

17<sup>TH</sup> WORLD CONFERENCE  
**ACUUS2020**  
VIRTUAL CONFERENCE

3-4 FEBRUARY 2021, VIRTUAL CONFERENCE

ACUUS2020.ORG



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## ON DEMAND PRESENTATIONS

**A LITERATURE REVIEW OF MEDICAL SUPPORT IN CAVE RESCUE AND CONFINED SPACE MEDICINE – IMPLICATIONS IN URBAN UNDERGROUND SPACE DEVELOPMENT.**

Dr Jimmy Goh CGH, Singapore

**BEHAVIOUR OF AN UNDERGROUND METRO STATION FOR DIFFERENT CONSTITUTIVE MODELS - A STUDY ON THE INFLUENCE OF MOHR-COULOMB AND OTHER ADVANCED CONSTITUTIVE MODELS USING PLAXIS 2D FOR THE PROPOSED CHENNAI METRO RAIL PHASE 2 PROJECT**

Ganesh Deepak Kanchuboyina AECOM, India

**COMPARISON OF ENVIRONMENTAL CONTROL METHODS IN LARGE SCALE URBAN UNDERGROUND PROJECTS**

Atte Werneman Forcit Consulting Ltd., Sweden

**COST BENEFIT ANALYSIS OF THE ATHENS METRO LINE 3 EXPANSION PROJECT.**

Prof Andreas Benardos National Technical University of Athens, Greece  
Dr Athanassios Mavrikos National Technical University of Athens, Greece

**DESIGN OF UNDERGROUND HIGHWAY RELOCATION TO PROMOTE URBAN REGENERATION IN ATHENS**

Prof Andreas Benardos National Technical University of Athens, Greece

**EFFECTS OF THE UNDERGROUND DISCHARGE CHANNEL / RESERVOIR FOR SMALL URBAN RIVERS IN TOKYO AREA**

Dr Hideo Nakamura Nihon University, Japan

**EXPERIENCE IN USING CROSS-WELL TOMOGRAPHY TO ASSESS SOIL STABILIZATION BY INJECTING A SOLUTION**

Dr Mikhail Lebedev Research OJSC "NIPPII "Lenmetrogiprotrans", Russian Federation

**FIRE SAFETY ISSUES IN UNDERGROUND SPACES: A NEED FOR REGULATORY EVOLUTION – FRENCH, SWISS AND HONG KONG SAR, CHINA (HONG KONG) CONTEXTS**

Michel Deffayet Centre d'Etudes des Tunnels, France

**RESEARCH ON THE DEVELOPMENT AND UTILIZATION OF UNDERGROUND SPACE IN BEIJING OLD CITY**

Prof XiaoDong Shi Beijing institute of urban planning and design, China  
Kejie Wu Beijing Municipal Institute of City Planning & Design, China

**SIMULATION MODELS FOR URBAN TRANSPORTATION AS INPUT FOR RISK ANALYSIS**

Dr Sandra König Austrian Institute of Technology, Austria

**STUDY ON PLANNING OF NEW UNDERGROUND RAILWAY & NEW STATION IN THE YAESU-KYOBASHI-NIHONBASHI DISTRICT (PART 2)**

Masami Yokotsuka The Urban Underground Space Center of Japan(USJ), Japan

**THE DESIGN AND CONSTRUCTION OF A LARGE COMPOSITE SUBWAY STATION IN LIMITED SPACE: AN EXEMPLARY APPLICATION OF OCUE METHOD IN XUZHOU, CHINA**

Dr Junzuo He Department of Geotechnical Engineering, Tongji University, China

**JACKING PRECISION CONTROL OF PIPE ROOF AND LARGE BOX CULVERT BELOW URBAN EXPRESSWAY-A CASE STUDY OF A LARGE UNDERPASS IN SHANGHAI**

Dr Chihao Cheng Tongji University, China

**A NEW SOLUTION TO THE CONSTRUCTION OF UNDERGROUND METRO STATIONS IN DENSE URBAN AREAS IN SOFT GROUND: CONSTRUCTION COMBINATION OF OPEN-CUT SHAFTS WITH QUASI-RECTANGULAR JACKING BOXES**

Yifeng Yang Department of Geotechnical Engineering, Tongji University, China

**WATERPROOFING DESIGN FOR BURIED DECKS**

Ben Hickman CSSW.LONDON, United Kingdom

**RYAZANSKAYA TRANSIT ORIENTED DEVELOPMENT, MOSCOW RUSSIA**

Dr Stefano Ceccotto Geodata SPA, Italy

**STUDY ON THE DISTRIBUTION OF SULFUR-BEARING FORMATIONS IN THE SICHUAN BASIN AND ITS DAMAGE TO TUNNEL ENGINEERING**

Prof Peidong Su Southwest Petroleum University, China

**SPATIAL ACCESSIBILITY AND FUNCTIONAL LAYOUT IMPACTS ON URBAN UNDERGROUND SPACE DEVELOPMENT: A CASE STUDY OF SHANGHAI**

Yun-Hao Dong Research Center for Underground Space and Department of Geotechnical Engineering, Tongji University, China

**UNDERGROUND HEAT STORAGES**

Arto Wegelius AFRY Finland Oy, Finland

**PRINCIPLES OF THE INTEGRATED DEVELOPMENT OF MOSCOW CITY UNDERGROUND SPACE**

Prof Dmitry Koniukhov JSC Mosinzhprouekt, Russian Federation

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## WEDNESDAY FEBRUARY 3

9:00 OPENING & WELCOME WORDS  
CHAIR: ILKKA VÄHÄÄHO

9:05 WELCOME WORDS FROM ACUUS  
ACUUS PRESIDENT DIMITRIS KALIAMPAKOS

9:15 WELCOME WORDS FROM CITY OF HELSINKI  
DEPUTY MAYOR FOR URBAN ENVIRONMENT ANNI SINNEMÄKI

9:30 KEYNOTE 1 - PETER VESTERBACKA  
Wake Up Call

9:50 KEYNOTE 2 - TUOMAS SILVENNOINEN  
PES-Architects- Underground



PETER VESTERBACKA  
FinEst Bay Area



TUOMAS SILVENNOINEN  
Design Director, Partner,  
PES-Architects

10.20-10.45 BREAK

### SESSION 1 ARCHITECTURE

STREAM 1 11.00-12.00 CHAIR Pia Selroos

10:45

11:00 DESIGN FRAMEWORK FOR LIGHTING AND OCCUPATIONAL WELL-BEING IN UNDERGROUND SPACES  
Dr Henrika Pihlajaniemi Oulu School of Architecture, University of Oulu, Finland

11:15 A SPATIAL PROTOTYPE OF NATURAL VENTILATION IN UNDERGROUND PUBLIC SPACES COMBINING COURTYARD WITH WIND TOWER  
Dr Yueming Wen Southeast University, School of Architecture China

11:30 THE IMPLICATIONS OF TECHNOLOGICAL PROGRESS IN ARCHITECTURAL THINKING: THE FUTURE IMPOSSIBILITY FOR AN ARCHITECTURE OF HIDING  
Julian Beqiri Architect at OMA (Office for Metropolitan Architecture) Rotterdam, Netherlands

11:45 WILLINGNESS TO WALK IN UNDERGROUND SPACE – EVIDENCE FROM SINGAPORE  
Dr John Zacharias Peking University, China

12.00-12.30 BREAK

### SESSION 2 CITY DEVELOPMENT 1

STREAM 2 10.45-11.30 CHAIR Max Pihlström

QUANTITATIVE ANALYSIS OF SPATIAL VITALITY OF UNDERGROUND SPACE IN METRO AREA BASED ON SPATIAL CHARACTERISTIC AND SOCIAL ACTIVITY  
Yajie Xu Anhui University of Science and Technology, China

Underground Space Development in the Congested Urban Areas - Challenges, Opportunities and Key Design Considerations  
Y.K. Ho HKSAR Government, Hong Kong  
Jeffrey Wong HKSAR Government, Hong Kong

DEPTH ESTIMATION OF UNDERGROUND PIPES USING GROUND PENETRATING RADAR BASED ON 3D VELOCITY SPECTRUM METHOD  
Dr Jian Peng China Construction Eighth Engineering Division .Corp .Ltd, China

THE IMPLEMENTATION OF NETWORK GOVERNANCE FOR SUSTAINABLE URBAN UNDERGROUND USAGE, A COMPARATIVE ANALYSIS OF THE CASE STUDIES OF THE CITIES OF RIO DE JANEIRO, BRAZIL AND HELSINKI, FINLAND.  
Luis Carlos Mestrinho MSc. Bartlett School of Planning, UCL, United Kingdom

### SESSION 3 SAFETY AND HUMAN FACTORS 1

STREAM 1 12.30 - 13.30 CHAIR Janne Lehto

12:30 CONSTRUCTION OF UNDERGROUND SERVICE TUNNELS AS PART OF DISASTER MANAGEMENT  
Nanami Suzuki The Urban Underground Space Center of Japan(USJ), Japan

12:45 RESILIENCE OF UNDERGROUND PEDESTRIAN SYSTEM: A NEW APPROACHES THROUGH NETWORK ANALYSIS  
Dr Ziwei Zhao Research Center of Underground Space, Army Engineering University of PLA, China

13:00 CAVERN FIRE SAFETY – OVERVIEW OF REQUIREMENTS AND PRAGMATIC SOLUTIONS IN HONG KONG  
Wai Hon Tsang Geotechnical Engineering Office, Hong Kong

13:15 ENHANCING UNDERGROUND DEVELOPMENT USERS' HEALTH THROUGH FACILITIES MANAGEMENT: A STUDY OF THE UNDERGROUND METRO SYSTEM IN HONG KONG  
Dr Isabelle Chan University of Hong Kong

13.30-14.00 BREAK

### SESSION 4 ITACUS SESSION PLANNING FOR SUSTAINABLE UNDERGROUND SPACES

STREAM 2 12.30 - 13.30 CHAIR Han Admiraal and Antonia Cornaro

READ MORE INFORMATION BY CLICKING HERE - Speakers include:  
The ITACUS co-chairs Han Admiraal (Enprodes Management Consultancy) & Antonia Cornaro (Amberg Engineering)

Dr. Marilu Melo (University of NSW and ITACUS lead on Urban Integration)  
Dr. Loretta von der Tann (NGI – Norwegian Geotechnical Institute)  
Shana Debrock (Flanders Government, Department of Environment and Spatial Planning and University of Antwerp PhD candidate)

Dr. Chrysothemis Paraskevopoulou (University of Leeds and ITACUS lead on urban sustainability)

Petr Salak (Dr. Sauer & Partners and ITACUS co-lead for the Young Professionals Think Deep Program), Rosanne Verloop (Amberg Engineering and ITACUS co-lead for the Young Professionals Think Deep Program)

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## SESSION 5 TECHNICAL APPROACHES AND INNOVATIONS

PARTNERED BY



STREAM 1 14.00 - 15.30 CHAIR Juha Kukkonen

- 14:00 INNOVATIONS OF THE SERIES TECHNOLOGIES OF SELF-ADVANCING MACHINE IN SOIL AND THEIRS APPLICATION PROSPECT  
Prof Lu Qingguo Beijing University of Technology, China
- 14:15 A NON-INVASIVE GROUNDWATER FLOW DETECTION BEHIND SHORTCRETE SURFACES BY MEANS OF THERMOGRAPHIC MEASUREMENTS.  
Arend Oudman City of Helsinki, Finland
- 14:30 OPPORTUNITIES AND CHALLENGES IN THE DIGITALIZATION OF THE TUNNEL BLASTING OPERATION  
Hector Parra Forcit International, Finland
- 14:45 DIAGNOSTICS OF CONDITION OF SOIL LYING IN THE FOUNDATION OF SEWER COLLECTORS AND METRO TUNNELS BY CROSSHOLE SOUNDING METHOD IN URBAN UNDERGROUND SPACE  
Dr Aleksei Arkhipov "Geodiagnostika" LLC, St. Petersburg, Russian Federation
- 15:00 INFLUENCE OF THE DEEP PIT CONSTRUCTION ON A SETTLEMENTS OF SURROUNDING BUILDINGS  
Prof Ilizar Mirsayapov Kazan State University of Architecture and Engineering, Russian Federation
- 15:15 IMPROVING TUNNELING LONG-TERM DRILL AND BLAST PRODUCTIVITY  
Jouko Muona Sandvik Mining and Rock Solutions, Finland

15:30 - 16:00 BREAK

## SESSION 6 UNDERGROUND INFRASTRUCTURES

STREAM 2 14.00 - 15.15 CHAIR Mikael Rinne

- AN EDGE-COMPUTING-BASED SENSING SYSTEM FOR TUNNEL AND UNDERGROUND SPACE RISKS  
Ruida Huang Tongji University & Shanghai Municipal Engineering Design Institute (Group) Co., Ltd, China
- RENOVATION MODE FOR GROWING UNDERGROUND PEDESTRIAN SYSTEM WITHIN STATION AREA: A CASE STUDY OF SHANGHAI JING'AN TEMPLE STATION  
Ziyun Zhang Tongji Research Center for Underground Space, Tongji University, China
- DEFORMATION CHARACTERISTICS OF SEDIMENTARY ROCK DUE TO CONTINUOUS CHANGES OF MOISTURE CONTENT IN WETTING PROCESS  
Dr Yota Togashi Saitama University, Japan
- INTEGRATION OF 3D MODELS OF STRUCTURES AND GEOLOGICAL COMPOSITION AS AN UNDERGROUND INFRASTRUCTURE MODEL  
Toshiaki Hakoda JGC Japan Corporation, Japan

## SESSION 7 CITY DEVELOPMENT 2

STREAM 1 16.00-17.00 CHAIR Eivind Grøv

- 16:00 CHALLENGES IN DESIGN AND CONSTRUCTION OF UNDERGROUND CEMETERY  
Arik Glazer Rolzur Underground Solutions, Israel
- 16:15 A PERSPECTIVE ON THE GOVERNANCE OF LONDON'S SUBSURFACE  
Loretta von der Tann Norwegian Geotechnical Institute, Norway
- 16:30 MULTIPLE ROCK WORKS IN DEMANDING URBAN AREA FOR WASTE WATER TREATMENT DEVELOPMENT IN STOCKHOLM  
Kari J Korhonen YIT, Finland
- 16:45 RE-PROMOTING SUSTAINABLE UNDERGROUND URBANIZATION FOR DEVELOPED AND DEVELOPING COUNTRIES IN OUR MODERN HISTORY  
Dr AMY HUANGQING LI ACUUS, Canada

17:00

17:00 - 17:30 BREAK

## SESSION 8 URBAN PLANNING 1

STREAM 2 16.00-17.15 CHAIR Jouko Kunnas

- UNDERGROUND URBANISM - PLANNING IN 3D  
Elizabeth Reynolds MRTPI, United Kingdom
- INITIATIVES FOR FORMATION AND EFFECTIVE UTILIZATION OF UNDERGROUND PEDESTRIAN NETWORKS IN JAPAN  
Yuji Tsutsui Ministry of Land, Infrastructure, Transport and Tourism, Japan
- MAPPING OF UNDERGROUND SERVICE SPACE IN THE CENTER OF HELSINKI.  
Arend Oudman City of Helsinki, Soil and Bedrock Unit, Finland
- UNDERGROUND URBANISM IN THE U.S.  
Dr Priscilla Nelson Colorado School of Mines, United States

## SESSION 9 KEYNOTE SESSION

STREAM 1 17:30 CHAIR Per Tengborg

- 17:30 KEYNOTE 3 - BERND HAGENAH & THOMAS GRASSI  
Ventilation and Architectural Measures to Mitigate Pathogen Related Safety and Health Risks in the Transportation Sector
- 18:00 KEYNOTE 4 - K.N. GUNALAN



BERND HAGENAH  
Associate Vice President,  
HNTB Corporation



THOMAS I GRASSI  
Associate Vice President,  
HNTB Corporation



K. N. GUNALAN  
Asce President 2020

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## THURSDAY FEBRUARY 4

### SESSION 10 KEYNOTE SESSION

STREAM 1 09.00 - 10.00 CHAIR Jenny Norrman

- 9:00 **KEYNOTE 5 - JIAN WANG**  
Shenzhen Chegongmiao Integrated Underground Traffic Hub Project
- 9:30 **KEYNOTE 6 - ROSS DIMMOCK**  
Smart technologies for creating urban underground spaces



**ROSS DIMMOCK**  
Normet Vice President - Europe and Middle East

10.00-10.30 BREAK

### SESSION 11 URBAN PLANNING 2

STREAM 1 10.30 - 11.45 CHAIR Dongjun Guo

- 10:30 **A FEASIBILITY STUDY OF URBAN UNDERGROUND LOGISTICS SYSTEM - A CASE STUDY OF SHANGHAI**  
Dr Bin Lu Shanghai Municipal Engineering Design Institute (Group) Co., Ltd., China
- 10:45 **EVALUATION OF SPATIAL PERFORMANCE OF URBAN UNDERGROUND PUBLIC SPACE: A CASE STUDY OF WUJIAOCHANG SUB-CENTER IN SHANGHAI**  
Chen-Xiao Ma Research Center for Underground Space and Department of Geotechnical Engineering, Tongji University, China
- 11:00 **STUDY ON IMPLEMENTATION STRATEGIES OF MULTIFUNCTIONAL LINEAR UNDERGROUND SPACE: A CASE STUDY IN BEIJING'S SUB-CENTER**  
Wei Meng Beijing Municipal Institute of City Planning and Design, China
- 11:15 **THE MAIN CHARACTERISTICS OF URBAN UNDERGROUND SPACE REGULATORY PLAN FROM THE PERSPECTIVE OF CHINA'S SPATIAL PLANNING: A PRACTICE IN BEIJING SUB-CENTER**  
Gao Chao Beijing Municipal Institute of City Planning and Design, China
- 11:30 **AN EXPLORATION OF THE PLANNING APPROACH FOR NEW DEVELOPMENT AREA WITH UNDERGROUND SPACE IN HONG KONG**  
Kelvin Law AECOM Asia Co Ltd, Hong Kong

11.45 - 12.15 BREAK

### SESSION 12 PERSPECTIVES

STREAM 2 10.30 - 11.30 CHAIR Timo Saanio

- STUDY ON THE MANDATORY STANDARD OF URBAN UNDERGROUND SPACE CONSTRUCTION**  
Dr Yiqun Fan Shanghai Municipal Engineering Design Institute (Group) Co., Ltd., China
- VISUALIZATION OF 3D ROCK MASS PROPERTIES IN UNDERGROUND TUNNELS USING EXTENDED REALITY**  
Dr Mateusz Janiszewski Aalto University, School of Engineering, Finland
- TUNNELING FOR FUTURE TRANSPORTATION TECHNOLOGIES**  
Anthony Bauer HNTB, United States
- POSIVA EKA PROJECT - CONSTRUCTING THE WORLD'S FIRST FINAL DISPOSAL FACILITY OF THE SPENT NUCLEAR FUEL**  
Sanna Mustonen Posiva Solutions Oy, Finland

### SESSION 13 DESIGN PARTNERED BY



STREAM 1 12.15 - 13.30 CHAIR Mikko Inkala

- 12:15 **ENVIRONMENTALLY DRIVEN TUNNELLING IN FINLAND, TURKU WASTEWATER TREATMENT PLANT OUTLET INCREASE**  
Guido Nuijten AFRY Finland Oy, Finland
- 12:30 **SUB SEA TUNNEL LINKING FÖGLÖ WITH THE MAIN CITY MARIEHAMN IN ÅLAND**  
Prof Eivind Grov SINTEF, Norway
- 12:45 **DISPLACEMENT OF 'SLURRY WALL' IN THE COURSE OF SUBWAY STATION CONSTRUCTION ON THE WATER-BORNE TERRITORY ACCORDING TO 'TOP-DOWN' TECHNOLOGY**  
Dr Mikhail Lebedev OJSC "NIPPI "Lenmetrogiprotrans", Russian Federation
- 13:00 **ROAD TUNNEL CONSTRUCTION UNDER LIIPOLA DISTRICT IN VT12 LAHTI SOUTHERN BYPASS -PROJECT**  
Olli Salo AFRY Finland Oy, Finland
- 13:15 **PREDICTION OF BLAST-INDUCED GROUND VIBRATIONS WITH THE USE OF ARTIFICIAL NEURAL NETWORKS. A CASE STUDY IN GREECE**  
Zannis Xenios National Technical University of Athens, Greece  
Prof Andreas Bernardos National Technical University of Athens, Greece

13:30

13.45-14.15 BREAK

### SESSION 14 GEOTHERMAL ENERGY

STREAM 2 12.15 - 13.45 CHAIR Gregor Hillers

- THERMAL MODELLING OF DEEP GEOTHERMAL WELLS**  
Dr Elias Pentti AFRY Finland Oy, Finland
- ST1 DEEP HEAT PROJECT: GEOTHERMAL ENERGY TO THE DISTRICT HEATING NETWORK IN ESPOO**  
Matti Pentti ST1 Oy, Finland
- SEISMIC NETWORKS TO MONITOR THE 2018 AND 2020 GEOTHERMAL STIMULATIONS IN ESPOO/HELSINKI: DEPLOYMENT, DATA FEATURES, AND OBSERVATIONS**  
Prof Gregor Hillers University of Helsinki, Finland
- GEOTHERMAL ENERGY IN URBAN PLANNING**  
Dr Nikolai Bobylev Saint Petersburg State University, Russian Federation
- COULD GROUND HEAT AND GEOTHERMAL ENERGY BE THE ANSWER TO CLIMATE CHANGE PREVENTION AND ENERGY DEMAND?**  
Ilkka Vähäaho City of Helsinki, Soil and Bedrock Unit, Finland
- LOCAL GEOTHERMAL LOW TEMPERATURE HEATING NETWORKS - CARBON NEUTRAL FUTURE OF DISTRICT HEATING**  
Mikael Maksimov QHeat, Finland

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## SESSION 15 SUSTAINABILITY AND ENVIRONMENT

STREAM 1 14:15 - 15:45 CHAIR Arend Oudman

14:15	SEASONAL UNDERGROUND STORAGE OF SOLAR THERMAL ENERGY Dr Mateusz Janiszewski Aalto University, School of Engineering, Finland
14:30	UNDERGROUND GREEN FARMING Klaus Wachter SCAUT Association, Switzerland
14:45	CARGO SOUS TERRAIN – AN INTELLIGENT LOGISTIC SOLUTION FOR OUR CITIES Dr Hans-Martin Braun AFRY Switzerland Ltd., Switzerland
15:00	HYDROGEOLOGY AND HYDROGEOCHEMISTRY IN PLANNING OF UNDERGROUND FACILITIES Anneli Wichmann AFRY Finland Oy, Finland
15:15	SUSTAINABLE UNDERGROUND OPERATIONS – THOUGHTS ON BATTERY ELECTRIC VEHICLES IN TUNNELLING Panu Oikkonen NORMET OY, Finland
15:30	CARBON FOOTPRINT IN ROCK CONSTRUCTION PROJECT Jyri Liukko YIT Suomi Oy, Finland

15:45-16:15 BREAK

## SESSION 17 URBAN PLANNING 3

STREAM 1 16:15 - 17:15 CHAIR Sanja Zlatanic

16:15	MAPPING SUBSURFACE QUALITIES FOR PLANNING PURPOSES: A PILOT STUDY Dr Jenny Norrman Chalmers University of Technology, Sweden
16:30	UNDERGROUND MASTER PLAN OF THE CITY OF HELSINKI Pasi Rajala City of Helsinki, Finland
16:45	SIGNIFICANT ROLE OF THE UNDERGROUND WORLD IN HELSINKI ENERGY TRANSITION Jouni Kivirinne Helen LTD, Finland
17:00	THE ONSET OF UNDERGROUND URBAN PLANNING IN FLANDERS Shana Debrock Departement Omgeving Flanders/ Faculty of Design Sciences University of Antwerp, Belgium

17:15-17:30 BREAK

## SESSION 16 REUSE OF UNDERGROUND SPACES

STREAM 2 14:15 - 15:15 CHAIR Erik Johansson

14:15	DEVELOPMENT OF PUBLIC SPACES AFFECTED BY THE DEVELOPMENT OF UNDERGROUND SPACES: A NEW METHOD TO IMPROVE LIVING STANDARDS IN TEHRAN METROPOLIS Mohammad Mahdi Safaee ACUUS Iran, Islamic Republic of	14:15
14:30	UNDERGROUND HEAT MINE – POTENTIAL FOR LARGE SCALE PRODUCTION AND STORAGE OF CO2-FREE THERMAL ENERGY Dr Lasse Ahonen Geological Survey of Finland, Finland	14:30
14:45	THE EFFECTS OF PREDESIGN ON REUSABLE UNDERGROUND SPACES IN AN URBAN CONTEXT Ville Annala Kalliosuunnittelu Oy Rockplan, Finland	14:45
15:00	SAVILAHTI UNDERGROUND SPORT AND EVENT CENTER Veera Tasapuro AINS Group, Finland	15:00

BREAK 15:15-15:45

## SESSION 18 SAFETY AND HUMAN FACTORS 2

STREAM 2 15:45 - 16:45 CHAIR Raymond Sterling

15:45	PARAMETERS THAT AFFECT TENABILITY CONDITIONS DURING FIRE EMERGENCY IN METRO TUNNELS Despoina Papakonstantinou National Technical University of Athens, Greece	15:45
16:00	ROLE OF FAN CONTROL TECHNOLOGIES IN SAFE, RELIABLE AND ENERGY EFFICIENT TUNNEL VENTILATION. Maria Fedorovicheva ABB, Finland	16:00
16:15	UNDERGROUND RESCUE 2019 - 2022 Risto Mäkeläinen Callio Underground Rescue, Finland	16:15
16:30	COMPUTER MODELING ANALYSIS OF METRO TICKET GATES IMPACT TO EVACUATION PROCEDURES Despoina Papakonstantinou National Technical University of Athens, Greece	16:30

BREAK 16:45-17:30

## CLOSING SESSION

STREAM 2 17:30-19:00 CHAIR Jacques Besner

17:30	KEYNOTE 7 - JANET BENINI Sustained Transportation Operations During Pandemic	17:30
18:00	KEYNOTE 8 - DIMITRIS KALIAMPAKOS	18:00
18:30	ACUUS 2023 ANNOUNCEMENT AND CLOSING WORDS	18:30



JANET K. BENINI



DIMITRIS KALIAMPAKOS  
ACUUS President