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PLANNING AS A TRANSFORMATIVE ACTION IN AN AGE OF PLANETARY CRISIS

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Colophon

Editors:

Zeynep Enlil

İclal Dinçer

Typesetting & Layout:

Soykan Güler

Alev Yavuz

Asya Kuzu

İlayda Kuru

Cover Design:

Milk Agency

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CONTENTS

CONTENTS

TRACK 1 - POSTGROWTH URBANISM

TRACK 2 - PLANNING AND LAW

TRACK 3 - MOBILITY

CONTENTS

TRACK 4 - GOVERNANCE

CONTENTS

CONTENTS

CONTENTS

TRACK 6 - URBAN CULTURES AND LIVED HERITAGE

CONTENTS

TRACK 7 - INCLUSION

CONTENTS

TRACK 8 - EDUCATION AND SKILLS

TRACK 9 - URBAN FUTURES

CONTENTS

CONTENTS

TRACK 18 - TOURISM

The Italian Integrated Water Service as a Promoter of Soil Desealing Processes

Gregorio Pezzoli
University of Bergamo
Email: gregorio.pezzoli@unibg.it

Abstract
Urban soil sealing exacerbates climate change impacts by disrupting the hydrological cycle and increasing flood risks. This paper examines how Italian Integrated Water Service Companies are promoting soil desealing to enhance urban resilience and environmental sustainability. Case studies of MM S.p.A., Gruppo CAP, and BrianzAcque in Lombardy reveal a strategic shift towards implementing Nature-based Solutions and Sustainable Urban Drainage Systems, such as depaving and bioretention areas. Regional policies, like Lombardy's hydraulic invariance principle, and national funding are crucial enablers. While promising, the limited geographical spread of these initiatives underscores the need for broader national adoption and supportive policy frameworks.

Keywords: Integrated Water Service Companies (IWSCs); Nature-based Solutions (NbS); Public spaces; Soil Desealing; Urban resilience

Introduction

The contemporary world is being impacted by the adverse consequences of climate change. The causes of this phenomenon can be attributed to the increase in anthropogenic greenhouse gas emissions (IPCC, 2023). Urban systems have been identified as both the largest generators of these climate-altering gases and the most adversely affected by them (Short & Farmer, 2021). The phenomenon of rising global temperatures, a consequence of climate change, exerts a direct influence on the hydrological cycle. The global nature of the water cycle is evident, yet the utilisation of this resource, its supply, and the associated conflicts are inherently localised phenomena (Menga, 2024). This alteration in the hydrological cycle has been shown to result in increased precipitation intensity and frequency (Trenberth, 2011), leading to flooding and periods of severe drought (Hunt & Watkiss, 2011). This dynamic results in alterations to the distribution of water between the water table and the surface, which in turn has direct consequences for erosion, runoff and water stress experienced by plants (IPCC, 2022).

The disruption of the water cycle is exacerbated by soil consumption, i.e. the expansion of infrastructure and urban areas at the expense of the natural and agricultural systems (European Commission, 2012). A considerable proportion of the soil that is consumed is also sealed. Soil sealing can be defined as the process by which soil is permanently covered by an impermeable artificial material (European Commission, 2012). The impact of soil consumption and soil sealing on water resources is multifaceted. It leads to a reduction in infiltration and increased runoff resulting in an overloading of the sewage system. Secondly, it contributes to a decline in biodiversity both above and below the soil. It also reduces the soil's capacity to store carbon and evapotranspiration. Finally, it disrupts the chemical and biological binding of microorganisms (European Commission, 2012). In 2022, Italy's soil consumption, expressed as a percentage of the total area of "usable" soil in the country, was recorded at 10.16% (SNPA, 2024).

A variety of techniques have been developed for the purpose of enhancing the management of the urban water cycle within urban systems. In particular, Nature-based Solutions (NbS) and Sustainable Urban Drainage Systems (SuDS) have been identified as playing a pivotal role. Nature-inspired solutions (NbS) are defined as interventions that offer multiple benefits with the potential to address environmental challenges (Sowińska-Świerkosza & García, 2022). In addition to economic and environmental benefits, they have the capacity to generate positive externalities from a social perspective (Haase et al., 2017; Bockarjova et al., 2022). SuDS are systems that utilise natural processes, green infrastructure and traditional infrastructure to collect, infiltrate, store, convey and treat rainwater at the location where precipitation occurs (Davis and Naumann, 2017). These natural technologies have the potential to mitigate the impacts of climate change in urban areas, including rising temperatures, flooding risks and droughts (Hobbie and Grimm, 2020). Furthermore, these interventions contribute to increasing the quantity and quality of urban public spaces.

The present contribution aims to explore the ways in which the actions and projects of Integrated Water Service Companies (IWSCs) can promote public space initiatives that enhance resilience to climate change and environmental sustainability.

The analysis will proceed according to threefold criteria. Firstly, a classification of the type of interventions implemented and their relation to other benefits in addition to urban drainage (e.g. temperature regulation, enhancement of urban biodiversity, etc.). Secondly, the identification of regional and local policies that enabled and supported the success of the projects. The final stage of the process is the evaluation of the projects' effectiveness, equity and scalability. The selection of case studies was initially based on three criteria: the strong urbanisation of the optimal territorial areas, the actual role of the IWSCs as a promoter of soil unsealing, and the geographical variety, with the objective of selecting representative cases throughout Italy. Following an initial review of the websites of all Italian companies (approximately 100), only three that were active in soil unsealing were identified, all of which were located in the Lombardy Region. The primary sources of the projects are drawn from grey literature, encompassing project data sheets, information websites, and institutional websites of integrated water service companies, municipalities, and provinces.

The Integrated Water Service (IWS)

The concept of Integrated Water Service (IWS) was born in Italy in 1994 (L. 36/1994), but is currently regulated by the Legislative Decree Environmental Regulations of 2006, which defines it as 'constituted by the set of public services of capture, adduction and distribution of water for civil uses, sewerage and wastewater treatment, and must be managed according to principles of efficiency, effectiveness and economy, in compliance with national and EU regulations' (D. lgs. 152/2006). The Integrated Water Service refers to specific territorial areas, the Optimal Territorial Areas (OTA). These areas are defined - by means of regional laws implementing Law 36/1994 - according to three parameters: (i) respect for the unity of the hydrographic basin or sub-basin or contiguous hydrographic basins; (ii) overcoming management fragmentation; (iii) achievement of adequate management size, defined on the basis of physical, demographic, technical parameters and on the basis of political-administrative subdivisions (Law 36/1994). In some regions, the subdivision follows that of the provinces, while in other cases it follows other territorial requirements. The IIS of a specific OTA is assigned to a service manager, a public or private company. However, there are cases of companies entrusted with the management of multiple OTAs. The managing company takes care of the aqueduct (collection, adduction and distribution) and sewerage (collection, conveyance and purification).

The topic of water sustainability has entered the policies of these companies. A large part of their efforts is dedicated to reducing leakages - the value of which stands at 42.4% in municipal drinking water distribution networks (ISTAT, 2024), optimising monitoring systems and raising awareness of the importance of water as an asset. A strategic shift in focus, away from their traditional core business, has recently been initiated by a number of these companies. This strategic shift is characterised by the promotion and implementation of actions with the objective of enhancing urban drainage systems, mainly on public space. These policies, aimed at achieving a harmonious city-water relationship, are implemented through a combination of conventional 'hard' engineering interventions, e.g. detention basins, and more contemporary and sustainable approaches, e.g. NBS, and SuDS.

Case studies analysis

The three cases examined, which are the only ones identified among those actively involved in sustainable urban drainage improvement measures, are the three companies MM S.p.A., Gruppo CAP and BrianzAcque. Their OTAs are part of two contiguous areas: the Metropolitan City of Milan and the province of Monza Brianza, within the region of Lombardy. It is one of the most urbanised areas in the country, so much so that it is referred to as the "Megalopoli Padana" (Turri, 2000). Within the Italian context, Lombardy stands as a notable exemplar, with a land taken that accounts for 12.19% of the region's total territory (compared to the national average of 7.16%) (ISPRA, 2024). The province of Monza Brianza has consumed 40.78% of the soil within its borders (first in Italy), while for the Metropolitan City of Milan the value stands at 31.88% (third in Italy) (ISPRA, 2024). In 2017, the Lombardy Region adopted a regulation on the principle of hydraulic invariance (R.R. 7/2017). This regulatory framework

pertains to the management of rainwater, with the objective of mitigating water runoff to conventional urban drainage systems. The principle of hydraulic invariance states that the maximum volume of stormwater runoff discharged from urbanised areas into receptors must not exceed the volume that existed prior to urbanisation. The regulation sets out standards for specific categories of building, urbanisation, and infrastructure projects. The application of the regulation has consequences for the entire regional territory, in a diversified way according to the class of criticality.

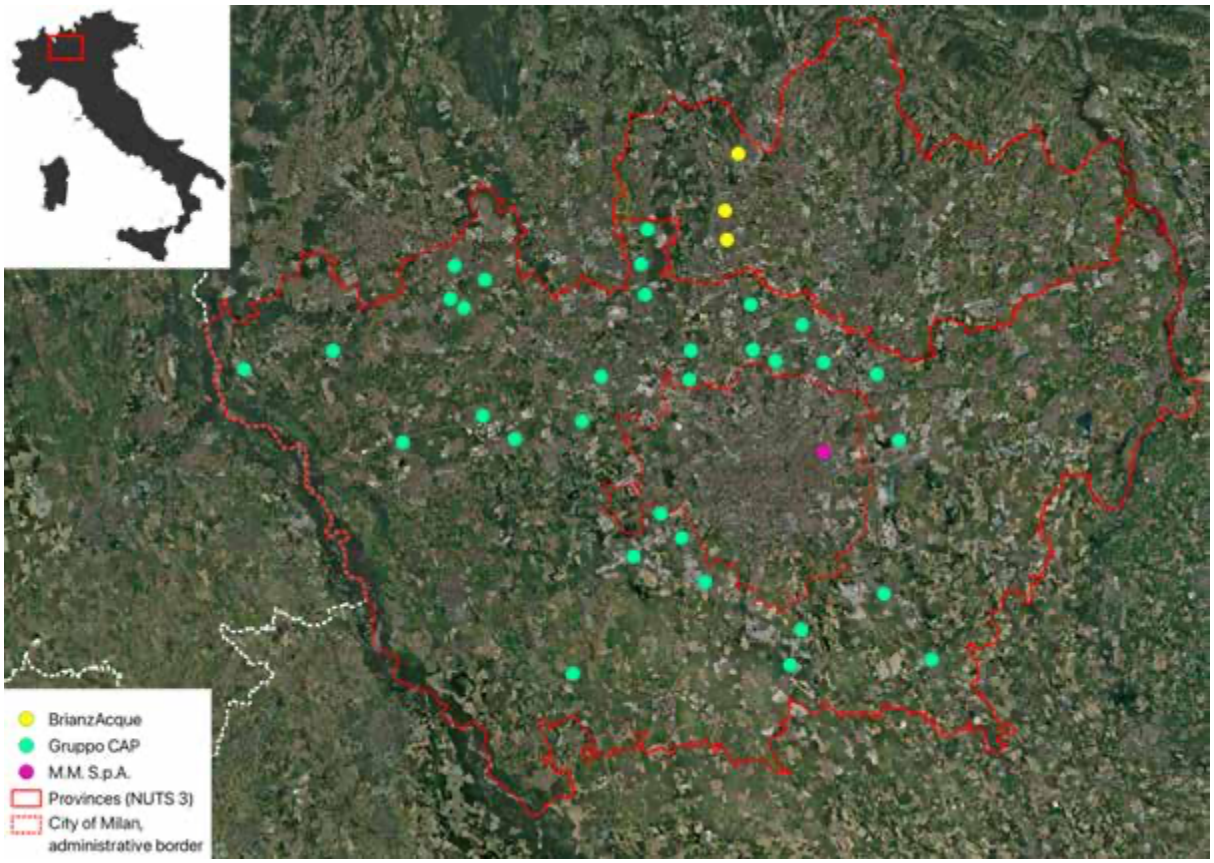

Figure 1: Location of interventions within the Milan metropolitan area. Author's elaboration.

MM S.p.A. and the Municipality of Milan

MM S.p.A. is a multiservice company operating in the fields of engineering (building and infrastructure) and the management of public residential buildings, schools, and sports facilities. It has also managed the Integrated Water Service of the Municipality of Milan since 2003.

The company has developed a first sustainable urban drainage project within the municipality of Milan, in the section of Via Pacini between Via Teodosio and Via Capranica (opened in 2023). The road segment under consideration is approximately 200 metres in length. It contains a central parterre that is free of vehicular traffic, and it is in this area that the intervention is primarily focused. The system is comprised of roadside drains equipped with overflow mechanisms that facilitate the direct conveyance of initial rainfall, which is characterised by elevated levels of pollutants, into the sewer network. Subsequent rainfall is directed towards designated bioretention areas situated within the central parterre of the road, thereby ensuring the effective management of water resources. The division of this sector into three ecological areas was based on the theoretical frequency of flooding and, consequently, the availability of water. The planting of flora was meticulously curated, with a total of approximately ten different species being selected. The implementation of automatic irrigation systems, which are connected to tanks that do not utilise potable water, is also planned to ensure resilience in the face of potential drought periods. The area had previously been used as an unregulated dirt parking area. The

intervention resulted in the creation of new pedestrian pathways, away from vehicular traffic, as well as various elements of street furniture. The construction site also intervened in the side area of the road, with an extension of pedestrian spaces and crossings. Moreover, the intervention has the potential to enhance biodiversity; however, there are concerns regarding its efficacy in mitigating temperature. The area is characterised by the presence of approximately 30-metre-high buildings and a tree-lined landscape, comprising mature, tall species. While the theoretical potential of the new vegetated parterre to contribute to a reduction in total temperatures is evident, further investigations are required to ascertain a significant effect. The objective of the initiative is to extend the pilot project by a further 700 metres.

The company is also undertaking analogous projects in the city of Milan, including those located in Via Guido da Velate and Via Paravia. It is important to note that the municipality has independently concluded additional depaving works within the city. This is indicative of an increasing awareness of the necessity to adopt mitigation and adaptation strategies, particularly within highly urbanised contexts such as Milan.

BianzAcque and the province of Monza and Brianza
BrianzAcque is the public company responsible for the management of the IWS in the province of Monza Brianza, located in the north of Milan. It is responsible for the management of 3,000 kilometres of pipelines, and its annual water supply exceeds 100 million cubic litres, serving a population of 875,000 individuals across 55 municipalities. The model utilised is one of in-house provision, with responsibility for sewerage and purification services also falling within the organisation's remit. The urban drainage interventions promoted by BrianzAcque are underpinned by a circular economy approach, with the overarching objectives of enhancing public space, reducing the risk of flooding and urban heat island phenomena. Three interventions, which were carried out and partially financed by the company, are here illustrated.

The first intervention is situated within the municipality of Cesano Maderno, which has 19,886 inhabitants (ISTAT, 2025), in the western area of the province. The intervention by BrianzAcque, which is based on tree-lined flower beds, rain gardens and drainage systems, concerns a 700-metre stretch of Corso Roma. The project encompasses the construction of 150 square metres of tree-lined pits and 900 square metres of bioretention areas. The financial outlay required for the project is €1.2 million, to be shared between the company, the municipality of Cesano Maderno, and the Lombardy Region. The objective of the project is twofold: firstly, to absorb heavy rainfall by reducing the pressure on the existing sewer network; and secondly, to create new green spaces to contribute to urban well-being.

The second project is focused on the municipality of Meda, which has 11,637 inhabitants (ISTAT, 2025) and is in the western area of the province. The project under discussion pertains to the development of a multifunctional park situated between Via degli Angeli Custodi and Via Giovanni XXIII. The project is composed of four primary interventions: the soil desealing of a parking area with the installation of permeable pavement, the transformation of an undeveloped area into an equipped and accessible park, and the creation of a bioretention area inside the new park. The project will also establish a new network for collecting white water, with the objective of directing it towards the newly developed park. In addition to the planting of 120 new trees, the intervention will enable the sustainable drainage of more than 10,000 m² and the revitalisation and opening to the public of the new park area of approximately 5,000 m². The cost of approximately €700,000 will be covered by BrianzAcque and the Lombardy Region.

The final project in the province of Monza Brianza pertains to the municipality of Boviso Masciago, which has a population of 8,245 (ISTAT, 2025). The '*Facciamo fiorire l'acqua*' (Let's make water bloom) project involves the retrofitting of 800 metres of Via Matteotti, entailing the establishment of small bioretention areas (over 50, with a cumulative surface area of 1850 m²). These areas are designed to collect rainwater and facilitate its gradual infiltration into the soil, thereby mitigating the risk of sewer overloading. The new green elements feature over 60 trees, 100 shrubs and 1700 m² of lawn. The intervention will entail the construction of a new cycle path, the reduction of the carriageway, and the imposition of a 30 km/h speed limit. The funding of over €1.3m was largely financed

by the Lombardy Region as part of the 'Lombardy Plan for Soil Protection and Mitigation of Hydrogeological Risks' project. This intervention is characterised by dual value, namely the improvement of rainwater management on site through the drainage of the sewage system. Conversely, the reduction in the speed limit, the construction of cycle tracks and the substantial increase in green areas have collectively enhanced the urban quality of the area, particularly regarding soft mobility and temperature reduction.

Gruppo CAP and the Metropolitan City of Milan

Gruppo CAP is the company that manages the integrated water service within the Metropolitan City of Milan (excluding the municipality of Milan). In a similar way to previous cases, in addition to the supply, sewerage and purification service, a series of actions aimed at improving urban water management have recently been launched. The first action was in 2018, when the 'Manual on good practices for the use of sustainable urban drainage systems' was published. The document is the result of a collaboration with the Department of Agricultural and Environmental Sciences of the University of Milan. The objective of the document is to identify innovative solutions that will mitigate flood runoff and reduce flood risk in the territory of the Metropolitan City of Milan. With regard to these solutions, the report describes their technical and economic characteristics, highlighting the importance of SuDS as an optimal solution.

The CAP Group launched the '*Milano Città Spugna*' (Milan Sponge City) project in 2021. The project entails the execution of 90 interventions across 32 municipalities. The total cost of the project is estimated to be approximately €50 million, with financing being provided through a call for tenders as part of the National Recovery and Resilience Plan. The CAP Group and the Metropolitan City of Milan submitted the application to the call for tenders 15 days after its publication. This is indicative of the company's and the territory's strategic approach to sustainable urban water management. The significant financial investment facilitates the implementation of interventions with the fundamental objectives of preventing flooding, combating soil erosion and the effects of climate change, decreasing the vulnerability of natural and socio-economic systems, and strengthening territorial resilience.

Due to the volume of data, several simplifications were implemented during the analysis of the 90 projects (table 1). Initially, projects were aggregated on a municipal basis. Consequently, traditional hydraulic engineering interventions, including storage tanks and reservoirs, were excluded from the study. The remaining interventions were classified into four categories: depaving, permeable pavement, renaturalisation, and bioretention system. However, many of the interventions can be attributed to more than one family. For instance, the intervention in Baranzate involves the renaturalisation of a brownfield site and the construction of a bioretention basin. The distinction between the initial two families - depaving and permeable pavement - is determined by the post-intervention use of the area. In the former, the removal of the pavement results in the exposure of the ground, while in the latter, the removal of the impermeable pavement is followed by the installation of a draining pavement. The bioretention family, on the other hand, encompasses all interventions, both large and small in scale, that are designed to conserve water over a period of time by means of slow release into the soil. Examples of such interventions include infiltrating and draining trenches, tree boxes and deep infiltration systems. For each intervention, the specific location (car park, park, square, street) was identified, along with the respective ownership and potential disconnection from the sewerage system.

The interventions have an average size of approximately 16,500 m2. The most compact intervention is in the municipality of San Vittore Olona and encompasses an area of 1,300 m2, incorporating drainage, paving, and infiltration wells within a brief road segment. The most extensive intervention, covering an area of 63,000 square metres within the municipality of Rho, encompasses a range of measures including the removal of paved surfaces and the disconnection of various roads and car parks from the sewerage system, all situated on municipal land. The two interventions illustrated here are also the least (260,000.00 €) and the most expensive (6,000,000.00 €). The ownership of the intervention areas is exclusively public. A total of 17 interventions have been identified, involving the disconnection of the rainwater collection system from the sewer system. The interventions on roads pertain to 10 municipalities and are predominantly focused on permeable pavements and bioretention areas. Those related to squares are 14, with interventions related to draining paving, depaving, and bioretention

areas. Parks were involved in seven municipalities through interventions involving all four families (depaving, permeable pavement, renaturation, and bioretention system). Finally, car parks were the subject of interventions in 17 municipalities, mainly through permeable pavement and bioretention systems.

Table 1: the classification of 'Milan Sponge City' projects

City	Sup. m2	Invest. (€)	Parking	Park	Square	Road	SuDS
Arluno	2.600	500,000	Yes	No	Yes	No	Permeable pavement
Assago	18.000	1,200,000	Yes	No	No	Yes	Bioretention system Permeable pavement
Baranzate	9.600	2,750,000	No	Yes	Yes	No	Renaturalization Bioretention system Permeable pavement
Bollate	24.300	1,500,000	No	No	Yes	Yes	Bioretention system Depaving
Bresso	3.400	375,000	Yes	No	No	No	Bioretention system Permeable pavement
Buscate	20.000	1,000,000	Yes	No	No	No	Bioretention system
Canegrate	13.800	925,000	Yes	No	No	No	Bioretention system Permeable pavement
Cesano Boscone	13.600	1,000,000	Yes	No	No	No	Bioretention system
Cesate	3.500	325,000	No	No	Yes	No	Bioretention system Depaving
Cinisello Balsamo	10.000	1,400,000	No	No	Yes	No	Bioretention system
Cologno Monzese	52.700	4,725,000	Yes	Yes	No	No	Bioretention system Permeable pavement Depaving
Cormano	13.800	1,425,000	No	Yes	No	No	Bioretention system
Cornaredo	5.400	1,500,000	No	No	Yes	No	Bioretention system Permeable pavement Depaving
Corsico	7.800	975,000	Yes	No	No	No	Permeable pavement
Garbagnate Milanese	30.700	1,800,000	Yes	Yes	No	No	Bioretention system Permeable pavement
Legnano	42.800	2,590,000	Yes	No	Yes	No	Permeable pavement Depaving
Marcallo con Casone	7.200	525,000	No	No	No	Yes	Bioretention system
Melegnano	3.900	450,000	No	No	Yes	No	Bioretention system
Opera	29.800	3,100,000	No	No	Yes	Yes	Bioretention system

Paderno Dugnano	25.300	1,680,000	No	No	Yes	No	Bioretention system Depaving
Pieve Emanuele	14.300	1,150,000	Yes	No	Yes	Yes	Bioretention system Permeable pavement
Rho	63.100	6,000,000	Yes	No	No	Yes	Bioretention system Permeable pavement Depaving
Rosate	7.600	950,000	Yes	No	No	Yes	Bioretention system Depaving
San Giorgio su Legnano	9.700	1,500,000	No	Yes	Yes	No	Bioretention system Permeable pavement Depaving
San Giuliano Milanese	19.000	1,400,000	Yes	No	No	No	Bioretention system
San Vittore Olona	1.300	260,000	Yes	No	No	Yes	Bioretention system Permeable pavement
Sedriano	12.700	1,625,000	No	Yes	No	No	Bioretention system Depaving
Segrate	12.000	550,000	No	Yes	No	No	Bioretention system
Sesto San Giovanni	29.000	2,250,000	Yes	No	No	Yes	Bioretention system Depaving
Solaro	10.000	1,600,000	No	No	Yes	No	Permeable pavement Depaving
Trezzano sul Naviglio	7.400	1,125,000	Yes	No	No	Yes	Bioretention system Permeable pavement Depaving
Turbigo	3.000	1,550,000	No	No	Yes	No	Permeable pavement
TOTAL	**527.300**	**50 mil.**	**17**	**7**	**14**	**10**	

Discussion

The present study set out with the objective of investigating the methods by which Italian IWS companies may promote public space initiatives that enhance climate change resilience and environmental sustainability, with a particular focus on soil desealing processes. The analysis was conducted through a systematic process, beginning with the classification of interventions, followed by the identification of enabling regional and local policies, and culminating in the evaluation of project effectiveness, equity, and scalability. The findings from the three case studies – MM S.p.A., Gruppo CAP, and BrianzAcque – operating within the highly urbanized Lombardy Region, demonstrate a strategic shift in the core business of these IWSCs towards sustainable urban water management and the active promotion of NbS and SuDS. The case studies reveal a clear typology of interventions, predominantly focused on depaving, permeable pavement, renaturalization, and bioretention systems.

The success and proliferation of such projects is facilitated by the presence of supportive regional and local policies. The Lombardy Region's adoption of the hydraulic invariance principle (R.R. 7/2017) represents a significant regulatory framework, mandating that stormwater runoff from urbanized areas must not exceed

pre-urbanization volumes. This regional mandate exerts a direct influence on the operational context of IWSCs, thereby encouraging the implementation of SuDS. The elevated land consumption of the target OTAs, attributable to the substantial urbanisation of Lombardy, can also be regarded as a catalyst for the initiation of sustainable urban drainage processes. Furthermore, the financing secured through national recovery and resilience plans, as evidenced by Gruppo CAP's 50 million € '*Milano Città Spugna*' project, underscores the importance of governmental support and investment in scaling these initiatives. The collaborative funding models, involving IWS companies, municipalities, and regional governments (e.g., BrianzAcque's projects), also demonstrate a shared commitment to addressing climate change impacts.

In terms of effectiveness, the projects demonstrate clear potential for mitigating the impacts of climate change. The interventions have been shown to directly address the overloading of sewage systems and the disruption of the water cycle, which is exacerbated by soil sealing. This is achieved by increasing infiltration and reducing runoff. The enhanced green spaces contribute to urban well-being and, in theory, to temperature reduction, though further investigation is sometimes needed to ascertain significant thermal effects. The emphasis on disconnecting rainwater collection systems from sewers in many of Gruppo CAP's projects highlights a direct and effective strategy for improving urban water management.

Regarding the principles of equity and scalability, the extensive implementation of these interventions across multiple municipalities, as exemplified by Gruppo CAP's '*Milano Città Spugna*' project encompassing 32 municipalities, signifies a considerable degree of scalability. The public ownership of intervention areas across all the projects analysed suggests a potential for equitable access to these enhanced public spaces and their benefits. However, a more in-depth examination of the socio-economic status of the neighbourhoods where the interventions take place, alongside monitoring of any gentrification resulting from these interventions, and the active involvement of the community in the project, would be appropriate. A further key consideration is the investigation of citizens' perceptions of the interventions, in terms of tangible improvements in quality of life, increased access to green areas, and reduced flood risk. The identification of only three IWSCs actively involved in soil desealing, all within Lombardy, suggests a geographical disparity in the adoption of such practices across Italy. While Lombardy's high soil consumption rate and pioneering regional regulation make it a natural leader, the region's limited geographical spread indicates a need for broader adoption and policy frameworks in other regions.

The strategic shift evidenced in these IWSCs signifies an awareness of their expanded role that extends beyond conventional water services. By proactively advocating for soil desealing and SuDS, these companies are transitioning towards a more comprehensive approach to urban water management, incorporating ecological and social benefits into their operations. This proactive engagement has the potential to establish IWS Companies as pivotal actors in the fields of urban climate resilience and sustainability. By shifting beyond the mere management of existing infrastructure, they are able to proactively influence and shape the urban environment.

Conclusions

The adverse impacts of climate change, particularly the disruption of the hydrological cycle, in combination with an increased consumption of soil, necessitate innovative urban management strategies. This paper has demonstrated the emerging role of Italian IWSCs as crucial promoters of soil desealing processes and Nature-based Solutions (NbS) within public spaces, thereby enhancing urban resilience and environmental sustainability. The case studies of MM S.p.A., Gruppo CAP, and BrianzAcque in Lombardy illustrate a significant and positive strategic shift in IWSCs operations. These companies are now proactively implementing a range of SuDS interventions, including depaving, permeable pavements, renaturalization, and bioretention systems. These offer multifaceted benefits beyond just urban drainage, such as improved urban biodiversity, temperature regulation, and enhanced public spaces. The success and expansion of these initiatives is strongly supported by regional policies that facilitate them, such as Lombardy's principle of hydraulic invariance, and substantial national funding mechanisms, such as the National Recovery and Resilience Plan. While the examples from Lombardy

demonstrate a promising model for addressing soil sealing and its consequences, the limited geographical spread of such proactive IWSCs across Italy highlights a significant opportunity for broader policy adoption and implementation nationwide.

In conclusion, Italian IWSCs possess the potential to be pivotal drivers in transforming urban areas into more resilient and sustainable environments. The evolution of their role, from that of service providers to that of active promoters of green infrastructure, is imperative in order to mitigate the effects of climate change, foster healthier urban ecosystems, and improve the quality of public life. Future efforts should focus on replicating these successful models across other regions in Italy and strengthening policy frameworks to encourage a widespread integration of soil desealing and NbS into urban planning and water management strategies.

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