The Urban Infrastructural Landscape in Transition

Lauttasaari Water Tower: From Technological Monument to Recreational Place

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ABSTRACT

This Master’s Thesis addresses the urban infrastructure of water as a medium connecting nature, the society and technology. Infrastructure is understood as a socio-technical system and a shared platform for interaction between objects. Water is the core infrastructure for human life, and moreover, the infrastructure for transporting and treating water forms the foundation of urban settlement. Yet the development of infrastructural systems has removed the experience of water from the urban realm, and produced an ever-expanding but invisible maintenance network sustaining everyday life – the hidden city.

The theoretical framework for the thesis is the discourse of landscape urbanism that has been prominent in the fields of landscape architecture and urban studies in recent decades. Through contributions from international authors in architecture, landscape architecture, geography and urban planning, the thesis aims at articulating an interdisciplinary understanding of the contemporary urban context, based on the concepts addressed by the aforementioned fields. The focus is on establishing an integrated design approach towards the city, concerned less with traditional boundaries of profession, and more in the potential opening up of new methodologies, narratives, and sites for spatial exploration.

The infrastructure of water is studied from a historical perspective in the context of urban networks, and in a case study of Ancient Rome. Roman infrastructures display an example of a water system serving both the functional purposes of water sustaining the city, and the social aspects of experiencing water in the public realm. To establish a local context, the development of water systems in Finland is introduced, including a study of the water tower as an architectural type operating in the water supply network. The research focuses in Helsinki, as it forms the only multi-node urban region in Finland, and thus the organization of its infrastructural networks is substantial to the study of Finnish waterworks, both in the past and today.
Finally, the research is applied in a design project negotiating the interfaces between infrastructure, architecture and landscape within the local condition of the Helsinki water supply system. The project site in Lauttasaari is an infrastructural landscape in transition, as the decommissioned water tower on Kotkavuori is set to be demolished despite calls for preservation. The thesis project addresses the qualities of infrastructure as part of the collective memory of a place, and seeks to uncover its potential in enriching the experience of urban realm. The project is an exploration of a water treatment environment as a place of recreation, integrating the hidden city to the landscape of everyday.

By applying techniques of green infrastructure to the remains of the existing but disused water supply structures, and flipping the purpose from supplying pure water to purifying grey water on site, the project seeks to challenge the way wastewater is perceived and treated in the contemporary society. Instead of all water going down the drain, the water supply system could become more sustainable and more efficient by recognising the potential to reclaim and reuse most of urban wastewater volumes.

In the thesis project, low-polluted grey water from homes in the neighborhood is diverted to the hill of Kotkavuori, and treated in a sequence of steps forming a recreational path down the slope to the seaside. Finally, the purified water is released into the Baltic sea via outdoor sea baths, inviting citizens to experience and interact with the water, and to renegotiate the boundary between manmade and natural, the hidden city and public space, and infrastructure and landscape.

This Master’s thesis is completed as part of the Master’s Programme in Architecture at Aalto University School of Arts, Design and Architecture, Department of Architecture. The supervisor of the thesis for the chair of Building Design is Professor Hannu Huttunen, and the instructor is Frances Hsu, Ph.D.

Keywords: infrastructure, landscape, urban nature, recreation, water, water tower, Helsinki, Lauttasaari.
TIIVISTELMÄ


Veden infrastruktuuria tutkitaan työssä historiallisesta näkökulmasta urbaanina verkostona, sekä kohdeanalyysinä antiikin Roomasta ja nyky-Helsingistä. Rooman infrastruktuuri on esimerkki järjestelmästä, jossa toteutui sekä toimiva ja tarkoituksenmukainen vedenjakelu, että veden kokemuksellisuus ja sosiaalinen merkitys kansalaisten arjessa. Helsingin vesijärjestelmä puolestaan on Suomen mittakaavassa ainutlaatuinen laajuutta puolesta, ja sen käsittely diplomityössä sisältää myös vesitornit arkkitehtonisena rakennustyöppinä osana vedenjakelua.

Tutkimuksen teoreettista ja historiallista viitekehystä sovelletaan suunnittelusuosuudessa, joka käsittelee infrastruktuurin, arkkitehtuurin ja maiseman välisiä rajapintoja Helsingin paikalliskontekstissä. Suunnittelualue on Lauttasaaren muutettu kaupunkikuva: lukuisista
valituksista huolimatta purettavaksi määrätyn vesitornin ympäristö Kotkavuorella. Suunnitelma ottaa kantaa infrastruktuurin merkitykseen osana paikan muistoa, pyrkien rikastuttamaan kaupunkiympäristön kokonaisvaltaista kokemusta yhdistämällä vedenkäsittely virkistykseen; näkymätön kaupunki jokapäiväiseen ympäristöön.

Suunnitelma yhdistää vihreän infrastruktuurin käytöstä poistettuihin vedenjakeluverkon rakenteisiin Kotkavuorella, ja haastaa käsityksiä jätteestä muuttamalla aiemmin puhtaana veden jakeluun käytetyn maiseman osaksi harmaan veden paikallista käsittelyä. Nykyjärjestelmässä kaikki viemäristä alas virtaava vesi on samanarvoista jätteettä, mutta huomioimalla eri käyttötarkoitusten vaatima puhdistusaste ja jatkokäyttömahdollisuudet, suuri osa kaupunkien valtavista jätteesivolyymeistä voitaisiin kierrättää, säestäen raakavettä ja energiaa.

Suunnitelmassa harmaavesi lähialueen kodeista johdetaan Kotkavuorelle, jossa se puhdistuessaan vaihe vaiheelta muodostaa virkistysreitin alas merenrantaan, jossa vesi lasketaan merikylpylän kautta näyttävästi Itämereen. Työ kutsuu kaupunkilaisia kokemaan urbaani vesi osana kaupunkiympäristöä, kyseenalaistaen rajapintoja luonnon ja ihmisen tekemän, näkymättömän kaupungin ja julkisen tilan, ja infrastruktuurin ja maiseman välillä.

Diplomityöön on tehty osana arkkitehtuurin maisteriopintoja Aalto-yliopiston Taiteiden ja suunnittelun korkeakoulussa, Arkkitehtuurin laitoksella. Työtä valvoi rakennusvalmistelun professori Hannu Huttunen, ja sitä ohjasi Frances Hsu.

Avainsanat: infrastruktuuri, maisema, kaupunkikuono, virkistys, vesi, vesitorni, Helsinki, Lauttasaari.
INTRODUCTION TO SOCIO-TECHNICAL SYSTEMS
Boys drinking from a public well in Pasila, 1950s.
Image: Eino Heinonen/Helsinki City Museum (edited).
THE MOST SALIENT CHARACTERISTIC OF TECHNOLOGY IN THE MODERN WORLD IS THE DEGREE TO WHICH MOST TECHNOLOGY IS NOT SALIENT FOR MOST PEOPLE, MOST OF THE TIME.

Paul N. Edwards, Infrastructure and Modernity.¹

Contemporary human life, or identity and experience, consciousness and cognition, is penetrated by new technologies. The consequences of such diffusion are not yet known, while the society in transformation is still in the phase of celebration, rather than inquiry; "every technology is used before it is completely understood".² When discussing the prevalence of technology in the contemporary society, we rarely think of roads or municipal water supplies. The search for novelty in technology echoes the paradigm of architecture in search of new superlatives: the tallest, the slimmest.

When technology matures, as it does today in an accelerating pace, it becomes naturalized, practically imperceivable, in the everyday landscape. Infrastructure generally reappears in the mind of the public only when it fails, and even then, the attention is "reactive, isolated, and short-lived".³ The more a technology becomes self-evident, and fades into the background of discussion, the more the society tends to become dependent on it. Therefore, mature technological systems become infrastructures, the fabric of a modern society, connecting different "scales of time, space and social organization".⁴

¹ Edwards 2002, 1.
² Wieseltier, 2015.
³ Frischmann 2012, ix.
The term infrastructure is widely used in discussing almost any prevalent, shared human construction. The Merrill-Webster Dictionary defines infrastructure as "the basic equipment and structures (…) that are needed for a country, region, or organization to function properly", or more simply: "the resources (…) required for an activity". Keller Easterling articulates a contemporary understanding of infrastructure in the introduction to *Extrastatecraft: The Power of Infrastructure Space*: “a hidden substrate – the binding medium or current between objects of positive consequence, shape, and law”, and ultimately, “the shared standards and ideas that control everything (...).”

Infrastructural resources commit core input into a range of productive activities, generating beneficial spillover effects to the society. Infrastructure embodies social operatives, such as synergy, collaboration and accessibility. Easterling further frames infrastructure as “the overt point of contact and access between us all – the rules governing the space of everyday life”.\(^5\) Infrastructure is interaction between things, loaded with potential.

Sociologist Bruno Latour argues that "(...) forms of organization are inseparable from technical gestures".\(^6\) All infrastructures are by nature socio-technical, and Latour notes that infrastructures make tensions apparent within what he calls the *modernist settlement*; explained by historian Paul N. Edwards as the "social contract to hold nature, society and technology separate, as if they were ontologically independent of each other".\(^7,8\)

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\(^5\) Easterling 2014, 11.  
\(^7\) Edwards 2002, 2.  
\(^8\) Latour 1999, 14.
Water is the most basic enabling infrastructure for human life. It reveals the fragility of our civilization against the complexity of the Earth’s ecosystem: we are completely dependent on an element which can easily become polluted, and is unevenly distributed globally. Infrastructure for transporting and treating water forms the social and technical foundation of urban settlement, yet its design has been compartmentalized into a field oblivious to the experiential qualities of a city. The story of water links us to the past, and to the total ecosystem much bigger than our perception. It is the true connecting tissue of urbanity to natural processes, unraveling the artificial separation of nature, society and technology in the world of human experience.
RATHER THAN WAITING FOR THE PAST INFRASTRUCTURE TO GET DECOMMISSIONED AND REBORN WITH A NEW SOCIAL PROGRAM – COULD WE CONCEIVE OF OUR PUBLIC INFRASTRUCTURE TO COME WITH INTENDED SOCIAL SIDE-EFFECTS FROM DAY ONE.

Bjarke Ingels: Rethinking Social Infrastructure

ONLY WHAT IS THE FOCUS OF OUR ATTENTION CAN ALSO BE THE SUBJECT OF OUR COMMUNICATION AND OF OUR DESIGN.

Maya Kohte: Focus on Mutations: Landscape Architecture in Urban Landscapes

The recent renewed interest in infrastructure in the fields of architecture, landscape architecture and planning reflects a paradigm shift in design practice, a reaction to the perceived inability of architecture to critically engage the contemporary built environment. Urban areas have been radically transformed in the past 50 years, and traditional objects of architectural and urban knowledge, such as the city itself, have become seemingly intangible to the profession of architecture.

9 Ingels 2012.
In order to be able to address the current questions of cities, there must be a reorganization of practice and knowledge within the disciplines.\textsuperscript{11} The contemporary "postmetropolis"\textsuperscript{12} can only be fully understood through new fields, methods and objects. The fields of architecture, landscape and urbanism need to be translated into "a continuous landscape of transdisciplinary encounters", fostering new instrumental capacities.\textsuperscript{13} Urban areas entail economic, political, social and cultural relationships, the complexity of which requires an equally versatile set of perspectives and responses to address both current and future issues.\textsuperscript{14}

Landscape urbanism aspires to offer the necessary framework. Using the term ethos, architect Christopher Hight defines landscape urbanism as a mentality, and a mode of operation "determining the way questions are asked" at the level of design practice, as opposed to a theory of design.\textsuperscript{15} Landscape architect James Corner further suggests four core themes for landscape urbanism in his influential 2006 essay \textit{Terra Fluxus}: processes over time, the staging of surfaces, the operational or working method, and the imaginary.

Corner emphasizes urban processes in space and time, which he considers to play a much more significant role in urban relationships than spatial forms. In the notion of 'staging of surfaces', Corner discusses the potential of the urban surface at different scales as a continuous horizontal plane "from the sidewalk to the street to the entire infrastructural matrix". The third theme, ‘the operational method’, is a call for operative strategies alongside or instead of a trajectory of provocative paper architectures. In 'the imaginary', Corner brings up enrichment of the collective imagination as the foremost motivation for design and planning efforts, and concludes: "landscape urbanism is (...) a

\textsuperscript{11} Hight 2003, 22–23.
\textsuperscript{12} A term introduced by Edward W. Soja to differentiate globalized, postmodern urban development from the pre-1960s modern metropolis, see Soja (2000): Postmetropolis: Critical Studies of Cities and Regions.
\textsuperscript{13} Hight 2003, 22–23.
\textsuperscript{14} Mostafavi 2010, 13.
\textsuperscript{15} Hight 2003, 22–23.
speculative thickening of the world of possibilities”.

Studying "dynamic relationships and agencies of process" is inherent to the discipline of ecology, which suggests that an environment is shaped by incremental and cumulative effects by individual factors on a board field of operation, to paraphrase Corner. By applying this operative definition of ecology, cities and infrastructures can be considered "ecological” as much as forests and rivers. Furthermore, researchers in the field of urban ecology have for decades argued for an integrated, transdisciplinary planning of the city as an ecosystem, pointing to issues such as the ecological footprint of a city*, which can exceed the physical area of the city by hundreds of times.

Historically, tasks like ecology, land surveying, construction of roads and bridges, and networks of communication were included in architects’ casual line of work. For example, Frederick Law Olmsted’s proposals for Boston’s Emerald Necklace in the 1880s incorporated transport infrastructure, flood and drainage engineering, the creation of scenic landscapes, and urban planning. Architects and landscape architects have a number of tools, such as mapping, projection, calculation, notation and visualization, for operating at the large infrastructural scale. In addition to these, newest design technologies can be applied.

As engineer, architect and historian Antoine Picon points out, in a "world saturated by technology”, addressing problems of urban landscape calls for strong strategic visions, as almost any issue will be faced with an abundance of available technological solutions. Unlike engineering or other technical fields, architecture possesses unique capabilities

* "Measured as the land area necessary for sustaining the current levels of resource consumption and waste discharge by a population” Wu et al. 2012.

16 Corner 2006, 32.
17 Corner 2006, 28–32
18 Wu et al. 2012, 35-36.
19 Mossop 2006, 185.
20 Allen 1997, 52.
to shape a city. By engaging social and cultural meanings, an architect integrates the potential to trigger unanticipated courses of events in time; unforeseen even from the authors point of view.\(^{22}\)

In his 1997 essay *Infrastructural Urbanism*, architect and theorist Stan Allen defines seven propositions concerning infrastructure in a transdisciplinary context\(^{23}\):

1. INFRASTRUCTURE WORKS NOT SO MUCH TO PROPOSE SPECIFIC BUILDINGS ON GIVEN SITES, BUT TO CONSTRUCT THE SITE ITSELF, CREATING THE CONDITIONS FOR FUTURE EVENTS.

2. INFRASTRUCTURES ARE FLEXIBLE AND ANTICIPATORY; THEY WORK WITH TIME AND ARE OPEN TO CHANGE.

3. INFRASTRUCTURAL WORK RECOGNIZES THE COLLECTIVE NATURE OF THE CITY AND ALLOWS FOR THE PARTICIPATION OF MULTIPLE AUTHORS.

4. INFRASTRUCTURES ACCOMMODATE LOCAL CONTINGENCY WHILE MAINTAINING OVERALL CONTINUITY.

5. ALTHOUGH STATIC IN AND OF THEMSELVES, INFRASTRUCTURES ORGANIZE AND MANAGE COMPLEX SYSTEMS OF FLOW, MOVEMENT AND EXCHANGE.

\(^{22}\) Allen 1997, 54.

6. INFRASTRUCTURAL SYSTEMS WORK LIKE ARTIFICIAL ECOLOGIES. THEY MANAGE THE FLOWS OF ENERGY AND RESOURCES ON A SITE, AND THEY DIRECT THE DENSITY AND DISTRIBUTION OF A HABITAT.

7. INFRASTRUCTURES ALLOW DETAILED DESIGN OF TYPICAL ELEMENTS OR REPETITIVE STRUCTURES, FACILITATING AN ARCHITECTURAL APPROACH TO URBANISM.

Despite their focus on infrastructural operations, Allen’s propositions remain relevant due to their applicability to the transdisciplinary design practice, perhaps more in focus now than ever before as questions of sustainability have become part of the architectural discourse. Allen’s propositions articulate an anticipatory practice, not merely a reactionary approach.

The open-ended quality of infrastructure differentiates it from other kinds of large-scale interventions, such as master planning. Infrastructures always carry a sense of collectivity, of a common project; the authorship of the multiple, as opposed to individual expression. By setting up a framework, infrastructure simultaneously creates rudimentary limits and encourages contribution. In other words, infrastructure is a civic endeavor, described twofold by landscape architect Kathy Poole: "First, civic realm is that which is conceptually and physically common to all residents (...). Second, a civic consciousness transcends the desires of an individual or a particular group; it supports the common good". As an investment and an implementation of new techniques, an infrastructural project carries a promise of progress, of an increasing quality of life.

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25 Raxworthy; Blood 2004, 11.
Infrastructural networks as large public investments are urban by nature, and their complexity increases with the urbanization of a society. In contemporary urban areas, infrastructure can no longer be seen as a large isolated object, or something separate from the environment and the spatial strategies shaping the city. In 1988, scholar, photographer and landscape architect Anne Whiston Spirn criticized the lack of interest landscape architects, urban designers and architects presented for water and sewer systems. She pointed out infrastructures of Ancient Rome, and the fountains of Baroque Rome celebrating a reconstructed water supply (see chapter 4.2), as structures that were at once "utilitarian, a source of sensual pleasure and symbolic meaning". Today, discourse in the aforementioned fields, especially in landscape architecture, is much less limited to traditional boundaries of profession. In the essay *Stormwater Infrastructure*, landscape architect Brooke Ryan discusses the potential of design to "reinvent our everyday experience and consequently change societal attitudes towards sustainable water use”. She calls for design of opportunities for civic activity and engaging functions to encourage a "cultural connection” between infrastructure as landscape and the public. Infrastructure presents a promise in the form of a 'landscape typology' to be diversified and varied.

The common framework of cities and infrastructure can be utilized to redefine professional identities involved in urban development. Landscape has been transformed by infrastructure throughout the history of urban settlement, but the operative focus transcending traditional boundaries of discipline will create an entirely new range of public space available for social programming. By integrating infrastructure into architecture, landscapes, urban settings or living environments, the project begins to address social and imaginative aspects as much as engineering.

26 Shannon; Smets 2010, 9.
27 Whiston Spirn 2004, 356.
29 Shannon; Smets 2010, 9.
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A 2.2-meter-wide pipe for raw water intake during installation at Asikkalanselkä, Lake Päijänne. The intake supplies water for over 1 million people in the Helsinki region, 120 kilometers away from the water source. Image: HSY (edited).
BUT IF ANYONE WILL NOTE THE ABUNDANCE OF WATER SKILLFULLY BROUGHT INTO THE CITY, FOR PUBLIC USES, FOR BATHS, FOR PUBLIC BASINS, FOR HOUSES, RUNNELS, SUBURBAN GARDENS AND VILLAS; IF HE WILL NOTE THE HIGH AQUEDUCTS REQUIRED FOR MAINTAINING THE PROPER ELEVATION; THE MOUNTAINS WHICH HAD TO BE PIERCED; THE LEVELED VALLEYS; HE WILL ADMIT THAT THERE HAS NEVER BEEN ANYTHING MORE MARVELOUS IN THE WHOLE WORLD.

Pliny the Elder: Natural History (36.123) (on Roman aqueducts)¹

Water is the vital resource to all human life, and its availability was historically the primary factor for a city to emerge. Urbanization patterns were tied locally to underlying hydrological conditions,² and uncovering the natural hydraulic potential of a site meant efficiency.³ In a contemporary society, the dependency to water for drinking, production, agriculture and household uses is covered with a centralized water transportation network, as is the treatment of wastewater and stormwater.⁴

The planning of modern technological networks, the "hidden city”,⁵ has been the trade of engineers, while the visible urban realm has for the most part belongs to the domain of architects and urban planners.

¹ Dodge 2000, 277.
² Stokman 2008, 2.
³ Picon 2005, 100.
⁴ Stokman 2008, 2.
⁵ Gandy 2004, 365.
However, the immense network of physical infrastructure in urban areas underlies the experience of living in a city, and moreover, infrastructure of water plays a crucial role in the creation of the tangible city. For this reason, geographer and urbanist Matthew Gandy argues that water has "become one of the focal points for new attempts to conceptualize the materiality of urban space and the evolving relationship between human body and urban technological networks". Antoine Picon suggests considering cities as complex hydraulic entities, or "as a series of watersheds".

Most Western cities implemented municipal water supply systems by the end of the 19th century, radically changing the urban way of life as water for the household no longer had to be transported from a well or a natural water body, with the ever-present risks of contamination. Time was saved by not retrieving water over long distances, yet on a downside households were faced with new costs, and wells lost their social dimension as community nodes. All in all, reliable water supply and treatment systems contribute immensely to the everyday lives of citizens, and today they can be seen as a prerequisite for an established society.

Contemporary water management was preceded by what Gandy calls the "bacteriological city". The "socio-spatial arrangement" was born out of advances in epidemiology and microbiology, new technical and managerial knowledge in urban governance, new financial instruments for large engineering projects, new planning mechanisms to allow for strategic urban visions over competing private interests, and the rise of the urban industrial bourgeoisie. In the bacteriological city, centralized forms of urban governance were developed hand in hand with the preliminary networks of water supply and waste water treatment in the mid-19\textsuperscript{th} century; the era of the "water revolution", as described by Siegfried Giedion.

\begin{itemize}
\item[8] Asola 2003, 10.
\end{itemize}
Pierre Patte: *Section of a Street*. From *Mémoires sur les objets les plus importants de l’architecture*, 1769. Patte’s section is considered to be one of the first architectural drawings to address urban infrastructure as part of the spatial realm of the city. Furthermore, infrastructural systems are presented in a direct relationship to building interiors. Patte’s visualization established a departure from the prevalent view of the city as a collection of representational forms.\textsuperscript{10} Image source: *The City as a Project* (Aureli (ed.) 2013).

\textsuperscript{10} Aureli 2013, 30.
The founding of the “hidden city” paralleled a transformation of the private realm, as a new understanding of concepts such as hygiene, cleanliness and privacy (and thus, moral), with inventions like the modern bathroom, reconfigured use of space. New programs and functions in the private sphere affected equally the design of urban public space.¹¹ Cultural scientist Susanne Hauser applies the term Einhausung from German sociology to describe the 19th century process of formerly public activities, such as washing up and doing the laundry, disappearing behind closed doors, into the private realm.¹² In accordance with the creation of technical infrastructure of water, fountains became popular architectural objects in public space. The hidden utilitarian water and the monumental visual water were ontologically separated, a dichotomy that continues to this day.¹³ Eventually the network of water spread out from the city into the regional and national scales for power generation and water resources. Matthew Gandy concludes: ”The plumbing of the metropolis was (...) a process of both physical reconstruction and social engineering”.¹⁴

By the 1920s, the increasing complexity of technical networks in urban areas prompted a metaphoric understanding of a city as a machine, the environmental and infrastructural problems of which would be addressed with technology. The meaning of ‘civic’ was transformed, as the standardization of physical environments was generally applauded as progress, and civic structures were assessed on purely technical criteria, instead of on social or aesthetic values. Moreover, Kathy Poole argues that ”the technical criteria became the social and aesthetic criteria”, and continues, ”testimonies of the mechanistic view toward infrastructure are visible everywhere in the contemporary city”.¹⁵

The development of water management has had a profound effect on a number of inter-relationships: between human body and the

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¹² Hauser 2005, 43.
¹⁵ Poole 1998.
city, between social and bio-physical systems, between development of technical networks and capital flows, and between the visible and invisible dimensions of the urban realm. In the contemporary city, infrastructure possesses little civic importance, in the sense of common structures appropriating social and cultural connections. The "politics of efficiency" have overrun ecology, aesthetics and expression of meaning, and water has been stripped of its former symbolic values. Water technologies have matured and disappeared in hundreds of kilometers of underground pipes and within walls of buildings, or water has been transformed into "virtual water" in food processing and product industries. Centralized infrastructure has made water practically disappear from everyday life; in the words of landscape architect Antje Stokman, it has "disconnected the land use from the logics of the watershed", and water-related processes of the landscape from the world of human experience. Water itself has lost the status of a natural resource and become infrastructure.

Ubiquitous water infrastructure in developed countries has been accompanied by an increasing realization of global scarcity of potable water. Freshwater accounts to only 2.5 % of total water resources globally, and an even smaller percentage is usable for drinking. Around 30 % of freshwater is natural groundwater, which provides the best quality water, but the resources are not directly renewable. Yet, water is being wasted and degraded all over the world; it is treated like a commodity instead of a human right.

In Finland, there is an abundance of renewable freshwater, as annual rainfall is rather high and the evaporation rate is low. However, Finnish watercourses are very sensitive as ecological systems due to geographical

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16 Gandy 2011.
17 Poole 1998.
18 Gandy 2011.
19 Davis 2013.
21 Myllyntaus 2004, 8.
22 Ryan 2004, 221.
and climatic reasons. Moreover, the amount of energy needed to supply, purify and treat growing cities’ potable water and wastewater is a critical topic in Finland, as well as globally.

Water and energy are inextricably linked on multiple levels, beginning with solar energy as the driver of photosynthesis, and the water cycle on Earth. The nexus of water and energy in sustaining the society is further articulated by the fact that water is generally required in all energy conversion processes, while energy is a necessity for utilizing water. In urban water systems, energy is needed to distribute, use and treat water, while water and wastewater contain energy which can be used in electricity and heat generation. Editors of Water-Energy Interactions in Water Reuse, Peter Cornel, Kwang-Ho Choo and Valentina Lazarova state that the contemporary linear model of water management* often lacks the “necessary recognition and understanding” of these crucial links between energy and water. Furthermore, they outline some of the key questions in resource-efficient water management: 

**WHAT KIND OF WATER QUALITY IS NEEDED IN EACH RESPECTIVE CASE OF APPLICATION?**

**HOW MUCH ENERGY HAS TO BE SPENT TO REACH THE REQUIRED QUALITY STANDARD?**

The editors highlight *Fit for Purpose* as the key solution to sustainable water management; meaning that the treatment level of water is defined based on the purpose, and not treating all water to potable level. The

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* Linear water management implies the traditional paradigm of centralized water management supplying water of one treatment level for all purposes, and all water down the drain being treated the same as wastewater, not to be reclaimed.

23 Myllyntaus 2004, 11.
concept of *Fit for Purpose* additionally involves reclaiming water as “service water” for appropriate applications, which include agricultural and landscape irrigation, toilet flushing, fire protection, or industrial processes.\(^{25}\) In fact, only 26% of daily water consumption would require potable level treatment.\(^{26}\)

In addition to the important question of sustainable use of resources, xenobiotics present a growing threat that has yet to be addressed in the context of centralized water management. Despite energy-intensive and costly wastewater treatment efforts, xenobiotics such as traces of medicine, hormones, sweeteners, and other chemicals are not being eliminated from wastewater before it is exhausted to water bodies. The amount of applicable research on the topic in the Finnish context is limited, but records from other countries have identified natural ecosystems being disrupted by chemical traces in treated wastewater.\(^{27}\) However, the *Fit for Purpose* standard of recycling and reclaiming water, and the utilization of treatment techniques involving green infrastructure (such as ground filtration) can radically decrease the amount of xenobiotics released into nature.

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\(^{25}\) Meda et al. 2012, 29.  
\(^{26}\) Finnish Ministry of the Environment 2014.  
\(^{27}\) Brozinski; Kronberg; Mannio 2012.
Päijänne Tunnel (built 1972–1982) feeds the Helsinki Region with raw water. The 120-km long underground construction concretizes the dependence of urban areas on rural sites to maintain water supply.

1 Water intake at Asikkalanselkä, Lake Päijänne
2 Kalliomäki Distribution Pump, 1 MW hydropower plant
3 Korpimäki Pumping Station
4 Silvola reservoir
5 Pitkäkoski Water treatment plant, 0.4 MW hydropower plant
6 Vanhakaupunki Water treatment plant
A diagrammatic representation of Helsinki waterworks.
Linear Water Management or Fit for Purpose? Case Helsinki

Like in most developed urban centers, the water system of Helsinki is based on the linear water management model: All water supplied to users in the network is potable, and all consumed water is treated as wastewater.

1 Urban Water Use

![Pie chart showing Urban Water Use]

- Households: 56%
- Industry, services: 25%
- Other: 18%

2 Domestic Water Use

On average: 155 l/day/person

![Pie chart showing Domestic Water Use]

- Hygiene: 45%
- Cooking: 20%
- WC: 15%
- Laundry: 15%
- Cleaning/other: 5%

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28 Vesilaitosyhdistys 2012.
Of the total nutrient load in urban wastewater, black water constitutes 87 % of nitrogen and 78 % of phosphorus residues. In the HSY (Helsinki Region Environmental Services Authority) process, biogas produced in wastewater treatment is utilized for heat and electricity generation, and nutrients are recycled into soil products by composting sludge.

In linear water treatment, black water with its high concentrations of nutrients, harmful bacteria and organic matter is diluted with low-polluted grey water from showers, wash basins and kitchens. In current processes, domestic wastewater is 99.5 % water, and by diverting grey water streams the treatment and nutrient recovery of more concentrated black water would be more efficient. Grey water could be treated separate from black water with lighter, less energy-intensive methods, such as ground filtration in green areas, and reclaimed for appropriate purposes in which potable water quality is superfluous. As only around 1/4 of daily water usage would require potable water, reclaiming water “fit for purpose” could save up to 90 % of energy consumption associated with water supply, and 70 % of the raw water.

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30 Henze; Ledin 2001.  
31 Helsinki Region Environmental Services Authority (HSY) 2015.  
Conclusion

Large infrastructural networks such as water supply and sewerage are highly path-dependent and carry a heavy initial investment, and thus, are difficult to modify during their life span. Yet, a sustainable water management model involving the *Fit for Purpose* standard would require a so-called *third pipe system*. In other words, instead of one line down the drain, there would be at least two lines diverting water from different sources for optimal treatment; one for traditional wastewater (heavily polluted streams), and one for grey water. Implementing such changes would mean heavy modifications to the existing infrastructural network.

Moreover, it is not only the massive reconstruction effort necessary to separate black and grey water that stalls the evolution of a more sustainable, more efficient water system: The idea of abundant pure water directly from the tap penetrates the urban lifestyle. As discussed in the first chapter, infrastructure is as much a matter of social organization as a technical system, and a lack of public acceptance can form a serious obstacle to transforming the urban water system. Questions of hygiene and health are must be addressed in the context of water reuse and green infrastructure, while terminology like grey water can understandably cause intuitive aversion to reclaiming domestic wastewater.

A series of experiments in urban settings could be the tool to introduce and test future-oriented water management concepts locally. First implementing solutions in micro scale could prove useful in establishing boundary conditions for iterations for the macro urban realm, and beyond. Interaction between local citizens and experimental projects could be a key method in creating the prerequisite social conditions for sustainable water use, and to inform political decision-making in favour of resource-efficient water management. A complete change of attitude towards consuming water will be necessary, and the perception of wastewater must change. Only then can we rebuild a truly sustainable relationship to water in the society.

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34 Meda et al. 2012, 30.
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II CONTEMPORARY PERCEPTIONS OF LANDSCAPE
(...) TO CONTINUE TO OPPOSE NATURE AGAINST CULTURE, LANDSCAPE AGAINST THE CITY (...) IS TO RISK COMPLETE FAILURE OF THE ARCHITECTURAL AND PLANNING ARTS TO MAKE ANY REAL OR SIGNIFICANT CONTRIBUTION TO FUTURE URBAN FORMATIONS.

James Corner: Terra Fluxus\textsuperscript{35}

\textsuperscript{35} Corner 2006, 27.
Techno-nature: The Contemporary Urban Condition

Originating from the 16th century Dutch word landschap, the term landscape was initially used to refer to the demarcation of land, but with time it was appropriated to describe "a way of seeing space from a distance". Landscape art until the 19th century developed a sense of landscape as a "visual panorama", but within the last century the use of the term has become much more diverse, including urban and industrial spaces and their representations in visual culture.¹ Geographer and urbanist Matthew Gandy analyses the change in perception from the 19th century romanticist landscape onwards in his 2011 essay Landscape and Infrastructure in the Late-Modern Metropolis: "(...) there has been a shift from an emphasis on the relationship between landscape and the idealized human subject, (...) to a more nuanced and dynamic interpretation of the precise contexts within which landscapes are produced and experienced."²

On one hand, the Industrial Revolution of the 18th century made way for human domination as the overarching theme for the past 200 years of interaction between nature and the society: “As part of the process and outcome, cities are both the symbols of monumental progress and the evidence of mighty destruction (...).”³ On the other hand, with the rise of the industrial city, nature provided an exotic, remote destination, a place "elsewhere" of the polluted urban realm.⁴

Moreover, during the 20th century, increasing ecological and environmental concerns and the rapid urbanization taking place globally had a profound effect on the concepts of nature and landscape. Nature became further associated with untouched wilderness, isolated from the urban context.⁵ The environmentalist approach, focusing mostly on

¹ Gandy 2011, 57.
² Gandy 2011, 57.
³ Wu et al. 2012, 35.
⁵ Girot 2013, 9..
the physical properties of the environment, segregated city and nature ontologically in a subject-object relationship, reflected in Latour’s concept of the modernist settlement. As discussion on landscape focused on preservation from human activity, city (or urban landscape) and nature started to become mutually exclusive as ideas.\textsuperscript{6}

Taking a position against the radical environmentalist trend, landscape architect Christophe Girot urges a reintegration of urban nature into everyday lives, as places to consciously engage with. To Girot, the immanent landscape, as he calls it, is a societal concern, rather than an environmental one: by removing the synthetic boundary between landscape and city, a meaningful bond between citizens and nature can be enforced.\textsuperscript{7} Water could be used as an transcendental element to recreate the bond, as water is present everywhere in cities, but for the most part isolated from human experience. Girot argues that ubiquitous nature in the contemporary city can become a driver of change from within, with landscape architecture creating the framework for reconciling ecology with cultural and societal issues, simultaneously addressing economic, aesthetic and environmental aspects.\textsuperscript{8} In a similar vein, landscape architect Antje Stokman laments the near loss of the potentials of infrastructure of water for ”shaping urban form and meeting broader human, ecological and aesthetic objectives” in her 2008 paper \textit{Water Purificative Landscapes}.\textsuperscript{9}

On the level of human experience, Antoine Picon argues that we live in a ”techno-nature”; a spatially blurred condition between the natural and the artificial. Management of water in a settlement used to provide a clear distinction between the worlds of natural (resources) and artificial (engineering structures), but today’s techniques like biological treatment of water and green infrastructure blend the separation between what is natural, and what is not, even further. Picon sees this symptom of the

\textsuperscript{6}Girot 2013, 8.
\textsuperscript{7}Girot 2013, 8.
\textsuperscript{8}Girot 2013, 10.
\textsuperscript{9}Stokman 2008, 2.
urban condition as a demand for more responsibility, as the society is now completely in charge of the environment they inhabit.\textsuperscript{10}

Ecological techniques for the built environment, such as green infrastructure, need to be utilized for the immanent landscape. Green infrastructure uses natural hydrologic processes for water management, with integrated program like green spaces for the community. Sustainable infrastructure is acknowledged as the prerequisite for a sustainable community,\textsuperscript{11} and in many cases, like flood prevention, replacing natural processes with less sustainable technical systems might only creates more costs in the long run. Urban green areas entail a range of social, environmental and economic benefits, and in addition to recreational opportunities, green spaces contribute to “child development, environmental education opportunities, a promotion of social inclusion, development of personal and community identity, and the strenghtening of community ties in local communities”.\textsuperscript{12}

The key asset of green infrastructure is its ability to generate and engage these positive side-effects, as is rarely the case in mono-functional infrastructure typical to civil engineering.\textsuperscript{13} In the essay \textit{Redefining Infrastructure}, landscape architect Pierre Bélanger argues for an integration of landscape into infrastructure as the operative surface for new infrastructural proposals. He questions the ”prominence of civil engineering as one of the most influential disciplines of the 20th century”, and demands an interdisciplinary mission for a more renewable, flexible infrastructure.\textsuperscript{14} The argument is echoed in a broader sense in Leon Wieseltier’s essay on technology and the contemporary society, \textit{Among the Disrupted}: ”the character of our society cannot be determined by engineers”.\textsuperscript{15}

\textsuperscript{11} United States Environmental Protection Agency 2014.
\textsuperscript{12} Cilliers et al. 2012, 124.
\textsuperscript{13} Finnish Ministry of the Environment 2014.
\textsuperscript{14} Bélanger 2010, 16–17.
\textsuperscript{15} Wieseltier 2015.
In engineering, natural processes with their degenerative effects on built structures have understandably been seen as counteractive for infrastructures, whereas the professions involved in designing the environment often perceive infrastructure as something alien and oppressive to ecology.\textsuperscript{16} Despite the active development of ecological techniques in the last 50 years, ecology has not been actively pursued in contexts engaging the city.\textsuperscript{17} The schism in attitudes toward natural processes is equally present between architecture and landscape architecture. Architectural operations are defensive against wind, rain and temperatures; that is their most rudimentary offering to humans, to form a shelter. In this understanding, pushing for a more integrated experience of urban nature in architecture requires a vastly different approach to that of landscape architecture. Transformation and change in architectural building materials during their life cycle is often considered deterioration, perhaps with the exception of the aesthetics of graying wood or the green patina of copper.

The field of architecture needs to find new skills, materials or techniques to overcome the culture of throwaway structures: low quality materials that are casually replaced as soon as they change (deteriorate) are not a sustainable solution for the quality of the built environment. Moreover, the layered presence of architecture from different eras is in itself an expression of transformation in urban space. As conceptualized by Piranesi in his Campo Marzio plan and other etchings (see chapter 4.2), architecture, like infrastructure, can be the strategic connecting tissue between the past and the future. The effects of time, climate and use provide significant enrichment to the perception of urban surroundings, and the ability to design and construct architecture that evolves with time and use, both in physical terms and metaphorically, is closely tied to the immanent urban landscape.

\textsuperscript{16} Corner 2006, 25.
\textsuperscript{17} ibid, 29–30.
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IV TRANSCENDING THE MODERNIST SETTLEMENT: HISTORICAL AND LOCAL PERSPECTIVES TO ARCHITECTURE OF WATER
Anita Ekberg frolicking in the Fontana di Trevi in the 1960 film La Dolce Vita.
Introduction

To create a historical framework for the design project, I analyze Roman infrastructure of water from the Antiquity, to the reconceptualization of historical structures in the Neoclassical period by Giovanni Battista Piranesi. Rome presents a case replete with iconic infrastructures spanning centuries, but equally a model for "provision of resources in an artistic manner";¹ the buildings and structures supplying water engaged citizens in different ways to experience water in their daily life. Within one highly developed hydraulic system, water induced both pleasure and purpose.

The context analysis explores Finnish waterworks, and specifically architecture of water in Helsinki. The aim of the analysis is to reflect on the development of local infrastructures and their implications to the urban environment, in order to establish a spatial and cultural context for the design project.

¹ Raxworthy; Blood 2004.
Water *Intra Urbem*: The Infrastructural Landscape of Ancient Rome

WITH SUCH AN ARRAY OF INDISPENSABLE STRUCTURES CARRYING SO MANY AQUEDUCTS, COMPARE, IF YOU PLEASE, THE PYRAMIDS, OR THE FAMOUS BUT USELESS WORKS OF THE GREEKS!

Julius Sextus Frontinus: De Aqueductu Urbis Romae².

The most recognizable form of Roman imperial infrastructure was the extensive water transportation system, parts of which are still in use. Engineering knowledge and water management technologies were adopted and applied from Etruscans and Greeks, but the sheer volume of Roman infrastructure differentiates it from predecessors. New applications were necessary, as the growing city of Rome quickly exhausted the Tiber as a source of clean water. By the end of the 4th century BC, the once abundant wells and springs could no longer satisfy the needs of the urban population. The first aqueduct, the Aqua Appia, was built in 312 BC to supply the fastest growing areas.³

Research on aqueducts, sewers and other infrastructure of water offers remarkable glimpses into the way of life of ancient Romans. A. Trevor Hodge concludes in his benchmark book *Roman Aqueducts & Water Supply* that "the aqueducts were, and had to be, a public and collective enterprise. The wells and cisterns (...) were a strictly private and individual one", and goes on to write "there were (...) two quite separate water systems operating in parallel and independently, fulfilling different

* lat. intra urbem = (with)in a city

² Hodge 1992, 48.
³ Dodge 2000, 251.
purposes and observing different rules. It was the wells that provided essential services and the aqueduct that was a luxury”. Thus, households depended on wells and cisterns for their daily consumption of water, even after an aqueduct was built to serve the city. Some Roman cities never even had an aqueduct, London among them. Yet, when an aqueduct was built, it was appropriated for a number of uses, and the newly abundant water supply tended to change the whole urban pattern; in Pompeii, garden layouts and plants changed once the Aqua Augusta was built in 30–20 BC. As cities grew, the perception of water management changed from merely a necessity into a cultural symbol; a matter of civic pride.

The main reason for undertaking the construction of an aqueduct was to supply the many baths (thermae, large public bath complexes, and the small-scale balnae), fountains and gardens, not primarily to provide citizens with clean drinking water or to promote hygiene. For example, the Aqua Virgo in Rome, the only ancient aqueduct to have continuously functioned to this day, was specifically built for supplying the Baths of Agrippa. Baths were a standard even in all forts of Hadrian’s Wall, the construction of which begun in 122 AD to separate the Roman empire from barbarians of Britain. This highlights the appreciation held for the, cultural, social and sensual qualities of water, from baths as the center of social life to public fountains all around the city as a display of prestige.

Aqueducts not only transported resources to urban areas, but in their monumentality they also manifested the capacities and wealth of the Roman empire. Additionally, as aqueducts were vulnerable to enemy attacks, their construction was undertaken during times of peace, signaling confidence in the power of the state. In many cases, aqueducts were funded by booty from victorious wars, closely linking imperial triumph and societal attainment in the form of infrastructure.

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5 Dodge 2000, 246.
6 Hodge 1992, 49.
7 Dodge 2000, 252.

Giovanni Battista Piranesi’s interior view of the vault of Acqua Vergine, from *Il Campo Marzio dell’ Antica Roma*, 1762. The aqueduct has nearly deteriorated into a ruin, yet it is still partially functional. A new opening has made into the structure to create a basin for washing clothes. Image source: Piranesi: The Complete Etchings (Ficacci 2000).
Early 19th century painting of the elevated level of Acqua Vergine. The water basin is in use. Present day Via Nazareno is visible above the arch in the background. Image source: Max Page/http://viewsfromrome.blogspot.fi/

A preserved part of Acqua Virgine on Via Nazareno, pictured in 2014. Photo: Max Page.
Roman infrastructures represent an iterative approach. They were not planned as an overall scheme, but rather infrastructures were developed in accordance with the growth of cities and the needs of the people.\(^8\) Generally, the construction of new aqueducts for the city of Rome was linked to periods of population growth, and aqueducts first supplied the fastest growing neighborhoods, synchronized with large building construction efforts.\(^9\) Citizens’ needs were satisfied by tapping new springs and building new channels for the water.\(^10\) There was a practical reason for not mixing new supplies with old in existing channels: the quality of water could be controlled, and raw water of different qualities and temperatures could be diverted for different uses. Water of poorest quality was used for irrigation, while the aqueduct with the best water was prioritized for drinking. The public was outraged when Emperor Nero allegedly bathed in the springs supplying the Aqua Marcia, generally agreed to carry the most "clear, cool, and pure" water; ideal for drinking. The appreciation for the pure water is evident in Frontinus’ words: "even the Marcia, so charming in its brilliancy and coldness, is found serving baths, fullers, and even purposes too vile to mention".\(^11\)

Aqueducts of Rome followed hillsides in the upper elevations, but once they reached the Roman Campagna, the recognizable masonry arcades were constructed to retain the necessary elevation and gradient to proceed into the city. To reduce materials, effort and cost, new channels were often simply built on top of an existing arcade, resulting in monumental multi-level structures.\(^12\) Even today, the traces of these ancient infrastructures are visible in the countryside. It is, however, worth noting that despite running in the countryside, aqueducts were by nature urban, "underlying the urban orientation of Roman civilization". There was a clear distinction between urban (\textit{intra urbem}) and countryside (\textit{extra urbem}) water supply. In rural areas, only the wealthiest benefited

\(^8\) Dodge 2000, 277.
\(^9\) ibid, 252.
\(^10\) ibid, 254.
\(^11\) ibid, 262.
\(^12\) ibid, 254.
A timeline graph of population of Rome and the construction of aqueducts. Aqueducts were built during times of peace and prosperity, following population growth, and as part of a larger urban development within the city. After Pace, Pediconi. Source: Roman Aqueducts & Water Supply (Hodge 1992).
from aqueducts when they could afford to pay for water rights, but otherwise the rural population got nothing of the water flowing through their lands.\footnote{Hodge 1992, 49–50.}

As water supply from the aqueducts was constant and could not be turned off, by considering the quality of water necessary for different uses Romans were able to redirect water to serve several purposes. Aqueduct water was often used for powering mills in the course of its run, sometimes the channel even ran right through the building. After reaching the city, the water was distributed to its primary user, and from there it was discharged to flush latrines and sewers, or in some cases for running a mill. Similarly, overflow at nighttime (when consumption was the lowest) was purposeful for cleansing drains and streets. Even the debris separated from raw water in the settling tanks could be utilized as building material.\footnote{Dodge 2000, 263.}

In the Roman cityscape, baths, fountains and basins were emblematic of wealth and high quality of life, and thus their abundant provision was valued above others.\footnote{ibid, 250.} Bath complexes were a grand celebration of all sensual and experiential qualities of water; different temperatures and sounds, experienced in the lavishly decorated buildings, with ornamented statutory walls displaying gratitude for the endless supply of water. As the main target of an aqueduct was often a bath, architecture of the \textit{thermae} celebrated the effort of transporting water from far away. As in the case of Aqua Virgo leading to the Baths of Agrippa, the water was employed to provide for "an elaborate layout of baths, gardens, lake, and swimming canal".\footnote{Aicher 1993, 351.}
Diagrammatic plan of the Baths of Agrippa. The oldest large public bath in Rome was commissioned by statesman Marcus Agrippa in 25 BC for private use, but he eventually donated the *thermae* to the people of Rome. The aqueduct Virgo was completed in 19 BC to supply the baths. Bath layout after Palladio.
THE PARTICULAR FEATURE OF AQUEDUCT WATER THAT SHOULD BE CELEBRATED ABOVE ALL OTHERS WAS ITS PROFUSION; HENCE THE EMPHASIS ON CASCADES AND FOUNTAIN JETS. WATER NOT CARRIED IN JARS, NOT HAULED UP (...) OUT OF WELLS BUT ENDLESSLY TUMBLING, NIGHT AND DAY, OUT OF A GREAT SPOUT RIGHT IN THE CITY CENTRE – THAT WAS THE TRUE MAGIC OF THE AQUEDUCT.

A. Trevor Hodge: Roman Aqueducts & Water Supply

17 Hodge 1992, 11.
Aqueducts were infrastructural landmarks appropriating landscape in pace with the expansion of the Roman empire.\footnote{Hodge 1992, 1.} After the collapse of Rome by the 6th century AD, the city was reduced to the lowland area of Campo Marzio by the Tiber river, and most of the grand architecture, baths among them, were abandoned.\footnote{Aureli 2011, 89.} Aqueducts were deliberately blocked or cut to prevent invading forces from utilizing them, but even if some were later repaired, consumption patterns changed. For the most part, water was redirected for running mills, and the second main user was the church, requiring water supply for baptisteries and baths for the clergy and the poor. Drinking water was only retrieved from wells.\footnote{Dodge 2000, 275.}

In the post-Roman period, many aqueducts were fitted with a terminal display fountain, mostra, providing a "public memorial to the whole hydraulic achievement".\footnote{ibid, 268.} Earlier in the Antiquity, many aqueducts did have a fountain near the end of their run, but those fountains mostly lacked any referral to the aqueduct behind them, and thus are not classified as mostre. Mostra fountains were of different sizes and the amount of decoration varied, but their designated purpose as memorials was honored in inscriptions and ornamentation alluding to the achievement of the builders, or the qualities of the specific aqueducts water.\footnote{Aicher 1993, 340–344.}

In Ancient Rome, such a memorial type would not have been likely, as the bath complex to which the water was lead from the aqueduct presented a memorial for water in itself.\footnote{ibid, 351.} Today, there are seven major aqueducts serving the city of Rome, and six of those have a mostra. Three of those date back to the Renaissance and Baroque periods, the most famous one being the Trevi fountain celebrating the waters of the ancient Aqua Virgo, reconstructed in the 15th century as Acqua Vergine.\footnote{Aicher 1993, 340–344.}

The Magnificenza: Piranesi’s Multiple City

In the mid-18th century, Venetian architect and engraver Giovanni Battista Piranesi completed series of images depicting Rome that have been avidly read as a "visual manifesto" to this day. His engravings challenged the prevalent classical language of architecture, and introduced a critical re-conceptualization of ancient structures. His etchings present Rome as a surface inhabited by ancient fragments; both real and speculative, multiplied and manipulated.\(^{25}\) However, instead of presenting the most celebrated buildings of the Antiquity, like temples, Piranesi chose more unconventional subjects for his etchings: aqueducts, water towers, tombs, and city walls. The selection highlights functional qualities over beauty in Roman architectures,\(^{26}\) and thus allowed Piranesi to question the architectural discourse of the time, which focused on stylistic and proportional notions via classical orders.


\(^{26}\) Aureli 2011, 116.
The most famous part of Piranesi’s work is the Campo Marzio plan, or the *Ichnographia Campi Martii antique urbis*, and its prologue image, *Scenographia Campi Martii*. Pier Vittorio Aureli sees the Scenographia as one of the most radical images in the history of projects for cities, as ruins of the Roman antiquity are depicted in a desolate landscape, in the deteriorated condition they were in, yet without the context of the surrounding city of the time. In Piranesi’s manifesto, the destruction of modern Rome is a prerequisite for a new city, the Campo Marzio plan, in which the ruins of ancient monuments survive as the link between old and new. The remains represent simultaneously an end result and a beginning; that which has survived, and that which will guide the construction of a future city.\(^{28}\)

With the Campo Marzio, Piranesi presented an astonishingly modern understanding of space, which architectural theorist Teresa Stoppani considers “an architecture beyond form, which works with change and materiality”.\(^{29}\) Piranesi’s work recognizes the multitude of forces shaping a city, reinterpreting Rome as a "a multiple city made of past and present, (...) dynamic, layered, fragmented”, in a constant state of becoming.\(^{30}\)

\(^{28}\) Aureli 2011, 85.  
\(^{30}\) ibid, 101.

PIRANESI’S FOCUS ON ROMAN ARCHITECTURE EMPHASIZES THE PURPOSEFUL BEAUTY OF THIS ARCHITECTURE, THE MAGNIFICENZA, AND THE FACT THAT ROMAN STRUCTURES WERE NOT SIMPLY MONUMENTS BUT ALSO INFRASTRUCTURE.

Pier Vittorio Aureli: Instauratio Urbis

History of Finnish Water Systems

The story of water management in Finland offers an interesting case of solutions for water supply being adopted from rural areas to cities. The first systems for water supply and latrines were implemented in fortresses and manors, and Turku castle got its first water pipe made of copper and lead as early as in the 16th century.\(^{31}\) Knowledge of technologies was actively exchanged between different regions in the 19th century. Wells provided the primary source of water in the agrarian society, yet in towns the quality of well water was often poor, and there was strong seasonal variation in availability. Wooden pipes were adopted from the countryside as a partial solution for improving water supply in urban areas,\(^{32}\) but modern water and sanitation did not develop until the 1870s, when the first communal piped water system was constructed in Ilmajoki. Rural piped water supply systems were initially small but iterative in the sense that they were often later expanded and improved.\(^{33}\)

The Finnish Local Government Act of 1875 enabled independent local governments and municipal infrastructure services. The first urban water system was implemented in Helsinki in 1876, with other cities and towns following. By the First World War, all major cities were served by tap water, and as an unusual yet far-sighted strategy, water meters for were introduced as early as 1890 to distribute high costs of supply and maintenance. Early urban water and sewerage systems were primarily developed to prevent destructive fires in wooden cities, as well to address hygienic and public health concerns. After a long public debate, water-based toilets were slowly adopted starting around 1900, radically increasing demand for water supply, as well as pollution of water bodies. The Water Rights Act enacted in 1902 emphasized utilization of water resources for economic purposes, but pollution and contamination issues already present in several cities were not addressed.\(^{34}\)

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\(^{31}\) Katko; Juuti; Pietila 2006, 391.

\(^{32}\) Myllyntaus 2004, 12.

\(^{33}\) Katko; Juuti; Pietila 2006, 391.

\(^{34}\) ibid, 391–394.
First wastewater treatment plants were constructed in 1910 in Lahti and Helsinki. Separate sewers were built in Helsinki in 1938, and other cities adopted the practice after the Second World War. The new Water Act of 1962 finally started modern water pollution control by regulating discharge of wastewater by communities and industries, and regulations were made stricter as practices and technologies developed. Again, wastewater treatment was first implemented in small communities, and only later in big cities. Moreover, pulp and paper industries, the biggest polluters, only started treating their wastewater in mid-1980s, demonstrating how new requirements were first enforced on the politically 'easy targets', and only later on the more powerful and more complex institutions. Principles of Integrated Water Resources Management (IWRM), the key model of contemporary water management, began to be gradually implemented from the late 1970s onwards, when water and sewage utilities started to be systematically combined.\(^{35}\)

As rapid urbanization took place in Finland from 1950s onwards, consumption of water supplied by municipal networks increased strongly. The increase was expected to be a permanent trend, and thus large investments were made on water systems, such as the 120-kilometer-long Päijänne tunnel servicing the growing metropolitan region, primarily cities of Helsinki, Espoo and Vantaa.\(^{36}\) In recent years, consumption of water per capita has declined, as technical advancements have enabled a much more efficient use of water for industries and households. Current challenges faced by urban water systems concern mostly the maintenance of the network, as it requires constant investment and development. Densifying urban regions require equally new investments and maintenance, and as urban infrastructure of water is highly path-dependent, implementation of new technologies or practices constitute large expenses. Especially cities with many layers of infrastructure, Helsinki foremost, needs to plan new networks carefully to integrate them into historical parts of the system.\(^{37}\)

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\(^{35}\) Katko; Juuti; Pietila 2006, 391–394.

\(^{36}\) ibid, 395.

\(^{37}\) HSY 2015; Vuorilehto, interview 10/2014.
Finnish Water Tower as Architectural Type

A tradition of water towers for water storage was developed in towns and cities in the beginning of 20th century. Early Finnish water towers were one-of-a-kind architecture, made commonly of concrete, and in some cases of masonry, brick, or steel.\(^{38}\) The function of a water tower is simple: water is pumped mechanically up into the elevated reservoir from which it is distributed into the pipe network according to demand. The necessary pressure results from the difference in elevation between the water level in the tower and the outlet point. Water towers balance consumption and supply of water, as consumption varies according to the time of day, while supply is more or less constant. During the night the water tank of the tower fills up, and during the day the water level is in flux. Water towers also provide a backup for a pause in supply, for example in the case of a large fire or a technical problem in the network.\(^{39}\)

Ismo Asola has described the evolution of water tower typology extensively in his book *Water Tower – Landmark of the Community*, published in 2003. The first elevated reservoir that can be described as a water tower was built in Hanko in 1910. Different kinds of water tanks were built before that, like the impressive masonry reservoir in Alppila from 1876, the same year Helsinki established its waterworks. Early water towers were built on a high hill close to town centre, and often included lookout terraces to take advantage of the location. Architecturally, they bear historicist resemblance to towers of city halls, churches or fortresses,\(^{40}\) which is fitting when one considers the pride Finnish cities and towns took in constructing their waterworks, often modeled after European precedents. Famous architects of the time, like Lars Sonck and Selim A. Lindqvist were appointed to design towers as infrastructural landmark buildings. This first active phase in water tower construction lasted into the 1930s.\(^{41}\)

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\(^{38}\) Katko; Juuti; Pietila 2006, .
\(^{39}\) Asola 2003, 15–20.
\(^{40}\) ibid, 90.
\(^{41}\) ibid, 54–57.
Water from the treatment plant now is potable, and it will be pumped up into the water tower.

Raw water is purified at a water treatment plant.

Water is usually pumped up into the tank during the night, when consumption and price of electricity is low.

Water level in tank must be elevated higher than highest outlet in the supply network.

Potable water flows into the supply network with sufficient pressure by gravity.

After being consumed, water becomes waste, and will be treated at a wastewater treatment plant, finally to be released into a water body.
In the 1940-50s, a period in Finnish history known as the post-war rebuilding era, architecture of water was often integrated into other building program necessary for urbanizing towns, such as city halls and other public or recreational buildings. This type of water storage is called a water castle, vesilinna in Finnish, a building consisting of hybrid program of civic nature. Prominent examples include the Kemi water castle in Lapland, a white tower by the Bay of Bothnia designed by Bertel Strömmer in 1940. The building houses the city hall, a restaurant and a rooftop terrace in addition the water tank. The competition program initially also included a hotel, a library, the magistrate, a museum, the district court, and a theatre, but those were eventually not realized. A water castle in Varkaus from 1954 is a residential tower and a water reservoir, and at the time of construction it was the tallest apartment building in the Nordic Countries. Water castles, like water towers previously, were in the repertoire of well-known architects; Erik Bryggman even designed two, one in Turku (1941) and one in Riihimäki (1951).

Water castle as building type gave way again to water towers in the 1960s. Development of conical concrete structures enabled more efficient construction and a more purposeful ratio of volume to height for the water tank. Lauttasaari water tower from year 1958 in Helsinki was the first large conical water tower in Finland, and the height of the tower had to be lowered from initial plans not to exceed the height of the church in the new Lauttasaari residential area. The massive Myllypuro water tower with two nested conical reservoirs became an instant landmark of the suburb in Eastern Helsinki in 1965. However, the cost of concrete casts and of labour was perceived to be too expensive by mid-1960s, and new methods were sought after, as over 200 new water towers were constructed in Finland during the 1960–70s. Economic recession and a reorganization of the construction industry increased pressure to lower costs of water towers, which were increasingly seen as infrastructural engineering projects, rather than architecture. Restaurants or lookout

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42 Asola 2003, 58–63.
43 ibid, 64–67.
44 ibid, 68.
Riihimäki water castle, designed by architect Erik Bryggman in 1951, and the swimming stadium in the late 1960s. Photo: Arvo Haakana/ Collections of Riihimäki Museum.
terraces that used to be common features became rare by the 1970s. The building boom for water towers was over by the 1980s, as water consumption eventually leveled despite urbanization, and demand for new reservoirs decreased. Today, there are around 400 water towers in use.45

Water tower is no longer a manifestation of technical advancement like it used to in the first half of the 20th century. However, water tower as a building type represents the history of water supply in the landscape, even if the tower is repurposed or out of use. Due to the passive, object-like physical quality of the towers, one can not actually perceive externally if the structure is in use or not. In cities, towns and neighborhoods all over Finland, the local water tower has become a landmark, yet awareness of the underlying water supply system promoting values of public health, democracy and civic infrastructure has all but disappeared. Development of the water tower typology exhibits a clear trend from engaging architecture into pure technology and engineering during the 20th century, but if understanding of the potential of creative social infrastructure emerges, the type awaits to be rediscovered.

45 Asola 2003, 76, 86.
Architecture of Water in Helsinki

Helsinki region as the only multi-node urbanized area in Finland is a unique case in the context of Finnish waterworks. Helsinki established its municipal water system in 1876 to serve the population of less than 30 000. Today, there are 610 000 inhabitants in Helsinki, and the Helsinki region consisting of 14 municipalities is home to 1,4 million people. From urban water management point of view the most relevant area for observation is the Metropolitan region; Helsinki, Vantaa, Espoo and Kauniainen, as the four municipalities merged their waterworks in 2010. The new institution HSY (Helsinki Region Environmental Services Authority) provides water supply and wastewater services to over one million people, around 18 % of total Finnish population.

To this day, Helsinki skyline has been characterized by an even silhouette with only churches and water towers popping up. The generally low building height has enabled Helsinki to maintain the unique tradition of water towers; a simple system based on pressurizing the water supply network by gravity, which cities with high towers and skyscrapers are not able to utilize. However, as new tower developments are planned in several areas in the capital, the universal nature of the strategy is lost, as outlet points in the new towers will be elevated higher than the level of water in existing water towers. Case-sensitive solutions of building-specific water storages or other techniques common in dense cities worldwide will be applied to the new Helsinki, meaning that the once ubiquitous water tower system will lose some of its universality. However, as population growth in Helsinki is increasing and new large residential developments are being planned also outside the urban environment (as in the case of Östersundom), a contemporary water tower might come up in the future to redefine the context of the building type.

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46 HRI/Helsingin kaupungin tietokeskus 2015.
47 HSY 2015.
48 HSY 2015.
The areal growth of Helsinki to this day, as seen in annexations.
The fast growth of urbanized areas in the 1950–70s was paralleled by an expansion of the water supply network. A diagram of water mains in 1975, data from Helsinki City Water Services.
HSY currently maintains 12 water towers with a total storage capacity of 106,300 m³. The first water reservoir in Helsinki was built on top of a hill in Alppila the same year as the waterworks, in 1876. The Alppila water castle was a masonry construction with a rectangular reservoir of 2,617 m³. The reservoir was extended in 1902 and 1915, and a renovation and extension from 1929 increased the volume to accommodate 13,000 m³ of water. Before the 1929 renovation, which included new brick facades, the old Alppila reservoir with its stone walls was like a hilltop fortress in the landscape. A second reservoir of 16,000 m³ was built next to the old one in 1938. The round building designed by Gunnar Taucher has a small rooftop pavilion, and a vegetated green roof.

1950–70s was a period of rapid population growth in Helsinki. During a wave of urbanization, people from rural areas moved to the capital city for work. Influenced by planning ideals of the time, new residential areas were built outside of the historic city center with apartment buildings rising into previously forested or agricultural landscapes. Urban fabric grew out of Helsinki peninsula into areas like Lauttasaari in the 1940–50s, and in the 1960–70s, suburbs such as Myllypuro provided new inhabitants with modern apartments close to nature, even further away from the historical parts of Helsinki. New neighborhoods required extensive investments to infrastructure, signaled by the suburban water towers of Lauttasaari (1958), Vuosaari (1964, demolished in 2005), Myllypuro (1965) and Roihuvuori (1977). Two impressive water castles were built in 1957 and 1970 in Ilmala, with a combined storage capacity of nearly 40% of total tank volume in the Helsinki region. Quite appropriately they also house the Helsinki Region Environmental Services Authority headquarters.

The large number of water supply architecture from the decades of urban growth speaks of fast urbanization. It also reminds of the path-dependency of modern infrastructure of water, as only the Vuosaari and Lauttasaari water towers from that era are no longer in use, the

49 HSY 2015.
50 Asola 2003, 50–53.
51 HSY 2015.
rest are still functional parts of the network. Infrastructure of water is not an agile system, and with the high initial investment as well as continuous fixed costs the chosen mode of operation needs to stand time. The achievement of successfully operating a historically layered network, built iteratively over two centuries or more, is remarkable. As total consumption volumes of water has remained rather stable (yet with consumption per person decreasing), Helsinki has expanded, densified and maintained the underground network of water infrastructure, but new landmark structures have not been built.\footnote{HSY Vuorilehto, interview 11/2014.}

By studying the contemporary urban context of Helsinki’s water towers, it is remarkable that their immediate vicinity remains in most cases a residual zone, appropriated into recreation by people living nearby. The landscape of water towers is characterized by wooded areas surrounding the tower, as well as a close visual link to other types of infrastructure, especially that of transportation and mobility. As a result, water towers dominate the landscape when taking the metro in Eastern Helsinki, as commuters will be accompanied by the view of Myllypuro and Roihuvuori towers, or by car on Länsiväylä highway with the Lauttasaari tower as the local landmark. The Ilmala water castles are visible to train passengers on the Espoo-bound tracks, and to the Hakamäentie/Vihdintie highway.

The water towers of Helsinki have in recent decades been going through a phase of major overhaul. Due to changing patterns in demand and supply of water within the city, the infrastructural use of two water towers, Vuosaari and Lauttasaari was discontinued in 1985 and 1996 respectively. In 2003, the two water towers in Alppila were also decommissioned, yet their historical status has been acknowledged in a preservation plan. Both Alppila towers function as storages for the Linnanmäki amusement park. The round tower also houses an in-door roller coaster, and there have been plans to convert it into a hotel, but for now, the building remains in the current use.

When a water tower is no longer purposeful to HSY, it is removed from the network of waterworks, and the maintenance is transferred to the

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\footnote{HSY Vuorilehto, interview 11/2014.}
City of Helsinki. Despite considering different options, the Helsinki City Planning Committee approved the demolition of the Vuosaari tower in 2005, while the tower in Lauttasaari is facing demolition probably in Fall 2015.

It seems there is no strategy for repurposing infrastructure, as the obsolete water towers of Vuosaari and Lauttasaari were left empty for decades, causing such deterioration of structures and surfaces that renovation and future maintenance were eventually deemed too expensive. There is no obvious protocol for which department of the city services should adopt and develop the maintenance of such a project, relating back to the vague status of an “infrastructural architecture” such as a decommissioned water tower: is it rentable space, maintained by the Real Estate Department? Or a landmark without indoor access, seen to by the Helsinki City Museum in collaboration with the Public Works Department and the National Board of Antiquities? In a statement discussing the fate of Lauttasaari water tower, the Helsinki City Museum urged for a thorough inventory of infrastructural buildings in Helsinki, including a policy plan.

Methods and attitudes of preservation matter, too: in the case of Lauttasaari, a variety of schemes to renovate the tower into apartments, offices or a restaurant were refused by the City of Helsinki on the grounds that they would have completely transformed the tower silhouette. In other words, the relationship between the existing and the new was too incoherent to be considered purposeful reuse instead of a completely new development on the site. This raises important questions about the qualities which are valued for preservation in the case of infrastructure, conventionally appreciated exclusively for its function. As for water towers, their sculptural verticality resulting from engineering efforts transitions into pure form in the urban landscape, after the water storage function is discontinued.

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53 HSY; Vuorilehto, interview 11/2014.
54 Helsinki City Museum 2013.
There is a lingering technocratic attitude towards infrastructure, a refusal to find meaning and social content in its physical organization. Both water tower demolitions have been actively protested by citizens, as for locals, they represent disruption of an appropriated landscape. Flexibility of architecture to accommodate change is widely applauded as an urban quality, and the same attitude must be extended to urban infrastructure, to find out its potential in enriching the urban environment, reborn as spatial artifacts in transition.
An Anthology of Helsinki Water Towers

Alppila I (Old Tower)

Building year: 1876–1929
Volume: 13,000 m³
Architect/engineer: Several,
1st phase Endre Lekve

Decommissioned in 2003, currently used for storage by Linnanmäki amusement park.

Alppila II (Round Tower)

Building year: 1938
Volume: 16,000 m³
Architect: Gunnar Taucher
Engineer: Emil Holmberg

Decommissioned in 2003, currently used for an indoor rollercoaster and storage by Linnanmäki amusement park. A green roof was implemented during the Winter war (1939–1940) to disguise the water tower as a park.
Ilmala I

Building year: 1957
Volume: 20 000 m³
Architect: Karl Ruben Lindgren
Engineer: T. R. Vähäkallio

In addition to the water tank, the water castle houses offices, a restaurant, and the headquarters of Helsinki Region Environmental Services Authority.

Lauttasaari

Building year: 1958–1959
Volume: 4 500 m³
Architect: Ossi Leppämäki
Engineer: Paavo Simula

**Vuosaari**

Building year: 1964  
Volume: 1 500 m³  
Architect/Engineer: Väylä Engineers  


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**Myllypuro**

Building year: 1965  
Volume: 13 400 m³  
Architect: Bertel Saarnio  
Engineer: Paavo Simula
Ilmala II

Building year: 1970
Volume: 21 500 m$^3$
Architect: Karl Ruben Lindgren
Engineer: T. R. Vähäkallio

The water castle houses offices in addition to the water tank.

Roihuvuori

Building year: 1978
Volume: 12 600 m$^3$
Architect: Simo Lumme
Engineer: A. Pitkänen

The foot of the tower displays a mural by artist Heikki Kuula.
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An Anthology of Helsinki Water Towers

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V SITE ANALYSIS: LAUTTASAARI AS AN INFRASTRUCTURAL LANDSCAPE IN TRANSITION

Photo: Miikka Pirinen/Helsingin Sanomat (edited)
The Story of Lauttasaari in 4+1 Landscapes

2 000 BC: The Three Islands

The history of Lauttasaari began around 5 000 years ago when the tallest hill, Myllykallio, rose from the post-glacial Littorina Sea. Kotkavuori and Veijarivuori followed by 2 000 BC, but it was not until much later that the three islands became connected with a valley.¹

¹ Lauttasaaren säätiö
16th Century: The Fishing Village

Earlier written records of Lauttasaari date back to 1543, describing four peasants cultivating land and fishing in Lauttasaari, then known as Drommensby. Along with fishing, shipping became a source of wealth for the early settlers of the island.²

² Lauttasaaren säätö 2015.
19th–early 20th Century: The Summer Retreat

After purchasing the Lauttasaari manor estate in 1871, Ivan Wavulin, a Russian-born businessman, started to decisively develop the island community. He saw an opportunity in building villas and leasing land to the high society of Helsinki as Summer residences.

In 1911, the estate was purchased by Julius Tallberg, who attempted to further sell the land to the City of Helsinki but was refused, as Helsinki did not see potential in the island. At the time, Lauttasaari was settled by only a few permanent residents, along with a small community of summer residents.

In 1913, Tallberg built a small restaurant Drumso Casino, and a sea bath with a beach and sports fields on today's Hevosenkenkälahti bay to attract visitors. A year later, he initiated the steam ferry Drumsö to run between Ruoholahti and Lauttasaari, and then added a horse-drawn tram to bring visitors from the harbour to the Casino. More activities followed, such as a summer theater venue and a sledding hill. In Winter when the Casino was closed, a cafe was opened at the Manor house. Tallberg’s efforts paid off, and Lauttasaari became a popular recreational destination to the citizens of Helsinki.³

³ Lauttasaaren säätiö 2015.
Postcard depicting the summer idyll of Lauttasaari in the beginning of the 20th century. Image: Lauttasaaren säätiö.

Drumsö Casino in 1910s. Image source: Lauttasaari-Seura.

Postcard of the sea bath near the Casino, pictured before 1913. Image: Lauttasaaren säätiö.
In addition to branding Lauttasaari for recreational activities, Julius Tallberg wanted to develop the island into a more urban settlement. As early as 1913, he commissioned a first master plan draft from architect Birger Brunila, yet it was not until a bridge was built in 1935 to connect Lauttasaari to Helsinki mainland when the planning of the island finally took off. First apartment buildings were built in the 1930s, mixing into the prevalence of wooden villas, but as Lauttasaari was annexed to Helsinki in 1946, a wave of modernization took over in the 1950–60s. Due to the pace of urbanization in Lauttasaari, infrastructure lagged behind in the early years. Especially the capacity of sewage and water supply soon proved insufficient, and it was only in the late 1950s that much-needed construction and maintenance efforts finally took place, including the iconic water tower that soon became a landmark structure for the progress of urbanity.\(^4\)

Recent decades have seen the former industrial area of Vattuniemi transform into a residential neighborhood, a regular narrative of the post-industrial city. Some maritime industrial activities remain, preserving some of the sub-urban qualities of Lauttasaari.

Lauttasaari has held onto its recreational side throughout the years. City of Helsinki maintained a camping ground in Särkiniemi 1957–1971, and small holiday cottages in Särkiniemi and Veijarivuori served as popular resorts for the growing urban population. Initially temporary structures, the two holiday villages still thrive, and mark the continuation of an island community identity, a life surrounded by the sea, a step away from the busy urban life. Boats, piers and other sailing infrastructure are essential to the Lauttasaari landscape, linking urban inhabitation to the Gulf of Finland archipelago. Despite their closed-off presence for non-members, sailing clubs activate the shoreline throughout Summer, while during the Winter, boats are stored in the harbour lots, hiding under covers, waiting for Spring.

\(^4\) Lauttasaaren säätiö 2015.

First apartment buildings on Otavantie next to the Manor on the left, pictured in 1939. Kotkavuori with scattered wooden villas is on the top-right. Photo: Lauttasaaren säätiö.
Kotkavuori neighborhood pictured in 1974. Population growth in Lauttasaari leveled by the mid-1970s as land value increased, which was reflected in the demographics: less families with children, and less inhabitants of working class professions. Photo: Kai R. Lehtonen, Lauttasaaren säätiö.

Sailing landscape. Aerial image of Helsingfors Segelklubb (HSK) harbour in Lauttasaari, Vattuniemi on the left and Kotkavuori with the water tower on the right. Photo: Tapio Kurki 2012.
2050s: The Urban Lauttasaari

Helsinki City Planning Department published a draft for a new City Plan in late 2014, titled Vision 2050: Urban Plan (Yleiskaava 2050: Kaupunkikaava). While work on the plan continues, a zoom into the proposal draft presents a radical vision for Lauttasaari.

Today, Lauttasaari is home to 22 000 people, and the plan would nearly double the population with 18 000 new residents. As housing prices and research of nation-wide trends all point to strong population growth in the Metropolitan region, the City of Helsinki is determined to find land for residential development close to transportation links and existing urban hubs: Lauttasaari presents an opportunity, with the new metro station set for opening in 2016, and its close proximity to the city center.

Most of new development would take place along Länsiväylä, domesticated from a highway into a boulevard in the vision. Interestingly, Kotkavuori is not noted as a green space, but in the abstraction of the overall scheme, included in the Länsiväylä development area. A new neighborhood park is proposed in the plan draft appendix documents along the Northern shore, ignoring the existing green space of Kotkavuori, rich in layered historicity.

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5 Yleiskaava 2014.
Appendix documents from the City Plan draft. **Top:** Key development areas. **Next page top:** Urban nature (in green), note: Kotkavuori omitted. **Next page bottom:** Main recreational areas (green), planned recreational area (pink).

Source: Helsingin Yleiskaavaluonnos, 25.11.2014. City of Helsinki City Planning Department.
SOMETIMES THE ABSENCE OF A THING MAKES YOU SO MUCH MORE AWARE OF IT.

Wim Wenders®
Due to the rapidly increasing population and new industries occupying Lauttasaari in the 1950s, the capacity of water supply mains and the pressure in the network soon proved insufficient. During consumption peak hours, supply to the highest floors of the new apartment buildings was nearly nonexistent, much to the dissatisfaction of inhabitants. The problem was rather common in new neighborhoods of Helsinki, as the city was struggling to urbanize the large areas that had been annexed in 1946, especially since during the post-war rebuilding phase.\textsuperscript{7}

The water tower of Lauttasaari was finally built in 1958–1959 to fix the local water supply. Initially, Myllykallio was chosen as the site for the tower, but as the church of Lauttasaari was being planned on an nearby site and the water mains had to be linked to Salmisaari, the location was eventually changed to Kotkavuori, the second tallest hill. The tower is 32 meters tall, and the tank has a diameter of 42 m, with a storage capacity of 4,500 m\textsuperscript{3}. The design of the water tower was trusted to Ossi Leppämäki, an architect of the City’s Public Works Department, and Paavo Simola, a leading expert in concrete structures.\textsuperscript{8} At the time, most water towers were built in cylinder form, yet an ambitious construction method enabled a conical shape for the Lauttasaari tower, unseen in such large scale in Finland: prestressed concrete. The construction resulted in the shape which prevented large fluctuations of pressure in the network which had plagued Lauttasaari in the past.\textsuperscript{9}

As water consumption per capita has decreased since the 1980s, new models of water system management and development of the infrastructural network made the Lauttasaari water tower obsolete in the 1990s. The tower was decommissioned in 1996, and despite active protests from citizens and calls for preservation by authorities, the City Planning Committee of Helsinki approved a plan to demolish the tower in 2013. The demolition is expected to take place in late 2015.\textsuperscript{10}

\textsuperscript{7} Lauttasaaren säätiö 2015.
\textsuperscript{8} City of Helsinki Public Works Department (HKR) 2014.
\textsuperscript{9} Lauttasaaren säätiö 2015.
\textsuperscript{10} City of Helsinki Real Estate Department (KV); Supreme Administrative Court, 2015.
Lauttasaari water tower (in original form)
Section 1:400
Horizontal projections 1:400
Horizontal projections 1:400

3-3

4-4

5-5

6-6

7-7
A Thesis for Kotkavuori

URBAN LANDSCAPES PRESENT AN ACCUMULATION OF COLLECTIVE MEMORY INTERSPERSED WITH THE PRIVATE REALM OF INDIVIDUAL EXPERIENCE.

Matthew Gandy: Landscape and Infrastructure in the Late-Modern Metropolis

A place of meta-locality, Kotkavuori embodies imagery and landscapes specifically “of Lauttasaari” (the water tower, the rocky geography, and the remaining old wooden villas) and simultaneously links to the hidden but ever-present infrastructural network, the metabolism of the city itself. For over 50 years, the water tower has visually represented the urban water supply, which took decades to become fully operational on the island. The relationship between sea water surrounding Lauttasaari in every direction and purified household water in the tower, originating from Lake Päijänne 150 km away, has embodied the tension between natural and manmade, landscape and object, nature and city; water as recreation and water as infrastructure. The project is for the site to continue the dialogue even after the tower is demolished.

Due to the monofunctional approach of civil engineering, infrastructure tends to label spaces as residual. The infrastructural landscape is dominated by its operation, and once infrastructure is decommissioned or demolished, the landscape needs to be reframed, and appropriated. In the case of Kotkavuori, the serendipity of the site seems lost to Helsinki urban planners. They are underestimating its recreational potential without the water tower, and the importance of experiential urban nature in this part of Lauttasaari.

11 Gandy 2011, 58.
The urbanity of Lauttasaari is unique, but contested. In today’s urban form, small scale residential areas and apartment buildings from 1950s onwards are clearly separated, yet both are quintessential to the identity of Lauttasaari. Recreational areas become places of negotiation and reconciliation: the beach and Myllykallio hill surrounded by public amenities successfully serve the purpose of bringing residents together in the public realm.

The population of Lauttasaari is currently increasing through on-going development in Vattuniemi, a former industrial area south of the Kotkavuori neighborhood. Yet, a more radical change is proposed in the Helsinki 2050 plan draft: a maximum of 18 000 new residents added to the current population of 22 000. Most of the development would take place along Länsiväylä, transformed from a highway into a boulevard. The plan draft maps Kotkavuori as an urban development area, the same category as the most central neighborhoods of Helsinki. Thus, in the plan vision, Kotkavuori is not seen as a green space or recreational area, but as a potential site for in-fill. In contradiction, however, even the plan appendixes recognize a need for a new park to be planned along the northern shore of Lauttasaari.

Kotkavuori should be developed as the local park instead of a new site: it marks a distinct place rooted in the oldest historical layer of inhabited Lauttasaari, a fragment of the lost 19th century Summer paradise, and as the connecting element between the future neighborhood along the pacified Länsiväylä and the 1950s core of Lauttasaari, where a metro station and a new commercial center will be opened in 2016. The steep topography of Kotkavuori, 32 meters above sea level, will detach the old from the new even after Länsiväylä is transformed, if the spatial and programmatic possibilities of the site are not explored and utilized decisively to prevent the separation. Kotkavuori needs to engage both current and new Lauttasaari residents with the layered historicity of the site, a proactive negotiation of the future to the existing.

Kotkavuori water tower used to link Lauttasaari to the larger urban network, an infrastructural automonument pin-pointing the connection from afar, but when the tower is gone, the site must claim a new role within the immediate environment of Lauttasaari.
What makes Lauttasaari unique is the closeness of the sea and urban nature, and the identity of an island community; a lingering memory of the popular summer retreat from the city in the 19th–20th century city. Sailing clubs with the piers and berths, not to mention the abundance of white sails in the horizon all around Lauttasaari, are quintessential to the local landscape, signaling freedom to explore the coasts near and far. The shoreline is activated by seasonal sailing during the warmer months, yet in Winter, the boats are stored in the harbour lots, static and out-of-place on dry land. The piers are inaccessible to non-members, and there are other occasions of privatized seaside, such as Saunaseura, a members-only sauna club.

The ontological separation of nature and city is tangible in the way the sea frames the landscape in Lauttasaari. A popular recreational path runs along the edges of the island, offering panoramic vistas to maritime Helsinki and to the archipelago. The sea defines Lauttasaari not only in geographical terms, but also visually: it establishes the dominance of looking outwards, instead of experiencing a complementary local urban landscape within Lauttasaari. New housing especially in Vattuniemi is developed around the maritime aesthetics; each building is reaching higher than the next for painting-like views of the sea, at least in the most profitable top floors. If northern Lauttasaari becomes radically more urbanized along lines of the 2050 plan, the quality of the urban environment and recreation can not be dependent solely on the obvious seaside. Furthermore, the seaside must remain accessible and active to all, and offer an extended invitation to interact with the landscape.
Vattuniemi penthouses are sold on the value proposition of panoramic views to the archipelago. Image: Kokema Design.

While boats enable a unique way of interacting with the sea to their owners, they also represent a privatisation of the seashore in the way of fenced-off berths and yacht clubs in Lauttasaari. Photo: Heini-Emilia Saari 2015.
Detached or semi-detached house
Apartment building, three floors or less
Apartment building, more than three floors
Non-residential
Diagram of residential typology in Lauttasaari. Small scale housing is concentrated into areas close to the shore, while multi-storey apartment buildings are mostly located in the inner parts of Lauttasaari, less intensively in contact with the seaside and the recreational amenities.

Diagram of recreational activities in Lauttasaari. Public recreational facilities in blue, privately maintained with restricted access in black. Source of data: City of Helsinki Service Map; site observations.

The northern side of Lauttasaari is much less active in terms of recreation infrastructure than the central and southern parts of the island. Based on site visit observations, the recreational path going around Kotkavuori on the northern side also seems much less popular than the same trail on the southern shore of the island, despite impressive views towards Salmisaari and the Helsinki inner bay areas.
The Hidden City. In the underground realm of flows and networks, Lauttasaari is not an island. An interconnected web of pipes, mains, tunnels and rails, violently drilled into the ground, maintains the world above the surface. Water towers connect the city-wide underground network to the landscape, and thus, they are operational landmarks of the uninhabited Helsinki; of the urban metabolism.
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VI THESIS PROJECT: THE NOUVELLE NATURE – KOTKAVUORI AS INFRASTRUCTURE FOR URBAN RECREATION

James Corner: Terra Fluxus

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36 Corner 2006, 33.
The name of the chapter borrows from landscape architect Christophe Girot, who writes in the essay *Vers un nouvelle nature* (2005): "[The] nouvelle nature, or "new nature" is meant to sharpen our senses and reconcile us with our environments and a feeling of belonging". Furthermore, the concept of nouvelle nature introduces "a reduced and symbolic form of nature, marking the advent of a new relationship between public space and the way we live". Girot mentions three factors for the making of a nouvelle nature: Time (to construct the environment with the necessary patience), the anthropology of nature (the link between human well-being and nature), and the physical reinstatement of natural structures in the existing urban fabric.37

Unlike architecture and landscape architecture, infrastructure dominates over particularities of place with its entitled urgency. Infrastructural projects do not integrate or adapt, they reconstruct the site with their system parameters and path dependency that are neither spatial nor site-specific. On the other hand, infrastructure in itself is not expected to create enriching experiences into the urban realm, spatial or otherwise; rather, infrastructure is purely means to an end (clean water, electricity, mobility). This is a lost opportunity, and a counter-effective approach to designing the urban environment. Infrastructure, landscape and the spatial city form one entity, and should be designed as such.

The site for the project is Kotkavuori, today the site of the Lauttasaari water tower destined for demolition in late 2015. The tower is an infrastructural relic, a dominant landscape feature, and an embodiment of the interaction between the environment of everyday life and the hidden city maintaining it. The design proposal addresses the temporal quality of the location: the site is on the verge of a radical transformation. The aim of the proposal is to engage the site, appropriated by the community, with the inevitability of change in the spatial environment, and in the interaction with urban water. The project presents a friendly hack into the centralized water system, reconstructing a spatial framework for a new relationship to water.

The Return of Urban Water on Kotkavuori

The demolition of Lauttasaari water tower will not only cut out a man-made part of Kotkavuori that has defined the site from up close and from afar for over 50 years, but more importantly, the demolition urges a reinstallment of meaning. The potential of the site lies in negotiating the pending future development of Lauttasaari with the historical layers tangible on Kotkavuori, and in engaging the local citizens with the transformation. Lauttasaari has evolved into the current urban landscape through disruptions in the past; the summer villas made way to the modern city, and now, the monumental object will be replaced by a landscape of interaction. The infrastructural landscape of collective memory will become an operational landscape of recreation and contemplation: instead of storing water for consumption, Kotkavuori will rehabilitate consumed water. Re-connecting the perception of urban water to the ecosystem, it is an experimental infrastructure as urban nature.

Low-polluted grey water from homes in the neighborhood is diverted to Kotkavuori, treated on site by a process of ground filtration in a trail down the hill, and finally, when pure, released to the sea. The process utilizes remaining underground structures of the water tower as a settling tank, and with each stage of water treatment, creates new places to occupy for recreation. The project links the water from Päijänne and the private realm of homes to public space, and beyond to the Baltic Sea, an ecosystem and infrastructure in itself, shared by countries and continents.

Grey Water Filtration

Grey water filtration in a linear sequence down Kotkavuori integrates a recreational path to water treatment. Numerous iterations of ground filtration have been implemented in Finland. The most common application is the treatment of wastewaters in decentralized communities, such as vacation homes or farms, but the system can be scaled up and applied to urban settings. The technique presented here is applied from a ground filtration system developed by Wavin Labko Oy.
Biomimic floating treatment wetlands remove ammonium, nitrate, phosphorus, organic carbon and suspended solids from water. The floating wetland concept is based on the BioHaven technology developed by Floating Island International.

Plant roots absorb nutrients and pollutants, further accelerated by microbial activity in the biofilm around the roots.

Microbe growth is increased with a dense, porous matrix made of recycled plastics.
The Sequence of Water

1. Home
Daily showering, cooking, and washing up adds up to a total of 90–130 liters of grey water per person.

2. Settling tank
Grey water volumes of approximately 3 000 people living nearby are diverted and pumped up to Kotkavuori for localised treatment.

3. Purification path
From the tank, water is lead to a ground filtration trail down Kotkavuori, on a continuous slope of 0.5–1 mm/m. The method also filtrates and transports stormwater run-off on site.

4. Sea baths
Finally, the treated grey water is released in a manmade cascade into a series of pools by the shore. The outlet of water is as continuous as household water consumption, and water changes constantly as the pools overflow into the sea.

5. Floating Wetlands
As water from the pools reaches the sea, the interface of the two waters is marked by floating constructed wetlands, islands of public space at sea, which can be occupied freely for recreational activities. The islands also create habitats for plants and fish while purifying the eutrophicated Baltic sea water by a “concentrated wetland effect”, a man-made technology for a natural process.
Existing facilities activated by the project

- old stone pier
- street basketball court
- recreational path around Lauttasaari
- public well
- playground
Lighting connecting different parts of the project
Public Outdoor Bathing in the Helsinki Area

- beach
- outdoor swimming facility
- planned facility
- project
Large steps integrated into the rock form new landscape elements and park furniture in the open areas of Kotkavuori.

Path route is defined by the topography and a 0.5...1 % slope for water flow.

New stairways in the forest link Kotkavuori to the recreational path around Lauttasaari.
The former water tower site becomes an open space, an amphitheater, at the apex of Kotkavuori.

Small settling ponds are accompanied by seating to create places of contemplation and rest.
Site plan 1:1500
Seaside

floating islands
wooden terraces
Site section a-a 1:500 (in two parts):
The sea baths and the pier create a new recreational public space by the sea.
public well
Site section b-b 1:500: Water overflows continuously in pace with water consumption in homes, keeping the pool water in motion and creating an interface between the sea and the baths.
Site section c-c 1:500:
Amphitheater on the former site of the water tower on the top of Kotkavuori. The open space can be used for local events and gatherings, and the structures of the settling tank underground create an elevated platform to function as a stage.
Bibliography


The massive reconstruction effort necessary...
In 1910, 70% of apartments in Helsinki are equipped with running water and sewers.

Alppila I (Old Tower) 1876–1929
Volume: 13,000 m³
Alppila I (Round Tower) 1938
Volume: 16,000 m³
Ilmala I 1964
Volume: 4,500 m³
Lauttasaari 1958–1959
Volume: 1,500 m³
Vuosaari 1964
Volume: 13,400 m³
Ilmala II 1970
Volume: 21,500 m³
Roihuvuori 1976–1977
Volume: 12,600 m³

Several existing structures have been decommissioned from the water supply network, among them the main tower of Vuosaari and Lauttasaari. Maintenance is costly, and the infrastructural network and regional cooperation, as well as technical solutions, have developed in recent decades, making the towers unnecessary.

The tower in Vuosaari made way to residential buildings in 2005, but the landmark of Lauttasaari, standing empty since 1996, still needs to find a new future.

Due to the rapidly increasing population and new industries occupying Vuosaari in the 1960s, the capacity of water supply network was non-proven sufficient. During consumption peak hours, supply to the highest floors of the new apartment buildings was mainly unsatisfactory, which to the dissatisfaction of inhabitants. The position was rather common in new neighborhoods of Helsinki, as the city was struggling to urbanize the large areas that had been annexed in 1946, especially since during the post-war rebuilding phase.

The water tower of Lauttasaari was finally built in 1938 (1939) to the touristic water supply. Initially, Myllykallio was chosen as the site due to the existence of Lauttasaari as the location for the tower, but as the church demolished, the second tallest hill was set for late 2015. The tower was decommissioned in 1996, and despite active protests from citizens and calls for preservation by authorities, the demolition is set for late 2015. The demolition is opposed to take place in late 2015.

The Urban Infrastructural Landscape in Transition

Heini-Emilia Saari
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In 16th Century: The Fishing Village

Historic written records of Lauttasaari date back to 1543, describing the first settlers and their activities. The island was inhabited by fishermen and peasants cultivating land and date back to 1543, describing four families living in Lauttasaari. Along with fishing, the primary activities were hunting, felling trees, and cultivating land. The earliest written records of Lauttasaari date back to 16th Century.

In 19th–early 20th Century: The Summer Retreat

In 1871, Ivan Wavulin, a Russian-born businessman, started to decisively develop the island community. He purchased the Lauttasaari estate in 1871, and began to build villas and hotels. He saw an opportunity in building villas and hotels and began to develop the island community. In 1871, Wavulin built a small restaurant on the island, and in 1908, he purchased the Lauttasaari estate in 1871, and began to build villas and hotels. He saw an opportunity in building villas and hotels and began to develop the island community.

In 1940s: The Modern Lauttasaari

In addition to the development of Lauttasaari for recreational activities, future Tallberg proposed to develop the island as a tourist destination. Tallberg had been a successful businessman, and he used his wealth to develop the island. He proposed to develop the island as a tourist destination, and he did so by building villas and hotels. He saw an opportunity in building villas and hotels and began to develop the island community.

By 2000 BC, the Lauttasaari hill, Myllykallio, rose from the post-glacial Littorina Sea, Kotkavuori following by 2000 BC. The first city in the world to develop an underground railway station, Helsinki, was founded in 1862, and its central business district was annexed to Helsinki in 1892. The Kotkavuori hill was annexed to Helsinki in 1892, and its central business district was annexed to Helsinki in 1892. The Kotkavuori hill was annexed to Helsinki in 1892, and its central business district was annexed to Helsinki in 1892.

The Hidden City

In the underground realm of flows and networks, Lauttasaari is an underground city. The dynamic is negotiated with the civic amenity of daily life, such as the water main which burst right beneath Helsinki Central Railway Station in 2009, closing down the line for four months but leaving no civic structures in an underground city. The urban hubs: Lauttasaari presents an underground realm of flows and networks, Lauttasaari is not an underground city. The dynamic is negotiated with the civic amenity of daily life, such as the water main which burst right beneath Helsinki Central Railway Station in 2009, closing down the line for four months but leaving no civic structures in an underground city. The urban hubs: Lauttasaari presents an underground realm of flows and networks, Lauttasaari is not an underground city. The dynamic is negotiated with the civic amenity of daily life, such as the water main which burst right beneath Helsinki Central Railway Station in 2009, closing down the line for four months but leaving no civic structures in an underground city. The urban hubs: Lauttasaari presents an underground realm of flows and networks, Lauttasaari is not an underground city. The dynamic is negotiated with the civic amenity of daily life, such as the water main which burst right beneath Helsinki Central Railway Station in 2009, closing down the line for four months but leaving no civic structures in an underground city. The urban hubs: Lauttasaari presents an underground realm of flows and networks, Lauttasaari is not an underground city. The dynamic is negotiated with the civic amenity of daily life, such as the water main which burst right beneath Helsinki Central Railway Station in 2009, closing down the line for four months but leaving no civic structures in an underground city. The urban hubs: Lauttasaari presents an underground realm of flows and networks, Lauttasaari is not an underground city. The dynamic is negotiated with the civic amenity of daily life, such as the water main which burst right beneath Helsinki Central Railway Station in 2009, closing down the line for four months but leaving no civic structures in an underground city.
Floating islands create places to occupy on the water, and the concentrated wetland effect purifies the eutrophicated Baltic Sea. The pool landscape renegotiates the shore line, and establishes a new boundary between land and sea which can be experienced directly in the water.

**Sources:**
1. Ground filtration technology applied from wastewater treatment systems by Wavin Labko.
2. The floating treatment wetland concept is based on the BioHaven technology developed by Floating Island International.

### THE SEQUENCE OF WATER ON KOTKAVUORI

- **2 Purification path**
  - Grey water: Wastewater in a linear sequence down Kotkavuori integrates a recreational path to water treatment.
  - Ventilation and integrated lighting
  - Grey water filtration in a linear sequence down Kotkavuori integrates a recreational path to water treatment.
  - Wooden surface
  - Pontoon
  - Subsurface habitat for fish
  - Collection pipe for filtrated grey water
  - In-fill ground material
  - Sand filtration layer
  - Gravel
  - Distribution pipe for untreated grey water
  - Profiled module for even distribution

- **1 Home**
  - 5 Floating islands
  - Pier around the pools
  - Recreational path around Lauttasaari
  - Public well

- **4 Seaside baths**
  - The treated grey water is released to a permeable sea side to connect with the water and the landscape. The outlet of water is to sustain sea life as a continuous sea life environment, and the water changes constantly by overflow into the sea, creating a tangible interface of purified infrastructural water, water as recreation and water in the landscape.

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### FROM TECHNOLOGICAL LANDMARK TO RECREATIONAL PLACE

**Existing Facilities Activated**

- **1 Home**
- **2 Settling tank**
  - Subsurface habitat for fish
  - Collection pipe for filtrated grey water
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### Public Outdoor Bathing in the Helsinki Area

- **Showering, cooking, and washing up adds up daily to a total of 90–130 liters of grey water per person.**
  - Grey water volumes of approximately 3 000 people living nearby are diverted and pumped up to Kotkavuori for localised treatment. An existing underground space of the water tower is used as a settling tank.
  - The treated grey water is released in a manmade cascade into a series of pools by the sea.
  - Visitors are invited to interact with the water and the landscape through bathing, strolling and observing. The outlet of water is as continuous as household water consumption, and the water changes constantly by overflow into the sea, creating a tangible interface of purified infrastructural water, water as recreation and water in the landscape.
New stairways in the forest link the water treatment path and the other interventions on Kotkavuori to the popular recreational path going around Lauttasaari.

The former water tower site becomes a designed ruin: an open space at the hilltop with the same dimensions as the demolished tower, and an amphitheater for local events.

The purification path is defined by two parameters: the steep topography, and the continuous 0.5...1% slope necessary for the water flow.

Large steps integrated into the rock form new landscape elements and park furniture in the open areas of Kotkavuori. They invite visitors to explore the site even outside common paths, and spark new awareness of the place through fragmental interventions.

Stairways to the end of the purification trail to a shortcut to the former water tower site.

Places to sit are added along the path to offer places of contemplation and rest. They are accompanied by small settling ponds with vegetation in which the water flow is slowed down.
The Urban Infrastructural Landscape in Transition

Lauttasaari Water Tower: From Technological Monument to Recreational Place

Heini-Emilia Saari

| Master's Thesis 2015 |

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Site plan 1:500

Seaside

The public well (vesiposti) provides drinking water from the Helsinki water supply network.

Uniform lighting links the seaside to Kotkavuori wooden terrace.

Floating islands double-function as sea water treatment interventions and platforms for visitors.

The pier extends the recreational path from land to sea.

Small harbour for visitors.

Beach for kayak landing.

Diving platform at the deep end.

Basketball court.

A new stair and a wider bicycle line highlight the activated recreational trail.

Section a-a 1:200

Boat harbour for visitors.

Pier as extension of the recreational path around Lauttasaari.