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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

TRACK 1 - POSTGROWTH URBANISM

Varvara Toura, **From abandonment to critical conception: post-growth policies for the resilience of deindustrialised areas. The case-studies of Ile-de-Nantes and Docks-de-Seine in France**

[34](#)

Mark Groulx, Tara Clapp, Benjamin Bryce, Mikhaila Carr & Keone Gourlay, **Planning the Great Acceleration: Contributions of planning theory, ideology, and implementation to planetary transformation and social-ecological decline**

[49](#)

Abdalrahman T. Y. Alashi & Özhan Ertekin, **Deprivation Analysis in Turkey and Its Provinces: Insights for Post-Growth Urbanism**

[63](#)

Chiara Moretti, Roberto Bologna & Giulio Hasanaj, **Toward New Circular Urban Economies: Regeneration Models for the Ecological Transition of Cities. European Cases and Initiatives.**

[84](#)

Dila Toprak & Eren Kürkçüoğlu, **Post-growth Redefinition of Urban Textures: The Changing Faces of Human Scale through Eminonu and Maslak Central Business Areas in Istanbul**

[100](#)

Francesca Giangrande, Luciano De Bonis & Giovanni Ottaviano, **Alto Medio Sannio inner area between marginality, latent place knowledge and territorial heritage**

[115](#)

TRACK 2 - PLANNING AND LAW

Fanny Tremblay-Racicot, Jérôme Couture École & Léa Béliveau, **Use of New Municipal Fiscal Powers for Sustainable Urban Development: Development and Application of a Strategic Financial Planning Method in the City of Mascouche**

[129](#)

Margherita Emilia Re, **Land Take and Logistics Hubs: Castel San Giovanni, the Milan Logistic Region's Gateway to Emilia-Romagna (Italy)**

[145](#)

YaZhen Cai & Tzuyuan Stessa Chao, **Exploring the Application and Challenges of Urban Planning Legal Systems Guided by Nature-Based Solutions: A Case Study of Kaohsiung City, Taiwan**

[159](#)

Burcu Soygüzeloğlu & Tüzin Baycan, **Legal Pathways for Urban Mobility Resilience : A Content Analysis of Policy Documents for Istanbul's Transport Systems**

[173](#)

Pierpaolo Cicconi, Giorgio Caprari & Elio Trusian, **Legislative innovations in times of crisis. The proposal for a new Italian law on territorial governance and the experimentation in the Marche Region**

[185](#)

İrem Ceylan, **Public Interest or Private Profit? A Case Study of How Public Interest is Redefined Through Political Power And Land Commodification in Istanbul**

[200](#)

TRACK 3 - MOBILITY

Akkelies van Nes, **The walkability potential matrix – a new method for measuring sustainable destination configurations in town and city centres**

[213](#)

Tianxin Zhang & Mengde Zheng, **Optimisation of non-motorised facilities in urban fringe sheltered housing areas: Transport Accessibility and Equity Enhancement Based on Supply and Demand Analysis**

[234](#)

Emine Yetişkul & Metin Şenbil, **'15-minute city' in Turkey: a framework for sustainable urban planning and governance in mid-sized Turkish Cities**

[245](#)

Metin Şenbil & Emine Yetişkul, **is sump a panacea for dynamic cities? bridging ambition and reality: a case study of Istanbul**

[256](#)

Emine Yetişkul & Metin Şenbil, **Urban rail transit usage in developing countries: the case of Istanbul**

[268](#)

Omer Dogan & Sugie Lee, **Socioeconomic Disparities in Daily Activity Spaces: Insights from Smartphone Mobility Data on Non-Commuting Trips**

[281](#)

Zhoulanyi Xing, Junting Lin, enshan Chen, **Correlation Analysis Between Rail Network Nodal Attributes and Passenger Staying Rate: A Case Study of China's Yangtze River Delta Region**

[301](#)

Wendi Dong, **An Exploration of Route Synergy between Attractions in Xi'an's Main Urban Area Based on the Node-Place Model**

[310](#)

Wang Su, Wang Yuchen, Zhang Shangwu & Huang Jianzhong, **Evaluation and Optimization of Public Service Facility Accessibility in Planning Future Community Living Circles: A Case Study of Yangpu District, Shanghai, China**

[318](#)

Wang Yuchen, Chen Ge & Huang Jianzhong, **A Study on the Travel Characteristics of Rail Transit Passengers in Township Areas of Wuxi City**

[333](#)

Clément Hacquard, Maxime Hachette, Berk Celik & Alain L'Hostis, **Modelling Access Ergonomics to Daily Life Resources using Sustainable Modes within the Eurométropole de Strasbourg**

[348](#)

Yufei Qu, Yuying Zhu, Xiaoxi Zhang & Chuan Wang, **Impact of Multi-Station Aggregate Hub Redevelopment on Surrounding Urban Areas: A Case Study of London's King's Cross**

[364](#)

Jia Wei, Shangwu Zhang & Quan Yuan, **Urban freight mobility modes recognition classification and inclusive freight policy exploration based on truck trajectory data: A case study of Shanghai, China**

[379](#)

Caterina Villani, Toka Fahmy Aly, **GenAI Street Experiments: A Critical Framework for Urban Design Teaching and Learning**

[395](#)

Yutong Ma, Mengyue Mei & Tongyu Sun, **Exploring Pedestrian Comfort and Urban Mobility: A Multi-Modal Assessment of Walking Experiences at Popular Restaurant Destinations in Shanghai**

[408](#)

Aydin Furkan Terzi, Ayşenur Koçyiğit, Koray Aksu & Hande Demirel, **Performance Analysis of 15-Minute City Zones Through Spatial and Machine Learning Techniques**

[427](#)

Xinrui Guo & Yuan Zhu, **The Appropriate Intensity of Rail Transit Station Area near Historic Districts: A Case Study of Shanghai, Nanjing, Kyoto and Tokyo**

[439](#)

Ge Wan & Jianzhong Huang, **Travel Characteristic of Elderly People in Towns of Shanghai Metropolitan Area: An Urban Rural Mobility Network Analysis**

[458](#)

Jiayu Gu, Luyao Niu & Wenjia Zhang, **Why public transport interventions work or not? A meta-analysis based on the behaviour change wheel model**

[467](#)

Yanyun Mao & Jian Zhuo, **Planning amidst Planetary Crisis: Rethinking Theory and Practice through Adaptive Transformations in Public Transport**

[494](#)

Jennifer Jiang, Dayanna de Mello Sousa, Ágota Barabás, Jörg Rainer Noennig & Domokos Esztergár-Kiss, **Adapting the 15-Minute City Model for Suburban Areas: Key Performance Indicators (KPIs) and Multimodal Mobility Strategies**

[509](#)

Yuxiao Ma, Qiao Zhang, Jing Deng & Jianzhong Huang, **«Beyond Growth» in China: Coordinated Optimisation Strategies for Rail Transit Networks and Regional Spatial Structure in the Post-Urbanisation Context**

[522](#)

Baekchan Jeon & Myounggu Kang, **Beyond Access: A Grid-Based Framework for Measuring Service Levels and Inequity in Multimodal Public Transit**

[537](#)

Elisabetta Vitale Brovarone, Francesca Blanc, Giulia Melis & Aida Shaneh, **Sustainable Urban Mobility Plans: a catalyst for transformative urban practices?**

[555](#)

Yoon Kyubin & Kang Myounggu, **Analysis of Regional Disparities in Public Transportation Accessibility: A Spatial Approach to Equal-Time Job Accessibility**

[566](#)

Kehao Li, Xiu Yang, Hu Yumin & Chao Liu, **Exploration of the Relationship between Travel Activity Chains and Self-Assessed Health of Rural Community Residents: Based on Multi-Source Data and Health Survey Questionnaire**

[579](#)

TRACK 4 - GOVERNANCE

Byeongsun Ahn & Yuri Kazepov, **Rethinking Policy Learning in Urban Policy Mobility**

[602](#)

Xin Li & Christa Reicher, **Actors in power networks: an institution framework of historic urban district renovation actors in China**

[617](#)

Han Gao, **Typologies and Dynamics of Urban Growth Projects in Ethiopia: A Discursive Analysis**

[629](#)

Bin Liu, **Institutional Supply and Practical Pathway for Self-Renewal of Old Residential Areas in Hangzhou from a Multi-Agent Collaboration Perspective: A Case Study of Zhegong New Village**

[635](#)

Gülşah Tırış & Hilal Erkuş, **Cross-Scale Transactions and Multi-Level Governance on Spatial Gains of Commons: A Comparative Study from Türkiye**

[649](#)

Zhuyang Liu & Guiqing Yang, **Pursuing total volume or efficiency? A study on the coupling pattern of rural population and space: A case study from Huangyan District, Zhejiang Province, China**

[657](#)

Lu Chenyan & Huang Yi, **Research on Demand-Side Oriented Spatial Governance in Innovation Districts: A Case Study of Hangzhou West Sci-Tech- Innovation Corridor**

[670](#)

Bilgesu Sever, **Redefinition of Urban-Rural Boundaries Under Centralized Governance: Urban Ecological Movements in the Case of a Coastal Town, Ayvalık, Turkey**

[688](#)

Guyue Sun & Hong Jiang, **Construction of Regional Multi-dimensional Proximity Network from the Perspective of Collaborative Agglomeration – Analysis of Geographical Proximity Networks in Contiguous Rural Spaces**

[702](#)

Alankrita Sarkar, **Are you a Stakeholder or Streeholder? Formal and informal planning in the Flemish-Dutch Delta**

[718](#)

Palmira Ndesihala de Almeida, **The Bioeconomy, Experimental Governance, and Spatial Planning**

[738](#)

Yuhang Rao, **Rural Revitalization Beyond Administrative Boundaries: A Case Study of Villages Surrounding Taihu Lake, China**

[753](#)

Iuliia Kozlova, Elisa Conticelli & Serena Sgallari, **Zero Net Land Take Policy Mapping: A Multi-Level Analysis in the Context of Italy and Emilia-Romagna**

[765](#)

Luqiao Zheng & Zichao Xiong, **Participatory Community Planning and Collaborative Governance in the Post-Growth Era: A Case Study of the Nanning Love-U Garden Network in China**

[790](#)

Beyza Kurt, **Participation After Disaster: Central Government Approach to Participation Planning**

[799](#)

Rola Abu Hilal, Gillian Brady, Philip Crowe & Brian Crowley, **Identifying Barriers to Compact Urban Growth in the Irish Housing Sector: Insights from Industry Experts**

[813](#)

Doriana Musaj, **Navigating Conflicts and Paradoxes: Analyzing the Interaction of Urban Regeneration, Local Governance, and Public Policy in the Tirana Riverside Project**

[829](#)

Paul van den Bragt, **Public-Private Joint Ventures in Urban Area Development: Identifying and Governing Value Tensions**

[846](#)

Stefan Lazarevski & Rudoff Giffinger, **Designing A Comprehensive Indicator System For an Evidence-based Spatial Planning System Integration in Fringe Regions of the EU: A South Balkan Case Study**

[856](#)

Stefano Magaudda, Federica Di Pietrantonio, Serena Muccitelli & Carolina Pozzi, **Multi-Level Collaborative Governance for Environmental Protection and Climate Adaptation: Insights from EU-funded Projects**

[874](#)

Romina D'Ascanio, Elisa Avellini, Stefano Magaudda, Anna Laura Palazzo & Giancarlo Gusmaroli, **Collaborative governance through the Mediterranean. Framing a Community of Practice for Wetland Contracts**

[884](#)

Ana Escario Chust, Óscar M. Blanco, Guillermo Palau Salvador, Kawa Nazemi, Elena Correll, Uliana Eliseeva & Tanya Zerbian, **Enhancing resilience in water management agriculture: A Social Network Analysis approach to identify Leverage Points for climate adaptation**

[895](#)

Philipp Kerschbaum, **How meaningful is formal participation in environmental assessments? Examining the case of large-scale linear infrastructure projects in Germany.**

[911](#)

Céline Janssen, **Building institutional capacity for social value - reflections from the 'Back to the Neighbourhood'-project in the Netherlands**

[927](#)

Giovanni Ottaviano, Luciano De Bonis & Francesca Giangrande, **Self-government processes of the urban bioregion: insights from a study on the Metropolitan City of Rome Capital**

[935](#)

Ivan Blečić, Anna Maria Colavitti, Giulia Giliberto & Virginia Onnis, **Assessing the effectiveness of participation in urban planning processes: a dual perspective on civic engagement and process efficiency**

[949](#)

Anila Bejko, Fiona Imami & Besnik Aliaj, **The Risks of Purposive Transitions in Albania: Navigating the Just Green Transition in Light of Post-Socialist Legacies**

[960](#)

Federico Camerin & Juan Luis de las Rivas Sanz, **Redeveloping military land into affordable housing through a public-public partnership. The case of Valladolid's La Rubia barracks**

[974](#)

TRACK 5 - ENVIRONMENT AND CLIMATE

Yufei Quan, **Inspiration for Pathways towards Multi-Scale Green Urban Regeneration and Planning Construction under Dual Carbon Goals**

[989](#)

Zhaopeng Cheng & Chenxi Wang, **Return of Mythical Bird · Reborn of Wetland — Conservation and Restoration Planning & World Heritage Site Application Preparation for Fujian Minjiang River Estuary**

[1007](#)

Lihua Chen & Jing Gan, **The Thresholds of Urban Parks' Characteristics on Heat Mitigation Effect: Case Study of 120 Parks in Foshan, China**

[1022](#)

Lin Lin & Jin Xing, **Research on Energy-saving Renovation and Energy Consumption Correlation of Historical Residential Districts under the Background of Urban Renewal: A Case Study of Hehua Tang District in Nanjing City**

[1042](#)

Senmeng Hao, Taoling Li, Chunhui Zhang, Yanyan Xia & Zhaokui Wu, **Urban Wilderness Protection and Creation in China**

[1052](#)

Zhihan Zhang, Yuyue Huang, Xun Zhang, Qingxin Yang & Junyan Yang, **Enhancing Sustainable Cities Through Comparative Carbon Sink Benefits of Blue-Green Spaces: Evidence from Multi-Source Data**

[1064](#)

Maria Pizzorni, Irina Karaselnikova, Clotilde Havard, Amit Bhattacharya & Esra Kut Görgün, **Preserving the past or protecting the future? Harmonizing Cultural Heritage and Climate Adaptation in Siena**

[1075](#)

Shumin Wang, Guoao Liu , Jianyu Li, Xinyu Lin & Mingxing Hu, **Exploring Low-Carbon Urban Development at the Plot Scale: A Study of Carbon Emission Mechanisms and Empirical Exploration of Micro-Renovation for Emission Reduction**

[1087](#)

Asli Eylem Kolbas & Oswald Devisch, **Retracing Critical Energy Fictions with Youth through a Comparative Analysis of Community-Based Interventions**

[1106](#)

Zimeng Kong, Wenjing Dong & Yanhui Wang, **Hydraulic Heritage and Community Identity: Examining Socio-Ecological Resilience and Heritage Transformation in Huaibei Area, China**

[1129](#)

Yuanhong Qiu, Ting Zhang & Yuequn Cao, **The Expansion of High-Tech Zone Development and Regional Carbon Emissions: A Synergistic Exploration of Spatial Heterogeneity and Environmental Justice**

[1145](#)

Yucel Can Severcan, Nese Aydin, Ozlem Ozden Uzmez, Eftade O. Gaga, Aybuke Balahun Coban, Gonenc Ozarli & Goksun Yildirim, **Linking outdoor particulate pollution to children's negative experiences of their neighbourhoods: Findings from an interdisciplinary research project in Ankara**

[1157](#)

Ting Zhang, Yuanhong Qiu & Jianzhong Huang, **Coordinated Development and Coupling Mechanisms of Capital Flows and Carbon Emissions from the Perspective of Environmental Justice**

[1174](#)

Tian Haoran, Jin Xing, Niu Shengnan & Ma congchao, **Research on the Outdoor Wind Environment of Buildings under the Influence of Hills: The Beigushan Hill in Nanjing**

[1190](#)

Yi Hsuan Shen & Tzuyuan Stessa Chao, **Seeking a possible Positive Energy Districts (PEDs) location choice from a local context, a case study in Tainan City, Taiwan**

[1200](#)

Shuxian Feng & Tengfei Yu, **Land suitability modelling for Integrated Mangrove Aquaculture to adapt to salinity intrusion using Machine Learning and Deep Learning approaches in southwestern Bangladesh**

[1211](#)

Kathrin Meyer, **Optimizing Decision-Making for Climate-Neutral Post-War Buildings: The Architect's Role in Sustainable Transformation**

[1229](#)

Yihuan Wang & Junyan Yang, **Investigating the impact of Urban Form Elements on carbon emissions at Different Development Stages: Based on GWR Models**

[1240](#)

Qingxin Yang, Zhihan Zhang, Yuyue Huang, Xun Zhang & Junyan Yang, **Exploring the Carbon Emission Impact of Community Life Circle Shared Clusters: A Case Study of Nanjing, China**

[1254](#)

Cemre Betul Ay & Erblin Berisha, **Toward Equitable Carbon Markets: Spatial Planning for Climate Justice in Uganda**

[1265](#)

Siyang Li & Zeyin Chen, **Temporal-Spatial Distribution Characteristics of PM2.5 and Noise in the Under-Viaducts Space**

[1279](#)

Adriana Galderisi, Giada Limongi & Alessandra Scognamiglio, **Agricultural landscapes and agrivoltaic systems: the key role of landscape planning**

[1302](#)

Beyzanur Uzun & Gökçen Kılıç Ürkmez, **An Examination of the Environmental Impacts of Mega Projects on Rural Areas: A Case Study of Two Villages in the South Marmara Region of Türkiye**

[1317](#)

Havva Elmalı & Seung-Nam Kim, **Deep Learning-Based Commercial Building Energy Consumption Prediction Model Considering Occupant Density Using Mobile Network Big Data: A Case Study of Seoul**

[1337](#)

Deshayes Eloïse & Brown Will, **Accounting beyond boundaries: Exploring consumption-based carbon approaches in Paris and Gothenburg**

[1347](#)

Ana Lucia Britto, Thêmis Amorim Aragão & Jorge Nassar Fleury, **Social movements and collaborative climate adaption: the case of Campo do Bomba, in Duque de Caxias-RJ- Brazil**

[1360](#)

Ozlem Edizel Tasci, **Addressing Climate Equity Through Community Engagement on Virginia's Eastern Shore**

[1371](#)

Hualing Xu, Jing Wu & Kingsley Dogah, **Feminization of Energy Poverty in China: Contrasting Urban and Rural Experiences**

[1383](#)

Yuan Gao & Shenjing He, **Simulating Urban Green Space's Cooling Impact on School-age Children' Sleep Quality Using Diverse Planning Approaches**

[1402](#)

Başak Demireş Özkul, Pınar Gökçe Kılıç, Ali Yılmaz, Fatih Uzun, Aliye Ahu Gülümser & Lara Su Baykan, **Using Participatory GIS for Sustainable Campus Planning: Insights from GreenHack Hackathon**

[1420](#)

Anna Bertolazzi, Michelangelo Fusi, Giovanni Maifredi, Michela Nota, Michela Tiboni & Claudia Zani, **Exploring the link between biodiversity, health, and climate action through the URBioPark Project**

[1433](#)

Lekha Samant, **Between Walls and Water: Technocratic planning of stormwater infrastructure and the reshaping of everyday life in flood-prone Mumbai**

[1444](#)

Emanuele Garda, Gregorio Pezzoli & Marco Tononi, **The Legacy of Experience: Reflections on Climate Transition Strategies in Medium-Sized Italian Cities**

[1457](#)

Angel Burov, Angel M. Dzhambov, Donka Dimitrova, Iana Markevych, Kostadin Kostadinov, Marco Helbich & Mark J Nieuwenhuijsen, **Reintroduction of health impact assessment in Bulgarian city planning – why and how?**

[1467](#)

Carolina Giamo, Giulio Gabriele Pantaloni, Federico Farina & Andrea Nino, **SimulSoil: Ecosystem Service Modelling for Sustainability-Oriented Planning in the Metropolitan City of Turin**

[1486](#)

Anna Kaczorowska, **Urbanization, Biodiversity, and Ecosystem Services in Norway: Challenges and Strategies for Sustainable Land Use**

[1499](#)

Marco Carlotti, **Exploring Two Interpretative Models of Eco-cities in the United Arab Emirates: Masdar City and The Sustainable City Dubai**

[1502](#)

Lia Fedele & Angelica Nanni, **From Vulnerability to Resilience: Coastal Heritage as Environmental Infrastructure**

[1518](#)

TRACK 6 - URBAN CULTURES AND LIVED HERITAGE

Asma Mehan, **Reimagining Postgrowth Urbanism: Adaptive Reuse of Industrial Heritage for Sustainable Futures**

[1531](#)

Ye Sun, Chen Chen, **Understanding the cultural potential of rural history: A conceptual framework of cultural capital development**

[1539](#)

Sijie Liu, **The inheritance mechanism of rural living heritage in China based on the model of "rural governance - policy supply - protective activation"**

[1550](#)

Sidra Khokhar, **A Critical Ethnographic of Ziddi Feminist Socio-Spatial Practices in a Modern-Mohalla of Islamabad**

[1565](#)

Hou Rui, Sun Xi-jia, **The Intersection of National Image, Urban Development, and Civic Life: A Study on the 70-Year Evolution of Large-Scale Sports Architecture Heritage in Beijing**

[1595](#)

Xin Li, Christa Reicher, **Challenges and outlooks of incremental historic urban district renovation in China - take Beijing Hutong Dongsinan case as an example**

[1612](#)

Wendy Jo Mifsud, Alexander Farrugia, **Lived Heritage through the Changing Gaze: A Views and Vistas Analysis for Valletta**

[1628](#)

Özlem Tepeli Türel, Ahmet Türel, **Measuring Cultural Participation: A Comprehensive Study in Kayseri**

[1638](#)

Antonella Contin, **Metropolitan Cities as Living Monuments: Resilient Territories between Culture, Justice and Innovation**

[1653](#)

Zhe Wang, **Study on evaluation of liveliness level and promotion strategy for Intangible Cultural Heritage in Qinghai Province**

[1670](#)

Giuseppe Fraddosio, **The Mountain of Gargano Where the Sacred Dwells in the Forms of the Earth**

[1685](#)

Neslişah Kesici, Nilgün Çolpan Erkan, **(Re)Production of Urban Space through Cultural Events: Legacy of the Bergama Festival**

[1707](#)

Wenjing Dong, Zimeng Kong, Yanhui Wang, **Heritage Perception and Identity Construction Among Residents in Industrial Community Transformation: A Case Study of National Creative Park, Nanjing, China**

[1717](#)

Yanqi Chen, Yunying Ren, **Research on Cultural Adaptation Mechanisms of the Duku Heritage Corridor Based on Heritage Ecosystems**

[1729](#)

Xiaohan Zhang, Yan Wang, Wei Wu, **A Study on the Evolution Characteristics of the Spatial Layout of The Mountain Fortress System of Sichuan and Chongqing in China during the Song and Yuan Wars**

[1739](#)

Diana Amorim dos Santos da Silva, Melisa Pesoa Marcilla, **Drawn City: the effects of women's graffiti in public spaces of Rio and Barcelona through cartography**

[1759](#)

Shuyin Li, **The Dilemma of Authenticity: The Conservation and Reconstruction of Traditional Residences in China –Taking Pingyao, Shanghai and Suzhou as Examples**

[1769](#)

Jianren Zhi, Qun Zhang, **Exploring Spatial Evolution of Traditional Settlement Landscapes in the Southern Taihang Region of China: A Study on Cultural Ecosystem Dynamics and Reconstructive Strategies**

[1782](#)

Giada Limongi, Adriana Galderisi, Chiara Pisano, **Reversing cultural marginality in inner peripheries: the key role of community mapping**

[1797](#)

Ludovico Centis, **Silent evidence. On nuclear mounds, craters and caves**

[1804](#)

Zihan Ke, Yongjie Cai, **From Large-scale Modernist Planning to Small-scale Urban Blocks: Spatial Transformation Experiments in China's Large Gated Communities**

[1814](#)

Li Xin fei, Wei Qi, **The Manifestation of Patterns and the Reconstruction of Meaning: The Reproduction of Spatial Patterns and Role Interpretation Along Xi'an's Historical Urban Axis**

[1835](#)

Elena Guidetti, Adnan Pašić, Alessandro Massarente, **Overlapping urban processes: Research by design experiences in a Sarajevo city central military campus**

[1841](#)

Guangfeng Zhai, Zuyue Liu, Yan Wang, **A Study on the Identification of Historical and Cultural Resource Carriers Oriented by Value: A Case Study of the Taihu Lake Basin**

[1845](#)

Chunye Ma, Lan Wang, **Public emotions and visual perception of historic district : An AI approach using social media data**

[1856](#)

Gyuna Hwang, Jina Park, **The Spatial Dynamics of Cafés as Everyday Urban Spaces: Exploring Socialscapes through Streetscapes**

[1865](#)

Shaomin Zhang, Zimeng Kong, **Research on the Tourism Development Path of Human-Habitat World Heritage from the Perspective of Space Production: A Case Study of Pingyao Ancient City**

[1892](#)

Altea Panebianco, Ali Yaser Jafari, Barbara Caselli, **Digital Platform for Accessibility and Cultural Enhancement of Inner Areas in Italy**

[1907](#)

Ying Yuning, **The Value of Suqian Water Culture heritage from the Perspective of Cultural Landscape**

[1922](#)

Dan Ye, Yu Zhuang, Xin Li, **Research on the Revitalization Modes and Mechanisms of Historical Buildings in High-density Cities: A Case Study of Hong Kong**

[1933](#)

Paloma Guzman, Ole Fredrik Unhammer, Mesut Dinler, **Exploring Policy Frameworks for Cultural Heritage in Climate Adaptation and Disaster Risk Management: A Cross-Case Comparison**

[1953](#)

Gizem Ak, Murat Cemal Yalçın, **Exploring the Emotional Dynamics of Beyoğlu's Transformative Urban Atmosphere Through Music Ecosystems**

[1969](#)

Busra Nur Gundogdu, Imge Akcakaya Waite, **Participatory living heritage planning in practice: Lessons from Balıkcıköy, Istanbul**

[1984](#)

Iman Batita, Justin McGuinness, **Digital platforms, regulatory planning and heritisation: Airbnb and discourses around courtyard houses in the medina of Tunis (2011 to 2024)**

[2000](#)

Marcos Marina-Castello, Gabriel Marro-Gros, Ana Ruiz-Varona, **Canal Imperial de Aragón, the functionality of a water infrastructure and the inheritance of a traditional agriculture landscape in Spain**

[2007](#)

Andrea Di Cinzio, Lorenzo Morelli, **Heritage and Community. Strategies for a sustainable change of the mid-Adriatic coastline**

[2022](#)

Chao Ma, Zuobin Wu, Yimin Wei, **Complex System Conservation Technology for Spatial Cultural Heritage Networks: A Case Study of Qinghai Province, China**

[2035](#)

TRACK 7 - INCLUSION

Mao Weifeng, **Spatial Development Strategies and Policy Recommendations for Social Development in Shenzhen**

[2051](#)

Melis Oğuz Çevik, Safiye Özge Subaşı, Emre Söylemez, **Gender-Responsive Approaches in Post-Disaster Temporary Settlement Planning: Insights from Malatya and Adıyaman**

[2063](#)

Emre Çelebi, Elif Kısar Koramaz, **The Role of Spatial Alienation in the Journey of Existence as an Actor in Contested Urban Areas: The Case of Kasımpaşa, Istanbul**

[2076](#)

Duygu Cihanger Ribeiro, Paulo Silva, **Multiculturalism in Lisbon: Migration, Integration Policies, and Urban Space**

[2094](#)

Kaixuan Wu, **Inclusive Renovation Strategies for Aging Residential Communities — A Case Study of Daguang Subdistrict in Hangzhou**

[2103](#)

Lale Görgülü, Menelaos Gkartzios, **A Capital-Based Assessment of the Livelihood Vulnerability of Syrian Refugees**

[2117](#)

Tzu Hsuan Huang, Hsien Hsin Cheng, **Exploring Environmental Perception, Cognition, and NIMBY Sentiments Toward Psychiatric Hospitals: A Spatial Planning Perspective**

[2149](#)

Hilay Atalay, Nuran Zeren Gülersoy, **A Model for Measuring and Assessing Social Sustainability: Ankara Dikmen Valley Case Study**

[2160](#)

Pranavi Kasula, **Rethinking Social Inclusivity. The Case of Urban Villages in Delhi**

[2180](#)

Jiang Shengbin, Zhang Yuyun, **A Study on the Spatiotemporal Patterns and Influencing Factors of Urban-Rural Integrated Development: A Case Study of the Chengdu Plain Economic Zone**

[2202](#)

Shuyan Guo, Shijie Sun, **Transformation of Consumption Space in Urban Regeneration: Spatial Characteristics and Influencing Factors of Youth Subcultural Consumption Space**

[2222](#)

Sun Keyi, Wang Xingping, **The Demand-Supply Measurement of Youth Development-Oriented Cities Based on the Characteristics of Generation Z: A Case Study of Shanghai, Nanjing, and Hangzhou**

[2238](#)

Sin Yu Wang, Tzuyuan Stessa Chao, **Just smart? A Preliminary Study on the correlation of Smart City Infrastructure and Gentrification**

[2254](#)

Xun Zhang, Qingxin Yang, Zhihan Zhang, Yuyue Huang, Geyang Xia, **Unveiling travel communities of people with disabilities using smart card data: A case study of Nanjing**

[2262](#)

Chen Ge, Wang Yuchen, Huang Jianzhong, **What kind of shrinkage differences do urban agglomerations at different stages of development lead to in the era of negative population growth?**

[2272](#)

Chen Ge, Wang Yuchen, Huang Jianzhong, **Equity of pediatric diagnosis and treatment hospital allocation from the perspective of supply and demand: a case study from Shanghai, China**

[2283](#)

Binita Mahato, Arindam Roy, **Grassroots Organization and Informal Economy: Learnings from Hawker Sangram Committee**

[2291](#)

Ge Wan, Jianzhong Huang, **Floating Population Structure in Shrinking Area of Shanghai Metropolitan Area: An Urban-Rural Mobility Network Analysis**

[2312](#)

Yi Zhong, **Transformative Planning for Sustainable Futures: Bridging Global Goals and Local Actions through Adaptive Frameworks**

[2324](#)

Ruotong Zhang, Yi Wang, Zhongjie Lin, **Equity-Oriented Optimisation of Public Space Supply-Demand in Ageing Communities: A Behavioural Perspective on Elderly Residents**

[2330](#)

Jing Guo, De Wang, **Inclusive Urban Planning Based on Time-Use Analysis: A Markov Chain Approach Across Family Life Cycles**

[2342](#)

Huan Dong, Haixiao Pan, Zizhan Wang, Zhendong Wang, Kun Li, **Neighborhood walkability for older adults and their travel – Shanghai Anshan area case study**

[2359](#)

Huan Liu, **Study on the Construction and Inheritance of Rural Models in Shaanxi North from the Perspective of Human-Land Emotional Bonds**

[2375](#)

JiaQian Zhang, XiaoDong Xu, **Inequalities in Public Cultural Facility Distribution: A Comparative Analysis Across Demographic Groups in Wenzhou, China**

[2385](#)

Cui Bowen, **A Study on the Optimization of Public Service Facilities in the Inclusive '15-Minute Community Life Circle' Based on Equity: A Case Study of Wujiaochang Sub-district, Shanghai**

[2400](#)

Jennifer Minner, Jocelyn Poe, Felix Heisel, Ash Kopetzky, Maya Porath, Dylan Stevenson, Gretchen Worth, **Embodying Justice in the Built Environment: Transatlantic Reflections on Carbon Neutrality, Circularity, and Justice**

[2416](#)

Yuxing Zhao, Lan Wang, **How Spatial Factors Affect Respiratory Health in Coal Resource-based Cities: a Case-control Study in Eastern Yunnan Province, China**

[2429](#)

Yunzheng Zhang, Fubin Luo, **Who gets less urban greenness: A case study of Sydney**

[2441](#)

Stefania Butti, Emanuele Garda, Michela Cameletti, Marta Rodeschini, Gregorio Pezzoli, Francesca Morganti, **Beyond the ideal: rethinking Aging in (urban) Place through the lens of vulnerability. Insights from Italian CASA Project**

[2452](#)

Büşra Tilki, Elif Kısar Koramaz, **A Bibliometric Analysis on the Relationship Between Migration and Urban Design**

[2463](#)

Hülya Saçın, Ahmet Burak Büyükcivelek, **The Urban Factors in Highly Skilled Migration Motivation: The Case of Turkish Professionals in the Netherlands**

[2475](#)

Pavĺína Suchá, **Urban Form and Social Exclusion: A Spatial Perspective on Residential Segregation in Czech Cities**

[2493](#)

Carlotta Caciagli, Paola Piscitelli, Stefania Sabatinelli, Paola Savoldi, Aubrey Toldi, **Counteracting digital divides through a place-based inclusion process. Insights from an ongoing research project**

[2509](#)

TRACK 8 - EDUCATION AND SKILLS

Tara Lynne Clapp, Mark Groulx, **Pedagogy for the future: Equipping students for complex and climate-relevant practice**
[2529](#)

Sarah Isabella Chiodi, Lorenzo Liguoro, **Research-Driven Pedagogy: Advancing Transformative Skills in Spatial Justice and Urban Sustainability through Educational Innovation. Insights from the REPLACE Project**
[2537](#)

Edmond Hajrizi, Binak Beqaj, Skender Kosumi, Shqiprim Ahmeti, **UBT "SMART City": A Small-Scale City Ecosystem for Experimentation in Knowledge-Driven Urban Planning**
[2551](#)

Giuffrè, M., Benigni M.S., Fontana, C. Tomassoni, V., **Sismopoli, playing cities in risk**
[2568](#)

Begüm Eser, T.Kerem Koramaz, **Epistemological Uncertainties in Planning Education: The Transformative Role of Studio Pedagogy**
[2582](#)

Azza Kamal, **AI + Geospatial Models for Engagement and Performance Measures in the Pedagogy of Sustainable Planning Studio**
[2589](#)

TRACK 9 - URBAN FUTURES

Esin Ozkilig, Fatih Terzi, **Local Appropriation Model for Circular Maker Spaces (CMS) in Istanbul**
[2602](#)

Caterina Juric, **Unveiling Hidden Potential. A Typological Approach for the Underground Landscape.**
[2624](#)

Alexandros Mpantogias, Varvara Toura, **Reimagining the future of peri-urban spaces: planning narratives for the sustainability of these areas. The case study of "Stena tou Nestou" in Xanthi, Greece**
[2639](#)

Weiping Cao, Su Wang, Han Tao, **Spatiotemporal Evolution Characteristics and Planning Strategies of Population and Construction Land in Shrinking Chinese Counties**
[2655](#)

Dzheylyan Safet Karaulan Sozuer, Yasin Çagatay Seçkin, **Planning for Play-Friendly City: Global Narratives and Local Interpretations in the Context of Istanbul**
[2666](#)

Chen Gongda, **Research on the Distribution and Typological Characteristics of Urban Office Centres from a Fine-Grained Perspective: A Case Study of Yangpu District in Shanghai, China**

[2674](#)

Lea Petrović Krajnik, Damir Krajnik, Ivan Mlinar, Teodora Jelić, **Research on the Potential for Future Development of Labin and Raša in Istria**

[2695](#)

Aida Arik, **Towards transformative actions through perceptions research: Q-methodology as a tool for identifying ideological dimensions of planning problems**

[2715](#)

Yasmine Abdul Ghani, Imdat As, **From Masdar City, Abu Dhabi to Florya, Istanbul: What Can We Learn from Smart Cities?**

[2725](#)

Jan Schreurs, **Co-Producing the Future: Imaginaries at Work in Spatial Planning Practice**

[2741](#)

Manuel Caldeira, **Sensemaking In Urban Experiments: The Case of Barcelona's Superblocks**

[2755](#)

Katharina Mayer, Martin Berchtold, **The fictional municipality of "Zwirgberg" as a model for spatial planning in rural Rhineland-Palatinate**

[2771](#)

Giovanni Caudo, **Next Generation EU The Case of Rome, two strategic actions within a list of projects**

[2795](#)

TRACK 10 - THEORIES

Aksel Hagen, **Should planning and policy gather around the concept of "community of disagreement"?**

[2805](#)

Chandrima Mukhopadhyay, **Progressive Urbanism**

[2817](#)

Liangwei Du Xinwen Wang, **Localization and Application of Scene Theory in the Context of Historic Town Preservation in China: A Case Study of Shannxi Mizhi Ancient Town**

[2829](#)

Zhejun Wang, **The Role and Value of Theory in Urban Design: Can They Truly Shape the City?**

[2846](#)

Ruggero Signoroni, **Rethinking Promethean planning: An epistemological enquiry of technoscientific-centrism in planning theories**

[2855](#)

Liudmila Slivinskaya, **What planning needs from theorizing on place in times of global challenges**
[2868](#)

Paula Freire Santoro, Felipe Suzuki Ursini, Carolina Heldt D'Almeida, Débora Ungaretti, Amanda Silber Bleich, Gabriela Prado Filipe, **Different rental housing policies models and the ongoing difficulty of overcoming the housing crisis**
[2879](#)

Esen Gökçe Özdamar, **Pathways to Urban Resilience: Tactical Urbanism vs. Transdisciplinary Approaches**
[2895](#)

Grégoire Picard, Giovanni Fusco, Ornella Zaza, **The Insufficient Role of Urban Form and Its Uses in Baseline Assessments of Urban Plans in France**
[2914](#)

TRACK 11 - EMERGING TECHNOLOGIES

Izzy Yi Jian, Xiaosheng Zhu, Yangyang Pan, Kar Him Mo, **"Love the Specific Scene of Life": A Visual Analysis of User-Generated Narratives on Walkable City Spaces**
[2935](#)

Yun Ling, Jing Gan, **Spatiotemporal perception of disasters based on social media data in the context of climate change: A case study of Shanghai**
[2948](#)

Yuyue Huang, **Intelligent Urban Design: Self-organized Block Form Generation Using Reinforcement Learning - An Empirical Study from Nanjing, China**
[2967](#)

Xinzhuo Zhao, **Unravelling the Complexity of Urban Functional Organization Based on Explainable GeoAI**
[2976](#)

Ayşe Veliöğlü, Fatih Terzi, **Monitoring the Impact of Urban Regeneration on Green Infrastructure: Istanbul Case**
[2987](#)

Songming Li, Xiliu He, Shijie Sun, **Exploring the Emotional Spatial Patterns and Functional Perceptions of Internet-Famous Streets Based on Large Language Models: A Case Study of Nanjing Old City**
[3006](#)

Yangyang Pan, Zilu Wang, Peter Hasdell, Izzy Yi Jian, **Gamifying Participatory Design: A Digital Platform for Urban Renewal in Gangxia Urban Village, Shenzhen**
[3026](#)

Jian Chen, Guy Garrod, Menelaos Gkartziros, **Using Social Media Big Data and ChatGPT for Identifying Counter-urbanisation Hot Spots in China**
[3038](#)

Qianhui He, Shijie Sun, **Unraveling the relationship between the digital platforms and gentrification: Evidence from Nanjing, China**

[3064](#)

Abdallahman T. Y. Alashi, Özhan Ertekin, **Towards Drone-Based 3D City Information Modeling for Urban Analysis and Planning**

[3077](#)

Mustafa Raşit Şahin, Sila Özdemir, Emine Yetişkul Şenbil, **Advanced Quantification of Urban Complexity and Adaptive Capacity: Sub-Fractal Analysis and Spatial Statistics in Izmir**

[3099](#)

Shih-Hung Yang, Han-Liang Lin, Yu-Tung Lin, Ya-Zhen Cai, Mei-Kuan Li, Hsiao-Tzu Hsiung, Wen-Ying Chen, Yen-Lin Chen, Yu-Han Nien, **Geographically weighted machine learning for modeling spatial heterogeneity in off-campus student housing rents**

[3127](#)

Sila Özdemir, Mustafa Raşit Şahin, Emine Yetişkul Şenbil, **Exploring Regionalization and Centralization in Izmir: A Dual-Phase Analysis of Urban Morphology Using Sub-Fractal and Space Syntax Methods**

[3144](#)

Yu Zhuoyu, Li Chuanying, Wang Chenghao, Zhangwei, **Planning and Design Methods for Robot Work spaces in Smart Elderly Care Communities**

[3159](#)

Mani Dhingra, Aphra Kerr, **Towards Ethical Implementation of Urban Digital Twins: Addressing Key Challenges & Recommending Best Practices**

[3172](#)

Yılma Karatuna, Eren Kürkçüoğlu, **The Impact of Environmental Design Elements on Corporate Site Selection of Information Industry Companies in the Metaverse**

[3194](#)

Ayşenur Koçyiğit, Aydın Furkan Terzi, Koray Aksu, Hande Demirel, **Mapping Positive Energy: A Geographic Information System Approach to Defining Positive Energy Districts**

[3218](#)

Luyao Niu, Yurun Wang, Wenjia Zhang, **Leveraging Social Media Big Data and Large Language Models to Quantify the Temporal Dynamics of Cross-Border Spatial Identity: Evidence from Shenzhen-Hong Kong Region**

[3230](#)

Jintian Xu, Dujuan Yang, Qi Han, **Leveraging Digital Platforms for Circular Economy Implementation in the AECO Industry: Insights from Public-Private Partnerships**

[3256](#)

Berna Gürkan, Fatih Terzi, **Intersection of Digital and Physical: Phygital Urban Public Spaces**

[3270](#)

Zeynep Gülce Aydın, Fatih Terzi, **Digitalization, Culture and Urban Space Interaction : A Design Fiction Approach**
[3292](#)

Husain Vaghjipurwala, Katharina Borgmann, Maryam Hosseinzadeh, Agota Barabas, Jörg Noennig,
From Semantic to Thematic analysis: Extracting Research trends and topics from Text Data
[3311](#)

Yu Yinqi, Liu Liu, **AI-Empowered Research on Healthy Streets: An Iterative Path of Streetscape Perception, Evaluation, and Optimization**
[3326](#)

Tianxin Zhang, Mengde Zheng, **The Study on the Measurement and Enhancement Strategies of Urban Street Space Quality Based on Street View Images: A Case Study of Streets in the Central Urban Area of Xi'an**
[3346](#)

Balázs Cserpes, Rachele Vanessa Gatto, **A Digitalised Tourism Sector: Impact on Occupations and Geographies**
[3360](#)

Edmond Hajrizi, Binak Beqaj, Skender Kosumi, Shqiprim Ahmeti, **UBT "SMART City" Model as a Testbed for Emerging Digital Technologies and Transformative Urban Planning**
[3378](#)

Tarek Al-Rimawi, Michael Nadler, **Harnessing Smart Technologies in Real Estate: A New Paradigm for Spatial Planning and Urban Development**
[3393](#)

Rui Jiang, Bige Tunçer, Cem Ataman, **LLM-enabled Ontology Alignment to Support Complex Decision-Making in the Built Environment**
[3408](#)

TRACK 12 - DISASTER-RESILIENT PLANNING

Sun Xijia, Li Xiangfeng, Hou Rui, Li Xiaoming, **Floods and Livelihoods: A Multi-dimensional Comparative Study of Territorial Space Planning Policies for Flood Detention Areas in China**
[3425](#)

Adnan Oğuzhan, Bora Yerliyurt, **Industry 5.0 as a Tool for Strengthening Urban Resilience Against Disaster Risks**
[3438](#)

Dayeon Shin, Taeyeong Kim, Dakota Aaron McCarty, **Exploring the Feasibility of Sponge City Solutions for Flood Resilience in Gangnam, Seoul**
[3454](#)

Miao-Ching Shen, Hsueh-Sheng Chang, **Flood Risk Perception Under the Levee Effect: Adaptive Management Strategies for Heterogeneous Individuals**
[3466](#)

Gözde İdil Özcan, **What Are the Obstacles in the Recovery Process Considering the Role of Actors? The Case of the Kahramanmaraş Earthquake in Turkey**

[3478](#)

Francesca Paola Mondelli, Marta Rabazo Martin, Maria Grazia Cianci, **How the coastal cities are transforming? The disaster as catalysts of change**

[3494](#)

Tuğba Kütük, Cansu Güller, **Post-Disaster Population Mobility: Considerations for the February 2023 Earthquakes in Türkiye**

[3513](#)

Cora Fontana, Valentina Tomassoni, Margherita Giuffrè, Massimiliano Moscatelli, **Why should we bother about risk reduction at the urban scale? The Early Recovery System (ERS) framework to assess the impact of prevention instruments on post-quake urban functionality**

[3528](#)

Adem Sakarya, **Investigation Of Earthquake Damage in Terms of Different Land Covers: 2023 Kahramanmaraş Earthquakes**

[3543](#)

Aydan Ege Güven, Giulio Breglia, Marco Modica, **Critical Infrastructures and Their Role in Regional Resilience: Mapping EU Regions**

[3550](#)

TRACK 13 - HOUSING AND SHELTER

Jiaqi Zhao, Wenzhu Zhou, Wen Xiong, **A Study on Per Capita Housing Status and Living Quality Enhancement in Dashilan Historical and Cultural Block**

[3565](#)

Tolga Levent, **An Assessment on Provincial Differentiation of Housing Problem in the Turkish Case**

[3579](#)

Elifsu Şahin, Elif Alkay, **The Social Reflections of Neoliberal Policies, Planning Legislation, and Housing in the Istanbul Metropolitan Area**

[3592](#)

Mengjia Qiu, Li Bao, **Housing Justice in Urban Regeneration from a Hierarchical Perspective: Practice and Reflection on the Case of Nanjing, China**

[3605](#)

Pietro Bonifaci, Andrea Fantin, Jacopo Galli, Nicolò Genovese, Giulia Piacenti, Klarissa Pica, Marco Turcato, Elisa Vendemini, **Transitional housing. Adaptive and Sustainable Design Strategies for Gaza Strip Reconstruction**

[3629](#)

Ivana Katuriđ, Lucijan Ćerneliđ, **Planning for Compact Cities: The Interplay of Housing Provision and Urbanisation**

[3644](#)

Duygu Ćayan, Őzgöl Burcu Őzdemir Sarı, **Predicting Housing Prices: The Case of Ankara Housing Market**

[3656](#)

Oluwapelumi Obayanju, **Nigerian Housing Development Policies Impact on Lagos Housing Deficit (1960 – 2020) A Critical Literature Review)**

[3670](#)

Amin Alipour, Mahmoud Sharepour, **Ownership Dynamics of Low-Income Households Under Iran's Mehr Housing Policy (IMHP) (The Case Study of 13 IMHP Residential Complexes in Babol and Babolsar, Iran)**

[3688](#)

TRACK 14 - ETHICS, VALUES AND PLANNING

Kimberley Kinder, Sophia Spence, **Planning for gender health justice: A scoping review and research agenda**

[3709](#)

TRACK 15 - PROPERTY MARKET ACTORS

Alberto Bortolotti, **The financialisation of actors, practices and instruments. Insights from Milano's urban market**

[3722](#)

Semanur Őzcan, Oya Akın, **The State as an Entrepreneur Who Transforming Public Spaces: The Case of Zeytinburnu Fabrika-i Humayun**

[3727](#)

TRACK 16 - FOOD

Luanxuan Zang, **Dynamic Analysis of Cultivated Area-Food-Population System in Shrinking Rural Areas of Northeast China and Its Planning Strategies**

[3743](#)

İrem Őzdarendeli, Ekin GŐneş Őanlı Aydın, **Informing Sustainable Regional Food Chains through Serious Games: The Play Marmara "Food"**

[3753](#)

Luanxuan Zang, Weiping Cao, Su Wang, Han Tao, **The Evolution Characteristics and Planning Regulation of the Population-cultivated land-food (PCF) system in Rural Counties of China**

[3767](#)

Alessandra Manganelli, **Exploring the food-climate nexus through a justice lens: insights from urban experimentations.**

[3781](#)

Andrea Lulovicova, Philemon Germanique, Stephane Bouissou, **How Local Policies Transform Foodscapes, Influence Dietary Shifts, and Reduce Emissions: Insights from Six Mediterranean Sub-Regions in France**
[3794](#)

Sophia Arbara, **Reconfiguring Food Systems in Egypt's Nile Delta An Agroecological Approach to Delta Urbanism**
[3810](#)

Ayşe Burcu Kısacık, Merve Deniz Tak, **Empowering Women through Food Production from the Perspective of Cooperatives**
[3827](#)

Ana Moragues Faus, Alessandra Manganell, Tanya Zerbian, **Understanding the role of diverse cities for sustainable food security: a socio-ecological governance framework**
[3836](#)

Augusto Fabio Cerqua, **Urban Agriculture and Multispecies Commoning in Public Housing Regeneration: Rethinking Ecologies of Care in Scampia**
[3850](#)

TRACK 17 - PUBLIC SPACE

Asma Mehan, **Operationalizing Justice: Ethical Frameworks for Adaptive Planning in the Age of Planetary Crisis**
[3858](#)

Jiang Shengbin, Lin Roulan, **A Study on the Supply–Demand Relationship of Recreational Services Supported by Ecological Public Spaces: A Case Study of Nanjing, Jiangsu Province, China**
[3866](#)

Marichela Sepe, **Evaluating Public Space Resilience: an index and a case study**
[3878](#)

Mengde Zheng & Tianxin Zhang, **Urban Street Space in Planning Transformation: Analyzing and Optimizing the Quality Differences between Subjective and Objective Perspectives—A Case Study of Xi'an**
[3892](#)

Ying Sun, Xiangfeng Li, Zhizhe Sun, **Designing Accessibility Public Spaces in Old City Communities Based on the Outdoor Activity Characteristics of People with Disabilities: A Case Study of Chengxian Street Community in Nanjing**
[3904](#)

Varvara Toura, Alexandros Mpantogias, **Public spaces as agents of inclusive and sustainable urban transformations. The case study of "Xersonisos tis Panagias" in Kavala, Greece**
[3916](#)

Ruohan Yin, Reshaping Urban Spaces: Exploring the Role of Temporary Public Open Spaces in Alleviating Land Pressure in Hong Kong

[3934](#)

Marta Rodeschini, Emanuele Garda, Marco Tononi, Gregorio Pezzoli & Alessandro Filomeno, Urban Green Areas as a Tool for City Care: Insights from Medium-Sized Italian Cities

[3949](#)

Yan Xinhang, Huang Yi, Fostering Multicultural Integration in Transforming Context: Community Participatory Museum as a Bridge

[3964](#)

Aleksandra Stupar, Jelena Ivanovic Vojvodic, Aleksandar Grujicic, Over the rainbow: Urban oasis as an inclusion hub

[3979](#)

Han Tao, The Path of Land Use Control for Urban Development and Construction Projects in Germany

[3989](#)

Han Tao, Comparative Analysis of Legal Frameworks and Reform in Global Urban Planning Systems: Insights from 'Planning Regulation-Constrained' and 'Development Order-Guided' Models in the Stock Era

[4000](#)

Derya Koçaş, Elif Kısar Koramaz, Comprehensive Evaluation of Child-Friendly Public Spaces: The Zümrütevler Case as Istanbul's First Permanent Two-Stage Street Transformation

[4013](#)

Fei Kong, Ruoshi Zhang, Evaluation of Emotional Attachment Characteristics of Urban Vitality Complexes Based on EW-GRA-TOPSIS Model in the Context of Stock Renewal: A Case Study of Five Typical Urban Complexes in Beijing and Shanghai

[4034](#)

Burcu H. Ozuduru, L. Hilal Ozcebe, Rethinking Urban Living Environments: Investigating the Influence of Built Environment Features on Physical Activity Levels – Evidence from a Cross-Sectional Study in Ankara, Türkiye

[4058](#)

Ceren Kocer Gul, Ipek Akpınar, Bridging Rural and Urban Dynamics within the Framework of Rural Gentrification: Urladam as a Transformative Public Space

[4067](#)

Xinkai Yang, Li Bao, Community Reading Spaces as Social Infrastructure: A Case Study of Nanjing

[4079](#)

Leung Lik Fong, JIAN Yi Izzy, Wen Zhuoyi Vincent, The Role of Urban Green Spaces Attributes in Enhancing Leisure Opportunities and Psychological Well-Being Among Older Residents

[4103](#)

Qingyun Luo, Wenjun Xu, Mengling Jiang, Anqi Xia, **Temporary Urbanism in Action: Theme-Neighborhood (Mis) alignment and Visitor Response in Beijing Pop-up Markets**

[4119](#)

Mengyue Mei, Tongyu Sun, **Integrating Energy Performance and Public Space Metrics: A Study from the Perspective of Urban Design**

[4135](#)

Sezen Türkoğlu, Fatih Terzi, **Exploring Meanings and Experiences of Public Spaces: Topic Modelling Insights from Museum Gazhane**

[4147](#)

Emanuele Garda, Francesca Morganti, Michela Cameletti, Marta Rodeschini, Stefania Butti, Gregorio Pezzoli, **The age-friendly public city: initial reflections of a medium-size city as Bergamo**

[4163](#)

Merve Deniz Tak, Ayşe Burcu Kısacık, **Public Drinking as a Transformative Practice of Placemaking**

[4178](#)

Gregorio Pezzoli, **The Italian Integrated Water Service as a Promoter of Soil Desealing Processes**

[4186](#)

Vasiliki Fragkaki, **Public Space as Social Infrastructure for Urban Wellbeing: Transformation and resistance in Protomagias Square, Athens under persistent austerity**

[4197](#)

Cansu Kisla Kol, Esin Ozkiloglu, Imge Akcakaya Waite, **Exclusion of the vulnerable from public space in the shadow of urban transformation: the case of sex workers in Istanbul's Pera**

[4210](#)

Ángel Aparicio, **Planners and the moral power of the "unpleasant"**

[4231](#)

Anja Pejović, Riccardo Pollo, **From Car-Centric to People-Centric: Developing Street Transformations Through Environmental and Community Involvement Approaches**

[4241](#)

Necdet Ayik, **Reclaiming or excluding? The evolution of waterfront redevelopment and public space in Genoa**

[4251](#)

Aygül Demir, Zeynep Aslı Gürel, **Quests for Improving Visual Quality in Streets**

[4262](#)

Jiaxin Qi, Yuhang Rao, **Informal Utilization Characteristics of Underpass Public Spaces in Megacities from the Perspective of Co-Production Theory: A Case Study of Elevated Highway Underpasses in Guangzhou**

[4273](#)

Karla Barrantes Chaves, Nidia Cruz Zúñiga, Erick Centeno Mora, **After COVID-19: Urban Parks as Catalysts of Hope for the Common Good – The Costa Rican Case**

[4290](#)

Buse Ceren Ener, Erhan Kurtarir, **Visual Perception of Universal Design Interventions for World Heritage Sites: Case of Istanbul Historic Peninsula**

[4302](#)

TRACK 18 - TOURISM

Konstantina Nikoletta Karasarini, **Mass Tourism in Malia: Towards a Decolonial Model for the Lassithi Plateau**

[4310](#)

Maryam Farash Khiabani, **Exploring the genuine flavours of Tehran's cafes: a postmodern destination for tourism**

[4333](#)

Yixin Liu, Zhimin Li, Yixin Tian, Hao Wang, Ruqin Wang, **Research on the Correlation Between Tourists' Facial Emotion Perception and Street Spatial Elements Through Deep Learning: A Case Study of Traditional Tourism-Oriented Villages in China**

[4349](#)

Zeijing Zou, Xiaojian Chen, Yixin Liu, Yuxin Wang Leihao Liu, **Correlation Between Street Space and Tourist Behavior in Tourism-Oriented Traditional Villages Under Distinct Development Models: A Case Study of Yuanjia Village, Shaanxi Province**

[4359](#)

Qinghang Cheng, **Research on the Construction of City Walk Tourism Routes from the Perspective of Cultural Heritage Conservation: A Case Study of Bei yuanmen Historic and Cultural District in Xi'an**

[4377](#)

Yixuan Zhang, Shijie Sun, **Identification of Spatial Conflicts between Tourists and Local Residents: Based on "Nanjing Travel Pitfall Avoidance" Posts on Rednote**

[4388](#)

Chao Zhang, **Assessment and Optimization of Sustainable Tourism Planning for Suburban Rural Areas of Metropolitan Fringe Areas Based on Ecological Landscape Unit Division: Evidence from Huanglongxian, Nanjing**

[4406](#)

Jing Zhang, **Research on the Measurement and Evaluation of the Development Performance of the Red Cultural Tourism Space in Hadapu Town based on AHP and Fuzzy Comprehensive Evaluation Method**

[4422](#)

Yifan Song, Paulina Maria Neisch, **Planetary Gentrification of Rural China: the case of yangjiale**

[4441](#)

Aida Arik, Emmanuelle George, **The messy interplay between forces of resistance and forces for change in territorial transitions: A case study of an Alpine ski resort**

[4460](#)

Rümeysa Kuduban, Bora Yerliyurt, **Examining the Phenomenon of Overtourism in the Context of Local Community Perception: The Case of Bodrum.**

[4474](#)

Yuxiao Ma, Yuhan Zhou, Jianzhong Huang, **Traveling for Celebrities: Fandom Tourism and the Creatively Repurposing of Urban Spaces**

[4482](#)

Sarah E. Braun, Angelica De Vito, **Navigating the University-Tourism Nexus: Employing Participatory Strategies for Liveability in Sorrento**

[4495](#)

Sadullah AKSOY, Mehmet Penpecioğlu, **Exploring the Politics of Gastronomy Tourism and Gentrification Nexus: Gastro-Driven Development and Peri-Urban Geographical Change in the case of Urla Izmir**

[4512](#)

Wei-ning Shi, Zuo-bin Wu, Chao Ma, **Cultural route perspective: heritage tourism value evaluation and route optimization of the Silk Road (Shaanxi section)**

[4523](#)

SPECIAL SESSION 1

Lena Verlooy, Laura Shlakku, Tim Devos, **Energy Justice in Underprivileged Neighbourhoods: Reimagining Energy Transitions Through Community Storytelling**

[4535](#)

SPECIAL SESSION 2

Renzo Sgolacchia, **A Community Out of the Box: Understanding Flexibility and Justice through Self-organised Housing in the Netherlands**

[4550](#)

Nicola Russolo, **Water justice, scarcity and environmental flows. The case of Marseille**

[4557](#)

Luis Martin Sanchez, Elena Longhin, **Re-mining Punta Corna. A Laboratory on the Local Impacts of the Critical Raw Materials Act in the Alpine Region**

[4571](#)

Elena Marchigiani, Teresa Frausin, Valentina Novak, Sara Basso, **Designing Good Life for All. Explorations on a Fragile Neighbourhood in Trieste**

[4584](#)

Gabriele Leo, **The Old Town of Taranto. Reclaim neglected spaces to challenge narratives of decline**
[4617](#)

Emanuel Giannotti, Luca Velo, Maria Chiara Tosi, **Mobile justice in the face of climate change on the North Adriatic coast.**
[4638](#)

Nicola Fierro, Enrico Formato, **Civic peri-urban: repositioning peri-urban urbanization in new forms of inter-generational co-ownership.**
[4646](#)

SPECIAL SESSION 6

Joaquín Farinós Dasí, Moneyba González Medina, Alankrita Sarkar & Paul Gerretsen, **Spatial Planning and Metropolitan Governance to face Flood risk in the new Climate Change context: A comparison between Eurodelta Megaregion and Valencia metropolitan area**
[4656](#)

SPECIAL SESSION 8

Pitkänen, M. & Hollmén, S. H., **Decolonial Strategies for Urban Greenery: Insights from Reimagining Planning Through Epistemic Pluralism in Kumasi**
[4675](#)

SPECIAL SESSION 9

Deshayes Eloïse, Brown Will, **Accounting beyond boundaries: Exploring consumption-based carbon approaches in Paris and Gothenburg**
[4688](#)

SPECIAL SESSION 12

Özge Yalçiner Ercoşkun, Ebru V. Ocalir, Ceren Ercoşkun, Hilal Tulan Isildar, Buse Erbas, Janina Welsch & Anna-Lena van der Vlugt, **Evaluating the 15-Min City Concept in Ankara: Resident Perceptions of Accessibility in Çankaya and Keçiören**
[4703](#)

SPECIAL SESSION 13

Benedetta Grieco, Sabrina Sacco, Maria Cerreta, **A More-Than-Human Approach to Storytelling for Landscape Planning: Interactions Between Artificial Intelligence and Problem Structuring Methods**
[4713](#)

Ozge Ogut, Benedetta Cavalieri, Elisa Conticelli, Giulia Marzani, Claudia de Luca, **Assessing Climate Change Adaptability and Risk in Italian Territories Using Open Data**

[4726](#)

SPECIAL SESSION 18

Kirsten Mangels, Marvin Stiewing, **Smart regions in an ageing society - new challenges for spatial planning in relation to healthcare**

[4742](#)

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.

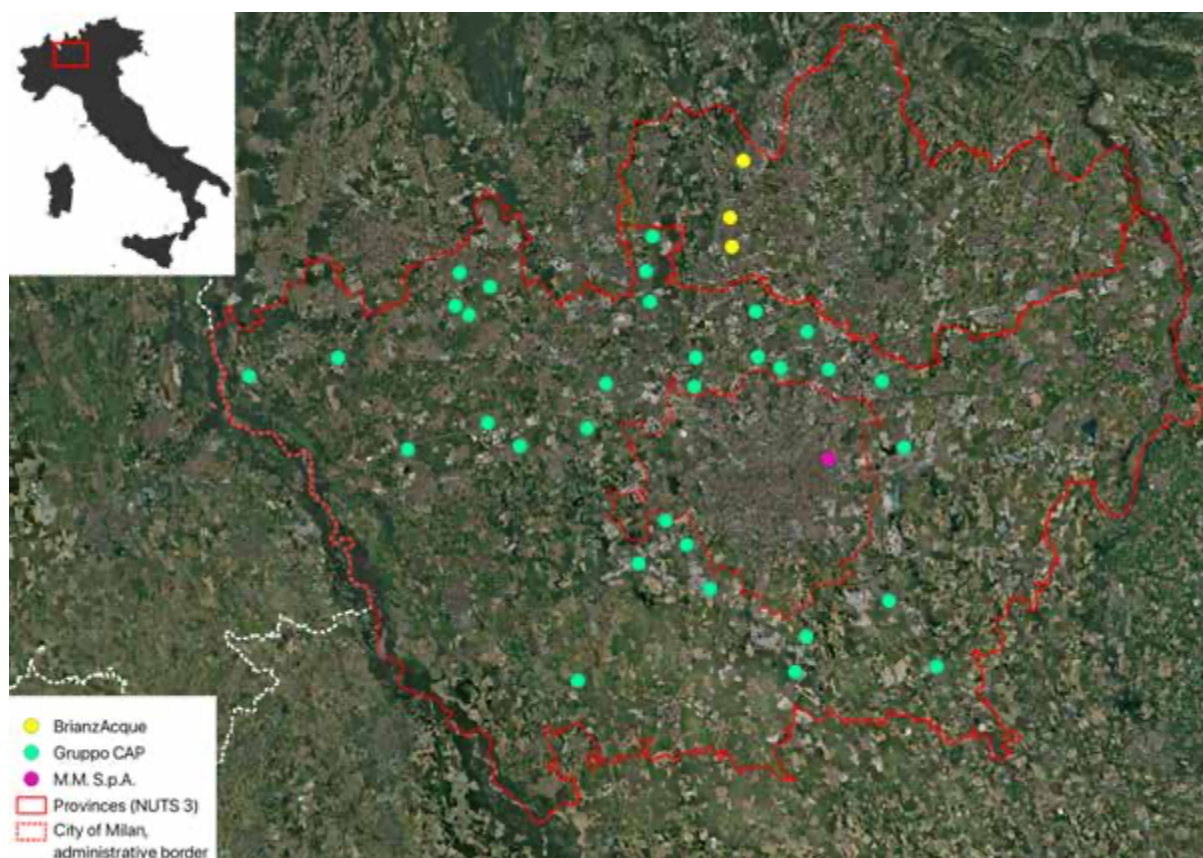


Figure 1: Location of interventions within the Milan metropolitan area. Author's elaboration.

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.

BrianzAcque 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 Renaturalization |
| Baranzate | 9.600 | 2,750,000 | No | Yes | Yes | No | 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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