technologies** used today, and the possibility to optimise target radius to the the maximum bending angle commonly produced by middle-size glass manufacturers.

Design brief definition
⬇
Creation of alternative solutions
⬇
Analysis and rating of each generated alternative
⬇
Identification of the best solution
⬇
Iterative and incremental approach to the selected design solution
⬇
Full design description
⬇
Design verification
⬇
Refinements
⬇
Design validation
⬇
Prototyping

Flow diagram describing the Design Solution Definition process adopted in this research to achieve the first prototype

Figure n. 242
Bell-shaped totem, with metal structure and curved glass shell. It is one of the first design solutions, delivering basic services.
Image Next city Lab for Hera Group
Visualization by Ilaria Fabbri

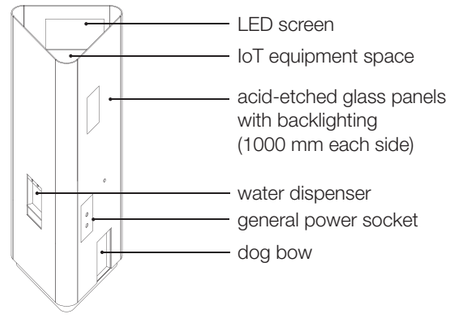
The main alternative design solutions are listed and briefly described as follows.

TRIANGLE-SHAPED POLE
This solution is conceived as an isolated triangular totem, whom inner metal structure is covered with **acid-etched glass panels**, with curved edges, LED backlit. Even though the geometry is **self-stable**, a concrete base is also considered, for a greater stability, with all necessary electrical and water system fittings.
The technical equipment of this version would include: environmental sensors, digital signage, SOS button, surveillance cameras, outdoor speakers, bottle filling faucet, dog bowl with dedicated nozzle, power outlets for device and electric vehicle and LED lighting. With a side in plan measuring 1000 mm, this solution can accommodate both **water filters** and the **cooler system**.

CAPSULE-SHAPED POLE (patented)
The plan of this totem is a rectangular shape with a pair of semi-circles positioned at opposite ends, for a full width of 865 mm and 285 mm in thickness. The proposed height of this object is 3100 mm from the ground.
The **metal plate** surrounding the shaft of the totem has a **twofold purpose**: it prevents **overturning** under static and dynamics forces and supports the glazed **seating**. The vertical shaft features backlit horizontal grooves, aiming to create **indirect glowing effects**. In addition to the previous version, the stadium-shaped one offers a public **bench** and **coloured photovoltaic glass** (for the seat and the roof protrusion); conversely, it does not have digital signage and the inner volume hardly accommodates water refiners, so it would dispense non-filtered room temperature tap water.

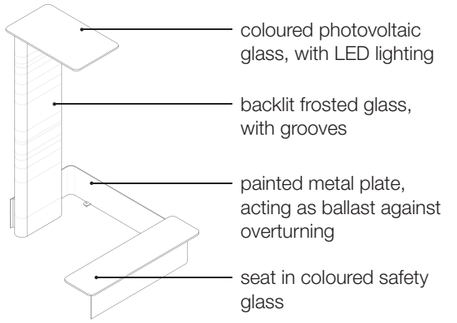
GLAZED PILLAR WITH SEATING
Conceived in several sub-variants, the common traits of this design hypothesis are the glazed, **cylindrical shafts**, with a diameter of 350 mm, made of **back-printed curved glass panels**, joined together, some of whom can be opened for maintenance. The glazed shell curves inward where the water faucet is located, for a more comfortable procedure of bottle refilling.
The metal base, which can be cylindrical or in blob shape, works as a ballast for stability and contains electrical cabinet and water chiller; technical feasibility concerning the inner storage space was also verified with detail drawings. The **seat** is designed with an irregular perimeter and rounded borders, protruding from the base, supposed to be made of **thick solid wood** (about 150 mm in thickness).

DOULBLE SLAB TOTEM
Design solutions called “double slab”, coming in different sub-variants, are the direct ancestors of the selected final design developed into the first prototype.
The key features are the vertical stele with two back printed glass panels and metal structure in the middle, and an **elongated opening** where the bottle rest and the dog bowl are located; therefore, this piece of street furniture would be **accessible on both sides**. Environmental sensors, power plugs, water dispenser and speakers are placed on the opaque span between the two glass panels. To be self-standing, the metal plate at the base of the totem extends and folds in a bench. Underneath the seat, the design envisaged an unobtrusive box were electrical cabinet and small chiller can be stored. After this proposed location of the refrigerator, it follows the necessity of a connection from the space under the bench and the totem, for water supply, a **weak spot** of the station.



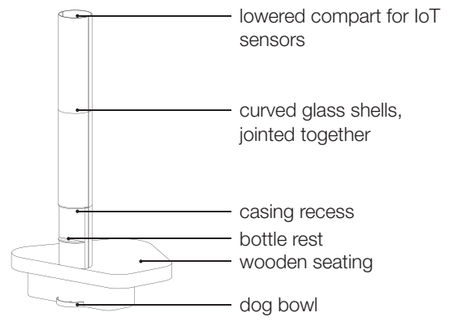
TRIANGLE-SHAPED POLE

wide accessibility	3
visual impact	2
self-stable geometry	5
extensible in service	1
water features	4
technical achievability	3
suitable advertising space	4
affordability	2



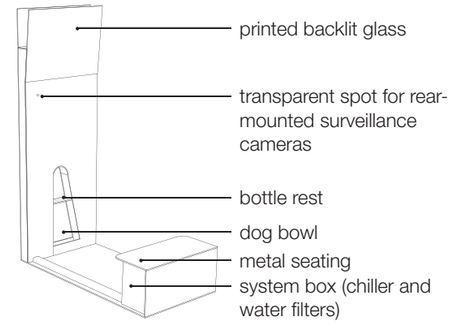
CAPSULE-SHAPED POLE

wide accessibility	2
visual impact	3
self-stable geometry	4
extensible in service	2
water features	1
technical achievability	2
suitable advertising space	1
affordability	2



GLAZED PILLAR WITH SEATING

wide accessibility	4
visual impact	2
self-stable geometry	5
extensible in service	1
water features	3
technical achievability	2
suitable advertising space	1
affordability	3



DOUBLE SLAB TOTEM

wide accessibility	4
visual impact	5
self-stable geometry	4
extensible in service	4
water features	5
technical achievability	4
suitable advertising space	5
affordability	3

Figure n. 243
Alternative design solutions assessment (summary).
Images Next city Lab for Hera Group
Visualisations by:
Tommaso Freguglia and Alessandro Balzan (triangle-shaped pole, glazed pillar);
Ilaria Fabbri (capsule-shaped pole);
Operavisual (double slab totem).

EVALUATION OF ALTERNATIVE DESIGN SOLUTIONS

The cross-disciplinary research team, composed of both faculty members (professor Gabriele Lelli and Phd Candidate Ilaria Fabbri) and Hera Group employees (Eng. Enrico Piraccini, Eng. Simone Allegra, Eng. Davide Cupioli and M. Eng. Federico Lazzarini from Innovation Central Direction) analysed how well each of the design alternatives meets the design objectives and technical requirements, with the industrial partnership of Ecoline, an Italian Leader company in the field of water treatment.

Evaluation criteria for selecting concepts were established. Cost-effectiveness was carefully considered; however, other criteria, such as time to develop and certify the prototype for public use, and feasibility of operations and maintenance, given that they significantly contribute to life cycle costs and to the system reliability (NASA, 2007).
In particular, Hera Group, as key stakeholder and bearing all pilot project costs, provided specific inputs and constraints: they encompassed **expenditures** and **time to deliver** (it is worth considering that, at this stage of the research, supply chains were disrupted and slowed down or even stopped production due to the first wave of COVID-19), **robustness**, **operational requirements**, like the compelling integration of filtering and cooling systems, **height constraints**, for an appropriate installation of sensors for capturing correct environment data, company visibility, or other less obvious aspects such as the availability of **advertising space** as profit opportunity, or free inner room for further expansion towards a **payment module**, delivering certain urban services for a fee. All this information was reviewed and documented, so that all parties came to an agreement on the prototype expectations.
Design alternatives were than ranked according to the identified selection criteria, summarized as follows: wide accessibility, visual impact, self-stable geometry, extensible in service, water features, technical achievability, suitable advertising space, affordability. This process allows to **pinpoint the best design solution** from among the alternative design concepts, drop less promising alternatives and proceed to the next level of resolution.

ITERATIVE AND INCREMENTAL APPROACH TO THE SELECTED SOLUTION
The Double slab totem stood out as the optimal solution maximising the goals; however, the evaluation highlighted several design issues that required further investigation.
The insulated connection between the system box under the metal bench, where the filtration and the chiller are located, and the vertical stele dispensing water, is the biggest weakness for the performance and usability of the station. Refrigerated water running through the pipe on the base plate is exposed to overheating in hot weather, with an increased demand for cooling that can overload the chiller; besides, the connection creates a physical obstacle that affects the design in accessibility and safety.

DOUBLE SLAB TOTEM 2nd VERSION
The successive refinement process on the selected design option determined the review of the bench location, along with better definition of the vertical stele, the envelope and its structure; firstly, the seating was moved centrally, then, sideward, so that the connection between the chiller and the water outlet is shorter and stored away from heat inside the system box. This halfway layout still has a metal plate at the base acting as a ballast against overturning, that folds to create the seat and it is cut on the outer side in the shape of a semi-circle dog bowl.

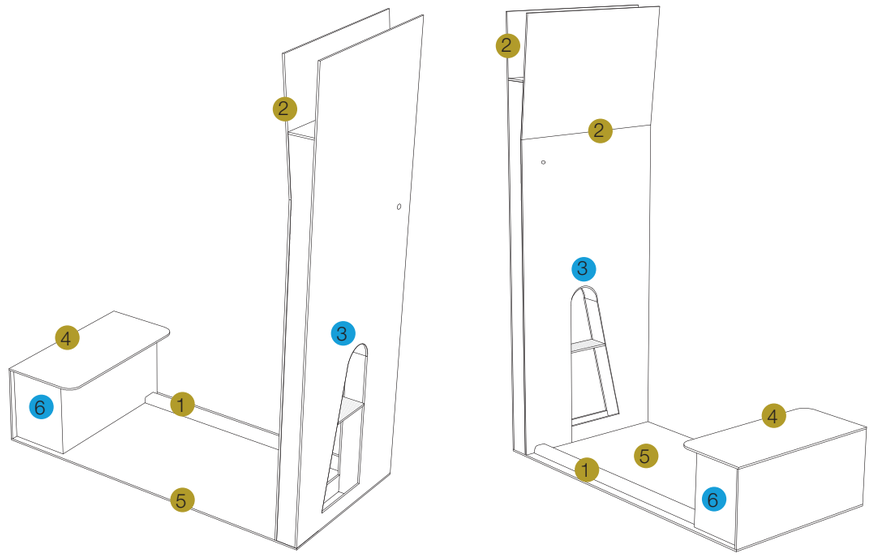


Figure n. 244
DOUBLE SLAB TOTEM 1st VERSION

1- The insulated connection between the system box and the vertical stele is the biggest weakness of this option.

2- Protruding glass panels and bent surface entail technical isses and additional costs.

3- The elongated opening is considered an iconic features to be mantained.

4- The folded metal seating can get extremely hot in the sun.

5- The metal plate at the base serves as ballast, but can create a physical obstacle.

6- Refrigerator and walter filters can be conveniently stored under the bench.

successfully improved feature

issue to be further developed

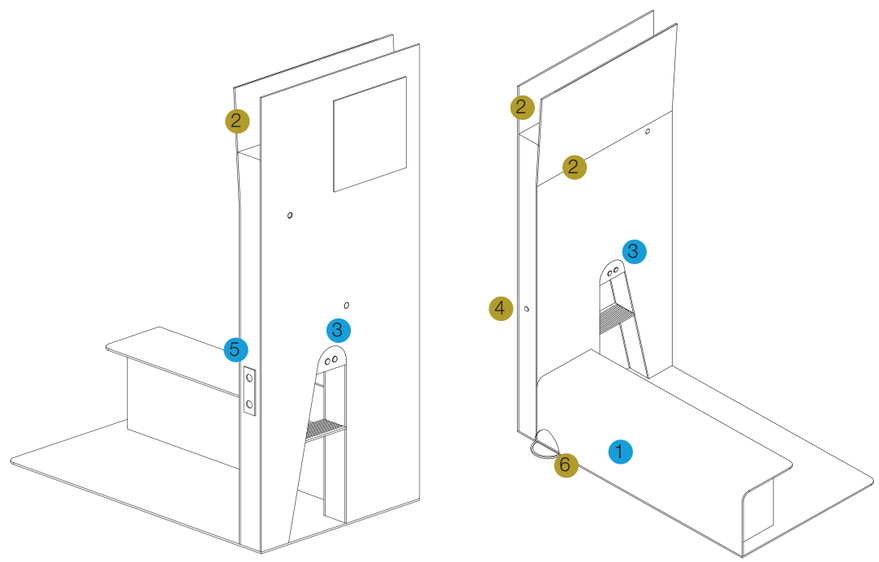


Figure n. 245
DOUBLE SLAB TOTEM 2nd VERSION

1- The connection between the chiller and the water outlet is shorter and stored away from heat inside

2- Protruding grall panels and bent surface entail technical isses and additional costs.

3- Bottle refill buttons can be properly installed in the upper part of the oblonged opening.

4- A delocalised button for the dog bowl can lead to a confusing user interface.

5- General power sockets can be usefully placed on the side of the totem

6- The dog bowl is not clearly visible

DOUBLE SLAB TOTEM 3rd VERSION

In the successive version, the whole stability of the station relies on the geometry and the weight of the **bench**, sculpted in **curvy shapes**, together with thick metal plates at the base of the stele, so the structure can dispense with the wide metal surface previously functioning as large counterweight. Inside the drop-shaped seating, the refrigerator is protected from hot wheatear and optimises water flows and energy demands.

The incremental design work lends to explore the possibility to use **wooden boards** for the seat, definitely more comfortable than metal, with a warm touch, and thermal insulation properties, for an additional help in the protection of the inner components from extreme temperatures. In the glazed back printed shell, a vertical LED wall would be integrated with a flush mounted installation, as developed thorough **detail drawings of glazing clips** and **backlighting system**; the length of glass panels' overhang from metal structure is also reduced.

Technical drawings evolved phase to phase towards **full design description**: the resolution of the design increased thanks to the **partnering with national experts** in water cooler dispensers, who supported in the identification of the effective size of all the components and connections, the recommended mutual placement and maintenance operations. In particular, the refrigerator, water and electric meters and the electrical cabinet are secured on the backside of the seat, that can be opened for an easier access to the devices from operators. In the design intention, the bench would be located exactly on the pit with incoming water pipes and energy supply; internally, pipes and connections run towards the smart totem, up to the water dispenser.

The third version of double slide totem anticipates of several details finally adopted in the prototype, such as the backlight system and the location of the dog bowl, at the bottom of the oblong opening, a stainless steel basin that gets filled with temperature water when the dedicated knob - moved next the other buttons for bottle refill – is pressed. Conversely, the attempt to take advantage of the empty space underneath the seat at the conjunction with the totem to put the necessary air vent grille, will be abandoned in final design in favour a simple solution where ventilation is located on the side of the bench.

DESIGN SOLUTION VALIDATION AND BASELINING

The final design of the prototype is achieved through a recursive and iterative process until the system – aesthetic, accessibility, technical requirements etc. – meets the stakeholder expectations. The most significant adjustments involved the perimeter of the stele, that features a **6-degree tilt inwards** (while the two vertical sides used to be parallel until that moment), and the removal of the structural base plate; in its place, two stainless steel rectangular profiles at both sides of the dog bowl. Levelling feet will be used to compensate for height differences or in the case of floor irregularities. Further review concerned the two sides of the totem: the structural C-shaped profiles, measuring 140 mm in height and 70 mm in width, is positioned with its cavity towards the exterior, and creates a C-channel, a kind of gola, running alongside the perimeter. The glazing clip and its joint with the structure and the backlighting system have been improved with a twofold purpose: firstly, to make the whole stele **look lighter**, focusing on the protruding slabs made of glass instead of a compact, bulky side, and to accommodate, and hide, the panel hinges, with whom it would be possible to open the totem for drainage, dispenser and filtering maintenance.

Finally, the curvy bench has been **shifted forward**, in order to obtain a greater stability and provide users on both sides with useful support surface: he narrowest tip of seating can conveniently serve as a stand for the bottle or other small objects.

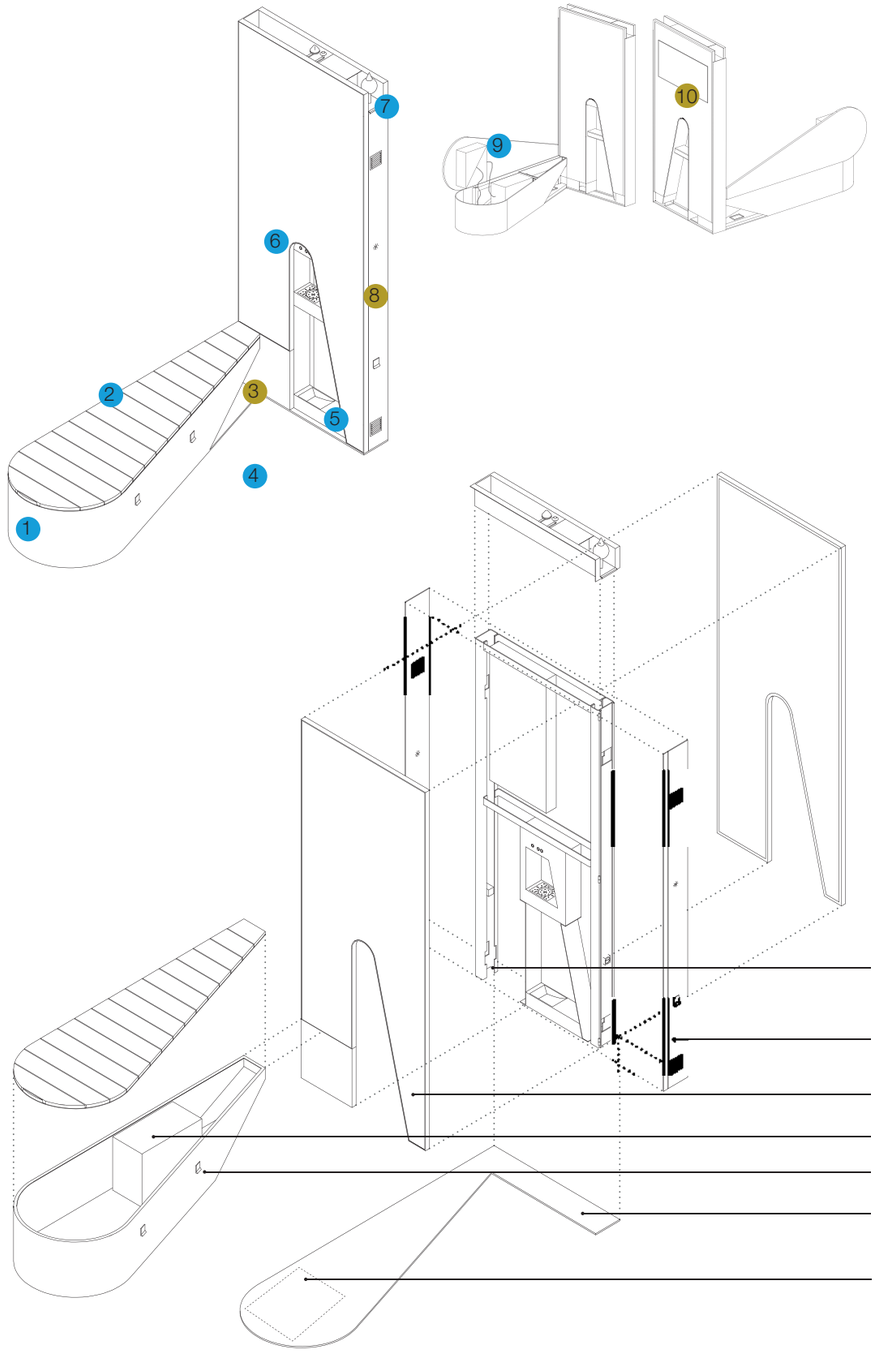


Figure n. 246
Increase in the design resolution
DOUBLE SLAB TOTEM 3rd VERSION

1- Drop-shaped bench, more spacious for people and system to be stored inside. It also offer greater stability.

2- Wooden seat would not heat up in sunlight and contribute to system insulation.

3- At the connection with the totem, the bench empties, and the vent grille are located on the slanted side.

4- Removal of the metal plate, since the bench alone provides for stability.

5- More visibility to the dog bowl if placed underneath water dispenser.

6- With all the command buttons, including the one filling the dog bowl, grouped at the top of the opening, the user interface would be more intuitive.

7- Glass panels' overhang from metal structure is reduced.

8- Compact, bulky side, measuring 215 mm.

9- The seat can be opened and the electrical cabinet is secured on its backside.

10- The mutual proportion of the oblonged opening and the digital screen should be revised.

FINAL DESIGN

The design of the multifunctional water station has been successfully registered to the **European Union Intellectual Property Office** on July 2nd 2020 with the patent number 008027726-0001; the certificate of design property appoints as inventors the following research members: from industry side (Hera Group) Eng. Enrico Piraccini, head of development, Innovation Central Direction, Eng. Simone Allegra, project development, Innovation Central Direction, Eng. Davide Cupioli and M. Arch. Federico Lazzarini, Innovation Central Direction; from academic side Prof. Gabriele Lelli, Next City Lab scientific coordinator, M. Arch. Roberta Bandini and PhDc Ilaria Fabbri.

The new multifunctional urban object has been called **PUNTOnet H_2O.** The name "PUNTOnet" was originally chosen in 2016 to indicate innovative smart containers designed and developed by Next City Lab research group, including the PhD candidate Ilaria Fabbri, for Hera Group multi utility. While "PUNTO" simply refers to a defined location, a specialized spot in the neighborhood, "net" hints to the network created among collection points and other smart urban elements; in the Italian language, "net" also recalls something neat, tidy and clear-cut (Fabbri and Lelli, 2021); adding just the suffix "H_2O" to that name, the multifunctional water station is branded in a way that marks the continuity with previous researches and prototypes in the same field of innovative urban services, developed by the candidate and other team members.

The first version of PUNTOnet H_2O is an innovative and high-tech street furniture delivering purified water for bottle refilling, along with a wide range of other urban services, able to collect and display data about the usage of these services and from the environment where the prototype is located.

A **2765-mm tall, shiny, colourful** totem that could act as an **easily visible beacon** throughout the city, featuring an **iconic oblong opening** that provides an uninterrupted view of the ground and its surrounding.

It is a **freestanding** structure, with no need of excavation works nor foundations. Its shape and weight are crafted to withstand strong wind pressure and high urban impacts, with the bench at the side of the totem providing the needed stability and counterweight. This choice simplifies installation and curbs costs, since no cuts or damages on the existing paving will result from the positioning, except for small civil works for the installation of subsurface pits bringing together municipal water and electrical supply, whenever the use of existing ones is technically not feasible. Stainless steel adjustable feet will conveniently plumb the totem and the bench, levelling the whole street element in case of slopes or irregular/rough surface.

PUNTOnet H_2O is completely **accessible** and can accommodate a wide array of users, including children, commuters, runners, homeless, and tourists, as well as pets. For each press on the corresponding wheelchair and kids-friendly button, it dispenses up to 50 cl of still filtered water, ambient or chilled; a third button fills the stainless steel bowl fixed in the lower part of the totem, enabling dog walkers to let their pet drink.

The shape of the smart totem allows the contemporaneous existence of the bottle refill nozzle and a dedicated space for watering animals, without affecting the station's hygiene.

Figure n. 247
Night postcard describing the proposed service glowing in the park. Tentative idea of packprinted glass with an enlargement picture of a fruit salad.
Visualization by Ilaria Fabbri
172

PUNTOnet H_2O cares about customers' health and tastes: it delivers **premium water** with **perfect mouthfeel**, thanks to the latest cutting-edge water filtration techniques that remove chlorine taste and odour that sometimes might be noticed while drinking tap water.
PUNTOnet H_2O has been designed with special **hygienic features**, like the use of stainless steel for all the external wetted components, being easy to clean, tough and corrosion resistant, without affecting taste. In addition, water exit point is recessed from the cylindrical nozzle, to prevent bottle rim, or other objects, from coming in contact with the dispensed water.

PUNTOnet H2O is **extremely versatile**, and able to adapt to any type of outdoor environment: its completely removable and replaceable backlit glass panels, with endless opportunities of print, provides a contemporary aesthetic and can be customized according to the location.

PUNTOnet H_2O is a **multifunctional** urban object: more than a basic drinking fountain, it offers a Wi-Fi connection, electric charge for smartphones, tablets, e-bikes and mobility scooters; it accurately assesses the quality of urban environment through a high-precision monitoring station, and watches nearby area with small security cameras, smoothly embedded in the two glass panels, to improve the perceived safety and quality of life within the neighbourhood.
The product also has a led screen enabling **marketing opportunity** that can **inspire engagement in healthy lifestyles**, environmental stewardship and promote positive, public messages or initiatives.

Besides water outlets and technology equipment, the prototype also includes a **public bench**, which is one of the top age-friendly features, as it can be more difficult for older people to enjoy walking without somewhere tor rest. Therefore, installing drinking water points combined with public seats throughout the city may also support seniors to go out, access services, and participate in walking and outdoor activities (WHO, 2012). As confirmed by an exploratory study conducted in Ottawa, a neighbourhood that is activity-friendly for seniors will also be a good place for everyone else to live, work, and play (Lockett et al., 2005). PUNTOnet H_2O is therefore a **community focal point** where to meet, work, take a break outdoor.
The drop-shaped seating houses the bulky system of the water station, and it is located exactly on the pit with incoming water pipes and energy supply; internally, pipes and connections run towards the smart totem, up to the water dispenser. Water and electric meters, and the electrical cabinet, are secured on the backside of the seat, that can be opened for easier maintenance operations.

Modularly extensible in its services and equipment, the prototype can potentially wide its operating range if combined with other street infrastructures and public domain facilities.
PUNTOnet H_2O also supports **circular economy**, since it is manufactured with recycled and recyclable material, durable and weather resistant.

Figure n. 248
Daylight postcard of the proposed service in the park, from the side of the bench.
Tentative idea of packprinted glass with a macro chloroplast.
Visualization by Ilaria Fabbri

URBAN LOCATION AND GROUND SURFACE

The service is dedicated and accessible to pedestrians of all ages, dogs, cyclists, kick scooters and wheelchair users; therefore, the area should be paved with **stable, slip resistant, non-stick and glare-free surface**.

To be properly used and maintained, PUNTOnet H_2O requires an **unobstructed floor space** measuring about cm 472x540; in the event that branches and hanging limbs extend onto that area, the location would be carefully evaluated by the research team with technicians. The appointed layout ensures there is a sufficient room around the unit for wheelchair and pedestrian **circulation** and **access.** Cyclists are also taken into account: bikers dismounting and stopping the motion of the bike to refill their bottle or recharge the vehicle could be a barrier for other potential users. This suggests that the drinking spot for bikers' water should be further apart, or the service located with an appropriate ground clearance. The additional space on the right (1500 mm) provides users, and in particular cyclists, with **useful manoeuvring space** for balancing and avoiding eventual obstacles.
Clear floor space oriented for both a forward or lateral approach is almost centred on operable portions (buttons and bottle shelf). The dual-sided water dispenser also allows users to perform tasks more comfortably, i.e using the right or left hand.

In case of pre-existing paving, its thickness shall be capable of supporting maintenance vehicles, in addition to the prototype's weight of about **500 kg**. While concrete is recommended, asphalt, compacted gravel and stabilised earth, clay brick or patio stones may be suitable as well. Conversely, if the site of the installation is unpaved, an approximately 20 cm thick **reinforced concrete slab** is required. This value may need to be increased depending on sub surface conditions. Form boards shall be set in order that the concrete slab slopes a minimum of 1%, to provide adequate **drainage**. Wire mesh inside the poured concrete will help to bridge over small imperfections in the subgrade, and lessen the likelihood that sinkholes will develop.
For safety reasons, the edges of the slab should be properly smoothed by running an edger along the perimeter. A **slightly rough surface** is greatly desirable for non-slip footing at the base of PUNTOnet H_2O: this can be achieved pulling a broom over freshly placed concrete. Brooming creates a brushed surface with grooves typically installed crosswise to the users' expected direction.
The surface of the concrete base shall not be higher or lower than 2,5 cm from the surrounding floor, to make the service accessible to all persons, including wheelchair users.
Two **subsurface pits** are needed to make the multifunctional water station work: the first one, providing portable water source and electrical supply; the second one drains excess water to storm-water or sewer. The appropriate dimension for both pits is about cm 40x40, concrete covered.

In this phase of the project, the research team supposed that site arrangement and shaft construction will be charged to public administrations willing to test the proposed service.

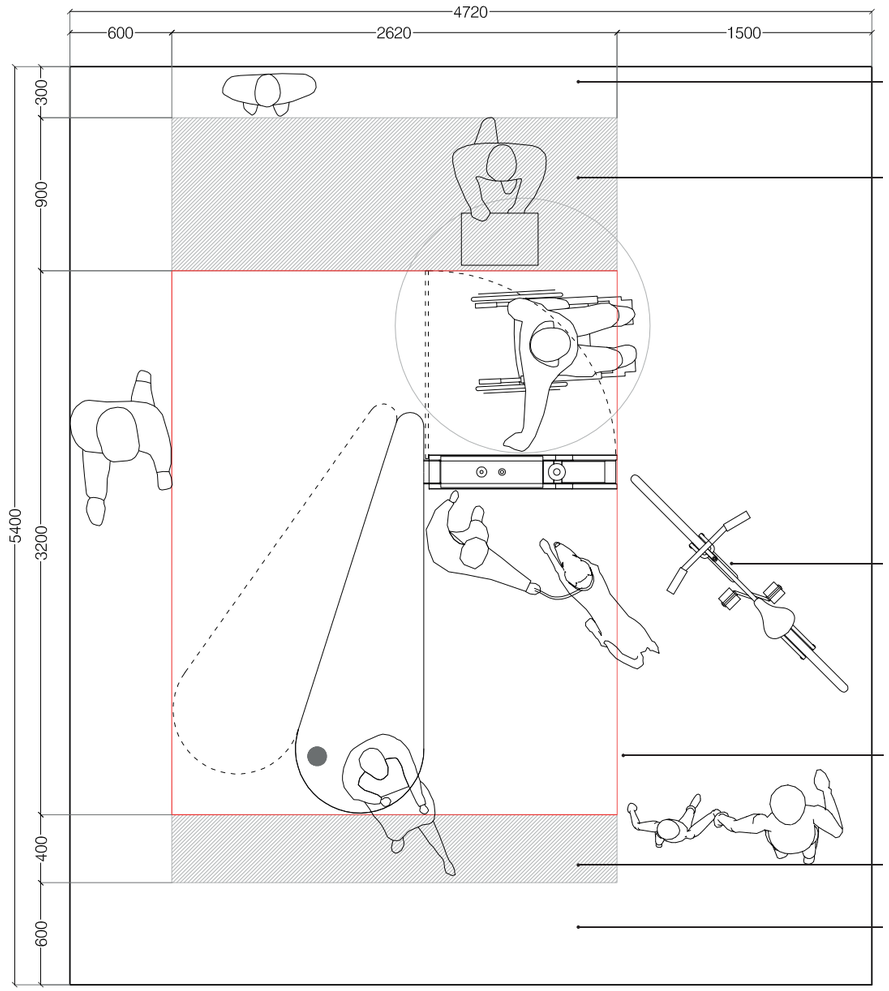


Figure n. 249
Minimum recommended size for the location.
Accommodation model depicting the dimensions and positioning of the clear floor space required by different users (manual chair and scooter users, dog owners, maintaining technicians,...)

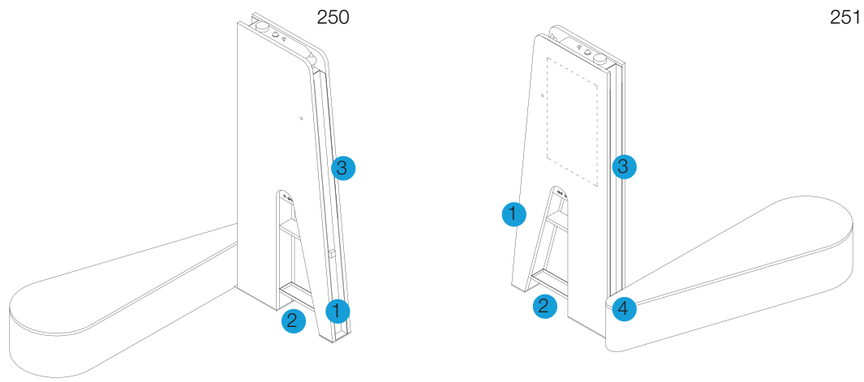
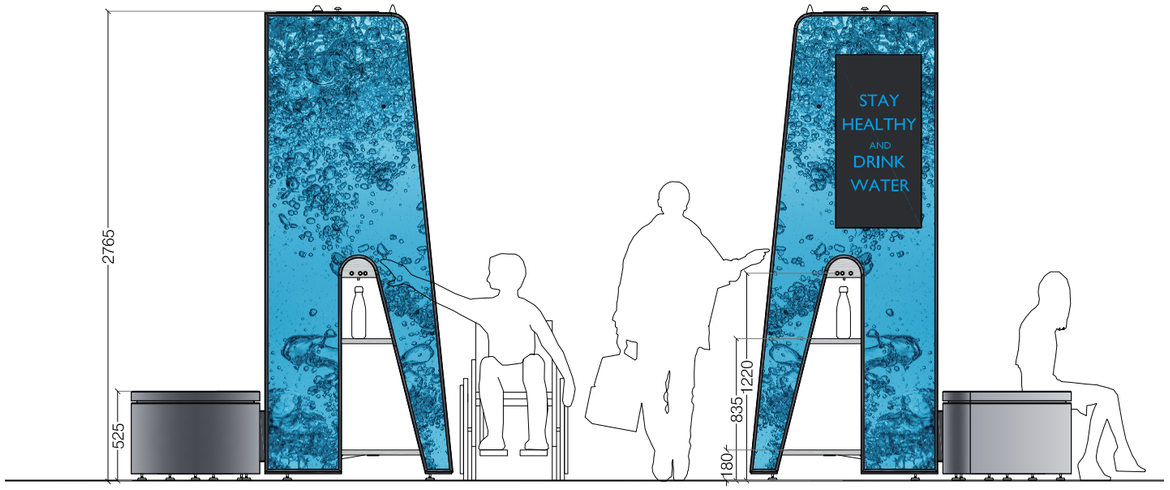


Figure n. 250, 251
Double-slab totem, final design, bench side, LED wall side.
1- Inward tilt of 6 degree.

2- Removal of the metal plate at the base, with an uninterrupted view of the ground as a result.

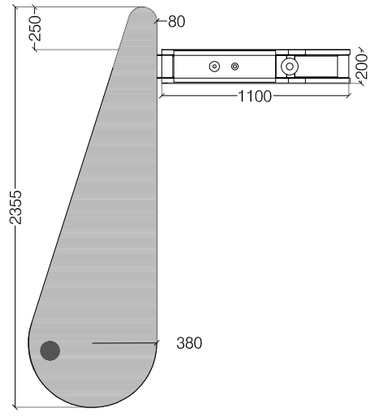
3- Perimeter C- channel making the side look thinner.

4- The curvy bench is moved forward and the smaller tip serves as a stand for the bottle or other small objects.

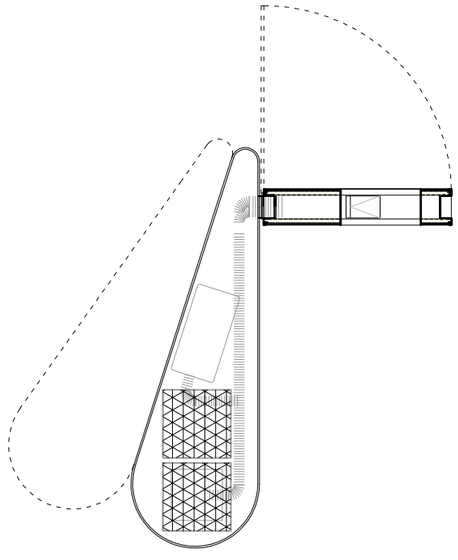


front view - bench side

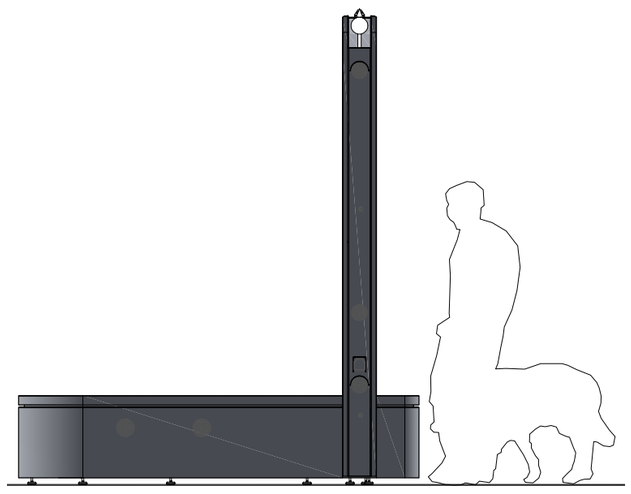
front view - LED screen side



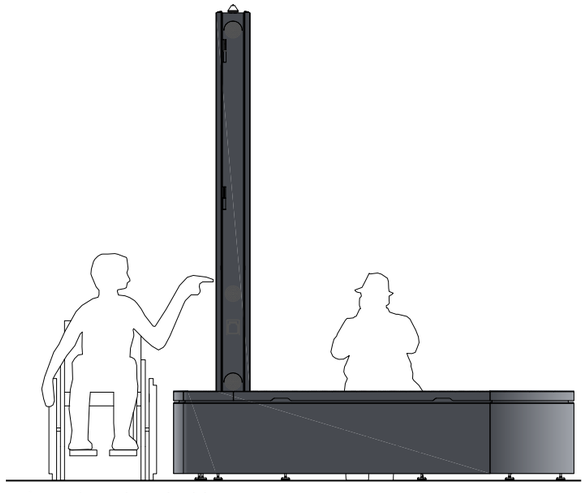
top view



vertical section showing the location of supply pits and the swing of maintenance access doors



front view - totem side



front view - bench side

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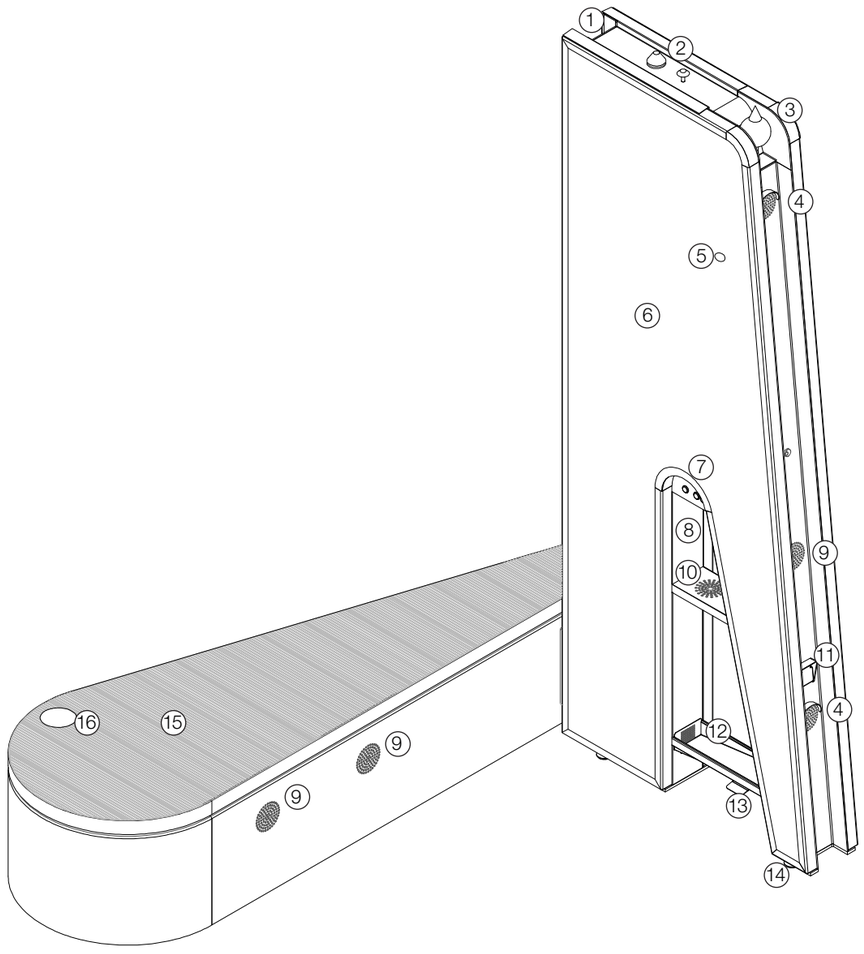

1- Public Wi-Fi

2- Air quality sensors

3- Sound level meter

4- Acoustic speaker

5- Surveillance camera (on both sides)

6- Back-lit, back-printed glass panel

7- Water dispenser with three stainless steel push buttons

8- Dual sided bottle refill window

9- Air vent holes

10- Bottle rest that allows single-handed operations

11- General outdoor outlets and USB charging, with power meter

12- Dog bowl in stainless steel with folding bottom

13- Foot pedal enabling to empty the bowl on the ground

14- Metal levelling feet to compensate eventualn height and floor irregularities

15- Public bench with a Wood Plastic Composite seating

16- Flush-fit wireless charger

Figure n. 252
Double-slab totem, final design, orthographic projections. The metal frame is supposed to be in RAL graphite Grey 7024

Figure n. 253
Double-slab totem, final design, axomometric view.

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HERA
STAY
HEALTHY
AND
DRINK
WATER

KEY FEATURES

- Contemporary design, suitable for different locations;

- Customizable back printed glass panels, according to the urban environment;

- Self-standing without foundation;

- Wide accessibility and child-friendly design;

- One-hand operation;

- Suitable for different sizes of reusable bottles;

- Dual sided bottle refill window, with brushed stainless steel bottle rest;

- Easy press raised steel buttons (filtered ambient water, filtered cold water, tap water dog bowl, each side);

- Sanitary recessed spout, limiting bottle rim or other objects from coming into contact with water outlet;

- Heavy duty chassis and internal frame;

- Tasty and filtered water;

- No standing water thanks to the drainage system;

- Modularly extensible services and equipment;

- Easy assembly and maintenance. The ease of mounting and dismantling the totem and the bench, and the simple access to inner working thanks to its opening parts, saves time and curbs operational and environmental costs.

Figure n. 254
Night postcard describing the proposed service glowing in the park. Packprinted glass shows a close view on icy cubes.
Visualization by Ilaria Fabbri

Figure n. 255
PUNTOnet H_2O in a historic square. Tentative idea of packprinted glass with an enlarged image of blurred water.
Visualization by Ilaria Fabbri