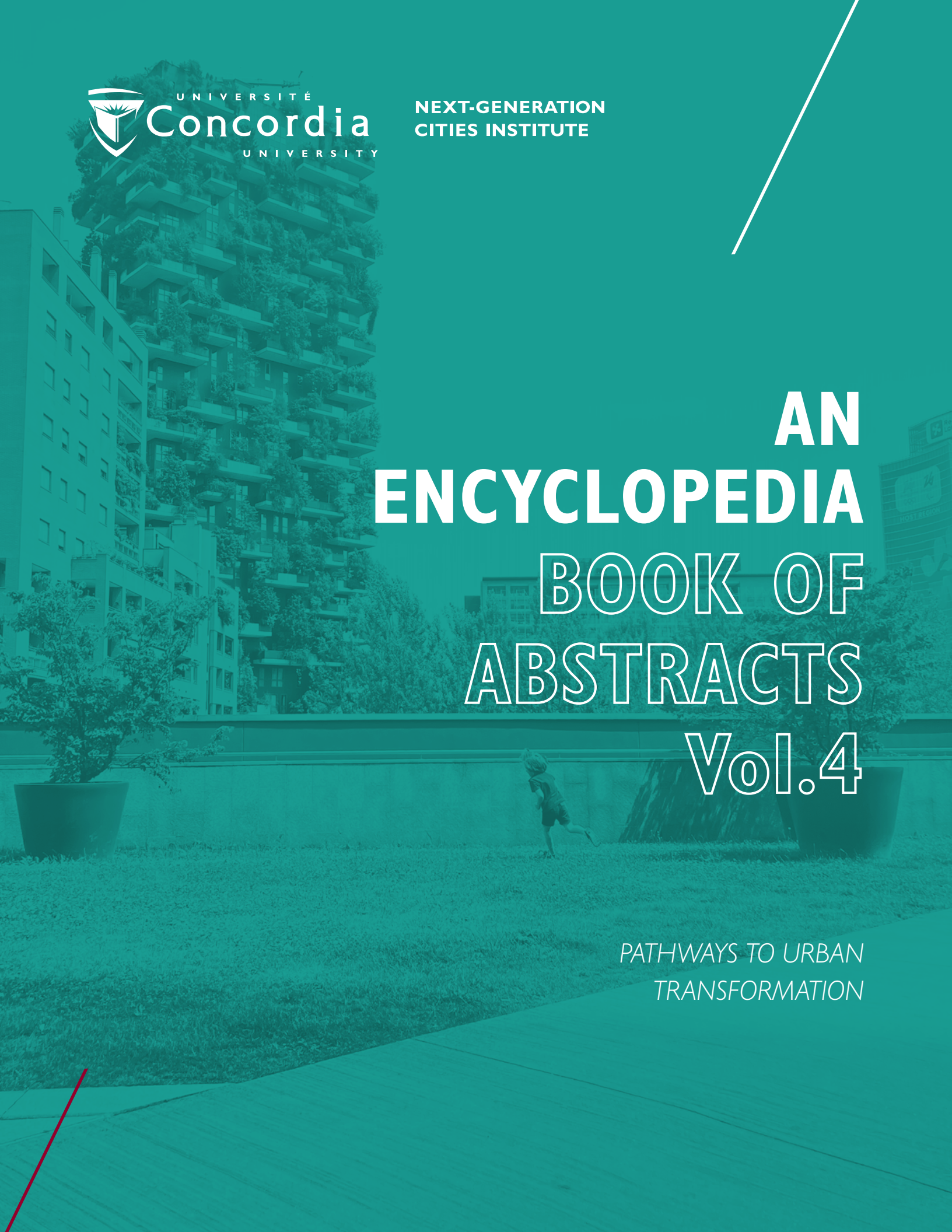


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NEXT-GENERATION CITIES INSTITUTE

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PATHWAYS TO URBAN TRANSFORMATION

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“THE FUTURE OF THE CITY”

INDEX

INTRODUCTION

TRANSFORMING CITIES: PATHWAYS TO ZERO CARBON, EQUITABLE, AND INCLUSIVE COMMUNITIES 7
Ursula EICKER, Baron TYMAS, Silvano DE LA LLATA, Pierre GAUTHIER, Erkan YÖNDER, Chun WANG, Govind GOPAKUMAR

PART 1

TRANSFORMING CITIES 11

V4_P01_C01
EMPOWERING CITIES IN THE RACE TO A JUST NET-ZERO TRANSITION 13
Hannah ABDULLAH, Ursula EICKER, Karim ELGENDY, Roxana Dela FIAMOR, Namita KAMBLI, Adeline ROCHET

V4_P01_C02
URBAN DEVELOPMENT AND CITIES IN THE GLOBAL SOUTH 15
Sreelakshmi RAMACHANDRAN, Govind GOPAKUMAR

V4_P01_C03
THE IMPORTANCE OF URBAN ECOLOGICAL INFRASTRUCTURE FOR BIODIVERSITY AND ECOSYSTEM SERVICES 17
Carly ZITER

V4_P01_C04
CHALLENGES FOR A MORE SUSTAINABLE FUTURE FOR INFORMAL URBAN SETTLEMENTS 19
Elaine VARELA, Jordi MORATÓ

V4_P01_C05
SUSTAINABLE URBAN MOBILITY: SHAPING CITIES OF THE FUTURE THROUGH THE SDGS 21
Jenny CHAVERRI

V4_P01_C06
FUTURE OF URBAN MOBILITY: CAN TRANSIT-ORIENTED DEVELOPMENT (TOD) HELP ENDING AUTOMOBILE DEPENDENCE? 23
Ahad FARNOOD, Govind GOPAKUMAR, Pierre GAUTHIER

V4_P01_C07
THE 15-MINUTE CITY: SOLUTIONS FOR SUSTAINABLE MOBILITY 25
Ahad FARNOOD, Ursula EICKER

V4_P01_C08
THE NEED FOR A NEW LEAGUE OF COMMUNITIES TO LEAD THE SHIFT TO SUSTAINABILITY 27
Daniel HOORNWEG

PART 2

SUSTAINABLE BUILT ENVIRONMENT 29

V4_P02_C01
TRANSFORMATIVE CHANGE IN REAL ESTATE; YIELD DEVELOPMENT PARADIGM AS A STRATEGIC DECISION-MAKING SUSTAINABILITY FRAMEWORK FOR IMPACT 31
Natalie VOLAND, Martin TOWNSEND, Ursula EICKER

V4_P02_C02
COMMUNITY ENGAGEMENT FOR ECO DISTRICTS IN A CROSS-STAKEHOLDER PARTICIPATORY GOVERNANCE FRAMEWORK: A CASE STUDY IN LACHINE-EST, MONTREAL 33
Natalie VOLAND, Myriam GRONDIN, Ursula EICKER

V4_P02_C03
ESG, A QUESTION OF SURVIVAL FOR BANKS AND THEIR CLIENTS? VALUE CREATION IN COMMERCIAL REAL ESTATE 35
René DEMERS, Julien ALARIE

V4_P02_C04
CONTESTED PLACES FOR SUSTAINABILITY: MAPPING INTERPRETATIONS OF SUSTAINABILITY IN THE CONTEXT OF BROWNFIELD REDEVELOPMENT 37
Veera TURKU, Ursula EICKER, Pierre GAUTHIER

V4_P02_C05
POSITIVE ENERGY DISTRICTS: TRANSFORMING URBAN AREAS INTO HIGH EFFICIENCY DISTRICTS WITH LOCAL RENEWABLE GENERATION AND STORAGE 39
Ursula EICKER, Andrea GABALDON MORENO

V4_P02_C06
FINANCING SUSTAINABILITY IN THE REAL ESTATE SECTOR: CHALLENGES AND OPPORTUNITIES 41
Thomas WALKER

V4_P02_C07
FINANCING INFRASTRUCTURES IN NEXT-GENERATION CITIES 43
Yunping LIANG

PART 3

LIVING LABS, LESSONS LEARNED, CASE STUDIES 45

V4_P03_C01
INNOVATION IN MUNICIPAL GOVERNANCE 47
Anaïs DEL BONO, Marguerite MENDELL

V4_P03_C02
LIVING LAB TYPOLOGIES AND METHODOLOGIES TO SHAPE THE NEXT GENERATION OF CITIES PRO-ACTIVELY 49
Michael BOSSERT

V4_P03_C03
LAB BATLLÓ, THE URBAN LIVING LAB OF CAN BATLLÓ IN BARCELONA: FROM AN INITIAL DESIGN OF AN INNOVATION LIVING LAB TO THE CRYSTALLIZATION OF BOTTOM-UP STRATEGIES THROUGH THE ENERGY COMMUNITY OF LA BORDETA 51
Oriol GAVALDÀ

V4_P03_C04
THE ABC ACCELERATOR: A MULTISTAKEHOLDER CONCORDIA UNIVERSITY HANDS-ON INITIATIVE TO SCALE IMPACT UPTAKE IN PRIVATE REAL ESTATE 53
Oriol GAVALDÀ, Natalie VOLAND, Ursula EICKER



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INTRODUCTION
TRANSFORMING CITIES: PATHWAYS TO ZERO CARBON, EQUITABLE, AND INCLUSIVE COMMUNITIES

Cities house most of the world's population, are hotbeds of innovation, power the global economy, and provide diverse social and cultural experiences and encounters. Yet, cities also entrench inequalities and unsustainability within infrastructure systems while consuming vast amounts of natural resources and creating much of the global polluting emissions. Against this background, it is imperative that we design and rebuild the next generation of cities as inclusive, collaborative, ecological spaces that ensure that marginalized urban communities are given access to effect change that matters to them.

In this fourth and final volume of the Next Generation Cities Encyclopedia, we intend to develop a paradigm shift of (re) building processes for sustainable and resilient communities and cities. The approach will offer cities multiple, interconnected pathways towards accelerating change: an integrated framework for transforming to next-generation cities will connect processes that have been historically dealt with in silos, while transformation scenarios will be imagined and brought to real life via living lab use cases to experiment, showcase and learn from.

The scope of the challenge requires an action-oriented pathway to a Next-Generation City. Such a pathway needs to provide an alternate paradigm to the overly techno-optimist pathway of Smart Cities and center on a value orientation of empowerment, transparency, and sustainability to achieve next-generation goals of equity, collaboration, ecology, and vibrancy. Briefly stated, the novelty stems from the ability to inform the rapid and layered urban change pathway with value commitments and co-creation processes. We see the next ten years as a time window within which we fundamentally change how we live and move in cities and how we run our industries. This "Decade of Action" requires out-of-the-box approaches, fast interventions, and rapid prototyping/ experimenting through which to lay an accelerated pathway of change.

Sustainability experimentation in cities is often driven by stakeholders seeing opportunity spaces. City networks such as C40, ICLEI, 100 Resilient Cities, the Global Covenant of Mayors, and many others can help to trigger competition to run more and more living lab experiments so as to join the front runners of sustainable cities.

We understand local urban issues as wicked problems that defy simple prescriptive solutions. Instead, we propose co-designed solutions through processes that bring together stakeholders and concerned community groups to simulate and test solutions. Scalable and replicable urban sustainability projects take a long time to build, monitor, and transfer experience. Here, urban simulation based on a fully digital representation of the city and big urban data offers significant gains in supporting rapid scale-up. A major novelty is using digital twins with their big data content in novel urban user experiences and interaction platforms. If diverse stakeholders can easily access data, playfully create scenarios, and debate modeling outcomes, digital twins will truly support next-generation city transformation. Co-creating scenarios with multiple stakeholders, from the community to the corporate and municipal world, and assessing various sustainable development goals (SDGs) and their targets will allow more cohesive and inclusive urban sustainability solutions.

There is high risk at all levels of this approach, from the framework setting and oscillation between grassroots community work and the corporate world's technology solution, over the effort of multi-scale modeling of an extremely complex urban system, up to the challenge of raising finance to implement large living labs that can be built, tested, and scaled up quickly.

The novelty of our approach arises from the attention to several process-level factors: adopting a hybrid change pathway that incorporates biophysical, sociocultural, sociotechnical, and techno-economic elements; enacting actions rapidly within multiple living labs to respond to climate change urgently; framing efforts around citizen's actions; and adopting a co-design approach that incorporates value commitments of empowerment, sustainability, and transparency to guide change. While science-based technological directions could provide solutions, these solutions need to be guided by specific value orientations and process-level details. Doing so will ensure that our climate and SDG goals are achieved while ensuring that our future cities are vibrant, equitable, and sustainable. Such an inclusive process orientation will not only enhance buy-in from different groups but will also leverage the success of our effort. However, the proposed process of co-designing solutions also generates risk. Since outcomes are co-created, clear and predictable results give way to a dynamic process with results emerging in situ. Furthermore, since courses of action emerge locally, their mobilization is contingent upon local factors that may not translate into scalable outcomes. Local approaches to change tend to be ad hoc, in service of a particular outcome and are not evaluated. This leads to high transaction costs for reinventing the approach, time and again, slower progress of implementing the actions needed to achieve the goals, misfits between the solutions being implemented and problems as perceived by local stakeholders and citizens, and the absence of a more holistic understanding of the contribution of the innovation to the future city. We aim to develop the foundations on how local stakeholders can be catalysts for engaging urban communities to co-create human and environment-centered solutions that align local action with global Sustainable Development Goals (SDG) and, more specifically, zero carbon targets.

We posit that the slowness of the transition toward a zero-emission way of life, the restoration of natural systems, and the building of material and social resilience are due to the difficulty in mobilizing and coordinating the efforts of organizations, companies, municipal or governmental actors and citizens towards concrete, well defined, targeted strategic initiatives. By "strategic," we

mean transformations that produce immediate and significant effects instead of incremental change. By "targeted," we aim for initiatives that have measurable impacts against emissions reduction targets, increase natural and human-made systems' resilience benchmarks, and quality of life indicators. To be "well defined," such ambitious initiatives require a framework on carbon accounting rules and scopes and inter-generational justice reflections to establish criteria and targets to be achieved within the next few years.

The difficulties stem in part from a silo approach that impedes the ability to address the systemic nature of most of the causes and effects of the heavy environmental footprint associated with our way of life in urban contexts (for instance, the links between urban forms and configurations, land-use distribution, and transportation; the food and goods provisioning systems; urban sprawl impacts on land coverage and their implications on biomass, ecosystems, and hydrological system, etc.). We need to reduce our greenhouse gas emissions now and simultaneously increase the resilience of our built, ecological, and social systems, keeping in mind that these aspects are interrelated. One key challenge pertains to the inability to relate the impacts of one's actions to the overall carbon footprint since some of those actions contribute to the problem indirectly or through snowballing dynamics. In short, it is often impossible for the actors to fully appreciate the nature and extent of the impacts of mundane and often seemingly innocuous actions.

The same argument could be made about how to engage in remediation actions. It is challenging for well-informed and well-intentioned individuals and organizations to engage in concrete initiatives requiring coordinated efforts. Top-down approaches can change boundary conditions, such as carbon taxes, but are often ineffective in engaging citizens. At the same time, traditional participatory processes seem too slow and rigid to frame decision-making. The urgency of the situation calls for exceptional measures. The usual development processes that engage the public, private, and community sectors in isolation or concert are too slow and severely lacking in coherence. The climate emergency requires bold new ways of mobilizing citizens, governments, and the corporate world to design and deliver zero-carbon solutions for the built environment, transportation system, urban goods, water, and waste handling. The approach of fast and intuitive access to status quo information, the co-creation and modeling of scenarios, and the testing in neighborhood scale prototypes or city-wide policies should provide the tools and methods needed to speed up local development projects and transfer the lessons learned.

Our vision is to create local action-oriented research hubs that integrate academic, municipal, and corporate actors and lead the development of innovative and inclusive zero-carbon neighborhoods. Successful local actions will be spread across existing cities' networks to reach the fast scale-up needed.

If we can succeed in mobilizing the local community at large to co-design large-scale zero-carbon sustainability living labs and transfer the experience to other cities, it could transform the way we live, work, and play in next-generation cities and contribute to putting a halt to climate change.

PART 1
TRANSFORMING CITIES



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Dr. Abdullah holds a PhD in sociology from the London School of Economics. Her research is focused on sustainable urban development and climate justice. She held research and teaching positions at the LSE, University of Leipzig, and Pompeu Fabra University. She was a senior research fellow at the Barcelona Centre for International Affairs (CIDOB), where she worked with the Barcelona City Council.



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Karim holds a master's degree from Berkeley in Urban Sustainability and Climate Change. He is the Founder and Coordinator of Carboun, an initiative promoting sustainability in Middle Eastern and North African cities. His interests include urban sustainability and resilience, climate policy, energy transition, and urban metabolism. He is a chartered member of the Royal Institute of British Architects and holds the World Green Building Council
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Roxana Dela FIAMOR

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A community-builder at heart, Roxana has worked with grassroots communities on four continents, engaging in a variety of service projects. Her research focuses on place-based transitions, where climate policies interact with people's aspirations. She views finance as a key enabler of the transformation. Her primary focus is bridging the gap between financial institutions, the public sector, and civil society organizations to drive positive climate impact.



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As an urbanist with a strong sense of justice, Namita focuses on the nexus between social, climate, and democracy, emphasizing a fast and fair transition.



Adeline ROCHET

Program Manager, Corporate Leaders Group Europe at the Cam- bridge Institute for Sustainability Leadership, Brussels

Adeline has worked in Brussels policy space since 2009, when she worked for the European Parliament. She moved into climate philanthropy after a decade when she became a Senior Policy Adviser at the climate think tank E3G on building decarbonization.

KEYWORDS

#MULTILEVEL CLIMATE GOVERNANCE #CLIMATE AND SOCIAL GOALS
#CROSS-SECTOR TECHNICAL AND FINANCING SOLUTIONS
#DIGITAL AND GREEN AGENDAS #URBAN ENERGY TRANSITION
#URBAN CLIMATE POLICIES #G20

EMPOWERING CITIES IN THE RACE TO A JUST NET-ZERO TRANSITION

Cities are where climate change battles will be won or lost. We propose a dedicated agenda on urban climate governance with five key focus areas. These five areas reflect a forward-looking approach across different governance, technical, and financial aspects in which cities require more support: (i) strengthened multilevel climate governance processes, (ii) broadened just transition to advance climate and social goals, (iii) new multilevel and cross-sector technical and financing solutions, (iv) linking the digital and green agendas to drive the urban energy transition (v) and more robust urban climate data.

To progress in the five action areas, cities require more governance, and technical and financial support from national governments and international organizations. Legal reforms and pioneering legislation are emerging as further areas where multilevel government cooperation is needed to implement innovative urban climate policies such as ultra-low emission zones and zero-carbon building standards or to make city climate action plans as binding as possible.

This work has been done as a policy paper for the G20, which includes not only the world's highest emitting countries but also some of the most urbanized. We recommend close cooperation with local partners on this agenda to ensure coherence and leverage existing cooperation structures.



Sreelakshmi RAMACHANDRAN

PhD Candidate, Junior Associate at the Loyola Sustainability Research Centre at Concordia University, Canada

Sreelakshmi is interested in understanding the institutional linkages behind various urban experimentation efforts that have sprung up recently in Indian cities. Specifically, she examines Urban Living Labs (ULLs) and the various interventions they test in active mobility, street re-ordering, and other low-carbon mobility initiatives. Sree seeks to investigate the role of ULLs in the longer-term urban rejuvenation project in the face of trends like embedding automobility, demographic shifts, and climate change. She is also interested in active mobility as captive modes, actors in the stakeholder matrix of mobility policy making, and the intersections between women's mobility and livelihoods.



Govind GOPAKUMAR

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Dr. Gopakumar has received many prestigious awards, including the National Science Foundation's (USA) Dissertation Improvement Grant. He is the 2010 recipient of the Robert Boguslaw Award for Technology and Humanism from the American Sociological Association for promising young scholars.

Dr. Gopakumar is an interdisciplinary scholar whose research interests are varied, but broadly, he is interested in how technological change becomes acceptable to society. In analyzing this puzzle, he thinks that a combination of social, policy, and technical dynamics play a defining role. His specific interests are in the policy dynamics of urban infrastructure change, social dimensions of water supply sustainability, urban infrastructure globalization, interdisciplinarity in engineering education, and social entrepreneurship for engineers.

He received his PhD in Science and Technology Studies from Rensselaer Polytechnic Institute. Before that, he received an MS in Energy and Environmental Policy from the University of Delaware and completed an MS in Electrical Engineering from Michigan Technological University. He has a B. Tech in Electrical Engineering from the College of Engineering, University of Kerala, India.

KEYWORDS

#GLOBAL URBAN DEVELOPMENT #SOUTHERN CITIES
#URBAN POLICY MAKING

URBAN DEVELOPMENT AND CITIES IN THE GLOBAL SOUTH

Cities in the Global South present an intriguing picture of change and continuity. This picture has recently been in the spotlight with increasing attention to the urban in global environmental policymaking happening within multi-lateral circles. This attention arising through the New Urban Agenda has sought to locate cities as vital components for global planetary sustainability. In this renewed attention to cities, recent efforts to understand cities in the Global South have acquired importance given the uniqueness of their historical, social and political context. Drawing upon the burgeoning literature that considers Southern cities in their epistemologies and ontologies as well as their political terrain, we locate how urban policymaking in the Global South refracts through the Southern cities and produces a variegated array of discontents and contradictions that pervade the possibility of urban sustainability in these locations.



Carly ZITER

Assistant Professor, Biology Department and faculty member of the interdisciplinary cluster for Smart, Sustainable, and Resilient Cities and Communities at Concordia University, Canada

Dr. Ziter completed an MSc in biology and natural resources sciences at McGill, and a PhD in landscape ecology at the University of Wisconsin-Madison (2014-2018). As a landscape and ecosystem ecologist, her research asks how landscape structure, land-use history, and biodiversity impact multiple ecosystem services and their relationships in urban and urbanizing landscapes. Her research program centers on the ecosystem services concept as a lens to ask ecological questions related to sustainability, policy, and practice. Ziter holds active research grants as a principal applicant or co-applicant from NSERC, SSHRC, and private foundations and consistently publishes in high-impact journals such as PNAS, Nature Sustainability, and Ecological Applications. In 2016, she conducted the first global meta-analysis focused explicitly on the underlying ecology of urban ecosystem services, centered on the role of biodiversity in service provision. Her recent and ongoing work includes quantifying how variation in impervious surfaces and canopy cover interact to affect urban air temperature at fine scales, developing community science approaches to urban biodiversity monitoring, and contributions to city-scale assessments of wild bee conservation and management – the results of which have contributed to urban planning and policy efforts to create more biodiverse, resilient cities. Ziter is also committed to integrating public engagement and science communication into her scientific work and was recently awarded Concordia's National Research Communicator of the Year.

KEYWORDS

#SUSTAINABILITY #ECOLOGY #URBAN ECOLOGY
#LANDSCAPE ECOLOGY #URBAN WELLBEING
#ECOSYSTEM ECOLOGY #BIODIVERSITY # URBAN BIODIVERSITY
#ECOSYSTEM SERVICES #URBAN CANOPY #URBAN MICROCLIMATE
#NATURAL ENVIRONMENT #URBAN ECOLOGICAL INFRASTRUCTURE

THE IMPORTANCE OF URBAN ECOLOGICAL INFRASTRUCTURE FOR BIODIVERSITY AND ECOSYSTEM SERVICES

If cities are to provide a healthy living environment and be resilient to future challenges, we must prioritize urban nature and the biodiversity it supports. Just as built infrastructure is critical to society, so too is the ecological infrastructure embedded within our cities. In this chapter, I provide a broad overview of the importance of urban ecological infrastructure – the parts of a city that support ecological structures and functions, as well as the ecosystem services that directly affect human well-being. Following an introduction to this broad concept, I draw on examples from global cities to introduce four key arguments for maintaining, enhancing, and restoring ecological infrastructure in our cities; specifically, that well-planned and managed urban ecological infrastructure: 1) provides direct health and wellbeing benefits to urban residents, in the form of ecosystem services; 2) can contribute to biodiversity conservation efforts within cities and surrounding regions, protecting non-human species; 3) enhances connection to, and appreciation for, nature more broadly, increasing pro-environmental behaviors among urban dwellers; and 4) can serve as a living laboratory to understand ecology and evolution in a world undergoing global change. I conclude the chapter by highlighting key challenges and misconceptions for urban biodiversity management, emphasizing the importance of inter and trans-disciplinary collaboration to achieve greener, more equitable future cities collectively.



Elaine VARELA

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Dr. Varela has a Ph.D. in Environmental Engineering from UPC, Universitat Politècnica de Catalunya (2012) and is a civil engineer who graduated from UFBA, Federal University of Bahia (2001). She is a member of the Board of Directors and Research at UNESCO Chair on Sustainability (UPC/Barcelona Tech), a professor of the Polytechnic School of UFBA; a leading researcher of GETEC (Group on Construction Technology and Management), and Former Director of BÁKÓ (Community Office on Engineering and Architecture). She was also a visiting professor at Concordia University (Montreal - Canada) between September 2021 and September 2022. With over 20 years of experience strategizing, securing funds, executing, and overseeing collaborative projects across Brazil, Kenya, Spain, and Canada, she works in sustainability, social responsibility, and innovation for the Built Environment. Her work encompasses a broad range of cutting-edge projects and research on circular economy, sustainable and resilient urban development, digital transformation, social development and inclusion, climate change mitigation and adaptation, and waste management.



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Professor at Universitat Politècnica de Catalunya and a Coordinator at UNESCO Chair on Sustainability, Spain

Jordi has a PhD in Microbiology from the Autonomous University of Barcelona (UAB). He is one of the founding members of the network RECYCLING THE CITY -RECNET- (www.recitynet.org); Executive Director of the RESURBE Program of the same RECNET network; and director of UNESCOSOST offices network (http://www.unescosost.org), with 15 offices in Colombia, Brazil, Argentina, Perú, and México. Since January 2020, he has been a coordinating committee member from the NATURA network (https://natura-net.org). He has 30 years of experience in research, education, and management of sustainable human development projects related to resources (water, soil, biodiversity), health and nature-based solutions (NBS), and the circular economy and participatory community development at the local and regional level, of which the last 20 years at the international level. The main works are related to the nexus of SDG 3, SDG6, and SDG 13, as well as SDGs 11 and 13, although all SDGs are covered directly or indirectly.

KEYWORDS

#BARRIERS, CHALLENGES #SLUMS #NEW URBAN AGENDA
#SUSTAINABLE CITIES AND COMMUNITIES

CHALLENGES FOR A MORE SUSTAINABLE FUTURE FOR INFORMAL URBAN SETTLEMENTS

A more sustainable future for cities and human settlements involves ensuring that all people living in these urban agglomerations can enjoy equal rights, opportunities, and fundamental freedoms. This statement is closely aligned with the idea of the right to the city advocated by Henri Lefebvre, which involves individual freedom to access urban resources and the individual and collective right to act in urban transformation. In this context, many organizations, institutions, and social movements focus on debate strategies to offer quality urban mobility and incentives for their citizens to occupy public spaces. The debate considers various topics such as sustainability, democracy, rights, equality, race, gender, mobility, urban agriculture, and solid waste management.

The growth of informal urban settlements, especially slums, makes this search difficult, especially in countries with emerging economies. They are clusters of housing usually built on land that allows the poorest families to access urban markets that would otherwise be unattainable. However, this urban expansion almost always comes with problems, such as poor sanitation access and living conditions. The slums symbolize this urban problem and represent a significant social challenge for emerging economies. Political and environmental trends point to urban intervention programs in these locations as a successful approach to dealing with these issues, providing better integration of low-income communities into urban contexts without interrupting local social relations. Several authors argue that it is necessary to commit the public sector to improving the quality of life in the slums, providing basic infrastructure such as drinking water, sanitation, urban mobility, etc. However, deeper strategies must be applied to search for a more sustainable future for metropolis cities.

This chapter discusses the challenges that metropolises and their slums must face in the quest for greater sustainability, resilience, and inclusion. It examines concepts related to the right to the city. It analyses literature about the theme, connecting this content with the commitments of the New Urban Agenda.

Our findings provide insights related to the current scenario of public policies and strategies, assessing their participatory and inclusive character and potential for implementation. They identify existing barriers and challenges and present recommendations to address urban development's unique and emerging challenges, particularly for developing countries. The chapter highlights the need for a local needs analysis and the strengthening of the capacity of subnational and local governments to implement regional and metropolitan governance effectively and sustainably.



Jenny CHAVERRI

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Jenny defended her PhD Thesis in Civil Engineering at Concordia University as a part of the CERC Prof. Ursula Eicker research team. Her research is in transportation and sustainable development. She works with transportation demand modeling and economics, gender equality, social and environmental justice, and the SDGs. Jenny holds a Master's in Science from the University of New Brunswick, Canada, majoring in pavement engineering and road safety. In her career, Jenny was the Head of Technical Auditing of the National Road Network of Costa Rica for transportation infrastructure projects and fighting corruption. She was a professor at the University of Costa Rica. She has worked as an international consultant for the Inter-American Development Bank, conducting in-service road safety reviews in several countries. Throughout her career, she has been invited as a keynote speaker by agencies from the United Nations and governments in Latin America in sustainable urban mobility and road safety.

KEYWORDS

#SUSTAINABLE DEVELOPMENT #SOCIAL JUSTICE # CLIMATE CHANGE
#SUSTAINABLE URBAN MOBILITY #BUILT ENVIRONMENT
#ROAD SAFETY #PAVEMENT ENGINEERING
#TRANSPORTATION ASSET MANAGEMENT

SUSTAINABLE URBAN MOBILITY: SHAPING CITIES OF THE FUTURE THROUGH THE SDGS

Sustainable development is about raising human well-being, not just income. While income is one of the aspects of life satisfaction, associating development with only economic growth creates social inequalities and exclusion and threatens human-induced climate change and people's health. Cities can be a driver for development. However, poorly planned cities and the business as usual in transportation can increase externalities. The SDG Index was created to monitor progress and identify priorities for the 2030 Agenda reporting for 193 countries, European and American cities, and Bolivian municipalities. The 2030 Agenda demands an integrated response.

Lack of integration across sectors is an obstacle to achieving sustainable development. Sustainable urbanization must integrate urban mobility, the built environment, and cross-disciplines for planning and designing cities. This fragmentation has led to social, environmental, and health challenges, taking a significant toll on the most vulnerable and marginalized. Thus, a literature review was conducted to understand the interconnectedness between urban mobility, the built environment, and the SDGs. An integrated framework for sustainable urban mobility and the built environment is proposed under five strategic areas: equity and social inclusion, health, climate change, economic development, and urban governance.

Key findings from the literature are that transportation planners must address "transport poverty," social inclusion, and gender equality. Urban sprawl limits accessibility to opportunities, fosters forced car ownership behavior and creates social segregation by race and income in poorly planned cities. In the spread of COVID-19 and the urban form, urban density does not contribute significantly, but overcrowded housing because of social inequalities and poverty. In addition, traffic-related air pollution is a predictor of mortality and morbidity. In the US, African Americans consistently breathe higher levels of air pollution.

Compact mixed-used developments integrated with sustainable transportation positively impact climate change mitigation. Considering the 5Ds of the built environment, accessibility to opportunities and urban density contribute the most. Long-term sustained investments and leadership are needed to implement the Avoid-Shift-Improve framework to attain the IPCC targets. Financial decisions for Transportation Oriented Developments must be people's inclusive and promote socially mixed compact housing developments around transit stations, rather than favoring land developments to foster wealth. Urban governance and frameworks must envision the alignment and integration of stakeholders. Integrating data for modeling and design for informed decisions and investments is essential. In this review, an integrated framework for sustainable urban mobility and the built environment is proposed, and it is recommended that an Urban Data Observatory with the SDGs at its core be designed to leave no one behind.



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Dr. Gopakumar has received many prestigious awards, including the National Science Foundation's (USA) Dissertation Improvement Grant. He is the 2010 recipient of the Robert Boguslaw Award for Technology and Humanism from the American Sociological Association for promising young scholars.

Dr. Gopakumar is an interdisciplinary scholar whose research interests are varied, but broadly, he is interested in how technological change becomes acceptable to society. In analyzing this puzzle, he thinks that a combination of social, policy, and technical dynamics plays a defining role. His specific interests are in the policy dynamics of urban infrastructure change, social dimensions of water supply sustainability, urban infrastructure globalization, interdisciplinarity in engineering education, and social entrepreneurship for engineers.

He received his PhD in Science and Technology Studies from Rensselaer Polytechnic Institute. Before that, he received an MSc in Energy and Environmental Policy from the University of Delaware and completed an MSc in Electrical Engineering from Michigan Technological University. He has a BTech in Electrical Engineering from the College of Engineering, University of Kerala, India.



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KEYWORDS

#AUTOMOBILE DEPENDENCE, TOD, CITIES, SOCIAL EQUITY

FUTURE OF URBAN MOBILITY: CAN TRANSIT-ORIENTED DEVELOPMENT (TOD) HELP ENDING AUTOMOBILE DEPENDENCE?

This chapter focuses on decarbonization as a future of urban mobility. Such an exploration has become particularly relevant in light of the significant impact that urban mobility has on global greenhouse gas emissions. At the core of the agenda to decarbonize urban mobility has been reducing the overwhelming dependence on personal automobiles. This is accomplished through various strategies, including pedestrianization, supporting active transport, and, importantly, Transit-Oriented Development (TOD). TOD refers to the development of compact, mixed-use communities centered around public transportation hubs. In recent years, TOD has emerged as a popular strategy to promote development that will reduce automotive dependence. By introducing TOD while addressing some of the challenges associated with this urban development approach, especially in the context of social equity, this article aims to contribute to a better understanding of the complexities involved in implementing what remains a valuable strategy in the urban decarbonization toolbox.



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KEYWORDS

#URBAN MOBILITY #TRANSPORTATION PLANNING
#ACTIVE TRANSPORTATION #PARKING MANAGEMENT
#TRANSPORTATION MODELLING

THE 15-MINUTE CITY: SOLUTIONS FOR SUSTAINABLE MOBILITY

By 2050, it is estimated that two-thirds of the world's population will be living in urban areas, and city expansion is inevitable. As cities' areas and population sizes increase, pressure on urban infrastructures and transportation systems also grows, increasing the environmental footprint. The 15-minute city is an urban planning concept that aims to enhance the quality of life in metropolitan areas by ensuring that residents can access their essential needs within a 15-minute radius, primarily through walking, cycling, or public transportation.

Accessing all essential services in densely populated areas is easier, and residents rely less on private cars that consume energy and time. To achieve sustainable development, cities need to control their urban sprawl and intensify population density. Moreover, there is a close connection between density, travel modes, and city diversity. Additionally, optimal density promotes local solutions for energy generation, food supply, and multiple uses of available space. Providing bicycle lanes and walkable pathways at optimal density will reduce the need for automobiles and promote social equity. Equity is also achieved by addressing the specific needs of various communities, including those of varying economic status. Governments and investors can both benefit from the equitable distribution of city services and reduced mobility costs.

An optimal density is essential for infrastructure planning. A mixture of services within walking distance invites people to walk or cycle from their homes. Moreover, providing and operating transportation infrastructure has high costs, and an optimum density can ensure sufficient users. On the other hand, a population density higher than the optimal size can lead to overcrowding and pressure on urban infrastructure, including transportation systems. As a result, it is vital to provide an optimal size for density considering the context.

In recent years, the 15-minute city, along with the compact city concepts, has gained wide acceptance among academics and urban planners as a sustainable urban form for the future, capable of dealing with the negative externalities of both the urban and transport models. Variables such as high densities, a public transport supply, and mixed-use development are usually found to be key elements for improving access to local services and promoting fairer transport models.

Furthermore, this research emphasizes the significance of optimal density as a means to achieve sustainable development. By exploring the potential of the 15-minute city and its implications for mobility, this paper aims to contribute to the ongoing discourse on sustainable urban planning and provide insights into the transformative solutions that can shape future cities.



Daniel HOORNWEG

Associate Professor in Energy Systems Engineering at Ontario Tech University. Ph.D., P.Eng.

For almost 20 years Dan was with the World Bank, including as Lead Advisor overseeing Sustainable Cities and Climate Change programs. Dan was the Chief Safety and Risk Officer for the Province of Ontario 2012-2020. Dan began his career in waste management working with City of Guelph and Region of Peel in Ontario and Government of Bermuda. He has worked with more than 400 governments on sustainability issues.

Dan is a Fellow with Canada's Transition Accelerator and the Global Cities Institute at University of Toronto, a Board Member of the Georgian Bay Biosphere, past board member with Clean Air Partnership, and served as Chair of the Region of Durham's Roundtable on Climate Change. Dan researches energy and material flows of cities and urban systems.

KEYWORDS

#HANSEATIC LEAGUE OF CITIES #URBAN SYSTEMS
#MIGRATION AND SUSTAINABILITY #NEW LEAGUE OF COMMUNITIES

THE NEED FOR A NEW LEAGUE OF COMMUNITIES TO LEAD THE SHIFT TO SUSTAINABILITY

As major forces like demographic shifts, earth systems degradation (e.g., climate change and biodiversity loss) take root, and as the world transitions from fossil fuels, geopolitics is changing dramatically. In the last 100 years the number of countries quadrupled (now ~196). National leaders, often in unorthodox ways, are encouraging wholesale shifts to countries, global institutions, and alliances. Cities are tasked with responding to these bio-physical and socio-economic shifts, in that they are most impacted by them, and that they are the largest cause of these forces. Cities differ from countries (and businesses) in two important ways: they scale, and they are immobile. Human nature strives for larger cities, and cities as urban agglomerations instinctively act as natural systems. Cities know that they need to come together for common security. Countries emerge when distant and flourishing cities agree to share a common narrative. Since 1648 and the Treaty of Westphalia, cities abandoned the Hanseatic League and formed countries to ensure their security. The major security threat to cities, however, is now as much from within, as from outside. The security threat from earth system degradation (e.g., migration, climate shifts, changes in resources need and availability, rising inequity) needs a new, or renewed, collective response. Cities, as communities, in a civic of cities, once again need to knit themselves together through a New Hanseatic League.

PART 2
SUSTAINABLE BUILT ENVIRONMENT



Natalie VOLAND

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Natalie has been reinventing the process of real estate development for over 25 years. Her roots as a social worker allow her to have a unique and purpose-driven design-centered outlook on development that prioritizes the historical protection of civic assets while being forward-thinking about using buildings to unite communities and push environmental advocacy. As a PhD candidate, she is specializing in the bridge of market business practices that drive sustainability in the built environment.

She is an award-winning, socially driven developer and a leader of the Quebec B Corp. Movement, where her companies contribute to the protection of the environment and foster social inclusion while making a market-driven profit to further the economic development of Montreal. Natalie manages 1.5 million square feet, supports over 500 entrepreneurs, and is an active expert public speaker, and mentor. Her newest venture, "Quo Vadis Capital," invests in carbon-mitigated accessible housing to address inclusion and climate change in real estate.

Natalie sits on several Boards and think tanks associated with her passion for being a leader in ESG development. Natalie is an active master planner and partners with universities to use her assets as teaching and prototype tools to evolve concepts on what kind of city we want to build.



Martin TOWNSEND

Growth Director at BSI, London, UK

In his career, Martin has worked as an environmental Regulator, advised Ministers, and worked with City Mayors and businesses worldwide of all sizes and sectors. Ensuring Sustainability comes alive and is an enabler of business success. Martin has also been a keynote speaker at many international conferences to ensure that, as a global community, we accelerate the rate of change while reducing the impact we have. Martin joined BSI in November 2019 and sits on several advisory boards for public and private sector organizations to support their success.



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KEYWORDS

#ACTIVE RESEARCH #REGENERATIVE REAL ESTATE #SYSTEM THINKING #CLIMATE MITIGATION #STAKEHOLDER COLLABORATION #CAPACITY BUILDING #YIELD DEVELOPMENT #INTEGRATED DESIGN #UNSDG'S

TRANSFORMATIVE CHANGE IN REAL ESTATE; YIELD DEVELOPMENT PARADIGM AS A STRATEGIC DECISION-MAKING SUSTAINABILITY FRAMEWORK FOR IMPACT

Climate mitigation requires an "all-hands-on-deck" approach to achieve climate targets set by the Paris Treaty. Real estate in the built environment produces approximately 38% of the global GHG emissions and allows an opportunity to drive change through a strong value proposition where capital markets can drive systemic change. The technical solutions exist in the marketplace. However, several key barriers to widespread adoption continue to block value-driven outputs. It is time to design the real estate development process and change the inputs that will drive cross-stokehold engagement and capacity building. Linked to the United Nations Sustainable Development Goals overview system, this paper will propose a decision-making framework called Yield Development Paradigm that will offer an innovative methodology for real estate development that seeks to output regenerative, accessible, climate-positive community building.

Key barriers to adoption will be laid out with a reflective practitioner methodology and backed by available literature of opportunities where the value orientations start the integrated design approach linked to systems thinking backed by activated research concepts. The evolution of stakeholder engagement is linked to the concept of capital inputs and attributes associated with purposeful value creation real estate development and will outline motives for change, the management of the change, and the methods on how to achieve the change, with the measurement of metrics for each key stakeholder. Traditional real estate has been one of the last major industries to have a risk aversion to innovation. Therefore, Yield Development Paradigm seeks to lay out a pathway that offers opportunities to create a profit-driven impact that benefits developers, city urbanists, citizens, and businesses by building capacity and communication between and among often opposing forces in the urban landscapes to create social and economic, and environmental value.



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Myriam GRONDIN

Urban Planner, Director General of Concert'Action, Lachine, Canada

Myriam is an urbanist and anthropologist. She has been working for a local table of social actors and non-profit organizations in the City of Lachine, as part of Concert'Action (CAL) since 2019. She started as lead in Atelier Lachine Est as part of a prototyping innovation on rethinking and planning to repurpose an industrial area in Lachine into an eco-district. Myriam coordinated, developed, and led thematic and multi-stakeholder workshops for public engagement. This process led to key initiatives being incorporated and adopted into the city master plan of Lachine. Among her duties is representing the proposed future Lachine eco-district in the Office of Shared Practices of the City of Montreal.



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KEYWORDS

#ECO DISTRICTS #SUSTAINABLE FUTURES
#URBAN REDEVELOPMENT #COMMUNITY ENGAGEMENT
#NEIGHBOURHOOD COMMONS #SYSTEMS APPROACH
#PUBLIC DECISION-MAKING ORGANISATIONAL FRAMEWORK

COMMUNITY ENGAGEMENT FOR ECO DISTRICTS IN A CROSS-STAKEHOLDER PARTICIPATORY GOVERNANCE FRAMEWORK: A CASE STUDY IN LACHINE-EST, MONTREAL

Our cities are growing faster than ever before while concerns for affordability, inclusion, and equity paired with climate resilience are at the top of mind for local citizens in terms associated with social justice. Tackling accessibility and a just transition in the development of urban centers can be complicated as many voices have different concerns and need a systemic approach to create eco-districts that are economically viable, socially responsible, and environmentally regenerative. Aligning with the United Nations Sustainable Development Goals, alongside the ambitions of the Paris Treaty, this article will propose a community engagement framework for a collaborative and publicly engaged decision-making process using the case study of Lachine Est in Montreal, Canada. This paper will address stainable future urban design on a neighborhood scale, outlining a multi-stakeholder collaboration framework through an empirical field study, reflective practitioner analysis, a quantitative survey of key stakeholders, and a literature review. As the neighborhood is a strong unit for civic engagement, the opportunity to turn barriers to opportunities allows public engagement to be able to co-design collective futures. It pushes innovation in public planning and decision-making alongside developers, community organizations, politicians, developers, and local citizens for maximum uptake of new paradigms in the development of eco-districts. This paper will highlight key stakeholders and their concerns that led to an organizational framework in the development of the eco-district in Lachine Est in Montreal, Canada. The process, lessons learned, and opportunities for scaling this innovative and collaborative design and decision-making framework that could be used as a blueprint for adaptation to other communities as lessons learned and opportunities are explored, validated, and shared.



René DEMERS

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Rene has worked in real estate at the National Bank for over 10 years. As Senior Vice-President, Commercial Banking and Private Banking, Real Estate, he is responsible for all real estate financing teams in Canada. With nearly 175 employees, this important division manages over 25 billion dollars in assets. The mission of the Real Estate Canada group and its experts is to support the top players in the real estate sector both in their interim construction financing projects and in their long-term financing projects. A leader in Canada, National Bank is the main banking institution in Quebec. It aims to achieve the most rigorous standards in terms of social responsibility. With branches in most Canadian provinces, it is also present in the United States, Europe, and worldwide through its representative offices, subsidiaries, and alliances.



Julien ALARIE

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Julien has worked for the National Bank for the past 12 years. He worked within the marketing team before joining Commercial and Private Banking in 1859, where he was a Senior Advisor, Business Strategies, and Client Experience.

Holding a PhD from Université de Montréal, he collaborates closely with the Real Estate Canada group at National Bank. Julien is also actively involved in his community, notably as a member of the Board of Directors of the BAnQ Foundation.

KEYWORDS

#ESG (ENVIRONMENTAL, SOCIAL, GOVERNANCE)
#ENERGY TRANSITION #FINANCIAL SECTOR #CLIMATE CHANGE
#RISK MANAGEMENT #REAL ESTATE #VALUE CREATION
#STAKEHOLDER ENGAGEMENT

ESG, A QUESTION OF SURVIVAL FOR BANKS AND THEIR CLIENTS? VALUE CREATION IN COMMERCIAL REAL ESTATE

The financial sector plays a pivotal role in advancing the transition towards improved environmental, social, and governance practices. The imperative to make substantial progress on all fronts is evident, with clear commitments from the Canadian government, provinces, and municipalities, starting with their participation in the 2015 Paris Agreement. Pressures for coordinated efforts are mounting from various directions. While acknowledging the interconnectedness of the three facets of ESG – with the energy transition intimately linked to social issues and governance matters, particularly transparency and data accessibility – this article focuses on the 'E' dimension.

Last summer's devastating forest fires and the resulting poor air quality served as harsh reminders of the urgency of addressing climate change. This article seeks to demonstrate how the financial sector can, and indeed should, serve as a cornerstone of the energy transition and a catalyst for growth for all stakeholders. It delves into both the risks associated with inaction and the opportunities presented by proactive engagement in ESG within the commercial real estate sector. What if embarking on the energy transition was beneficial for everyone involved?

The real estate sector, in particular, poses a significant threat to global warming and challenges attaining net-zero emissions targets. Such as the transportation and agri-food industries, the real estate sector faces unique material obstacles.

Enhancing the seamless integration of ESG considerations into a bank's operations yields value creation for everyone involved, including the bank itself, its clients, and the communities it serves. Financial institutions bear a responsibility that extends well beyond their own footprint. 97% of the emissions attributed to National Bank are generated by sources that it doesn't own or control directly. These are scope 3 emissions related to investment or financing. ESG risks and opportunities for financial institutions involve multiple stakeholders: clients, investors/insurers/financial partners, communities, governments, internal stakeholders, regulators, and rating agencies.

One prominent risk illustrates how important it is for financial institutions to assume a leadership role: the blocking of the capital market which can result from inaction on environmental matters. Such a risk demonstrates – and this is the purpose of this contribution – that ESG values are a matter of survival for banks.

It is crucial not only to focus on the risks mitigated through active engagement in the energy transition, which is often the first aspect that comes to mind but also to evaluate and present these endeavors from a value-creation standpoint.

Engaging in this transition process represents a distinctive opportunity for all parties involved to actively contribute to developing healthier environments and smarter cities. ESG value creation has a snowball effect, leading to even more value. The integration of ESG into a bank's commercial real estate operations prompts an important question: How is this integration realized? This article seeks to explore the key stages of implementation.



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Veera received her master's degree in administrative sciences with a specialization in the politics of the environment and regions from Tampere University in Finland, where she is also a co-founder of the Insurgent Spatial Practices research collective. Her research interests cover new forms of citizen engagement in urban planning, sustainable urbanism, socio-ecological transition dynamics, and informal uses of urban places. Inspired by vacant and abandoned spaces and their reuses, her recent research has addressed the implications of temporary urbanism for sustainable urban development. Her doctoral research focuses on the transformation of previous industrial sites, brownfields, in Montréal. By applying case study methods, Turku critically addresses sustainable brownfield redevelopment, from the perspectives of interactions and power relations. Also, she aims to investigate how different agents position themselves in relation to sustainable redevelopment through practices and representations shaped by diverse temporal and spatial scales.



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KEYWORDS

#URBAN SUSTAINABILITY #SUSTAINABLE URBAN TRANSFORMATION #BROWNFIELD REDEVELOPMENT #FRAME ANALYSIS

CONTESTED PLACES FOR SUSTAINABILITY: MAPPING INTERPRETATIONS OF SUSTAINABILITY IN THE CONTEXT OF BROWNFIELD REDEVELOPMENT

The role of cities as key players in sustainability is widely recognized. Despite the continuing salience of sustainability as a norm for planning and policymaking, there is no consensus over the societal goals for sustainability or how to reach them. Broadly, urban sustainability covers the realization of sustainable urban places, encompassing both sustainable urban structures and environments and economic, social, cultural, organizational, governmental, and physical change processes. This chapter builds on the conceptual ambiguity and the need to map contesting interpretations of sustainability. The notion of sustainable urban transformation offers a starting point to address the complex processes and dynamics of how sustainability manifests in cities. It supports an understanding of sustainability as both a normative goal and process, reflecting the open-endedness and interpretative nature of sustainability. Finally, sustainable urban transformation helps us to better understand sustainability changes related to brownfield redevelopment, by turning the focus on scales, agency, and representations in sustainability claims.

Brownfield redevelopment can be seen as a representation of urban transformation in current times, and the term is often discussed in relation to sustainability. Brownfield refers to previously developed industrial sites, including buildings and land, which have become vacant, often due to deindustrialization. For years, brownfield redevelopment in North America was connected to cleaning up contaminated land and thus providing a clean and safe environment for urban residents. However, since the 1990, the discussion has opened toward larger questions of urban sustainability. This shift has resulted in several researchers, planners, and policymakers declaring brownfields as key elements for sustainable transformation in cities. Despite the shared interest and commitment to sustainability, there is a growing strand of research showing how redevelopment projects have in practice fallen short of achieving sustainability outcomes holistically, including environmental, social, and economic aspects of sustainability. Also, the lack of citizen participation and gentrifying effects of brownfield redevelopment have been criticized. Based on that, the question that arises is to what extent is brownfield redevelopment sustainable?

As brownfield redevelopment has become a global planning issue in traditional industrial cities, it is essential to avoid the trap of perceiving it as intrinsically sustainable. This paper explores how the relationship between sustainability and brownfields has been framed in scientific research literature. Three dominant frames are identified, each one of them providing a distinct interpretation of sustainability, built on a specific scale and supported by a set of agents. The findings of the chapter support self-awareness about what type of framing is used when discussing sustainability in the context of brownfield redevelopment and what kind of values and assumptions it entails. The results can be further applied to develop a holistic framework for brownfield redevelopment, where sustainability is presented as more than a pre-defined planning paradigm, but as an integrative ideal that requires a continuous re-evaluation in changing conditions.



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PhD Candidate of Building Engineering in the Department of Building, Civil, and Environmental Engineering at Concordia University, Canada

Andrea graduated with a master's degree in Sustainable Energy Engineering (2018) at KTH Royal Institute of Technology in Stockholm (Sweden). She works on energy systems modeling and evaluation of energy system scenarios at the district level, including district heating networks (DHN), heat pumps, and various renewable energy sources (solar, geothermal, wind, etc.). She is the subtask B leader of the International Energy Agency Annex 83 on Positive Energy Districts. Her PhD research focuses on decision-making and planning tools to support renewable energy communities, as well as strategies to activate citizen involvement in the ongoing energy transition.

KEYWORDS

#POSITIVE ENERGY DISTRICTS #RENEWABLE ENERGY INTEGRATION
#URBAN DENSIFICATION #ENERGY STORAGE SOLUTIONS
#DIGITAL TWINS #COMMUNITY ENGAGEMENT
#SUSTAINABLE URBAN DEVELOPMENT #DECARBONISATION

POSITIVE ENERGY DISTRICTS: TRANSFORMING URBAN AREAS INTO HIGH EFFICIENCY DISTRICTS WITH LOCAL RENEWABLE GENERATION AND STORAGE

Positive energy districts have emerged as a new paradigm of next-generation city building, where energy is fully supplied from renewable sources. Different definitions of the spatial boundaries are still in discussion: an autonomous positive energy district supplies 100% or more of its own energy demand and any excess energy is exported to the grid. This concept works in low-density districts with large available surface areas for renewable energy, mostly solar photovoltaic generation, and low demand. In a dynamic, positive energy district, energy can be imported and exported from the grid, but the on-site renewable generation must still be higher than the demand. Again, if the urban density is high and the areas for power generation on roofs and façade limited, this concept has its limits. The most flexible definition is a virtual positive energy district, where renewable energy can be freely imported and exported but does not have to be produced on-site. Here questions of renewable ownership and power purchase agreements arise to make sure that new renewables are built to satisfy the demand of a district.

Positive energy districts thus have to consider both the demand side and the supply and storage options: only if demand is low by retrofitting existing buildings to high energy standards can local renewables make significant contributions. In today's urban discussion, densification and a resulting demand increase are very much on the agenda, as only dense urban areas can provide public and active transportation and, thus, overall low greenhouse gas emissions. The ongoing transformation of the transportation sector to electric vehicles adds local electrical loads to the low-voltage distribution network, which can only be reduced by higher public transportation shares. Together with the electrification of heating systems, urban electricity demand is on the rise, and its evolution needs to be carefully analyzed to find supply solutions that can cover changing demand.

Different options of renewable supply then need to be studied to determine the best energy mix between solar, wind, or waste to energy and to optimize the required storage volume. Options range from short to seasonal storage and strongly depend on the spatial boundaries discussed above: for an autonomous positive energy district, storage units need to increase in size, as the local demand must be supplied at all times. This increases the overall cost of the installation, but also the local resilience in cases of power outages.

To support the decision-making around demand reduction and renewable supply and storage in a complex district-scale setting, new simulation, and optimization tools are needed. Digital twins of the built environment are increasingly used to provide geometry information for building demand modeling and to manage data sets of construction and usage. Automated workflows need to be developed to facilitate both demand and supply modeling and the optimization tasks for the planning and operation of such renewable systems.

The implementation of positive energy districts not only encounters technical and financial challenges but needs new frameworks also to offer a socially inclusive and affordable perspective for the residents so that gentrification is avoided and the districts are mixed and vibrant.

Case studies on a neighborhood scale still play an important role in assessing performance, economics, and engagement of the community. If the success of such case studies in different regions, climates and social conditions can be shown worldwide, positive energy districts will become a major driver of urban decarbonization.



Thomas WALKER

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Dr. Walker is a full professor of Finance at Concordia University. Prior to his academic career, Dr. Walker worked in the German consulting and industrial sector at such firms as Mercedes Benz, Utility Consultants International, and KPMG. His research interests are in sustainability and climate change, aviation, corporate governance, and risk management. He has published over sixty articles in these areas. In addition, Dr. Walker has published five books on sustainable financial systems, emerging risks, sustainable aviation, environmental policies, and sustainable real estate in the past two years. He previously served as Director/ Co-Director of the David O'Brien Centre for Sustainable Enterprise, as Laurentian Bank Professor in Integrated Risk Management, as Chair of the Finance Department, and as Associate Dean, Research, at Concordia University, Canada.

KEYWORDS

#SUSTAINABLE FINANCE # REAL ESTATE
#SUSTAINABLE CONSTRUCTION #GOVERNMENT HOUSING POLICY

FINANCING SUSTAINABILITY IN THE REAL ESTATE SECTOR: CHALLENGES AND OPPORTUNITIES

A well-known concept in the field of financial economics is that, in the absence of governmental intervention, money flows to those entities that make the best use of it and that offer investors the highest rate of return for a given level of risk. Given that climate change goals such as global net zero emissions by 2050 are expected to incur costs in the hundreds of trillions of dollars, the question arises whether and how these costs can be met.

In many industries, such as the utility sector, equity and debt investors have started to realize the potential for new technologies (e.g., solar, wind, and geothermal energy) to outperform traditional carbon-based technologies. Similarly, there are credible moves in, e.g., the auto industry to replace gas-powered combustion engines with hybrid or fully battery-powered engines. In both industries, the move is not only driven by social and environmental considerations but also by the fact that the Earth's oil, gas, and coal reserves are limited and that other sources of power need to be identified. In this context, activist shareholders (including large institutional investors) play a major role because they exert pressure on corporate managers who lag behind or fully resist the industries' move to alternative energies. In the real estate sector, which arguably accounts for one of the largest proportions of global CO2 emissions, implementing sustainability-oriented and/or net zero emission standards poses unique challenges. The construction of sustainable buildings tends to be costlier than buildings that are erected via traditional construction methods, energy savings often don't pay off for decades (particularly in regions where electricity is cheap), and few large-scale industrial players can push the industry in a certain direction as, e.g., Tesla is doing in the auto industry. Moreover, most construction companies are privately owned rather than publicly traded, which means that they have no shareholders who can monitor and/or influence corporate behaviors and strategies. Finally, aside from new building projects, there is an immense need for existing buildings to be retrofitted and to be made more sustainable – at an enormous cost for homeowners who may not be willing or able to bear the associated costs.

In light of these challenges, is it reasonable to assume that financial market forces alone will steer sufficient capital to these endeavors? Are energy savings and contributions to the environment / our society sufficient to entice buyers and renters to pay a premium for green buildings? How can existing homeowners be enticed to retrofit their homes? How does the different industry composition (i.e., the higher proportion of privately owned firms and the associated lack of shareholder involvement) affect corporate behaviors?

Governments play an important role in addressing sustainability-related challenges through enticements (e.g., tax breaks for retrofitting projects) and penalties (e.g., fines for polluters). However, not every government and its political leaders are willing to implement such steps due to concerns about the associated costs (possibly necessitating the need for higher, unpopular taxes), rising unemployment in certain areas, the disenfranchisement of their voters, or because they are concerned about domestic firms losing their competitive edge by causing production costs for certain products to rise above those of competing firms in other countries.

Our study aims to highlight these issues and to provide detailed recommendations regarding how they can best be addressed, both through a pivotal rethinking of the finance / sustainability nexus, and through specific actions corporate boards and governments can implement.



Yunping LIANG

Assistant Professor in Construction and Infrastructure System Engineering at the University of Nebraska – Lincoln (UNL)

Prior to joining UNL, Dr. Liang was a tenure-track assistant professor at Concordia University, Canada. He got his PhD (Civil, 2021) and MSc (Operations Research, 2020) from Georgia Tech and BEng (Civil, 2017) from Tongji University. Liang's research interests are at the intersections of Civil Engineering, Operations Research, and Public Policy. Sponsored by agencies such as the National Science and Engineering Research Council and National Science Foundation, his research has led to 20+ peer-reviewed journal articles, conference proceedings, book chapters, and research reports. He is a recipient of international/ national awards, a reviewer of prestigious journals, and an active member of academic/ professional organizations in the United States and Canada. Currently, Liang's research strives to enhance infrastructure investment by improving accountability and effectiveness, promoting social equity in project development, and maximizing investments in sustainable facilities.

KEYWORDS

#CONSTRUCTION MANAGEMENT AND ECONOMICS
#CONSTRUCTION ANALYTICS
#SUSTAINABILITY & RESILIENCE OF INFRASTRUCTURE SYSTEM
#ENGINEERING (INFRASTRUCTURE) DECISION-MAKING
#PROJECT FINANCE #PROJECT DELIVERY SYSTEM

FINANCING INFRASTRUCTURES IN NEXT-GENERATION CITIES

Increasing Importance of Infrastructure Finance

The funding shortage to renovate existing infrastructure facilities and respond to climate and technological disruptions is causing daunting losses to families and communities worldwide. Governments – as the stewards of the majority of infrastructure investment – often rely on funding sources set up decades ago to meet ever-evolving expenditure needs. An example is that the U.S. federal gas tax, as a major transportation funding source, has not increased for more than three decades by 2023, while the accumulative inflation during the period is near 100%. Accordingly, from 1980 to 2015, federal infrastructure investment has fallen by half – from 1 percent to 0.5 percent of GDP. Facing the challenges, the U.S. government strives to enhance financial management and accountability (e.g., reducing improper payments) and actively explores innovative approaches to finance and deliver projects. In recent years, the U.S. Department of Transportation consecutively identified financial management, innovation, and the future of transportation among their top management challenges. They further indicated that financing and project delivery will ultimately transform how transportation agencies carry out their mission, shape their workforce, and deploy resources.

In this section, a review of the challenges of infrastructure finance will be conducted. Without loss of generality, the review will focus on four jurisdictions (i.e., Canada, United States, United Kingdom, and Australia) and three industry sectors (i.e., transportation, water/wastewater, and telecommunication). Financing challenges associated with emerging disruptions (e.g., climate change) will be particularly discussed.

From Financing Sustainable Infrastructure to Financing Infrastructure Sustainably

The meaning of this section's title is twofold. First, sustainable infrastructure finance should have the capacity to finance sustainable infrastructure projects. This develops the first section in the background of global trends on sustainable development. Second, as the definition of sustainability by ASCE, the financial activities of sustainable infrastructure system should be able to maintain and improve quality of life without degrading the quantity, quality, and availability of economic and social resources. Together with environmental and social, economic is one of the three pillars constituting sustainable development of the infrastructure system. However, in comparison to environmental impacts, less attention has been paid to the economic impact. Economically, sustainable development of infrastructure requires the maintenance of healthy markets without impairing the interests of stakeholders, including investors. In addition to the investment from the public sector, there is a track record of using private investment to fund infrastructure. Nevertheless, the capability of the project to deliver reasonable risk-adjusted returns and the attitudes of elected officers and the public towards private investments are two primary concerns of investors. This opinion is backed by a series of recent Public-Private Partnership (P3) failures – a major innovative infrastructure financing method. Examples include the legal disputes of the Purple Line project in Maryland over millions of dollars in cost overrun, Skanska's exit from the U.S. market for privatized infrastructure development after accumulating large losses on major contracts, and the termination of Denver airport P3 for unsatisfying cost and schedule performance. Predictably, a more thorough and proper risk assessment of P3 will increase the confidence of both the private and the public sectors.

In this section, innovations over the past decade with promising potential to facilitate sustainable infrastructure finance will be introduced. The introduction has two parts. The first part will focus on the innovations that help the public sector renovate its project financing (e.g., the design of new financing approaches) and improve the accountability of investment (e.g., the development of data-driven decision-making tools), so that more sustainable projects can be financed. The second part will focus on the innovations that enhance the risk management of private financing (i.e., P3), through which a more sustainable environment for private investors can be expected. Considering the gist of the chapter, this section will only cover market economy jurisdictions.

PART 3
LIVING LABS, LESSONS LEARNED, CASE STUDIES



Anaïs DEL BONO

Ph.D Candidate, Department of Management, Strategy, and Sustainability at HEC Montréal, Canada

Anaïs holds a degree from the École du Louvre, a Bachelor's degree in History, a Master's degree in Art History, and a Master's degree in Geography. Additionally, she has worked as a consultant and head of philanthropic strategies within museums and higher education institutions. Her primary research interests focus on the emotional sense-making processes of museums that have been targeted by environmental activists. This research seeks to understand and analyze how both individually and collectively, museum organizations have experienced, felt, and responded to the degradation of their emblematic artworks by eco-anxious collectives. This research project is co-supervised by Professors Anne Pezet (HEC Montréal) and Viviane Sergi (School of Management, UQAM). In parallel, Anaïs Del Bono is also engaged with the PhiLab, Africa unit, collaborating under the guidance of Professor Saouré Kouamé (Telfer School of Management, University of Ottawa) since 2021 on a research project addressing the development issues and social impact of international philanthropy, specifically focusing on the relational tensions between organizations in the Global North and Global South. Since 2023, Anaïs Del Bono has been involved in an action-research project under the direction of Professor Marguerite Mendell (Concordia University, School of Community and Public Affairs) and Nancy Neamtan, in partnership with the nonprofit organization Transition en Commun and TIESS (Innovative Territories in Social and Solidarity Economy), focusing on co-governance and citizen participation in the context of socio-ecological transitions at the urban scale. Passionate about teaching, Anaïs Del Bono is also dedicated to developing pedagogical innovations aimed at knowledge transfer through the visual arts, in order to understand the key challenges of sustainable development.



Marguerite MENDELL

Distinguished Professor Emerita, School of Community and Public Affairs, and Director of the Karl Polanyi Institute of Political Economy, Concordia University, Canada

Dr. Mendell is an economist and Distinguished Professor Emerita, School of Community and Public Affairs, Concordia University. She is also the Director of the Karl Polanyi Institute of Political Economy at Concordia University. She has published on the work and influence of Karl Polanyi, the social economy in Quebec and internationally, democratizing capital and solidarity finance in Quebec, and the evolution of "social finance" internationally. Her more recent work is on innovation in public policy design, particularly on the co-construction of public policy at all levels of government. Her research, publications, and public engagement address processes of economic democratization. Margie Mendell was a member of the Advisory Policy Committee on framework legislation for the social economy, adopted by the Government of Quebec in 2013 as well as on the Action Plan for the social economy (2016-2020). She is a member of the Advisory Council and an Honorary

Co-founding Member of the Global Social Economy Forum (GSEF). She recently collaborated with the United Nations Research Institute on Social Development on the development of Sustainable Development Performance Indicators (SDPIs) and as an International Advisor for the International Labour Organization (ILO) project on Strengthening the Social and Solidarity Economy in five countries across Asia. Margie Mendell was awarded a Prix du Québec (Prix Marie-Andrée Bertrand) by the Government of Quebec in 2013. She was named Officer of the Order of Quebec in 2014 and Member of the Order of Canada in 2017 in recognition of her contribution to the development of the social economy and to engaged scholarship. In 2024, Margie Mendell was named Officer of the Order of Montreal.

KEYWORDS

#SOCIAL INNOVATION #SOCIAL IMPACT #STRATEGIES #VISUAL ARTS #SOCIO-ECOLOGICAL TRANSITIONS

INNOVATION IN MUNICIPAL GOVERNANCE

This chapter addresses the urgent need for innovation in municipal governance, particularly in the context of contemporary urban challenges that demand an interdisciplinary and systemic approach. Traditional municipal governance often operates within silos, with departments focused on specific needs and objectives. However, the complex issues of social justice, equality, and socio-ecological transitions cannot be effectively tackled without breaking down these silos and fostering collaboration across various sectors, and bringing stakeholders into the process of public policy design.

The effectiveness of urban governance hinges on its ability to embrace collective intelligence. This chapter will explore various examples where innovative practices in urban governance have emerged, highlighting their success in addressing complex systemic problems. These case studies will illustrate how cities can navigate the interconnected challenges of the 21st century through integrated strategies that prioritize collaboration over competition among departments.

A central theme of this chapter is the relationship between democracy and the capacity for effective socio-ecological transitions. The chapter posits that a robust democratic framework is essential for cities to effectively confront these pressing challenges. Democratic engagement must be more than a political ideology; it should be a foundational principle institutionalized within urban governance structures. The complexity of contemporary objectives necessitates a governance model that facilitates cooperation and inclusivity, allowing diverse voices to contribute to decision-making processes.

The current governance model often isolates objectives by thematic areas, limiting the capacity of municipalities to achieve systemic solutions. To respond effectively to complex social, economic and environmental challenges, cities must leverage collective intelligence, tapping into the knowledge and perspectives of various stakeholders. This chapter will draw upon a substantial body of literature that discusses the role of co-governance mechanisms and citizen participation in urban settings, demonstrating how these approaches can enhance democratic practices and contribute to more sustainable and equitable outcomes.

Examples from various cities around the world will serve as key illustrations, showcasing innovative governance practices that have led to positive transformations. These examples will highlight the importance of inter-departmental collaboration, citizen engagement, and the integration of diverse perspectives in policy-making processes. By examining successful models of urban governance, the chapter will underscore why such innovations are not only necessary but imperative in today's complex social, economic, environmental, and political landscape.

In conclusion, this chapter advocates for rethinking municipal governance, emphasizing the necessity for greater er democratization that transcends traditional boundaries. It asserts that democracy is non-negotiable and must be embedded in the fabric of urban governance. By fostering an inclusive environment that prioritizes innovation and collective intelligence, cities can better address the multifaceted challenges of the 21st century, ultimately leading to more equitable and sustainable urban environments.



Michael BOSSERT

Manager, Strategy, Innovation and Outreach at the Next-Generation Cities Institute, Concordia University, Canada

With the background of an architect, interior architect, and innovation manager, he worked for different engineering and architecture firms in Germany and Finland. Before he moved to Canada, he held the position of Managing Director for the Center of Sustainable Energy Technology Research at the University of Applied Sciences Stuttgart. Motivated by complex tasks, he developed and managed several national and international interdisciplinary and transdisciplinary projects, always in the role of bridge-builder between different professions and interest groups.

Currently, he is responsible for innovation and knowledge transfer from academia to industry, civil society, government, and vice versa. He is part of the International Sustainable Campus Network's advisory board and boosts living lab approaches lead by universities, as they are innovative and long-term key players in shaping the Next-Generation Cities.

KEYWORDS

#LIVING LABS #URBAN LABS #CAMPUS AS A LIVING LAB #SOCIAL INNOVATION #CO-CREATION PROCESSES FOR THE NEXT-GENERATION CITIES #SUSTAINABLE ENTREPRENEURSHIP

LIVING LAB TYPOLOGIES AND METHODOLOGIES TO SHAPE THE NEXT GENERATION OF CITIES PRO-ACTIVELY

Cities serve as dynamic centers of innovation, fostering economic development and sustainable solutions to societal and environmental challenges. The interactions among urban residents stimulate creativity, resulting in innovative products and services tailored to specific urban needs. However, cities also confront complex issues exacerbated by global warming, including resource strain, transport congestion, and environmental degradation. The Smart City 3.0 model, which emphasizes citizen co-creation, presents a promising strategy for addressing these challenges. The quintuple-helix innovation model, integrating academia, industry, government, civil society, and the natural environment, promotes sustainable development and resilience. Cities globally are taking climate action, with initiatives such as the C40 network leading the transition to a low-carbon economy. The Sustainable Development Goals and the New Urban Agenda provide frameworks for these efforts, emphasizing empowerment, transparency, and sustainability to achieve equity, collaboration, ecology, and vibrancy. Living Labs, as collaborative methodologies, are essential for addressing urban transformation challenges, offering real-world testing environments and fostering interdisciplinary collaboration. This holistic approach accelerates innovation and enhances its relevance and impact, making it indispensable for contemporary complex challenges. The Living Lab methodology and its application are gaining attention as it facilitates the transfer and co-creation of knowledge to realize democratic and user-centred innovative solutions to climate change and other major challenges of our time. However, the term Living Lab is used in various approaches. Therefore, a literature review of Living Labs' epistemology will distinguish between different typologies and categorize how different approaches and methodologies can offer toolkits for various situations and processes.



Oriol GAVALDÀ

Lead, Zero Carbon Communities, Next-Generation Cities Institute, and part of the UNIVER/CITY 2030 Initiative at Concordia University, Canada

Oriol holds a degree in industrial engineering, a master of science in renewable energies and the environment, and a degree in economics. He started his engineering career working in the development sector for six years, implementing rural electrification projects all around the globe. After this experience, he joined the cooperative AIGUASOL in 2006, working on several consultancy projects related to renewable energy and energy efficiency, mainly focused on the tertiary and industrial sectors. Later, Oriol oriented his work on deepening business model analysis and financing of energy efficiency projects. He has worked as an independent consultant for the biggest multilateral finance organizations (World Bank, UN, CAF). Structurally, he has been the R&D head of AIGUASOL for 3 years and general manager (CEO) for 6 years, positioning Aiguasol as one of the leading sustainability companies in the Spanish energy sector.

KEYWORDS

#URBAN PLANNING #METABOLIC ANALYSIS #LIVING LAB
#SOCIAL ENGAGEMENT #SOCIAL INNOVATION

LAB BATLLÓ, THE URBAN LIVING LAB OF CAN BATLLÓ IN BARCELONA: FROM AN INITIAL DESIGN OF AN INNOVATION LIVING LAB TO THE CRYSTALLIZATION OF BOTTOM-UP STRATEGIES THROUGH THE ENERGY COMMUNITY OF LA BORDETA

It is absolutely necessary to create a suitable framework to be able to respond to challenges such as climate change, environmental pollution, lack of equality, and energy poverty, to name just a few. The traditional evolution dynamics of legislation and regulations, which mediate between technology and society, are often unable to keep up with the frenetic pace of changes that have occurred since the beginning of the 21st century. This is why new mechanisms and tools are needed to quickly update regulations and administrative procedures. In recent years, different methodologies have appeared, such as test beds, regulatory sandboxes, low-regulation zones, or living labs, where new urban and relational models are tested in physically limited areas with specific objectives, but in any case, aimed at promoting technological, social, and economic innovation. This is why Barcelona, one of the leading cities in energy initiatives, has promoted the development of a living lab in one of its most socially renowned communities, Can Batlló.

The Can Batlló community was born in a collision between private property interests, municipality interests, and neighbors. After the abandonment of a factory occupying 81,000 m2 of the city, the neighbors organized themselves through the assembly group "Plataforma Can Batlló" with the slogan "If they don't do it, we will Save Can Batlló." In June 2011, they obtained the transfer of part of Block 11 to manage its use and become a piece of civic equipment, starting the transformation works of the site at the same time that put the current urban project in crisis and showing an alternative model of neighborhood participation.

In the last years, the redevelopment of Can Batlló has started to take place, but at a slower pace than the neighbors expected. It is at this moment, that a collective of professionals linked to the social movements but with strong innovation and technical background proposed to both the municipality and the neighbors to develop a "living lab plan" for the implementation of measures to convert Can Batlló in an example of how an XXIst century city should develop in a bottom-up strategy. The current situation of the neighborhood in which the community of Can Batlló is inserted (La Bordeta) makes it an interesting case. Why? It is definitely a zone where social indicators show higher levels of energy vulnerability than the rest of Barcelona. To quote some interesting data, in La Bordeta, 18.5% of homes in the district cannot maintain an adequate temperature in the cold months, the risk-of-poverty rate in the district is 25.6%, 6 points higher than the Barcelona average, there are 36.2% fewer vehicles than in the rest of the city

It is knowing the circumstances that the developers' group made this strong proposal. The proposal has not only been a development of ideas but also a structural and methodological approach to such types of neighborhoods. The team has applied an integrated process that unites agile methodologies at the intersection of urban design, emerging technologies, public policies, and truly inclusive participatory processes. A new structure for diagnosis, co-creation of actions and projects, consensus, prediction, tests, measurement, and verification of change has been proposed. The methodology has placed a special emphasis on generating knowledge based on verification in operation, which includes measuring and collecting data and information, ordering and processing, and analysis to assess results and consolidate learning. This methodology will allow, in the future, a potential replication of the proposals in other places of a similar scale or application on a more global scale in Barcelona or other cities. The phases of the analysis have been: (i) Phase 1 Diagnosis of the scope (ii) Phase 2 Identification of strategic lines, (iii) Phase 3 Definition of general and detailed objectives, (iv) Phase 4 Presentation of model change actions (v) Phase 5 Proposal of pilot projects applicable to the field.

Despite most of the proposed pilot projects having found the interest of citizens and the municipality, one is now taking the lead. It is the Energy Community, under which different photovoltaic fields will be shared between final users (associations, citizens, and the municipality) under a cooperative scheme. The PV installations will be developed before December 2022.



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Oriol holds a degree in industrial engineering, a master of science in renewable energies and the environment, and a degree in economics. He started his engineering career working in the development sector for six years, implementing rural electrification projects all around the globe. After this experience, he joined the cooperative AIGUASOL in 2006, working on several consultancy projects related to renewable energy and energy efficiency, mainly focused on the tertiary and industrial sectors. Later Oriol oriented his work on deepening business models analysis and financing of energy efficiency projects. He has worked as an independent consultant for the biggest multilateral finance organizations (World Bank, UN, CAF,..). Structurally, he has been R&D head of AIGUASOL for 3 years, and general manager (CEO) for 6 years, positioning Aiguasol as one of the leading sustainability companies in the Spanish energy sector.



Ursula EICKER

Canada Excellence Research Chair (CERC) in Smart, Sustainable and Resilient Communities and Cities, Director of Concordia University's NEXT-GENERATION CITIES INSTITUTE, Professor in the Building, Civil and Environmental Engineering (BCEE) Department at Concordia University, Canada

Dr. Eicker is a German physicist who received her Ph.D. in Solid State Physics from Heriot-Watt University and her Habilitation in Renewable Energy Systems and Building Technology from the Technical University Berlin. She has led numerous international research projects in renewable energy supply systems and building energy efficiency at Stuttgart University of Applied Sciences. A central focus of her research is zero-emission, smart, and sustainable cities, integrating renewable energy sources and increasing city livability. A team of over 50 graduate students and software developers worked on numerous eco-district projects in Canada and created the urban modeling, data analytics, and stakeholder engagement platform Tools4Cities. Dr. Eicker founded the Next-Generation Cities Institute in November 2020 and addresses the challenges of urban transformation with a transdisciplinary approach and develops tools and strategies for a sustainable future. As a member of the Canadian Green Municipal Fund (GMF) council since 2024, Prof. Eicker supports environmental sustainability and community development. She is a member of several advisory boards, including the Catalonian Energy Research Institute IREC, the Ireland Research Centre for Energy, Climate and Marine Research MaREI, Unibail-Rodamco-Westfield, headquartered in Paris, and others.



Natalie VOLAND

INDI candidate and member of the Concordia Chair of Excellence in RelNDI candidate and member of the Concordia Chair of Excellence in Research on Smart and Resilient Cities and the Next Generation Cities Institute, Concordia University, Canada

Natalie has been reinventing the process of real estate development for over 25 years. Her roots as a social worker allow her to have a unique and purpose-driven design-centered outlook on development that prioritizes the historical protection of civic assets while being forward-thinking about using buildings to unite communities and push environmental advocacy. As a Ph.D. candidate, she is specializing in the bridge of market business practices that drive sustainability in the built environment.

She is an award-winning, socially driven developer and a leader of the Quebec B Corp. Movement, where her companies contribute to the protection of the environment and foster social inclusion while making a market-driven profit to further the economic development of Montreal. Natalie manages 1.5 million square feet, supports over 500 entrepreneurs, and is an active expert public speaker, and mentor. Her newest venture, "Quo Vadis Capital," invests in carbon-mitigated accessible housing to address inclusion and climate change in real estate.

Natalie sits on several Boards and think tanks associated with her passion for being a leader in ESG development. Natalie is an active master planner and partners with universities to use her assets as teaching and prototype tools to evolve concepts on what kind of city we want to build.

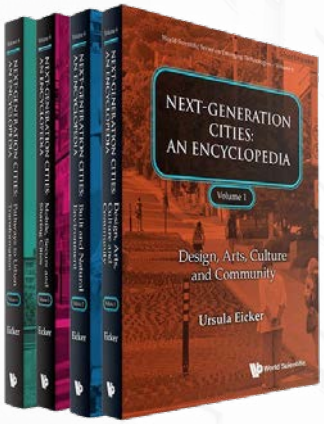
KEYWORDS

#ABC ACCELERATOR #CLIMATE ACTION #LOW-CARBON FOCUS
#REAL ESTATE SECTOR #ENERGY EFFICIENCY #SUSTAINABILITY

THE ABC ACCELERATOR: A MULTISTAKEHOLDER CONCORDIA UNIVERSITY HANDS-ON INITIATIVE TO SCALE IMPACT UPTAKE IN PRIVATE REAL ESTATE

This chapter describes the ABC Accelerator, a Concordia University-led initiative to promote climate action within Montreal's private real estate sector by fostering cross-disciplinary, collaborative approaches to building and retrofitting structures with a low-carbon focus. Critical aspects of the project include:

1. Framework and Approach: The ABC Accelerator addresses barriers in the real estate sector by engaging multiple stakeholders, including city planners, developers, energy providers, and financiers, to explore and adopt climate mitigation strategies collectively. It tests and benchmarks projects using a system-wide, hands-on approach to promote zero-carbon buildings.
2. Pilot Projects: Two pilot projects were initiated to evaluate the feasibility of proposed climate solutions. These projects included recommendations for energy efficiency, green building practices, and sustainability-focused financial incentives. Three scenarios were used: baseline (business-as-usual), ABC (low-hanging fruit), and Next Generation (ambitious, cutting-edge practices).
3. Challenges and Opportunities: The Accelerator faced differing definitions and risk tolerances across stakeholders, technical barriers, and regulatory constraints. However, the project fostered a collaborative environment that promotes scalable climate adaptation solutions by addressing these barriers through collective expertise.
4. Outcomes and Next Steps: The ABC Accelerator generated significant CO2 reduction potential for the pilot projects and established a model for climate-oriented real estate development. Moving forward, the project plans to expand its reach, offering open-source tools and resources to make climate solutions accessible to other developers and stakeholders in the Montreal area and beyond.



In conclusion, THE BOOK OF ABSTRACTS / VOL. 4 for the "Next-Generation Cities: An Encyclopedia" series, published by World Scientific Publishing Co Pte Ltd, introduces the diverse and interdisciplinary topics covered in the four volumes. Both publications are co-edited by Prof. Ursula Eicker, Canada Excellence Research Chair (CERC) in Smart, Sustainable, and Resilient Communities and Cities, and founding Director of the Next-Generation Cities Institute (NGCI), along with the team of Co-Directors representing the Institute's three research clusters: Built and Natural Environment (BAN), Mobile, Secure, and Sharing Cities (MSS), and Design, Arts, Culture, Community (DAC).

The presented abstracts offer the perspectives of authors who are primarily experts in the field of urban studies from Concordia University in Montreal, along with related experts from Canada and around the globe. In this way, this collection creates an international overview. It highlights the multifaceted nature of urban development, integrating insights from various fields to understand the challenges and opportunities facing our cities today. We invite you to explore the subsequent volumes, each offering unique perspectives on next-generation cities. Together, these volumes form a rich resource for shaping the future of urban environments.


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