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GAME CHANGER?
PLANNING FOR JUST AND SUSTAINABLE URBAN REGIONS

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Table of Contents

Track 01: Postgrowth **15**

Xin Li & Ting Yang, Urban Planning In The Post-Growth Era: Insights From World Bank Indicators . . . 16

Karin Holmstrand, Planning Beyond Growth: A Case Study Of Wellbeing-Oriented Planning In Wales And Cornwall . . . 50

Siwei Peng & Lu Yufei Na, Research On Rural Revitalization Planning From The Perspective Of Ecological Capitalization: Taking Nuanshui Township As An Example . 69

Wei Wei, From Howard's Garden City Movement To Zero-Carbon New Towns In The Postgrowth Era: The Case Of New Town Development In The Context Of Carbon Neutrality Of Shanghai . . . 83

Jinyi Wang, Shijie Sun & Xiaoyu Cong, The Internet As A Business Game Changer: A Study On Invisible Consumption Spaces In Nanjing Old City . . . 94

Federica Fiacco, Kezala Jere & Gianni Talamini, Can Fast Urban Growth Be Low-Carbon? Sub-Saharan Cities Towards New Territorial Strategies . . . 110

Qiang Yao, Research On Strategies For Enhancing Urban Spatial Resilience In Shanghai Based On The Connotations And Characteristics Of "Resilient Cities" . . . 128

Qiang Yao, Na An & Qingji Shen, Research On Strategies For Enhancing Urban Spatial Resilience In Shanghai Based On The Connotations And Characteristics Of "Resilient Cities" . . . 151

Giulia Luciani, Nature Is (Not) Democratic. Notes For A Community-Based Approach To "Natural Resources" . . . 174

Chiara Pisano, Adriana Galderisi & Giada Limongi, What Practices To Overcome The "Cultural Remoteness" Of Inner Peripheries? A Focus On Italian Case Studies . . . 186

Dongdong Chen, Micro-Intervention As A New Approach For Urban Regeneration In Metropolises: A Case Study In Beijing . . . 203

Track 02: Markets **216**

Alberto Bortolotti, Urban Policy Financialisation In Mega-Projects. The Case Of Milano Innovation District . . . 218

Alberto Bortolotti, Large-Scale Urban Development Projects As A Dilemma Affecting The Housing Crisis. The Case Of Milano Porta Romana . . . 235

Pauline Gali, Approaching Urban Renewal Through The Lens Of Urban Rent Theory . . 249

Emanuele Garda & Marta Rodeschini, Public-Private Dialogue In The Cultural Reuse Of Historical And Architectural Heritage: The Example Of The Carmine Monastery In Italy . . . 265

Track 03: Law **278**

Guangkun Zhou, Fallacies And Revisions: Evaluation Of Economic Benefits Of Development Rights Transfer And Density Bonus –17th And 69th Neighborhoods In Shanghai Hongkou Historic Conservation Districts Regeneration As The Case . . . 280

Zhiyu Pang & Yacheng Song, A Framework For Analysing Physical Form Outcomes Of Value Capture Paths Of Regeneration Projects In Residential Historic Areas . . . 305

Sara Benkirane, Navigating Complexity: Exploring Land Planning And Management Challenges In Morocco . . . 317

Li Wang, Can Transferable Development Rights Be Applied In The Chinese Context? — — A Comparative Study Between China And The United States . . . 336

Carolina Giaimo, Principles And Rules For Spatial Planning Governance And Government In Italy . . . 353

Ines Calor, Martinho Augusto & Mateus Magarotto, Land Readjustment In Braga Municipality - Looking Into The Future, Learning From The Past . . . 365

Linlin Dai, Changwei Feng, Jian Lin & Yun Liu, Multi-Planning Integration: Construction And Progress Of China's National Territory Spatial Planning System . . . 383

Chenli Qian, Yi Huang & Xiao Wu, A Comparative Study On Zoning Guidelines For Different Planning Types In China . . . 400

Zhao Zhao, Study On The Response Of Local Legislation To Coordinate The Interests Of Multiple Subjects In Urban Renewal From The Perspective Of Property Rights . . . 411

Track 04: Borders **428**

Yifan Cai, The Evolution Of Spatial Planning In The Border Area Between Shenzhen And Hong Kong, China . . . 430

Wenbo Xu & Shengbo Zhao, Administrative Boundary Effects Of Cross-Border Migration Of Manufacturing Enterprises: A Case Study From The Pearl River Delta In China 444

Yuxiao Ma, Jianzhong Huang, Qiao Zhang & Jing Deng, Coordinated Optimisation Of Multi-Level Rail Transit Network And Regional Spatial: International Contextual Differences And The Case Of Shanghai . . . 462

Rodrigo Vielmo Moura, Analysing Local Cross-Border Cooperation In Fragile Peripheral Areas In Northern Italy . . . 479

Lin Tian & Yao Cheng, Core-Periphery Industrial Linkages Of The Metropolitan Area From The Perspective Of Enterprise Linkages: The Case Of Three Cities Adjacent To Shanghai . . . 497

Yin Dou & Yihao Zhang, Study On The Characteristics Of Regional Intergovernmental Relationships Network, Based On The Analysis Of Planning Texts . . . 515

Andrés Martínez & Pere Fuertes, «The Franco-Spanish Mediterranean Strip. An Opportunity To Turn Applied Research Into Trans-Border Planning» . . . 523

Flore Guichot, Transit-Oriented Development In Asymmetrical Context: Learning From Cross-Border Paradoxes In The Great Geneva. . . . 539

Track 05: Mobility **561**

Kaichen Zhou & Lan Wang, Deciphering The Scaling Laws And Spatial Structure In Urban Micro-Mobility: Empirical Evidence From Bike-Sharing In Shanghai . . . 563

Jia Yi Liu & Yanbin Li, Exploring The Assessment And Strategies Of Street Inclusivity In Suzhou, China . . . 576

Arne Markuske, Urban Peripheries And The 15-Minute City . . . 594

Junting Lin, Zhiwei Li, Huali Zhang & Yu Zhuang, Form Follow Mobility: A Method To Identify Potential Urbanization Area In The Over-Rail Plane Under The Orientation Of Station-City Integration And Pedestrian Priority . . . 613

Ayesha Anwar & Hong Leng, Stepping Towards A Sustainable Future With Tod: Evaluating The Potential Of The Lahore City For A Regional Policy Reform . . . 627

Yunjing Wang & Yu Zhuang, Layout Patterns And Crowd Flows Of Commercial Space In High-Speed-Rail Station Complexes . . . 650

Sota Aida, Hirokazu Abe, Noriko Otsuka, Akira Takahashi & Kensuke Yasufuku, The Evaluation On Walkability In An Aging Society: The Case Of Senri New Town, Japan671

Giovanni Fusco, Meta Berghauser Pont, Valerio Cutini & Angelika Psenner, Guiding Principles For The 15-Minute City In Peripheral Areas: The Emc2 Model. . . . 690

Cédric Wehrle, Spaces Of Automobility: Diverging Trajectories Within The Liège-Aachen Diffuse City 708

Jan Bittner, Accessibility Of Local Amenities To Reduce Car Dependency: Obsolete Concept Or Change Yet To Come? The Prague Case. 719

Yunjing Wang & Yu Zhuang, Layout Patterns And Crowd Flows Of Commercial Space In High-Speed-Rail Station Complexes – Take Three Chinese High-Speed-Rail Station Complexes As Examples 732

Arzu Erturan & Bahar Aksel, Being A Child On A Car Free Island: Exploring Independent Mobility And Children's Perception In Büyükada-Istanbul 755

Hana Elattar, Arjama Mukherjee & Jörg Rainer Noennig, Stakeholders Of Participatory Planning: A Comparisonbetween Megacities And Cities In Europe 771

Michelangelo Fusi & Michela Tiboni, The Role Of Urban Planning In Perceived Accessibility To Public Transport 788

Miruna Draghia & Valentina Stan, Exploring Transformations In Sustainable Urban Mobility: Insights From Citywalk 2.0 Project And Beyond 804

Track 06: Governance **820**

Camilo Vladimir De Lima Amaral, Antonio Di Campli, Srivastava Rishabh & Elisa Verri, Conflictual Natures: The Role Of Architectural Imagination In Building Paths For Ecological Transition In The City Of Goias – Brasil 822

Yanxia Mu, Feng Luan & Jiahui Fan, Study On Governance Model Of Multi-Subject Participation In Rural Industry Development – A Case Study Of Shanghai Rural Revitalization Model Village 850

Kaixuan Lin, Jieming Zhu & Min Zhou, A Study On The Integrated Governance Model Of Development Zone And Town: Take South Jiangsu Region Of China As An Example 856

Pan Hu, Keyi Sun, Jialu Cheng & Yu Shi, Evaluation And Spatial Governance Strategies For Old Residential Areas' Renewal And Reconstruction In Urban Downtown Districts: A Case Study Of 70 Old Residential Areas In Changzhou ,China 882

Pieterjan Schraepen & Joris Voets, How To Deal With Conflictual Central Policy Incentives? Regional Governance Dynamics In Flanders Unpacked. 899

Robin Neef, Wim Leendertse, Stijn De Koning, Jildou Gerritsen & Rebekka De Witte, Tensions In The Original Premises Of The Iad Framework Compared To Contemporary Spatial Applications: Revisiting Elinor Ostrom 914

Zhuyang Liu, Wenxiao Yang & Beiyin Ni, Enterprise-Led Or Government-Led? Research On The Characteristics And Mechanisms Of Rural Gentrification In Metropolitan Suburbs Driven By Significant Projects Taking Lianmin Village In Shanghai As An Example 930

Na An, Chenyu Huang & Jiawei Yao, Awareness And Willingness Of Chinese Households To Reduce Carbon Footprint In Daily Life 940

Hana Elattar, Stakeholders Of Participatory Planning: A Comparison Between Megacities And Cities In Europe 958

Giulia Spadafina, Planning For Proximity In A Fragile Urban Context. The Case Of Tirana973

Verena Lenna, The Publicness Of Urban Commons. Insights From The Brussels Commoning Scene. 987

Sarah Isabella Chiodi & Lorenzo Liguoro, Urban Development Strategies: Navigating The Complexities Of Multi-Level Governance In Northern Italy 1003

Marida Borrello, Tiers Lieux And Wijkhubs: Infrastructures For A "Situated Democracy" ?1023

Track 07: Environment And Climate **1042**

Zhenpeng Zhang, Fang Fang, Andrew Greenlee & Jiankun Lou, Urban Heat Mitigation Effect And Affordable Housing Greenery Injustice Measured By Green View Index (Gvi): A Case Study In Washington, D.c. 1044

Zhenpeng Zhang, Fang Fang, Andrew Greenlee & Jiankun Lou, Urban Heat Mitigation Effect And Affordable Housing Greenery Injustice Measured By Green View Index (Gvi): A Case Study In Washington, D.c. 1065

Ruonan Jia & Zuobin Wu, Research On Spatial Optimization Strategies Of Rural Settlements In The Loess Plateau From The Perspective Of Disaster Prevention And Reduction—A Case Study Of Gaoxigou Village,China 1086

Sadaf Pirouzi, Fabiana Fabri & Loïc Sauvee, A Gis-Based Method For Prioritising Brownfieldstransformation Into Multifunctional Urban Greeninfrastructure: The Case Of Rouen Metropolis 1097

Luciano Agustin Pana Tronca, Climate And Transport Planning: A Messy Junction . . . 1105

Lucrezia Gelichi, Chlorophyll City: Regenerative And Restorative Urban Planning For A Sustainable Future Through Extensive And Branching Reforestation Initiatives . . . 1117

Beatriz Condessa & Rita Nicolau, Comparative Analysis Of Net Land Take In Portugal's Metropolitan Areas 1130

Jiankun Lou, Lan Wang, Jiayu Li & Yinghui Jia, How Urban Morphology Affects Wind-Heat Environment: An Example In Beijing From Ancient Cities To Modern Cities . 1140

Karina Landman, Regenerative Public Space As Game-Changing Option For Thriving Communities 1154

Christian Großhauser, „Potential Of Hydrogen Production By Wastewater Treatment Plants (Wwtps) - Technologies, Benefits, Challenges And Limitations Using The Example Of The Wastewater Treatment Plant Straubing“ 1169

Caroline Andersen & Martin Schulwitz, Asssessing Regional Potentials For Green Hydrogen Infrastructure Planning In Germany 1187

Giulio Giovannoni, Removing Cultural Barriers To Climate Change Adaptation In Tuscany1202

Roberta Pistoni, The Increasing Entry Of The Energy Subject In Spatial Planning Policies: New Visions For Energy Landscapes 1216

Apostolos Lagarias, Re-Definition(S) Of The Role Of Central Business Districts Under The Effect Of Extreme Heat Conditions And Climate Change: Evidence From The Mediterranean Context 1232

Lucila Urda Peña, Javier Julio Malo De Molina & Emilio Ontiveros, Analysis And Evaluation Of The Quality Of Open Spaces And Green Zones In Periurban Landscapes, The Greengates As Strategic Nodes Of Green Infrastructures. 1249

Krystallia Kamvasinou & Lorenzo Stefano Iannizzotto, Rethinking The Waste Of Planetary Urbanization For Urban Challenges: Potential, Strategies And Governance In Terrain Vague Projects 1269

Giulia Giacche, Anais Mohamed, Jean-Noël Consalès & Romain Melot, An Analysis Of Current Integration Of Urban Agriculture And Domestic Garden Into Urban Planning: The Case Of Île-De-France Region 1286

Evangelia Athanassiou, Planning Tools And Building Regulations Towards Greening Densely-Built Greek Cities: Scales Of 'Urban Green Grabbing' 1300

Emanuele Garda, Greening The Void: Actions For The De-Sealing And Renaturalisation Of Soils In Brownfield Regeneration Processes 1311

Margarida Calmeiro, The City Of Tomorrow Is Already With Us 1323

Ani Tola (Panariti), Paul Louis Meunier, Teuta Peshkopia & Geri Bisha, Strategies To Mitigate The Urban Heat Island Effect In Mediterranean Promenades Of France, Italy, And Albania 1334

Vidhulekha Tiwari, Ram Avtar, Santanu Bandyopadhyay & Arnab Jana, Quantifying The Effects Of Spatial Determinants Of Cooking Fuel Choices In India 1357

Alan March, Anna Hurlimann, Sareh Moosavi & Judy Bush, The Built Environment Policy And Practice Context To Facilitate Climate Change Action - The Role For Planning And Design 1371

Giovanni Ottaviano & Luciano De Bonis, The Self-Government Approach To The Planning Of The Gran Sasso Laga Park 1388

Track 08: Public Space **1398**

Ifigeneia Kokkali, The Open Orchestra Project In The Public Spaces Of Athens: An Urban Utopia With Transformative Power? 1400

Brigida Proto, On Freedom, Public Space And Women's Experiences Of Prostitution. The (In)Visible World Of The Bois De Vincennes In Paris. 1415

Yu Zhang & Qiang Sheng, Study On Spatial Distribution Of Fresh Supermarket Based On Street View Data 1429

Christine Mady, Repurposing Abandoned Transport Infrastructure Towards Social Inclusion: The Case Of Baana, Helsinkibaana, Helsinki 1442

Francesca Dal Cin, Cristiana Valente Monteiro, Nawaf Al Mushayt, Maria Ines Franco, Maria Matos Silva & Sérgio Barreiros Proença, The Public Space Between Land And Sea. Quarteira's Case 1469

Pelin Işık & Christa Reicher, Playful Urbanism In Diyarbakır: Dynamics Of Power And Play In Public Space Design 1485

Aslı Ulubaş Hamurcu & Fatih Terzi, Exploring User Preferences And Place Attachment In Urban (Public) Spaces: A Case Study Of Kadıköy Historical City Centre, Istanbul, Türkiye 1505

Yiting Jiang, How Social Media Influences Rural Spatial Practice And Place Identity: A Case Study Of Fuling Village 1523

Yan Zhou, Xinjie Shen & Hong Jiang, Continuing Community Spirit: Study On The Public Space Of "Pu-Jing" Community In The Ancient City Of Quanzhou 1537

Qianhui He, The Impact Of Online Social Activities On Public Spaces In The Digital Era - A Case Study Of Guochuang Park In Nanjing 1551

Giulio Giovannoni, Enhancing Suburban Life With Victor Gruen 1569

Ina Macaione, Alessandro Raffa & Bianca Andaloro, Design Climate-Adaptive Urban Green Regeneration: Nbs Strategies For Future-Proof Streetscapes 1578

Karla Barrantes Chaves, Nida Cruz Zúñiga & Erick Centeno Mora, Urban Parks Through People's New Lens: Opportunities Behind Covid-19 For Public Spaces' Policies In Costa Rica. 1605

Catarina Todorovic Caldeira & Ljiljana Cavic, Heterotopic Pocket Spaces Through Intermittent Occupancy 1623

Gregorio Pezzoli & Emanuele Garda, Designing The 'Right To Mobility': A Holistic Analysis To Rethink The Public City And Fighting Heat Waves In Urban Areas . . 1633

Kundani Makakavhule & Kwazi Ngcobo, In The Name Of Peace, Sanitise! 1644

May Saeedi, Tom Jefferies & Sean Cullen, Analytical Study Of Hospitality Culture And Urban Identity And Its Impact On The Future Of Marine Tourism In Red Sea Coastal Port Cities: Case Study Of Jeddah Saudi Arabia. 1659

Track 09: Inclusion **1680**

Dongyu Zhang, Hong Leng & Ziqing Yuan, Research On The Psychological Health Impacts For Children In Urban Built Environments 1682

Mengyao Zhang & Pan Hu, Study On The Comparison Of Development Efficiency Between Inner And Outer Urban Circles And The Balanced Development Strategy Of Marginal Areas: Analysis Based On The County Scale Of Chongqing 1694

Zsófi Veres, Maintain Temporal Dynamics: What Temporal Characteristic Needs To Be Preserved Within The Historic Marketplaces Of Palermo To Encourage Sustained Interactions? 1716

Xiaohe Zhang & Haixiao Pan, Equity In Essential Services Accessibility Among The Elderly: A Comparison Of Community Resilience During And After The Covid-19 Pandemic 1735

Zihao Chen & Yifan Yu, Study On Youth Friendly Urban Renewal Strategies From An Inclusive Perspective 1755

Yinghui Jia, Lan Wang & Jiankun Lou, Dispersed Urban Spatial Structure And Increased Urban Greenness Could Reduce Intra-City Health Inequalities In England 1766

Yajun Wen & Yifan Yu, Exploring Colour Planning Strategies For Children's Outdoor Playgrounds In Communities: An Analysis Of Children's Diverse Preferences In Shanghai, China 1777

Xiaojie Shen, Enhancing Social Interaction In Urban Spaces: The Role Of Vertical Greening Systems In High-Density Areas 1785

Rebecca Staats, Can Care Help Conceptualise Place Futures? Exploring The Potential Of Care As An Analytical Framework For Understanding Place Qualities 1797

Xiaojie Shen, Enhancing Social Interaction In Urban Spaces: The Role Of Vertical Greening Systems In High-Density Areas 1814

Xiaojie Shen, Enhancing Social Interaction In Urban Spaces: The Role Of Vertical Greening Systems In High-Density Areas 1826

Krity Gera, Peter Hasdell, Gerhard Bruyns & Diego Sepulveda Carmona, Exploring New Methodological Approaches To Mapping Socio-Spatial Mobilities 1838

Yun Yu & Yi Huang, How Are Youth Living In Ageing Neighbourhoods? A Case Study In The Central District Of Shanghai 1855

Angelina Grelle, Embracing Diversity: Ararat's Role In Inclusive Urban Development And Migration In Rome 1867

Carla Baldissera, All-Round Walkability Condition To Primary School In Milan 1878

Ye Zhan & Yifna Yu, Innovative Tools For Building Child-Friendly Communities: The Development And Application Of Child-Friendly Neighbourhood (Cfn) Built Environment Audit Tools, Insights From Shanghai 1890

Track 10: Education **1912**

Yujiao Wang, Xiao Wang, Chenyi Cai & Peng Tang, Deep Learning-Driven Morphological Dataset And Analysis Methods For Chinese Campuses 1913

Xueling Wang, Dynamic Visual Assessment Of Urban Streetscapes: Hengshan Street In Shanghai As A Case Study 1932

Katarzyna Rędzińska, Geospatial Virtual Reality And Planning Ar Laboratory For Education In Spatial Planning 1955

Anna Kaczorowska, Emiliya Popova, Günther H. Filz & Dorota Kamrowska-Zaluska, Building Tomorrow's Urban Futures:Reflections On The "Builddigicraft" Project And The Pursuit Of High-Quality "Baukultur" In Higher Education. 1965

Aleksandra Stupar, Ivan Simic, Vladimir Mihajlov & Aleksandar Grujicic, Embracing The Green Curricula? The New European Bauhaus As A Driver Of Environmental Change In The University Education 1984

Track 11: Housing **1997**

Miao Hu, Housing Improvement In Historic Districts Oriented Towards The People's 'Sense Of Gain' A Case Of Shanghai, China 1998

Lin Zhou & Chen Chen, Towards An Inclusive And Developmental Housing Regime In Chinese Megacities? Evidence From The Implementation Of The Affordable Rental Housing Programme In Shanghai 2007

Jiwen Han & Li Bao, Dynamics, Mechanisms, And Benefits Of Micro-Renewal In Urban Residential Areas A Case Study Of The Xiaoxihu Block In Nanjing 2027

Muzeyyen Anil Senyel Kurkcuoglu, Evaluation Of Fuel Poverty In Urban Regeneration Areas: A Case Study Of Ankara, Türkiye 2046

Teresa Frausin & Elisa Mariavittoria Bertolini, On Housing Affordability. Questioning The European Policy Perspective In Action 2058

Hee-Jung Jun & Jeong Hyun, Social Capital Among Public Housing Residents: A Comparative Study Between Mixed-Income Communities And Independent Public Housing2082

Qianzheng Geng, Ziming Wang, Jiaying Cui & Weizhen Shen, How Shanghai's Urban Heritage Conservation Plan Loses Effect? Paradoxical Governance Goals And Disparities In The Regeneration Of Residential Historic Neighbourhoods 2101

Jiaxin Qi & Yuhang Rao, Research On Informal Residential Space Under Viaducts In Shanghai: From The Perspective Of Socio-Spatial Transformation 2128

Elena Marchigiani & Valentina Novak, Rental Affordability, Housing First And Beyond. A Focus On The City Of Trieste (Italy) 2141

Gonçalo Antunes, João Seixas, Rui Pedro Julião, Jorge Ferreira, Margarida Picanço & Cristina Morgado, Housing Prices In Portugal And The Covid-19 Pandemic 2168

Track 12: Futuring **2187**

Liangkai Deng & De Wang, Individualized Perspective On Spatial Restructuring Of E-Commerce Villages: A Case Study Of Village Q In Shaanxi Province, China 2189

Enze Zhang & Jiaying Huang, Study On The Evolution Characteristies And Collaborative Governance Strategies Of "Production-Living-Ecological" Space At County Level In Loess Hills And Gully Areas–Taking Huangling County As An Example 2200

Elisabetta Vitale Brovarone, Loris Servillo & Alys Solly, Backcasting As A Tool For Governing Transitions Beyond Techno-Solutionism: The Torino2050 And Tomove Projects 2213

Melih Birik & Bahar Aksel Enşici, Projecting The Future: Scenario Building And Storytelling For Holistic Perception Of Future Context. 2223

Lea Petrović Krajnik, Damir Krajnik, Lucija Kustić & Marta Marelić, Scenario Planning Method In Conceiving Future Development Of Peripheral Areas: Island – City – Spatial Interconnecting For The Sustainable City Of Tomorrow 2237

Camilo Vladimir De Lima Amaral, Antonio Di Campli, Srivastava Rishabh & Elisa Verri, Utopias As A Design-Thinking Key For Counter-Hegemonic Ecological Transitions . 2256

Jan Schreurs, Integrating Metaphors For A Planning Ecology. Evaluating The Work Of A Local Quality Platform 2275

Antti Roose & Pille Metspalu, Unravelling A Sustainability Vision In The National Spatial Plan 2294

Miguel L. Navarro-Ligero, Francisco García-Triviño, Manuel Pérez-Docampo & Julio A. Soria-Lara, Prototyping Future Scenarios For Urban Planning Through The Production Of Virtual Reality Scenes 2306

Kersten Nabielek, David Hamers & Rienk Kuiper, Spatial Scenarios As A Tool For Future-Proof Spatial Planning In The Netherlands 2320

Track 13: Theories **2334**

Yosef Jabareen, Theorizing State Dispossessive Planning Vs. Community Self-Determinative Planning: The Case Of The Al-Bostan Palestinian Community Struggle Against The Israeli Planning In East Jerusalem 2335

Siling Chen, Jianing Shi, Jingxin Wang & Jianzhong Huang, Reviewing The Applications And Prospects Of The Concept 'Image Of The City' In Urban Planning Research . . 2355

Loukas Triantis, Planning As Magma. Suggestions From The Work Of Cornelius Castoriadis2367

Elli Papastergiou, Athanasios Kalogeresis & Georgia Pozoukidou, Subjective (Social) Well-Being In The Neighbourhood: A Conceptual Exploration 2382

Thomas Buhler, Isabelle Chesneau & Annabel Richeton, Since When Has Regional Planning Been Vague? An Analysis Of Textual Data From 7 Regional Master Plans Of Ile-De-France Region Between 1939 And 2019 2399

Jarre Parkatti, Reconnecting Planning Theory With Urban Design: Public Space As A Social And Architectural Concern 2416

Yanyun Mao & Jian Zhuo, Adaptive Planning In China: Research Progress, Implementation Effectiveness, And Future Prospects Based On Knowledge Mapping And Meta Analysis 2430

Track 14: Policy Mobility **2451**

Florence Bousquet, Exportation Of The Parisian's Urban Knowledge (1976-2005) 2453

Katerina Christoforaki, Post Covid19 Topiography: Prospects Of The Polycentric Operational Model For A Greek City. 2468

Yue Zhang & Siling Chen, Optimizing Land Resource Allocation And Functional Configuration In High-Tech Industrial Parks: A Case Study Of Chengdu Xinchuan High-Tech Innovation Park 2482

Daniele Soraggi & Valentina Costa, Ligurian Transfer: When Territorial Constraints May Hamper Mobility Policies Replicability 2493

Ludmila Kolouchova, From Global North To Global South: Exploring Creative City Policy Mobilities And Their Urban Impacts 2508

Sara Nafi, Transit-Oriented Development Approach To Social Sustainability, Doha City As A Case Study 2524

Ludmila Kolouchova, From Global North To Global South: Exploring Creative City Policy Mobilities And Their Urban Impacts 2539

Track 15: Histories **2555**

Xiaoxi Guo & Sihan Yang, Retaining Industrial Heritage Publicness: The Interrelationship Of Industrial Heritage And Public Space 2556

Beini Guo, Research On The Protection And Development Of Industrial Heritage In China And Europe Under The Background Of Urban Renewal—The Case Of Hanyeping Company 2593

Jie Tang, Xiaoqi Ye & Haidong Zhou, Research On Sustainable Protection And Inheritance Of Overseas Chinese Hometown Cultural Heritage: A Case Study Of Xiangshan Ancient City 2610

Yimin Wei, Zuobin Wu, Weining Shi, Chao Ma & Wendi Dong, Study On Refining Historical And Cultural Values Of Urban And Rural Areas In Qinghai Province 2626

Weining Shi, Zuobin Wu, Yimin Wei & Wendi Dong, Research On The Construction Of The Tang-Tibet Ancient Road (Qinghai Section) Heritage Corridor From The Perspective Of Cultural Ecology 2642

Xiaoyu Shi, Integrating Curation And Retail In Chinese Urban Commercial Revitalization: The Transnational Exchange Of The Curatorial Concept In Shanghai And Beijing, China 2658

Anjali Krishan Sharma, Planning Histories Of Delhi: Urban Governance Perspective . . . 2670

Bilge Nur Bektaş & Serdar M. A. Nizamoğlu, Interpretation And Presentation Strategies For The Heritage Of The Past: The Case Of Smyrna 2690

Jiaying Cui, Weizhen Shen & Qianzheng Geng, Rural Heritage Governed As Commons: A Case Study Of A Chinese Heritage Village From The Cultural Capital Perspective 2722

Cong Li & Kecheng Liu, An Analysis Of Value Reconstruction In Constructive Protection Practice For Archaeological Site Parks 2742

Track 16: Networks And Data **2764**

Zhehao Song, Jinze Li, Chenyi Cai, Yacheng Song, Yidan Jin & Peng Tang, Digital Modelling And Analysis Of The Network Structure For Residential Historic Areas In China 2766

Yin-Chen Chen, Explore The Improvement Of Humanity-Oriented Transportation Through Adaptive Topology Optimization Of Traffic Networks Using Density Fields 2783

Nataliia Yehorchenkova & Oleksii Yehorchenkov, The Game-Changing Role Of Ai In Urban Development Decision-Making: Trends And Future Perspectives 2791

Haoyang He, Lexun Wang, Jiayu Xu & Yuyang Liu, Citywalk Preference: An Expanded Measurement For Informing Data-Driven Urban Planning Based On Social Media Analytics 2801

Ge Wan & Jianzhong Huang, Spatial Network Characteristics Of Shrinking Areas In Shanghai Metropolitan Area: An Urban-Rural Population Flow Network Analysis . 2821

Fabio Bayro Kaiser, Christa Reicher, Esther Padberg & Sebastian Beisel, Transforming City Regions: Co-Designing Future Planning Education 2842

Burcu Soygüzeloğlu & Fatih Terzi, Insights Into Urban Spatial Dynamics Around Marmaray Stations In Istanbul: Evidence From Social Media Data 2857

Track 17: Risks **2876**

Ye Sun & Chen Chen, Resilience Building Of Tourism Villages Confronting Covid-19 In China's Metropolitan Hinterland: Evidence From Shanghai Metropolitan Area . . . 2878

Qianhui He, Shijie Sun & Jinyi Wang, Reflection And Prospects On Data Sources, Management, And Application In Chinese Smart Cities From The Perspective Of Platform Urbanism 2891

Zhuoxu Qi & Jin Duan, Response To Urban Waterlogging Control Under Different Topographic Conditions 2903

Jiang Wang, Inevitability Of Strengthen The Development Of Public Transport In Large Cities From The Perspective Of Security Resilience 2918

Qing Yuan, Jiuqi Meng & Hong Leng, A Study On The Path Of Enhancing The Social-Ecological System Resilience In Shrinking Small Towns In China 2928

Buri Qi, Jiaqi Lin & Lei He, Research On Assessment Model Of Disaster Prevention Capability Of Urban Residential Area 2939

Po-Yu Yang, Identification And Planning Of Potential Ventilation Corridors: A Case Study Of Wuhu, China 2958

Ruben Akse, Simone Ritter, Vincent Marchau & Wijnand Veeneman, Moving Forward In Uncertainty? A Serious Game For Validating Interventions To Manage Uncertainty In Public-Private Collaboration For Sustainable Mobility 2971

Giulia Motta Zanin, Olga Giovanna Paparusso & María Máñez Costa, Managing Coastal Risks In The Mediterranean Through Participatory Processes. Preliminary Insights From The Metropolitan City Of Bari (Southern Italy) 2987

Chih-Po Hsu & Hsueh-Sheng Chang, Flood Risk Management In The Face Of Climate Change: Strategic Spatial Planning For Integrating River Basin Management And Residual Risk 3003

Nataliia Yehorchenkova & Oleksii Yehorchenkov, Urban Resilience In Eu Cities: Insights From Ukrainian Citizens With An Understanding Of War Risks 3012

Aida Arik, David Chionne, Antoine Brochet, Yvan Renou, Juliette Blanchet, Isabelle Ruin & Jean-Dominique Creutin, How Far Do Decision-Makers See? A Spatiotemporal Investigation Of Flood Risk Governance In A French Alps City 3021

Bilge Nur Bektaş, Serdar M. A. Nizamoğlu & Meltem Şenol Balaban, Risk Management For Urban Heritage: The Case Of Izmir 3037

Guevara Viquez Sofia Na, Saturation As Urban Crisis. Understanding Anthropocene From Two Flooded Cities Of The Global South 3078

Maria Moleiro Dale, Ramon Vivanco, Joerg Rainer Noennig & Jan Barski, Bridging The Gap Between Resilience Research And Resilience Planning In Conflict Contexts. Application Of A Federated Urban Resilience Model Toward Rapid Recovery And Sustainable Development. 3093

Matteo D'ambros & Paola Cigalotto, The Necessity Of New Interconnections Of Multiple Ecosystems In The North East Italian Region Between Natural Hazards And A Desired New Ecology 3106

Track 18: Actor Constellations **3123**

Shufen Hu, Innovations In Semi-Formal Tools And Multi-Actor Cooperation For Urban Design Governance: The Practice Of City Chief Designer System In China 3124

Lena Verlooy, Tim Devos, Griet Juwet, Lilian Sol Cueva, Martijn Van Den Hurk, Antti Roose & Paulo Silva, Conceptualising The Urban Transformative Capacity Of Underprivileged Neighbourhoods Towards Realising Just Energy Transitions 3136

Special Session **3155**

Jiang Wang, Impact Of Tourism Development Process On The Production Space Of Cultural Heritage Sites From The Perspective Of Authenticity 3156

Luca Lazzarini, Maria Chiara Pastore, Israa Mahmoud & Annarita Lapenna, Dis-Integrated Urban Biodiversity: An Analysis Of Urban Policies And Plans In Italy 3163

Nesip Ömer Erem, Özlem Tepeli Türel & Ahmet Türel, Insights Into The Evolution Of Airbnb Accommodations: Beyoğlu Beyond Borders 3173

Constantin Diete, Nguyen Xuan Thinh & Jana Pauline Jegen, Urban Mining Of Mineral Building Materials In The Ruhr Area: A Spatial Analysis 3186

Maria Chiara Pastore Na & Claudia Ida Maria Parenti Na, Urban Forestry Plan: An Overview Through Different Contexts, Governance And Policies 3208

Mauro Baioni, Dispositive-Disposition Dyads As A Lever For Change-Making: The Reconfiguration Of School Spaces Promoted By The Metropolitan Regeneration Program Of Bologna 3222

Stefania Butti, Emanuele Garda, Maria Gattuso, Inaihá Laureano Benincá & Francesca Morganti, Aging In (Urban) Place: A Multidimensional Study To Explore Opportunities For Healthy Longevity In The City 3231

Antonella Marlene Milano, Transhumance Routes As Tourist Destinations: A Concrete Opportunity For Inner Areas Or A Romantic Suggestion? 3240

Giovangiuseppe Vannelli & Sarra Kasri, International, Transdisciplinary And Place-Based Academic Activities: Education, Research And Third Mission. The Experience Carried Out In Sant'eusanio Forconese (L'aquila, Italy) 3265

Enza Lissandrello & Marcus Zepf, Empowerment And Participatory Approaches To Urban Health: The E-City Programme 3278

Online Session **3298**

Marichela Sepe, Achieving Proximity In Public Space: Inclusion, Flexibility And Accessibility 3299

Pan Hu, Keyi Sun, Jialu Cheng & Yu Shi, Evaluation And Spatial Governance Strategies For Old Residential Areas' Renewal And Reconstruction In Urban Downtown Districts: A Case Study Of 70 Old Residential Areas In Changzhou ,China 3315

Hongyu Liu, Women's Participation In The Context Of Urban Renewal In China: A Case Study Of Yulin Community In Chengdu 3332

Jiayu Xie, Zhiqing Zhao & Meilin Zhu, Temporal Evolution And Conservation Of Urban Morphology In Harbin With Space Syntax 3344

Letizia Chiapperino & Mariella Annesa, Inhabiting The Rural Space. Reflections On The Housing Emergency Of Seasonal Workers In Agriculture 3352

Muntasyir Al Wafi, Ece Kurt & Serengul Secmen, Strategies For Small Public Space To Reclaim Urban Green 3367

Xin Zhao & Zuobin Wu, Social Media Text Mining And Flood Disaster Analysis Of Small Towns In Southern Shaanxi Qinba Mountain Area Based On Deep Learning 3384

Eugenia Vincenti, Mattia Bertin & Javier Ruiz Sanchez, Renewing The City Towards A Linear Attractors Frame. Fuor Cases In Iraq. 3395

Semra Niron & Imge Akcakaya Waite, Actors, Collaboration, And Conflict Dynamics In Local Governments' Urban Regeneration Incentive Strategies 3410

Kirsten Dormann, Urban Compounding: Housing What Is And What Could Be 3425

Mengying Tang & Zhenyu Li, Research On Urban Sharing Linear Space Design Based On Walking Experience 3440

Deiny Façanha Costa & Paula Freire Santoro, The Conception Of "Axes" In São Paulo, Brasil: A Mixture Of Travelling Of Managers And Ideas, New Urban Plan Methods, In An Incomplete Incorporation Of Transit Oriented Developments (Tod) Agenda . 3457

Hazal Ertem, Zeynep Elburz & Koray Velibeyoğlu, Critical Urban Infrastructure Within Concept Of Chrono-Urbanism 3474

Poster **3495**

Yuran Zhao, Hong Leng, Yan Zhao & Michele Bonino, Research On Carbon Accounting Methods For Urban Areas Based On Spatial Data Utilization 3496

Wei Wei & Junqiao Li, Investigating The Carbon Elements Based On Remote Sensing, Uav Oblique Photography, And Ai Technologies: A Case Study Of Nanhui New Town, Shanghai 3509

Jonida Meniku, Reflection On The Transformation Of Tirana's Architectural Spaces . . . 3519

Selin Aslan & Fatih Terzi, Assessing Public Sentiments In Post-Urban Regeneration: A Location-Based Analysis Of The Karaköy Salıpazarı, İstanbul 3530
Parashqevi Tashi, Ani Tola & Ani Tashi, Tirana's Housing Units And Parking In 2024 . . 3544

Backcasting as a tool for governing transitions beyond techno-solutionism: the Torino2050 and ToMove projects

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Abstract
The paper addresses the complex and multifaceted issue of how planners, public administrations and scholars can approach high-tech transitions, and more generally the governance of transition to desired futures beyond techno-solutionism. The paper first presents the results of the Torino2050 project, which addressed the issue of governing the transition to autonomous driving. It then discusses how a collaborative backcasting approach will be applied in the recently launched ToMove project, which will test an autonomous public transport shuttle and a robot for last-mile delivery in a quasi-superblock testbed area. The project is promoted by the Municipality of Turin and the authors are involved in setting up a participatory scenario planning process. The project is a useful opportunity to actively involve the public administration in the scenario planning process, taking stock of the lessons learnt in the previous Torino2050 project.

Keywords:
scenario-planning, backcasting, autonomous vehicles, public administrations

1. Introduction

The salvific power of urban smartification should not be taken for granted, nor should its sustainability (Cugurullo et al., 2023). Whereas techno-solutionism which dominates the smart city discourse highlights the potential of new technologies (including AI) for urban efficiency and performance, a passive laissez-faire approach from public administrations can lead to undesired, unexpected and ungovernable outcomes. The deployment of Autonomous Vehicles (AVs), being a dominant manifestation of the emergence of AI in the management and development of cities, fully encapsulates these dilemmas.

The advent of AVs is likely to produce significant changes in how we move and live. Yet, when, how and to what extent these changes will take place is unclear, due to several dimensions of uncertainty. Not only is there high uncertainty about when full automation will reach significant market penetration, but also the direction and intensity of the potential impacts of AVs are

related to how public administrations will intervene in their diffusion. Public administrations need to deal with this challenge, in the short and medium term, but they are often reluctant to take up the challenge (Curtis et al., 2019). This is due to various factors, such as the high levels of uncertainty, the long horizon – much longer than the timeframe of administrative and political offices, for instance – and the lack of sufficient "actionable" information to direct investments or planning priorities. Scenario planning methods (Ariza-Álvarez et al., 2022; Tori et al., 2023) can be very helpful to support public authorities in dealing with these issues, but they rarely enter planning routines.

Aiming to stimulate discussion on these issues, this paper refers to two projects. Firstly, it summarises the results of the Torino2050 project, aimed to address the issue of governing the transition to autonomous driving, defining, through a collaborative backcasting, a policy pathway toward urban liveability and sustainability in Turin (Vitale Brovarone & Staricco, 2023). The process involved public and private actors, and shed light on three very important issues. The first is the power of anticipatory visions and the importance of defining concrete propositions to govern the technological transitions, beyond techno-determinism and towards desired urban futures. The second is the opportunity to ride the wave of the seductive power of technological innovation to promote goals of liveability and reduction of vehicle traffic within urban neighbourhoods. The third is the challenge of actively involving public administrations in the scenario planning processes (Vitale Brovarone et al., 2021).

Secondly, it discusses how backcasting is going to be applied in the recently launched ToMove project, that will test an autonomous public transport shuttle and a robot for last-mile delivery in a quasi-superblock testbed area. The project is promoted by the Municipality of Turin, and the authors, as part of the FULL-Future Urban Legacy Lab of Politecnico di Torino, are involved to set up a participatory scenario-planning process. In this case, the public administration is leading the process, and has accepted the researchers' proposal to use backcasting as a tool to envision a desired future and govern the transition to it, seeing AVs as just a small part of a desired future. The project is therefore a useful opportunity to actively involve the public administration in the scenario-planning process, taking stock of the lessons learnt in the Torino2050 project.

2. Scenario planning

In recent years, scenarios have been increasingly used to support decision makers to engage with uncertainty. For example, in the transport sector scenario planning is a well-known method to help solve future mobility challenges of cities (Tori et al., 2023). Nevertheless, as Cordova-Pozo and Rouwette (2023: 1) point out, three main challenges "limit the spread and the usefulness of scenario planning: conceptual confusion, methodological chaos, and scarcity of evidence on its effectiveness". Moreover, visions and scenarios are often acontextual as they do not refer to real case studies. This can be seen in the literature on AVs, where scenario planning frequently does not refer to the real spaces in which these vehicles will be circulating and parking (Staricco et al., 2019).

The process of scenario building foresees the delineation of a number of scenarios (generally three), including the reference scenario (usually referred to as the 'Business as Usual' or 'BAU scenario'), that is used to compare desirable futures. An important part of scenario building process is also the identification of key factors, which "may determine qualitatively different paths for the socio-economic environment" (Stead & Vaddadi, 2019: 127). The timeframes of scenarios can vary: they can be developed for both the medium term (e.g. 5-10 years) and the long term (10 years or more).

According to Stead and Vadaddi (2019), scenarios can be quantitative or qualitative. However, both quantitative and qualitative scenario methods seem to carry a certain number of disadvantages. For example, Weimer-Jehle (2006) argues that the complexity of quantitative methods often makes it difficult to involve stakeholders in a scenario building process. To counter these disadvantages, mixed-methods approaches, such as the cross-impact balance (CIB) development of socio-technical scenarios could be used (Tori et al., 2023).

Stead & Vaddadi (2019) identify three main approaches to scenario construction: (i) the forecasting approach; (ii) the exploratory approach; and (iii) the backcasting approach. The forecasting approach is often quantitative, where substantial change is not expected and current trends continue in the future. The exploratory approach is usually interactive and involves the identification of key independent and dependent variables. The backcasting approach is a widely known normative scenario method, which formulates future visions and goes backwards to define the actions needed to achieve them. It is often used to look at long-term futures, examining the way in which the desirable future can be reached. To do this, expert stakeholder participation is expected throughout the various phases of the analysis. It then delineates a set of criteria and policy pathways to support decision makers.

In the following sections, this paper presents, examines and discusses how a backcasting scenario planning approach is being applied to a real context in the City of Turin.

3. The case study of Turin

The case study focuses on the City of Turin, located in the north-west of Italy. Known as the 'city of the car', the city has deep roots in its economic specialization in the automotive sector. Although its economy is no longer centred on the automotive industry, today the local population is largely car dependent and presents high ownership rates, among the highest in Europe. The public transportation system is underused, as well as the bicycle and car sharing networks and services. Nevertheless, the presence of a technologically advanced public infrastructure for the management of the local mobility has led to the designation of Turin among the first cities in Italy for the national experimentation of the 'Torino Smart Road' project.

In 2018, it was the first Italian city to have launched a pilot project, the 'Torino Smart Road', to experiment with the circulation of AVs on public roads. One of the most significant results of the initiative was the definition of a 35 km urban circuit on which innovative autonomous and sustainable mobility solutions could be tested on a real road network (Figure 1). This real-world experiment has helped to place Turin at the forefront as regards the transition to AVs.



Figure 1. A road in Turin equipped with technologies needed to test autonomous vehicles (Source: Scudellari et al., 2020).

In 2021, the City adopted its Sustainable Urban Mobility Plan, which will regulate actions and interventions with a time horizon of ten years (up to 2030), developing a vision of the mobility and transport system that could improve the quality of life of citizens. Moreover, the City of Turin is one of the 100 European 'Mission Cities' that is committed to reducing emissions by 2030, i.e. it is a hub of experimentation and innovation in the climate sector.

4. The Torino2050 project

This section summarises the results of the Torino2050 project[1], which addressed the issue of governing the transition to autonomous driving in the City of Turin. In particular, the research project focused on the possible impacts of the diffusion of AVs, as well as the policy strategies and instruments (e.g. transport and land use policies) that should be adopted to govern them. In fact, one of the aims of the project was to provide policy guidelines that the public administration could implement in the short, medium and long term, to guide the transition of autonomous driving towards a future scenario based on the sustainability and liveability of the urban environment. To do this, the research adopted a collaborative backcasting approach, involving both public and private stakeholders, in order to define a future vision and the actions needed to achieve it. In particular, the project involved the participation of the various stakeholders (e.g. public administration, private companies, non-profit associations) throughout all of the phases of the project. This strong collaboration allowed the research group to deepen the technical knowledge of autonomous driving systems, as well as the understanding of the potentials and risks of these new means of travel (Scudellari et al., 2020). Finally, the project defined a policy pathway toward urban liveability and sustainability (Vitale Brovarone & Staricco, 2023), where the diffusion of AVs could be managed in an integrated and sustainable way.

[1] The project "Governare l'impatto spaziale e territoriale della diffusione di Veicoli a Guida Autonoma" was carried out by the Interuniversity Department of Regional and Urban Studies and Planning (DIST) of the Politecnico di Torino.

As mentioned above, the study adopted a backcasting approach, formulating future visions and going backwards to define the actions needed to achieve them. The visioning exercise was carried out in three different phases (Staricco et al., 2019): (i) the development of three visions by the research group; (ii) the validation of the three visions through a focus group with expert stakeholders, and (iii) the selection of the most advisable vision through a set of more than 50 interviews with expert stakeholders. The first two steps were based on a think-tank model, whereas the third was grounded on a participatory model.

In the first phase, three long-term visions (2050) for the city of Turin were delineated:

(i) a 'business as usual' scenario (Vision 1), in which the diffusion of AVs would not be explicitly governed, not their positive or negative impacts;

(ii) an optimistic and technology centred scenario (Vision 2, strong deregulation), which assumed that the impacts of AVs on the city would be largely positive;

(iii) a pessimistic scenario (Vision 3, strong regulation), which presumed that the negative impacts of AVs on the city would prevail if not properly managed.

The three visions were defined with reference to fourteen items: i) road hierarchy, based on the articulation into main roads and local roads; ii) limitation to vehicle circulation; iii) parking areas, with a specific focus on roadside parking and areas to pick-up/drop-off the passengers, multilevel parking, and intermodal parking; iv) local public transport, with specific focuses on the main lines, feeder capillary network and reserved lanes; v) shared mobility, differentiated between motorised and non-motorised services (e.g. bike-sharing); vi) pedestrian areas; vii) bicycle facilities; and viii) modal split.

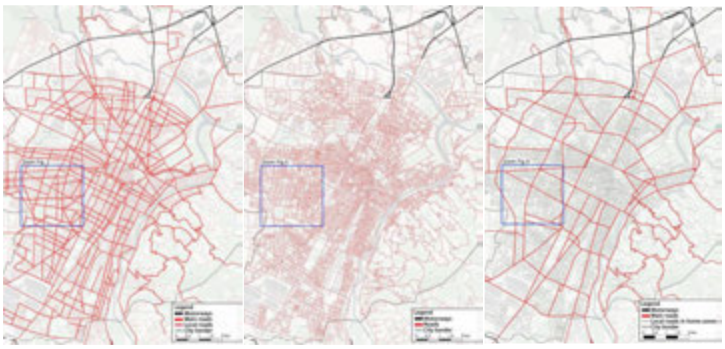


Figure 2. Road hierarchy in the three visions (Source: Staricco et al., 2019: 9, 11 and 13).

In the second phase, a focus group was organised and seven local experts in the transport sector (e.g. from the municipal and metropolitan administration, public transport authority, and third-sector associations) were invited to discuss and validate the three visions and assess their advisability and sustainability.

In the third phase, the seven experts who participated in the focus group and 44 other local stakeholders were interviewed to identify the most advisable of the three validated visions. The stakeholders were chosen in order to cover a wide range of actors interested in the possible future impacts of AVs in the City, such as: automotive companies, research centres, public administration, and environmentalist or professional associations. Finally, Vision 3 (strong regulation) was considered to be the most advisable, Vision 1 (business as usual) ranked second and Vision 2 (strong regulation) was deemed the least advisable.

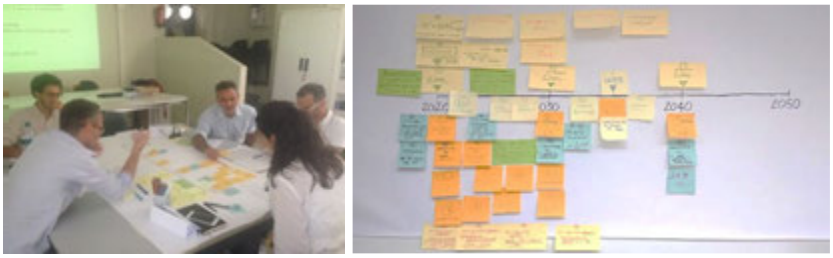


Figure 3. Policy pathway outcome of the Torino2050 collaborative backcasting (Source: Staricco et al., 2020).

The project has shed useful light on three very important issues. The first is the power of anticipatory visions and the importance of defining concrete propositions to govern the technological transitions, beyond techno-determinism and towards desired urban futures. The second is the opportunity to ride the wave of the seductive power of technological innovation to promote goals of liveability and reduction of vehicle traffic within urban neighbourhoods. The third is the challenge of actively involving public administrations in the scenario planning processes (Vitale Brovarone et al., 2021).

5. The ToMove project

Building on the lessons learnt in the Torino2050 project, this section looks at how backcasting is going to be applied in the recently launched ToMove project. The project is led by the City of Turin, and funded with 7 million euros by the National Recovery and Resilience Plan. The overarching aim of the ToMove project is to test an autonomous public transport shuttle and a robot for last-mile delivery in a quasi-superblock testbed area of the City of Turin. To do this, the project foresees a Living Lab, which focuses on the co-design of innovative and sustainable autonomous mobility solutions. As mentioned above, the project is promoted by the Municipality of Turin, and the authors, as part of the F*UL*L (Future *Urban Legacy* Lab) of the Politecnico di Torino, are involved in setting up a participatory scenario-planning process. The public administration has accepted the researchers' proposal to use backcasting as a tool to envision a long-term desired future and govern the transition to it, thus seeing AVs as just one part of a desired future. The project is therefore a useful opportunity to actively involve the public administration in the scenario-planning process. The aim is to actively involve the public administration from the beginning and throughout the various phases of the scenario planning process, thus facing one of the challenges which emerged from the previous Torino 2050 project.

Starting from the test area of the autonomous public shuttle of the ToMove project, envisaged near the Einaudi Campus of the Università di Torino, the scenario planning activity intends to look at a larger urban area, which can experiment with various different integrated forms of mobility. Referring to the approaches of organizing the urban fabric into superblocks (as in the well-known case of Barcelona, which many other cities are taking inspiration from), the area subject to experimentation includes the Vanchiglietta district and its immediate surroundings (Figure 4). The objective is to stimulate a broader reflection on the future of this part of the city, where important urban transformation projects are currently being implemented (e.g. projects involving green and blue infrastructures, redesigning public spaces, addressing climate neutrality, etc.). The study also takes into consideration current and future urban transformations in the test area and its surroundings, such as the former Italgas gasometer area

and the transformations along the riverside areas and the related parks, like the Meisino Park and the Fausto Coppi Motovelodromo.

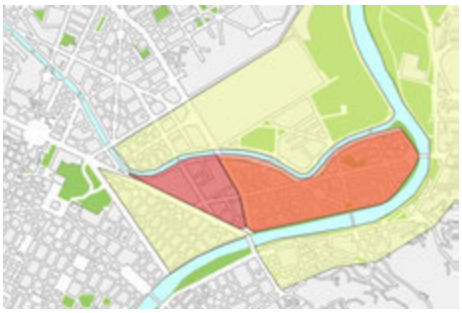


Figure 4. The testing area (in red), the Vanchiglietta area (in orange) and the interface areas (in yellow). Source: own elaboration.

There are various considerations underlying this choice, partly morphological and partly concerning the transformative urban potential. First, the area is contiguous with the autonomous mobility experimentation area around the block within which the Einaudi Campus is located. The extension of the area will provide access to a greater urban area in which to outline strategic transformation scenarios. Second, the spatial conformation of the area along its main road (Corso Belgio), an ogive shape surrounded by the rivers Dora and Po, which is relatively isolated with less than a dozen accesses via bridges lends itself to a reflection on the overall transformation. Third, there are various transformation processes already underway, in particular around the Einaudi Campus of the University of Turin and a former gasometer site. Fourth, the interface area extends north to the city's important monumental cemetery, partly because it is an attractor at an urban scale and partly because the area between the cemetery and the Dora is also relatively isolated. Fifth, the area offers possible solutions to support a redesign of mobility strategies on a larger scale, also through MaaS (Mobility as a Service) solutions. Moreover, this urban area is ideal for supporting a greater valorisation of the area along the rivers, as well as for integrating soft mobility routes.

The scenario planning activity goes beyond the experimental dimension carried out through autonomous driving tests, seeing AVs just as a part of a desired future. In fact, it aims to accompany a reflection on the future of this part of the city from various aspects, such as: innovative mobility (e.g. public transport, sharing mobility, bike lanes), urban regeneration (e.g. urban transformation projects, the redesigning of public spaces) and environmental sustainability (e.g. energy transition, circular economy, urban greening). The ToMove Living Lab also pursues the objectives of energy and environmental sustainability in line with the commitments undertaken within the European programme "100 Climate-Neutral Cities by 2030 - by and for Citizens", in which the City of Turin participates (see Section 3 above). It could be interesting, moreover, to exploit the momentum of Climate-Neutral Cities, where the concept of new mobility with MaaS services would be more visible on both a larger and smaller scale.

In order to co-design a new innovative mobility, the project involves the introduction of the concept of superblock, and the rethinking of public spaces, according to a principle of integration and diversification. In particular, these are the interventions that could be discussed with the various stakeholders and citizens: (i) the rethinking of vehicular traffic by concentrating it on some key sections; (ii) the possibility of using limited transit or pedestrianised areas; (iii) the connection with the areas along the river; (iv) the rethinking/connection with public transport lines; (v) the connection with MaaS systems,

creating exchange hubs; (vi) the taking into consideration of some of the major urban attractors (Einaudi Campus, former Italgas hub, monumental cemetery, etc.) and the customization of travel plans and integrated modes; (vii) indications for the redesigning of public spaces gained through the rethinking of vehicular transit spaces.

The project also looks at the overall normative framework, such as urban planning regulations: the comprehensive plan (Piano Regolatore Generale, PRG) and the various sectoral plans, such as the Sustainable Urban Mobility Plan (SUMP, Piano Urbano della Mobilità Sostenibile) of the Metropolitan City of Turin. Moreover, the test area, due to its particular location, offers the possibility of thinking about possible partnerships with carpooling systems, for innovative mobility services. Finally, the scenario planning will also consider how to integrate the topic of last mile logistics within the area. The scenario planning activity will be carried out within a CityLab[2], adopting the collaborative backcasting method, indicated in the literature as particularly suitable for supporting local authorities in the definition of transition pathways and policy packages towards desired visions for the medium and long term in contexts characterised by multiple elements of uncertainty.

As explained in Section 4 above, the collaborative backcasting method has already been tested by the research group as part of the "Torino2050 – Governing the impacts of the transition towards autonomous driving" project (Scudellari et al., 2019; Vitale Brovarone et al. 2021). The involvement of stakeholders will be based on the experience of the research group and the most recent indications from the scientific literature on scenario planning (Ariza-Álvarez et al., 2022; Tori et al., 2023). The backcasting approach is divided into different temporal and spatial levels (test area / extended area; ten-year scans) and is organised in five work phases:

i) a preliminary phase of identifying stakeholders;

ii) a visioning phase, with a pre-configuration of the different scenarios (there are usually three alternative visions of desirable futures, including the business as usual scenario) and of the transformation drivers;

iii) an interaction phase with experts and stakeholders (focus groups, interviews) to validate the scenarios, evaluate their strengths/weaknesses and select the desired scenario, to which the subsequent backcasting phase refers;

iv) a backcasting phase, for the definition of a policy pathway and the identification of different policy packages, i.e. sets of integrated policies to support the transition towards the desired future. These policy packages will then be evaluated against a series of criteria (e.g. environmental, social and economic). The backcasting operation will be conducted collaboratively, with the direct involvement of the stakeholders, followed by the re-elaboration and systematisation of the results by the research group.

v) a collective public restitution event. The results will be collected in a report that can inform and support the strategic plans and the definition of general (e.g. urban development policies) and sectoral (e.g. SUMP) guidelines of the City of Turin.

As regards the stakeholder involvement, four macro-categories of stakeholders will be involved in the process: (i) public administration; (ii) mobility and ICT services; (iii) research and consultancy; (iv) citizens' associations.

[2] Method already tested in Turin for the project financed by the Compagnia di San Paolo "Mover La Movida", proposed by the Municipality of Turin, and reported in the research report "Vivere, convivere, far vivere la notte a Torino" (Mangione et al., 2023).

6. Conclusions and future directions

As pointed out in the Introduction, today smart cities are dominated by techno-solutionism, pressing for more urban efficiency and enhanced performance. At the same time, the current advent of AVs is bringing a high level of uncertainty to urban areas. Public administrations and decision makers need to face this rising challenge but are often reluctant to do so (Curtis et al., 2019), which may lead to undesired, unexpected and ungovernable outcomes. Nevertheless, scenario planning seems to effectively support public authorities to deal with uncertainty, as well as to plan in such a long-term timeframe.

Both the Torino2050 and the ToMove (even if the latter is currently at an early stage) projects have shed light on a number of relevant issues as regards the application of scenario planning in the City of Turin. First, the governance structure of the urban environment is of fundamental importance to guide the future transition of cities. The urban normative framework, such as planning regulations and sectoral plans (e.g. the urban mobility plan), has a key role in shaping the desired future development of cities. As seen in the Torino2050 project, the "regulation of AV circulation and parking is likely to play an important role in governing the impacts of this innovation on the city" (Staricco et al., 2019: 17). Second, scenario planning seems to be a very useful instrument for decision makers in order to plan uncertainty. Moreover, as González-González et al. point out "in contrast with more commonly used forecasting approaches, backcasting provides a way of imagining a desirable future and identifying a set of core goals on which key decisions can be made" (2019: 153). It also seems that an active involvement of the public administration (as well as expert actors) during the different phases of the scenario planning processes helps the delineation and the evaluation of future scenarios. Finally, the literature on scenario planning seems to be mostly acontextual and a high number of studies seem to focus more on mobility issues rather than general planning issues. The case study of the City of Turin aims to help fill this gap and it is hoped that the ongoing implementation of the collaborative backcasting approach in the scenario planning will provide further fruitful results and considerations that can then be usefully applied in other contexts.

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