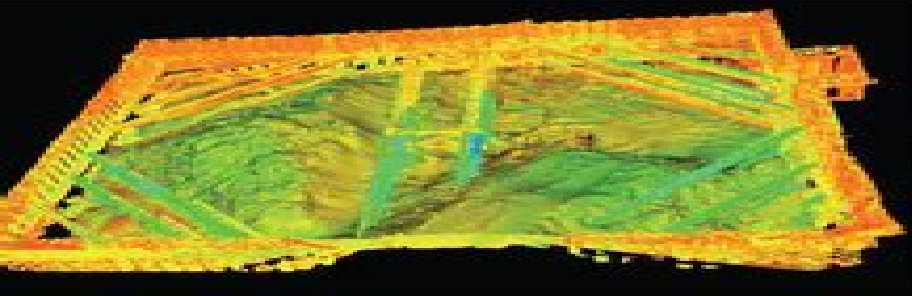




# UNDERGROUND ENGINEERING FOR SUSTAINABLE URBAN DEVELOPMENT

NATIONAL RESEARCH COUNCIL  
OF THE NATIONAL ACADEMIES



# Underground Engineering For Sustainable Urban Development

**Kjetil Fallan**



## **Underground Engineering For Sustainable Urban Development:**

Underground Engineering for Sustainable Urban Development National Research Council, Division on Earth and Life Studies, Board on Earth Sciences and Resources, Committee on Geological and Geotechnical Engineering, Committee on Underground Engineering for Sustainable Development, 2013-03-26 For thousands of years the underground has provided humans refuge useful resources physical support for surface structures and a place for spiritual or artistic expression More recently many urban services have been placed underground Over this time humans have rarely considered how underground space can contribute to or be engineered to maximize its contribution to the sustainability of society As human activities begin to change the planet and population struggle to maintain satisfactory standards of living placing new infrastructure and related facilities underground may be the most successful way to encourage or support the redirection of urban development into sustainable patterns Well maintained resilient and adequately performing underground infrastructure therefore becomes an essential part of sustainability but much remains to be learned about improving the sustainability of underground infrastructure itself At the request of the National Science Foundation NSF the National Research Council NRC conducted a study to consider sustainable underground development in the urban environment to identify research needed to maximize opportunities for using underground space and to enhance understanding among the public and technical communities of the role of underground engineering in urban sustainability Underground Engineering for Sustainable Urban Development explains the findings of researchers and practitioners with expertise in geotechnical engineering underground design and construction trenchless technologies risk assessment visualization techniques for geotechnical applications sustainable infrastructure development life cycle assessment infrastructure policy and planning and fire prevention safety and ventilation in the underground This report is intended to inform a future research track and will be of interest to a broad audience including those in the private and public sectors engaged in urban and facility planning and design underground construction and safety and security      **Underground Space** Raymond L. Sterling, John Carmody, Yingxin Zhou, Monique Labbé, Xiaozhao Li, Jianqiang Cui, 2025-10-07 Unlocking the Hidden Potential of Cities from the Ground Down With cities worldwide facing pressures from rapid urbanization climate change and land scarcity underground space has become a vital resource for sustainable and resilient urban development Underground Space Use Planning and Design provides a comprehensive framework for planners engineers architects and policymakers to understand and apply underground solutions and updates a landmark reference work on the topic Combining many decades of research practice and global examples this book offers authoritative guidance on how underground space can contribute to the creation of livable future ready cities Written by a team of experts from around the globe Underground Space offers An understanding of the many reasons why underground space is used and when to choose to build underground Broad coverage of underground uses from transport and urban utilities to underground architectural applications Recent advances

made in three dimensional urban underground planning Updated design approaches and human centered considerations for the exterior and interior design layout lighting and safety of underground spaces In depth exploration of sustainability resilience and adaptability issues Insights from several decades of hands on experience with modern underground designs Underground Space Use Planning and Design is an essential up to date reference on the subject for architects planners and engineers in public agencies private sectors and research institutions It is also valuable for use in courses on architectural design urban planning underground infrastructure and infrastructure provision

**Supercities On, Under, and Beyond the Earth** Jeff Dondero, 2020-02-08 As more and more people inhabit the Earth and live longer on it Super Cities will explode with populations of 20 30 even 100 millions or more But how will these cities accommodate such masses Who will build them and where How can they be sustained and their inhabitants provided for Here Jeff Dondero imagines the super cities of the future and explores the ways in which they can be sustainably built how transportation will move masses of people without cars how people will be fed and where waste will go and how we will move to cities underground under the sea in the atmosphere into space and on to other planets It describes some of the smart systems for buildings and homes and some of the new ways food and materials enough for such masses will be supplied Will super cities be the answer to our bursting population And if they will how can we best sustain and supply them Dondero offers suggestions and a blueprint for the future

*Proceedings of the 5th International Symposium for Intelligent Transportation and Smart City (ITASC)* Xiaoqing Zeng, Xiongyao Xie, Jian Sun, Limin Ma, Yinong Chen, 2023-04-27 This book presents research advances in intelligent transportation and smart city in detail mainly focusing on green traffic and urban utility tunnels presented at the 5th International Symposium for Intelligent Transportation and Smart City ITASC 2022 held at Tongji University Shanghai on May 20 21 2022 It is also branch of the International Symposium on Autonomous Decentralized Systems ISADS 2023 Due to rapid development in the domain of intelligent transportation and smart city many popular topics are included such as the 2BMW system Bus Bike Metro and Walking transportation safety and environment protection urban utility design and application the application of BIM in the city design This book collects papers with high quality including some authoritative scholars and most experienced engineers latest achievements which will provide guidance to those both in universities and entrepreneurs in the field of transportation and urban planning The first conference in the ITASC series was held in 2013 as a workshop of the International Symposium on Autonomous Decentralized System ISADS in Mexico City The second to fourth were held in May 2015 2017 and 2019 respectively in Tongji University Shanghai

**Sustainable Urban Development in Canada: A compendium of initiatives** Virginia White Maclaren, Intergovernmental Committee on Urban and Regional Research (Canada), 1993 V 1 Summary report V 2 Annotated bibliography V 3 Compendium of initiatives

Geoinformatics, 2006

Proceedings of the Institution of Civil Engineers, 2008

*Felsbau*, 2004

**Sustainable Urban Development in Canada: Summary report** Virginia White Maclaren, Intergovernmental Committee on Urban and Regional Research

(Canada),1993 V 1 Summary report V 2 Annotated bibliography V 3 Compendium of initiatives *Tunnelling. A Decade of Progress. GeoDelft 1995-2005* Adam Bezuijen,Haike van Lottum,2006 This book is an anthology of GeoDelft s most important publications on the subject of soft soil tunnelling in the Netherlands since 1992 The anthology is subdivided into field measurements grout behaviour model tests and numerical analysis **ITA-AITES 2004** R. Krishnan,J. Zhao,J. Nicholas Shirlaw,International Tunnelling Association,2004 **Abstracts, 30th International Geological Congress** ,1996

*Underground Space for Sustainable Urban Development* J. N. Shirlaw,Jian Zhao,R. Krishnan,2004 **Underground Skyscrapers** Ivy Silver,AI,2025-02-19 Underground Skyscrapers explores a radical solution to overpopulation and environmental concerns building entire urban environments beneath the Earth s surface The book examines the feasibility of subterranean architecture highlighting that our ability to engineer and inhabit the subsurface has evolved from ancient cave dwellings to modern underground infrastructure projects It argues that advances in technology could make underground living a sustainable and resilient urban development strategy offering a way to alleviate pressure on limited surface resources The book delves into the technological hurdles and psychological impacts of living in underground cities such as how to design spaces that avoid isolation and foster a sense of community It also considers the environmental benefits showcasing how subterranean structures can offer advantages over traditional buildings Through engineering studies architectural designs and sociological research the book builds the argument that underground skyscrapers are not just a futuristic fantasy but a potentially viable solution to urbanization challenges The book progresses logically beginning with an introduction to underground architecture then delving into engineering aspects psychological considerations and real world case studies It offers a comprehensive look at subterranean urban spaces providing insights for architects engineers urban planners and anyone interested in the future of urban living and sustainable urban development Abstracts ,1996

*Osaka and Its Technology* ,2000-03 *Underground City Systems* Marcus Tesla,AI,2025-01-24 Underground City Systems presents a fascinating exploration of the hidden infrastructure networks that sustain modern urban life tracing their evolution from ancient civilizations to contemporary metropolises The book masterfully weaves together historical research engineering principles and urban planning insights to demonstrate how subterranean systems have become critical to city functionality and resilience Through detailed case studies of cities like London Tokyo and New York readers discover how underground infrastructure addresses challenges of population growth resource management and environmental sustainability The book s journey begins with ancient water management systems like Roman aqueducts and Persian qanats establishing the historical foundation of underground engineering It then transitions to modern utility networks examining how water sewage electricity and telecommunications systems have evolved to meet growing urban demands Technical concepts are made accessible through detailed diagrams and 3D modeling while maintaining a balance between technical detail and practical application Structured in three main sections covering historical development current systems and future

challenges the book serves as both a comprehensive reference and practical guide for urban planners civil engineers and architects It uniquely combines archaeological findings municipal records and contemporary engineering studies to present a holistic view of underground infrastructure Special attention is given to emerging technologies like automated tunnel boring systems and smart infrastructure monitoring making this an invaluable resource for understanding the future of urban development     *The Philosopher's Index* ,2006 Vols for 1969 include a section of abstracts     *Memoirs of the School of Engineering, Nagoya University* ,1996     **Memoirs of the School of Engineering, Nagoya University** Nagoya Daigaku. Kōgakubu,1996

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