

Underground Infrastructures Planning Design And Construction

Practising engineers on site, in the design office or in client organizations will find this book an excellent introduction to the design and construction of sprayed concrete lined (SCL) tunnels. The complex behaviour of the early age behaviour of the sprayed concrete requires careful management. This book covers all aspects of SCL tunnelling – from the constituents of sprayed concrete to detailed design and management during construction. Although there is a close interdependence between all the facets of sprayed concrete, few engineers have the right breadth of experience and expertise, and this urgently needs to be transferred to the wider engineering community. Disseminating essential information for tunnelling engineers, Sprayed Concrete Lined Tunnels is key reading for all involved in or studying the process.

Underground the way to the future was the motto of the World Tunnel Congress 2013 in Geneva, Switzerland. The use of underground space has gained importance during the last years due to the tremendous global urbanization, the high demand on transportation capacities and energy production. All this result in a wider range of use of underground spa

Underground Engineering: Planning, Design, Construction and Operation of the Underground Space provides the author's vast experience as both an academic and practitioner. It covers Planning, Design, Construction and the Operation of Underground Structures. Targeted at young professionals, students and researchers new to the field, the book contains examples, illustrations and cases from diverse underground uses, from roads to disposal facilities. Sections cover the history of the field, upcoming challenges, the planning stage of the subsurface use, including financial planning and reliability forecasting, site investigation, instrumentation and modeling, construction techniques and challenges, and more. Young professionals in this area will benefit from the updated and complete overview of Underground Engineering. Students will find the examples and cases particularly didactic. Richly illustrated, this book is an excellent resource for all involved in the development of the underground space. Offers a complete introduction to the area, including planning, design, construction and the operation of underground structures Assumes little previous knowledge from readers Presents the most recent techniques and future technical trends Richly illustrated and packed with examples to help readers understand the fundamentals of the area

This volume contains a compilation of studies regarding novel technology of underground space development, behavior analysis and modelling of soils and underground infrastructure from the 6th GeoChina International Conference held in Nanchang, China from July 19 to 21, 2021. The scope of the studies covers both methodological and pragmatic solutions to critical issues, including soil arching and invert heaving, penetration resistance of mono-bucket foundations in silty soil, inception of debris avalanches, and novel infrastructure survey methods based on point cloud and image analysis. It is anticipated that this updated knowledge will lead to more resilient design, expedited inspection, timely maintenance and rehabilitation of underground infrastructure, and will be beneficial to both researchers and practitioners in the field.

Did alligators ever really live in New York's sewers? What's it like to explore the old aqueducts beneath the city? How many levels are beneath Grand Central Station? And how exactly did the pneumatic tube system that New York's post offices used to employ work? In this richly illustrated historical tour of New York's vast underground systems, Julia Solis answers all these questions and much, much more. New York Underground takes readers through ingenious criminal escape routes, abandoned subway stations, and dark crypts beneath lower Manhattan to expose the city's basic anatomy. While the city is justly famous for what lies above ground, its underground passages are equally legendary and tell us just as much about how the city works. 'Underground space' is a broad overview of the concept of underground space development investigating the issues that are associated with the sustainable development of urban underground space. This book shows the benefits, the possibilities and world-class examples of underground space development and how that translates into sustainable urbanisation. The book is intended for civil engineers, urban planners, urban designers and architects. It would also appeal to public policy makers and those involved with the future of urban development. It will provide multi-disciplinary information and aims to support a cross-disciplinary dialogue on the subject.

An easily accessible guide to scientific information, Hazardous Chemicals: Safety Management and Global Regulations covers proper management, precautions, and related global regulations on the safety management of chemical substances. The book helps workers and safety personnel prevent and minimize the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemical substances, which often result in toxic or explosive hazards. It also details safety measures for transportation of chemical substances by different routes, such as by road, rail, air, and sea. Discusses different aspects of potentially toxic and hazardous chemicals in simple and comprehensive language Provides toxicity and health effects of chemicals in simple, nontechnical language Covers scientific information on hazardous and potentially dangerous chemical substances at workplaces Offers fundamental knowledge about the biological and health effects of hazardous and potentially toxic chemicals in a comprehensive way Includes recent developments on safety management of hazardous and potentially toxic chemicals and related global regulations The author discusses the importance of knowledge in avoiding negligence during the use and handling of hazardous chemical substances. He stresses the importance of proper management and judicious application of each chemical substance irrespective of the workplace and eventually shows how safety and protection of the user, workplace, and the living environment can be achieved.

Share our experiences, our successes and failures, and our ideas and dreams, all with the goal of getting better at the work we love: building tunnels. Every two years, industry leaders and practitioners from around the world gather at the Rapid Excavation and Tunneling Conference (RETC), the authoritative program for the tunneling profession, to learn about the most recent advances and breakthroughs in this unique field. The information presented helps professionals keep pace with the ever-changing and growing tunneling industry. This book includes the full text of 111 papers presented at the 2019 conference covering such topics as contracting practices, design and planning, geotechnical considerations, hard-rock tunnel boring machines, new and innovative technologies, pressure-face TBM case histories, and tunneling for sustainability. The papers will inform, challenge, and stimulate each reader.

This Practical Guide to Rock Tunneling fills an important void in the literature for a practical guide to the design and construction of tunnels in rock. Practical Guide to Rock Tunneling takes the reader through all the critical steps of the design and construction for rock tunnels starting from geotechnical site investigations through to construction

supervision. The guide provides suggestions and recommendations for practitioners on special topics of laboratory testing, durability of rock and acceptance for unlined water conveyance tunnels, overstressing or deep and long tunnels, risk-based evaluation of excavation methods, contract strategies, and post-construction inspections. Key considerations and lessons learned from selected case projects are presented based on the author's extensive international experience of over 30 years and 1000 km of tunneling for civil, hydropower, and mining infrastructure, including some of the most recognized projects in the world to date. Instead of revisiting all theory and concepts that can be found in other sources, this book contains the hard learned lessons from the author's experience in the field of Rock Tunneling, gathered over 30 years of service.

This volume presents a selection of chapters covering a wide range of tunneling engineering topics. The scope was to present reviews of established methods and new approaches in construction practice and in digital technology tools like building information modeling. The book is divided in four sections dealing with geological aspects of tunneling, analysis and design, new challenges in tunnel construction, and tunneling in the digital era. Topics from site investigation and rock mass failure mechanisms, analysis and design approaches, and innovations in tunnel construction through digital tools are covered in 10 chapters. The references provided will be useful for further reading.

Have you ever wondered what lies beneath the streets of your city? Do you picture, in isolation, a series of train tunnels and pipes? Or perhaps the foundations of tall buildings that lie scattered, like icebergs, beneath the surface? As our cities grow up, out, and down, it is time we better understood how the different layers of these complex urban environments relate to one another. Underground Urbanism seeks to provide a new perspective on our cities, and consider how this might be used to engage more positively with them. So, tip your cities upside down to have a closer look, and let us rethink them from (below) the ground, up.

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.

Offers exposition of the classification of underground space, important considerations such as geological and engineering and underground planning. This title includes chapters concerning applications for underground water storage, underground car parks, underground metros and road tunnels and underground storage of crude oil, lpg and natural gas. Throughout the 38 chapters, this must-have volume outlines essential information about the implementation of emerging technologies, from building information modeling and 3D printing, to life cycle assessment and information technology in construction and engineering projects. It covers practical case studies to demonstrate the implementation of emerging technologies in a compact style, ensuring that practitioners can adopt these methods to realize immediate benefits in productivity, safety and performance improvement.

The Culture of Nature in the History of Design confronts the dilemma caused by design's pertinent yet precarious position in environmental discourse through interdisciplinary conversations about the design of nature and the nature of design. Demonstrating that the deep entanglements of design and nature have a deeper and broader history than contemporary discourse on sustainable design and ecological design might imply, this book presents case studies ranging from the eighteenth to the twenty-first century and from Singapore to Mexico. It gathers scholarship on a broad range of fields/practices, from urban planning, landscape architecture, and architecture, to engineering design, industrial design, furniture design and graphic design. From adobe architecture to the atomic bomb, from the bonsai tree to Biosphere 2, from pesticides to photovoltaics, from rust to recycling – the culture of nature permeates the history of design. As an activity and a profession always operating in the borderlands between human and non-human environments, design has always been part of the environmental problem, whilst also being an indispensable part of the solution. The book ventures into domains as diverse as design theory, research, pedagogy, politics, activism, organizations, exhibitions, and fiction and trade literature to explore how design is constantly making and unmaking the environment and, conversely, how the environment is both making and unmaking design. This book will be of great interest to a range of scholarly fields, from design education and design history to environmental policy and environmental history.

Tunnelling has become a fragmented process, excessively influenced by lawyers' notions of confrontational contractual bases. This prevents the pooling of skills, essential to the achievement of the promoters' objectives. Tunnelling: Management by Design seeks the reversal of this trend. After a brief historical treatment of selected developments, th

Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art contains the contributions presented at the World Tunnel Congress 2019 (Naples, Italy, 3-9 May 2019). The use of underground space is continuing to grow, due to global urbanization, public demand for efficient transportation, and energy saving, production and distribution. The growing need for space at ground level, along with its continuous value increase and the challenges of energy saving and achieving sustainable development objectives, demand greater and better use of the underground space to ensure that it supports sustainable, resilient and more liveable cities. This vision was the source of inspiration for the design of the logos of both the International (ITA) and Italian (SIG) Tunnelling Association. By placing key infrastructures underground – the black circle in the logos – it will be possible to preserve and enhance the quality of the space at ground level – the green line. In order to consider and value underground space usage together with human and social needs, engineers, architects, and artists will have to learn to collaborate and develop an interdisciplinary design approach that addresses functionality, safety, aesthetics and quality of life, and adaptability to future and varied functions. The 700 contributions cover a wide range of topics, from more traditional subjects connected to technical challenges of design and construction of underground works, with emphasis on innovation in tunneling engineering, to less conventional and archetypically Italian themes such as archaeology, architecture, and art. The book has the following main themes: Archaeology, Architecture and Art in underground construction; Environment sustainability in underground construction; Geological and geotechnical knowledge and requirements for project implementation; Ground improvement in underground constructions; Innovation in underground engineering, materials and equipment; Long and deep tunnels; Public communication and awareness; Risk management, contracts and financial aspects; Safety in underground construction; Strategic use of underground space for resilient cities; Urban tunnels. Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art is a valuable reference text for tunneling specialists, owners, engineers, architects and others involved in underground planning, design and building around the world, and for academics who are interested in underground constructions and geotechnics.

Underground – the way to the future was the motto of the World Tunnel Congress 2013 in Geneva, Switzerland. The use of underground space has gained importance during the last years due to the tremendous global urbanization, the high demand on transportation capacities and energy production. All this result in a wider range of use of underground space: besides the traditional road, railway, metro and utility tunnels, more and more other functionalities of modern life are placed under ground in order to free the surface for other uses. The 300 papers of the present book cover important aspects of modern underground infrastructures: Development and use of underground space; project planning and implementation (construction management, risk control, cost estimation and scheduling, contracting practices); design and analysis methods and considerations; construction technology developments; tunnel operation (safety, maintenance, rehabilitation and repair); case histories (learning from failures, long deep tunnels, underground construction for hydropower). Underground – the way to the future will be invaluable to specialists, contractors and design engineers in underground planning, construction and tunnelling worldwide, and to academics interested in underground and geotechnical engineering.

Practical Guide to Grouting of Underground Structures presents a hands-on discussion of grouting fundamentals and provides a foundation for the development of practical specifications and field procedures. Employing a pragmatic approach to the subject of grouting, Raymond W. Henn concentrates on areas such as the types of drilling, mixing and pumping equipment, and their application. The book focuses on how cementitious grouting is used in conjunction with the excavation and lining of tunnels, shafts, and underground caverns in rock. Overviews of cementitious grouting in soils and chemical grouting are also provided. Topics covered range from record keeping to quality control and testing requirements, field operations, and production rates. Practical Guide to Grouting of Underground Structures is written as a useful handbook for engineers, construction supervisors, inspectors, and other professionals involved in the planning, design, and implementation of underground grouting programs.

Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art. Volume 11: Urban Tunnels - Part 1 contains the contributions presented in the eponymous Technical Session during the World Tunnel Congress 2019 (Naples, Italy, 3-9 May 2019). The use of underground space is continuing to grow, due to global urbanization, public demand for efficient transportation, and energy saving, production and distribution. The growing need for space at ground level, along with its continuous value increase and the challenges of energy saving and achieving sustainable development objectives, demand greater and better use of the underground space to ensure that it supports sustainable, resilient and more liveable cities. The contributions cover a wide range of topics, from geomechanical behavior evaluation, evaluation of long-term tunnel behaviour, via monitoring excavation-related ground deformation to risk management for tunneling-induced deformations. The book is a valuable reference text for tunnelling specialists, owners, engineers, archaeologists, architects, artists and others involved in underground planning, design and building around the world, and for academics who are interested in underground constructions and geotechnics.

This volume comprises a set of high-quality, refereed papers that address the different aspects related to the geotechnical and structural design and construction of deep excavations, tunnels and underground space facilities as well as the effect of their construction on the surroundings. The papers cover planning, design, modeling, monitoring and construction aspects of these essential structures. The utilization of underground space using tunneling and deep excavations has become much needed to support the increasing needs of urban environments and to allow for functional extensions and sustainable developments in heavily congested areas. Recently, more utilities and transportation transit systems have been relocated underground because of scarcity of surface space. The growing interest in the use of underground space has necessitated commensurate advancements in related fields (geotechnical engineering, engineering geology and structural engineering), design tools, construction techniques and analytical and interpretation methods. The volume is based on the best contributions to the 2nd GeoMEast International Congress and Exhibition on Sustainable Civil Infrastructures, Egypt 2018 – The official international congress of the Soil-Structure Interaction Group in Egypt (SSIGE).

This single-volume thoroughly summarizes advances in the past several decades and emerging challenges in fundamental research in geotechnical engineering. These fundamental research frontiers are critically reviewed and described in details in lights of four grand challenges our society faces: climate adaptation, urban sustainability, energy and material resources, and global water resources. The specific areas critically reviewed, carefully examined, and envisioned are: sensing and measurement, soil properties and their physics roots, multiscale and multiphysics processes in soil, geochemical processes for resilient and sustainable geosystems, biological processes in geotechnics, unsaturated soil mechanics, coupled flow processes in soil, thermal processes in geotechnical engineering, and rock mechanics in the 21st century.

Geotechnical Aspects of Underground Construction in Soft Ground comprises a collection of 112 papers, four general reports on the symposium themes, the Fujita Lecture, three Special Lectures and the Bright Spark Lecture presented at the Tenth International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground, held in Cambridge, United Kingdom, 27-29 June 2022. The symposium is the latest in a series which began in New Delhi in 1994, and was followed by symposia in London (1996), Tokyo (1999), Toulouse (2002), Amsterdam (2005), Shanghai (2008), Rome (2011), Seoul (2014) and Sao Paulo (2017). This was organised by the Geotechnical Research Group at the University of Cambridge, under the auspices of the Technical Committee TC204 of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). Geotechnical Aspects of Underground Construction in Soft Ground includes contributions from more than 25 countries on research, design and construction of underground works in soft ground. The contributions cover: Field case studies Sensing technologies and monitoring for underground construction in soft ground Physical and

numerical modelling of tunnels and deep excavations in soft ground Seismic response of underground infrastructure in soft ground Design and application of ground improvement for underground construction Ground movements, interaction with existing structures and mitigation measures The general reports give an overview of the papers submitted to the symposium, covered in four technical sessions. The proceedings include the written version of the five invited lectures covering topics ranging from developments in geotechnical aspects of underground construction, tunnelling and groundwater interaction (short and long-term effects), the influence of earth pressure balance shield tunnelling on pre-convergence and segmental liner loading (field observations, modelling and implications on design). Similar to previous editions, *Geotechnical Aspects of Underground Construction in Soft Ground* represents a valuable source of reference on the current practice of analysis, design, and construction of tunnels and deep excavations in soft ground. The book is particularly aimed at academics and professionals interested in geotechnical and underground engineering.

This text describes topics discussed at the conference, including: tunnelling and construction in soft ground and rocks; geological investigations; tunnelling machines; planning for underground infrastructure; safety issues and environmental and social aspects of underground development.

This book presents three distinct pillars for analysis, design, and planning: urban water cycle and variability as the state of water being; landscape architecture as the medium for built-by-design; and total systems as the planning approach. The increasing demand for water and urban and industrial expansions have caused myriad environmental, social, economic, and political predicaments. More frequent and severe floods and droughts have changed the resiliency and ability of water infrastructure systems to operate and provide services to the public. These concerns and issues have also changed the way we plan and manage our water resources. Focusing on urban challenges and contexts, the book provides foundational information regarding water science and engineering while also examining topics relating to urban stormwater, water supply, and wastewater infrastructures. It also addresses critical emerging issues such as simulation and economic modeling, flood resiliency, environmental visualization, satellite data applications, and digital data model (DEM) advancements. Features: Explores various theoretical, practical, and real-world applications of system analysis, design, and planning of urban water infrastructures Discusses hydrology, hydraulics, and basic laws of water flow movement through natural and constructed environments Describes a wide range of novel topics ranging from water assets, water economics, systems analysis, risk, reliability, and disaster management Examines the details of hydrologic and hydrodynamic modeling and simulation of conceptual and data-driven models Delineates flood resiliency, environmental visualization, pattern recognition, and machine learning attributes Explores a compilation of tools and emerging techniques that elevate the reader to a higher plateau in water and environmental systems management *Water Systems Analysis, Design, and Planning: Urban Infrastructure* serves as a useful resource for advanced undergraduate and graduate students taking courses in the areas of water resources and systems analysis, as well as practicing engineers and landscape professionals.

The central role of infrastructure to cities, and in particular their sustainability, is essential for proper planning and design since most energy and materials are themselves consumed by or through infrastructures. Moreover, infrastructures of all types affect matters of economic and social equity, due to access that they provide or prevent. *Sustainable Infrastructure for Cities and Societies* shows how fundamental planning, design, finance, and governance principles can be adapted for sustainable infrastructure to provide solutions to make cities significantly more sustainable. By providing a contemporary overview on infrastructure, cities, planning, economies, and sustainability, the book addresses how to plan, design, finance, and manage infrastructure in ways that reduce consumption and harmful impacts while maintaining and improving life quality. It considers the interrelationships between the economic, political, societal, and institutional frameworks, providing an integrative approach including livability and sustainability, principles and practice, and planning and design. It further translates these approaches that professionals, policymakers, and leaders can use. This approach gives the book wide appeal for students, researchers, and practitioners hoping to build a more sustainable world.

Underground Infrastructures Planning, Design, and Construction Butterworth-Heinemann

This illustrated book gives young readers “a breathtaking and entirely original insight” into the complex systems that exist underneath modern cities (Kirkus, starred review). Caldecott Medal-winning author and illustrator David Macaulay takes readers on a visual journey through a city's various support systems—the many tunnels, pipes, walls, and other structures that help sustain the bustling life above. In *Underground*, Macaulay exposes a typical section of this intricate underground network and explains how it works. Along with his beautiful illustrations, Macaulay presents “a straightforward yet fascinating description of the labyrinth beneath the feet of any city dweller. And what a complex covered world [he] reveals! He invents an intersection of two streets and proceeds to show what we all might find if we dared to descend through that Alice-in-Wonderland manhole” (The New York Times).

This volume comprises a set of high-quality, refereed papers that address the different aspects related to the geotechnical and structural design and construction of deep excavations, tunnels and underground space facilities as well as the effect of their construction on the surroundings. The papers cover planning, design, modeling, monitoring and construction aspects of these essential structures. This volume is part of the proceedings of the 1st GeoMEast International Congress and Exhibition on Sustainable Civil Infrastructures, Egypt 2017.

Project planning is generally accepted as an important contributor to project success. However, is there research that affirms the positive impact of project planning and gives guidance on how much effort should be spent on planning? To answer these questions, this book looks at current literature and new research of this under-studied area of project management. The author presents his findings from an extensive review of project planning literature that covers more than 270 sources. He also discusses new research that analyzes data from more than 1,300 global projects. The book confirms that the time spent on planning activities reduces risk and significantly increases the chances of project success. It also concludes that there can be too much planning and shows that the optimum ratio of planning to effort is 25%. The book examines the impact of project planning on different industries. It discusses research in the construction and information technology (IT) industries, and presents a case study of how to plan and track a software development project. The book also looks at the impact of geography on project planning and success. Intended as a basic tool in the library of any project manager or general manager, this book brings to light project planning techniques and information that have never been published previously. It is an important resource on how to plan projects properly and propel your career forward.

Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art. Volume 10: Strategic use of underground space for resilient cities contains the contributions presented in the eponymous Technical Session during the World Tunnel Congress 2019 (Naples, Italy, 3-9 May 2019). The use of underground space is continuing to grow, due to global urbanization, public demand for efficient transportation, and energy saving, production and distribution. The growing need for space at ground level, along with its continuous value

increase and the challenges of energy saving and achieving sustainable development objectives, demand greater and better use of the underground space to ensure that it supports sustainable, resilient and more liveable cities. The contributions cover a wide range of topics, from investing in urban underground space, via effective use of underground space for sustainable cities, and the use of new energy carriers to the compound use of underground space for integrated campus-urban development. The book is a valuable reference text for tunnelling specialists, owners, engineers, archaeologists, architects, artists and others involved in underground planning, design and building around the world, and for academics who are interested in underground constructions and geotechnics.

Rock Mechanics for Natural Resources and Infrastructure Development contains the proceedings of the 14th ISRM International Congress (ISRM 2019, Foz do Iguaçu, Brazil, 13-19 September 2019). Starting in 1966 in Lisbon, Portugal, the International Society for Rock Mechanics and Rock Engineering (ISRM) holds its Congress every four years. At this 14th occasion, the Congress brings together researchers, professors, engineers and students around contemporary themes relevant to rock mechanics and rock engineering. Rock Mechanics for Natural Resources and Infrastructure Development contains 7 Keynote Lectures and 449 papers in ten chapters, covering topics ranging from fundamental research in rock mechanics, laboratory and experimental field studies, and petroleum, mining and civil engineering applications. Also included are the prestigious ISRM Award Lectures, the Leopold Muller Award Lecture by professor Peter K. Kaiser. and the Manuel Rocha Award Lecture by Dr. Quinghua Lei. Rock Mechanics for Natural Resources and Infrastructure Development is a must-read for academics, engineers and students involved in rock mechanics and engineering. Proceedings in Earth and geosciences - Volume 6 The 'Proceedings in Earth and geosciences' series contains proceedings of peer-reviewed international conferences dealing in earth and geosciences. The main topics covered by the series include: geotechnical engineering, underground construction, mining, rock mechanics, soil mechanics and hydrogeology.

Underground infrastructure (traffic and railway tunnels, water and sewage ducts, garages, and subways) is essential for urbanized areas, as they fulfill an important role in the transportation of people, energy, communication and water. Underground Infrastructure of Urban Areas is a collection of papers on the design, application, and maintenance of underground infrastructure. An examination of how human beings are brought into the planning of complex infrastructure projects, through analysis of a controversial public transportation project.

Policymakers are regularly confronted by complaints that ordinary people are left out of the planning and managing of complex infrastructure projects. In this book, Sebastián Ureta argues that humans, both individually and collectively, are always at the heart of infrastructure policy; the issue is how they are brought into it. Ureta develops his argument through the case of Transantiago, a massive public transportation project in the city of Santiago, proposed in 2000, launched in 2007, and in 2012 called "the worst public policy ever implemented in our country" by a Chilean government spokesman. Ureta examines Transantiago as a policy assemblage formed by an array of heterogeneous elements—including, crucially, "human devices," or artifacts and practices through which humans were brought into infrastructure planning and implementation. Ureta traces the design and operation of Transantiago through four configurations: crisis, infrastructuration, disruption, and normalization. In the crisis phase, humans were enacted both as consumers and as participants in the transformation of Santiago into a "world-class" city, but during infrastructuration the "active citizen" went missing. The launch of Transantiago caused huge disruptions, in part because users challenged their role as mere consumers and instead enacted unexpected human devices. Resisting calls for radical reform, policymakers insisted on normalizing Transantiago, transforming it into a permanent failing system. Drawing on Chile's experience, Ureta argues that if we understand policy as a series of heterogeneous assemblages, infrastructure policymaking would be more inclusive, reflexive, and responsible.

Increasing demand on improving the resiliency of modern structures and infrastructure requires ever more critical and complex designs. Therefore, the need for accurate and efficient approaches to assess uncertainties in loads, geometry, material properties, manufacturing processes, and operational environments has increased significantly.

Reliability-based techniques help develop more accurate initial guidance for robust design and help to identify the sources of significant uncertainty in structural systems.

Reliability-Based Analysis and Design of Structures and Infrastructure presents an overview of the methods of classical reliability analysis and design most associated with structural reliability. It also introduces more modern methods and advancements, and emphasizes the most useful methods and techniques used in reliability and risk studies, while elaborating their practical applications and limitations rather than detailed derivations. Features: Provides a practical and comprehensive overview of reliability and risk analysis and design techniques. Introduces resilient and smart structures/infrastructure that will lead to more reliable and sustainable societies. Considers loss elimination, risk management and life-cycle asset management as related to infrastructure projects. Introduces probability theory, statistical methods, and reliability analysis methods. Reliability-Based Analysis and Design of Structures and Infrastructure is suitable for researchers and practicing engineers, as well as upper-level students taking related courses in structural reliability analysis and design.

Geologists and civil engineers related to infrastructure planning, design and building describe professional practices and engineering geological methods in different European infrastructure projects.

This volume presents technical papers devoted to development and practical use of computer methods in geotechnical and geoenvironmental engineering. It covers issues on space use and construction, soil and rock mechanics, and mining applications amongst other topics.

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A collection of papers from the international symposium "Underground Infrastructure Research: Municipal, Industrial and Environmental Applications 2001". It explores materials for buried pipelines, pipeline construction techniques and condition assessment methods, and more.

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