BCRRA 2017
10th International Conference on the Bearing Capacity of Roads, Railways and Airfields
June 28-30 2017
Athens, Greece

Andreas Loizos, Chair
The date has arrived....

Thank you for keeping the date!

BCRRA 2017 Athens, Greece
Contents

- Background
  - Conference history / goals / topics / supporters
  - Conference / chairs / advisory committee / scientific committee / reviewers

- Conference Overview
  - Preconference Workshops / Keynotes Lectures / Special Presentations / Technical Sessions
  - Proceedings

- Paper Distribution
  - Total Papers / oral / poster / geographic distribution / distribution per session

- Program Overview
  - Sessions & Chairs
Background

- Professor Rasmus S. Nordal during a sabbatical year in USA around 1980 conceived the idea for the BCRRA conference. He started the work to put together international support and organized the first conference in Trondheim.

- The conference was initially organized under the title “Bearing Capacity of Roads and Airfields – BCRA” – 1st conference in 1982

- During the organization of the sixth BCRA conference in Lisbon, Portugal, the third component (Railways) was added to the overall scope of the conference

- The acronym BCRRA was first adopted during the organization of the 8th conference in Urbana-Champaign, Illinois, USA

- The current 10th BCRRA conference is jointly organized by the National Technical University of Athens (NTUA), the University of Illinois at Urbana-Champaign (UIUC) and the Delft University of Technology (TU DELFT)
# Conference History

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Type</th>
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<tr>
<td>2017</td>
<td>Athens, Greece</td>
<td>10th</td>
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<tr>
<td>2013</td>
<td>Trondheim, Norway</td>
<td>9th</td>
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<tr>
<td>2009</td>
<td>Champaign, Illinois, USA</td>
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<td>2005</td>
<td>Trondheim, Norway</td>
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<td>2002</td>
<td>Lisbon, Portugal</td>
<td>6th</td>
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<td>1998</td>
<td>Trondheim, Norway</td>
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<tr>
<td>1994</td>
<td>Minnesota, USA</td>
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<tr>
<td>1990</td>
<td>Trondheim, Norway</td>
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<tr>
<td>1986</td>
<td>Plymouth, United Kingdom</td>
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<tr>
<td>1982</td>
<td>Trondheim, Norway</td>
<td>1st</td>
</tr>
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**Map:**
- 1986
- 2002
- Greece - 2017
- 10th BCRRA

**BCRRA 2017 Athens, Greece**
Focus on

Rosal, Railways and Airfields
Conference Goals

The BCRRA 2017 Conference will cover aspects related to materials, laboratory testing, design, construction, maintenance and management systems of transport infrastructure focusing on roads, railways and airfields.

Additional aspects that concern new materials and characterization, alternative rehabilitation techniques, technological advances as well as pavement and railway track substructure sustainability will be included.
The conference includes aspects of transportation infrastructure focusing on roads, railways and airfields.

**Topics concentrate but are not limited to the following:**

<table>
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<tr>
<th>Topic</th>
<th>Topic</th>
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<tr>
<td>Policies on the bearing capacity of roads, railways</td>
<td>Maintenance and preservation</td>
</tr>
<tr>
<td>Unbound aggregate materials and soil properties</td>
<td>Reinforcement and rehabilitation design</td>
</tr>
<tr>
<td>Bound materials characteristics, mechanical properties</td>
<td>Analysis of Long-Term Pavement Performance (LTPP) data</td>
</tr>
<tr>
<td>Traffic loading</td>
<td>Drainage and environmental effects</td>
</tr>
<tr>
<td>Field measurement techniques and analysis tools</td>
<td>Climate change, energy and sustainability</td>
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<tr>
<td>Pavement field evaluation</td>
<td>Full scale testing (ALF, HVS)</td>
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<td>Correlation of laboratory and field testing results</td>
<td>Emerging technologies</td>
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<tr>
<td>Monitoring and assessment of roads, railways and airfields structures</td>
<td>Life cycle analysis</td>
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<tr>
<td>Geophysical methods for structural evaluation</td>
<td>Non-standard pavements</td>
</tr>
<tr>
<td>Pavement surface condition and performance assessment</td>
<td>Case histories of roads, railways and airfields</td>
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</table>
Brief conference overview

- Multiple Preconference Workshops
- Keynote Lectures + Invited Presentations
- >300 Paper presentations
- Special Technical Sessions (DaRTS meeting / EuroFWD UGM)
Scientific Supporters
International Advisory Committee (IAC)

Leif Bakløkk (Chair), Norwegian Public Roads Administration, Norway
Andreas Loizos (Co-chair), National Technical University of Athens, Greece
Christina Plati (Secretary), National Technical University of Athens, Greece

Imad L. Al-Qadi, University of Illinois at Urbana-Champaign, USA
Alessandra Bianchini, U.S. Army Engineer Research and Development Center, USA
David R. Brill, Federal Aviation Administration, USA
Antonio Gomes Correia, University of Minho/DEC, Portugal
David D. Davis, Association of American Railroads, USA
Andrew Dawson, The University of Nottingham, United Kingdom
Rolf Dollevoet, Delft University of Technology, The Netherlands
Guy Doré, Laval University, Canada
Sigurdur Erlingsson, University of Iceland and Swedish Road and Transport Research Institute, Iceland and Sweden
Brian Ferne, Transport Research Laboratory (TRL), United Kingdom
Ralph Fischer, Deutsche Bahn AG - DB Systemtechnik, Germany
Rita Moura Fortes, Mackenzie Presbyterian University, Brasil
Gregers Hildebrand, COWI, Denmark
Inge Hoff, Norwegian University of Science and Technology, Norway
Buddhima Indraratna, University of Wollongong, Australia

Geoff Jameson, ARRB Transport Research Ltd., Australia
Elias Kassa, Norwegian University of Science and Technology, Norway
Pauli Kolisoja, Tampere University of Technology, Finland
Jens Melsom, Norwegian National Rail Administration, Norway
Helge Mork, Norwegian University of Science and Technology, Norway
Jean Michel Piau, French Institute of Science and Technology for Transport, Development and Networks, France
Tom Scarpas, Delft University of Technology, The Netherlands
Ramesh Sinhal, Highways Agency, United Kingdom
Ted Sussmann, University of Hartford/ Volpe Transportation Center, USA
Susana Svetlicic, DRI Investment Management, Slovenia
Mark Swanlund, Federal Highway Administration, USA
Dariusz Sybilski, Road and Bridge Research Institute, Poland
Gabriele Tebaldi, University of Parma, Italy
Erol Tutumluer, University of Illinois at Urbana-Champaign, USA
Xinglong Wang, Heilongjiang Institute of Highway and Transport Research, P.R. China
Tomas Winnerholt, Swedish Transport Administration, Sweden
Benjamin Worel, Minnesota Department of Transportation, USA
Gordon Airey, The University of Nottingham, United Kingdom
Jostein Aknes, Norwegian Public Roads Administration, Norway
Sara Anastasio, Norwegian Univ. of Science and Technology, Norway
George Apostolopoulos, NTUA, Greece
Joraf Arstad, Norwegian Public Roads Administration, Norway
Jose Tadeu Balio, University of Sao Paulo, Brazil
Hartmut Johannes Beckedahl, University of Wuppertal, Germany
Andrea Belatto, Roma Tre University, Italy
Geir Berntsen, Norwegian Public Roads Administration, Norway
Amir Bhasin, The University of Texas at Austin, USA
Ronald Blab, Technische Universität Wien, Austria
Francesco Canestrari, Università Politecnica delle Marche, Italy
Silvia Caro, National Central University, Taiwan
David P. Orr, Cornell University, USA
Markus Oeser, RWTH Aachen University, Germany
Lillian Uthus Mathisen, Norwegian Public Roads Administration, Norway
Ezio Santagata, Politecnico di Torino, Italy
Alessandro Marradi, University of Pisa, Italy
Ezio Santagata, Politecnico di Torino, Italy
Manfred Partl, ASMUD, Turkey
Niki Kringos, KEDE, Greece
Johan Van Meer, University of Twente, Netherlands
Jorma Välimäki, VTT Technical Research Centre of Finland, Finland
Nihal Tuncay, Empa, Switzerland
Michael Vougiouklakis, Aristotle University of Thessaloniki, Greece
Mohamed Youssef, Université de Lyon, France
Tatsuya Ishikawa, Hokkaido University, Japan
Wei-Hsing Huang, Michigan Technological University, USA
Jake Hiller, University of California, USA
John Harvey, University of Nevada Reno, USA
Greg White, University of the Sunshine Coast, Australia
Jorge Carvalho Pais, University of Porto, Portugal
Konstantinos Vogiatzis, Aristotle University of Thessaloniki, Greece
Bjorn Ove Lerfald, Norwegian University of Science and Technology, Norway
Bjørn Ove Lerfald, Norwegian University of Science and Technology, Norway
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Alexandros Kokkalis, Democritus University of Thrace, Greece
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Amirpour Goudarzi, Sharif University of Technology, Iran
Andreas Drosos, Aristotle University of Thessaloniki, Greece
Rabihra Garba Saba, Norwegian Public Roads Administration, Norway
Mohreh Saleh, University of Canterbury, New Zealand
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Steve Goodwin, University of Manchester, UK
M-Prognost, University of Cambridge, UK
Nader Tabatabaei, Shahid Beheshti University, Iran
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Sang-Eun Park, University of Science and Technology, Korea
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Fabio Tosti, University of West London, United Kingdom
Yiannis Tsompanakis, Technical University of Crete, Greece
Waseeb Uddin, University of Mississippi, USA
Nils Sigurd Uthus, Norwegian Public Roads Administration, Norway
Carl Van Geem, Belgian Road Research Centre, Belgium
Julie Marie Vandenbossche, University of Pittsburgh, USA
Christ Vangurp, KONI, the Netherlands
Konstantinos Vogiatzis, Aristotle University of Thessaloniki, Greece
Haiyan Wang, Chang’an University, China
Kelvin Wang, Oklahoma State University, USA
Liu Wang, China University of Geosciences, Beijing
Kornkrit Rattanayakorn, King Mongkut’s University of Technology Ladkrabang, Thailand
Mohd Azmi, Universiti Teknologi Mara, Malaysia
Sahin Cem, University of Delaware, USA
Krzysztof Zalewski, Technical University of Wroclaw, Poland
Kamil Gdowski, Technical University of Wroclaw, Poland
Mounir Marzouki, LUNAM Université, IFSTTAR, France
Jianming Ling, Technical University of Denmark, Denmark
Jensningen Lind, Tongji University, China
Dallas Little, Texas A&M University, USA
Luis Guillermo Loria-Salazar, University of Costa Rica, Costa Rica
Massimo Loco, University of Pisa, Italy
Nikos Malakatsas, KEDE, Greece
Gülay Malikö, ASMUD, Turkey
Rajib Mallick, Worcester Polytechnic Institute, USA
Engelos Manthos, Aristotle University of Thessaloniki, Greece
Evangelos Manthos, Aristotle University of Thessaloniki, Greece
Alessandro Marmaduci, University of Pisa, Italy
Eyad Masad, Texas A&M University at Qatar, Qatar
Lillian Uthus Mathisen, Veidekke AS, Norway
George Mintsis, Aristotle University of Thessaloniki, Greece
Goran Mladenovic, University of Belgrade, Serbia
Anastasios Mouratidis, Aristotle University of Thessaloniki, Greece
Roar Nálsund, The Norwegian National Rail Administration, Norway
Sohel Nazarian, University of Texas at El Paso, USA
Athanassios Nikolaides, Aristotle University of Thessaloniki, Greece
Markus Oeser, RWTH Aachen University, Germany
David P. Orr, Cornell University, USA
Hasan Ozer, University of Illinois at Urbana-Champaign, USA
Jorge Carvalho Pais, University of Minho, Portugal
Tom Papagiannakis, University of Texas at San Antonio, USA
Manfred Partl, EMPA, Switzerland
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Andrei Petraiev, Emperor Alexander I St. Petersburg State Transport University, Russia
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Kelvin Wang, Oklahoma State University, USA
Lingbing Wang, Virginia Tech, USA
Yuhong Wang, The Hong Kong Polytechnic University, China
Greg White, University of the Sunshine Coast, Australia
Michael Wistuba, Technische Universität Dresden, Germany
Pyong Jun Yoo, Korea Institute of Construction Technology, S. Korea
Zhanping You, Michigan Technological University, USA
Adam Zoëka, Road and Bridge Research Institute, Poland

Scientific Committee (SC)
Scientific Reviewers

- A Special thanks to the scientific reviewers for their invaluable assistance reviewing the papers.
Preconference Workshops

Morning workshops: **9.00-13.00** (Tuesday 27 June 2017)

- **TOPIC:** Introducing FAARFIELD 1.41: Latest Updates to FAA Airport Pavement Design Procedures  
  *Coordinated by Dr. David R. Brill*

- **TOPIC:** Modelling and Testing of the Vehicle-Tire-Pavement System  
  *Coordinated by Prof. Markus Oeser, Prof. Frohmut Wellner and Prof. Michael Kaliske*

Afternoon workshops: **14.00- 18.00** (Tuesday 27 June 2017)

- **TOPIC:** Railway Track Settlements: Innovations in Monitoring and Maintenance  
  *Coordinated by Prof. Rolf Dollevoet*

- **TOPIC:** Cold Regions Engineering: Challenges and Opportunities  
  *Coordinated by Dr. Elena Kuznetsova and Prof. Guy Dore*
Preconference Workshops

Morning Workshops

BCRRA 2017 Athens, Greece
Preconference Workshops

Afternoon Workshops
## Program Overview

**BCRRA 2017 Tenth International Conference on the Bearing Capacity of Roads, Railways and Airfields**

- **Wednesday 28th June 2017**
  - **REGISTRATION**: 8:00
  - **ROOM MACCHIONI**: 8:00
  - **OPENING**: Chair: Andrea Lesaca, Israel M. Lluch, Tom Scarratt
    - 8:45
  - **Theme lecture**: Bill M. Haddad
    - 9:00
  - **Keynote lecture**: John Harvey
    - 9:30
  - **Coffee Break**: 9:45

- **Thursday 29th June 2017**
  - **REGISTRATION**: 8:00
  - **ROOM MACCHIONI**: 8:00
  - **Theme lecture**: Jeffrey Allsopp
    - 8:45
  - **Keynote lecture**: Ralf Dullweber
    - 9:00
  - **Sessions 1**: 9:30
    - 1. Structural design methods
      - Chair: Michel Frutos
    - 2. Stabilisation and reinforcement techniques and monitoring
      - Chair: Antoine Levoit
    - 3. Rehabilitation of pavements
      - Chair: Dieter Goedeken
    - 4. Recycling of materials and recycled materials
      - Chair: Chen-Chen Lin
    - 5. Mechanics of interfaces layers
      - Chair: Sarah O’Dowd
    - 6. Life cycle assessment and sustainability
      - Chair: Alternative Chambers
    - 7. Performance of asphalt mixes with additives
      - Chair: Mia Carne
  - **Coffee Break**: 12:45

- **Friday 30th June 2017**
  - **REGISTRATION**: 8:00
  - **ROOM MACCHIONI**: 8:00
  - **Theme lecture**: Dimitrios J. Dimotinos
    - 8:45
  - **Keynote lecture**: Raúl Dullweber
    - 9:00
  - **Sessions 2**: 9:30
    - 1. Performance of asphalt mixes with additives
      - Chair: Christian Reichert, Oliver Fort
    - 2. Environmental challenges (Part II)
      - Chair: Half Char
    - 3. Stabilisation and reinforcement techniques and monitoring (Part II)
      - Chair: Jorge Carvajal
  - **Coffee Break**: 12:45

- **Friday 30th June 2017**
  - **SESSION A.2**: 1.30
    - 1. Structural design methods
      - Chair: Michel Frutos
    - 2. Stabilisation and reinforcement techniques and monitoring
      - Chair: Antoine Levoit
    - 3. Rehabilitation of pavements
      - Chair: Dieter Goedeken
    - 4. Recycling of materials and recycled materials
      - Chair: Chen-Chen Lin
    - 5. Mechanics of interfaces layers
      - Chair: Sarah O’Dowd
    - 6. Life cycle assessment and sustainability
      - Chair: Alternative Chambers
    - 7. Performance of asphalt mixes with additives
      - Chair: Mia Carne
  - **Coffee Break**: 12:45

**End of sessions**: 18:30

*18:45 Gala Dinner / Voices Musicae*
Keynotes Lectures

“Imposed vs. chosen change: A vision for the future of the pavement enterprise”
John Harvey
Ph.D. Civil Engineering, University of California, Berkeley
Professor, University of California, Davis, Department of Civil and Environmental Engineering
Wednesday 28 June 2017
09:45 – 10:45

“Recent Innovations in Airfield Pavement Design and Materials”
Jeffery Roesler
Ph.D. Civil Engineering, University of Illinois, Urbana-Champaign
Professor, University of Illinois, Civil & Environmental Engineering
Thursday 29 June 2017
08:30 – 09:30

“Novel monitoring techniques for preventive maintenance of railway tracks”
Rolf Dollevoet
Ph.D. University of Twente, The Netherlands
Professor, Delft University of Technology, Railway Engineering
Friday 30 June 2017
09:00 – 10:00

BCRRA 2017 Athens, Greece
Special Presentations

**Theme lecture: “Toll Road PPP’s. A tool for innovation promoting cost efficiency through high quality pavements”**  
**By:** Bill M. Halkias, P.E., F.ASCE, F.ITE, President, Hellenic Association of Toll Road Network (HELLASTRON)  
Wednesday 28 June 2017  
9:30 – 9:45

**Special theme lecture: A deep-learning based fully automated cracking detection with pixel-accuracy**  
**By:** K.C.P. Wang, Professor at Oklahoma State University  
Thursday 29 June 2017  
15:25 – 15:45

**Theme lecture: “Developing Airport Business: The key role of pavements in airfield investments”**  
**By:** Dimitrios J. Dimitriou, Chairman of Athens Airport, Assistant Professor at DUTH  
Friday 29 June 2017  
08:45 – 09:00
Special Technical Sessions

- **2017 Meeting of the DaRTS Group**
  (Deflection at Road Traffic Speed)
  - **Friday 30 June (12:20-17:15)**
  - Room PELLA

- **8th European Falling Weight Deflectometer User Group Meeting**
  - **Friday 30 June (12:20-17:15)**
  - Room PELLA
Proceedings

- Proceedings in electronic format
- Booklet with abstracts
- Indexed in EI and Scopus
- The compendium of papers will be submitted for an SCI number

Credit card USB drive on last page of Abstract booklet contains full papers
Paper Distribution

- > 500 Submitted Abstracts
- > 380 Submitted papers for review
- 306 Accepted papers after peer review (*included in proceedings)
  - 209 papers for oral presentation
  - 97 papers for poster presentation
- Papers from over 40 countries
- Top contributor countries
  - United States (56) / United Kingdom (24) / Greece (21) / France (18) / China (18)
Paper Distribution
BCRRA 2017 Accepted Papers per country

PAPERS from 43 Countries

# of accepted papers

ARGENTINA  AUSTRALIA  BELGIUM  BRAZIL  CANADA  CHINA  COLOMBIA  CYPRIUS  CZECH REPUBLIC  DENMARK  FINLAND  FRANCE  GERMANY  GREECE  HUNGARY  INDIA  IRELAND  ITALY  JAPAN  LATVIA  LEBANON  MALAYSIA  MOROCCO  NETHERLANDS  NORWAY  POLAND  PORTUGAL  QATAR  RUSSIAN FEDERATION  SERBIA  SINGAPORE  SOUTH AFRICA  SPAIN  SWEDEN  SWITZERLAND  TAIWAN  THAILAND  TURKEY  UNITED KINGDOM  UNITED STATES
BCRRA 2017 - Accepted papers per session

# of Accepted paper

- Subgrade soils
- Unbound granular materials
- Asphalt mixes
- Effect of traffic loading
- Structural design and methods
- Backcalculation and monitoring
- Pavement serviceability condition
- Rehabilitation and maintenance issues
- Structural evaluation
- Performance modeling
- Geophysical assessment
- Airfield pavements structures
- Environmental challenges
- Full-scale testing
- Case histories
- Permanent deformability char. of...

BCRRA 2017 Athens, Greece
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<td>Sabine Leischner</td>
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<td>(Massimo Losa &amp; Dariusz Sybilski)</td>
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<td>Unbound granular materials</td>
<td>Sigurdur Erlingsson</td>
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<td>Performance modeling (2)</td>
<td>Francesco Canestrari &amp; Emin Kutay</td>
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<td>Asphalt mixes (2)</td>
<td>Sandra Erkens &amp; Eyad Masad</td>
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<tr>
<td>Mechanics of layers interfaces</td>
<td>Herve Di Benedetto</td>
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<td>Performance of asphalt mixes with additives (2)</td>
<td>Gordon Airey &amp; Silvia Caro</td>
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<tr>
<td>Geophysical assessment</td>
<td>Andrei Petriaev &amp; Christina Plati</td>
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<td>Effect of traffic loading</td>
<td>Athanassios Nikolaides</td>
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<td>Airfield pavements structures (3)</td>
<td>David Brill, Elie Hajj &amp; Greg White</td>
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<tr>
<td>Structural design methods</td>
<td>Michael Wistuba</td>
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<td>Railway track structures (3)</td>
<td>Simona Fontul, Rita Moura Fortes , Tatsuya Ishikawa, &amp; Pauli Kolisoja</td>
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### SESSION TOPICS

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<td>In-situ measurements techniques and monitoring (2)</td>
<td>Environmental challenges (2)</td>
</tr>
<tr>
<td>(Jorge Carvalho Pais &amp; Erol Tutumluer)</td>
<td>(Andrew Dawson &amp; Guy Dore)</td>
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<tr>
<td>Backcalculation analyses of deflection measurements (2)</td>
<td>Life cycle assessment and sustainability (2)</td>
</tr>
<tr>
<td>(Karim Chatti)</td>
<td>(Athanasios Chassiakos)</td>
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<tr>
<td>Structural evaluation (2)</td>
<td>Full-scale testing (2)</td>
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<tr>
<td>(Lev Khazanovich)</td>
<td>(Andrea Benedetto)</td>
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<tr>
<td>Pavement serviceability condition (2)</td>
<td>Case histories</td>
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<tr>
<td>(Markus Oeser &amp; Filippo Pratico)</td>
<td>(Pierre Hornych)</td>
</tr>
<tr>
<td>Rehabilitation and maintenance issues (2)</td>
<td>Permanent deformability characteristics of geomaterials and unbound</td>
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<tr>
<td>(Dimitris Goulias)</td>
<td>materials (2)</td>
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<tr>
<td>Stabilization and reinforcement (3)</td>
<td>Special technical sessions (2017 DaRTS meeting / 8th EuroFWD UGM) (3)</td>
</tr>
<tr>
<td>(Chassan Chebab, Anastasios Mouratidis &amp; Soheil Nazarian)</td>
<td>(Carl Van Geem, Gulay Malkoc &amp; Adam Zofka)</td>
</tr>
</tbody>
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BCRRA 2017 Athens, Greece
A Special thanks to:

The local organizing committee

Brad Cliatt, National Technical University of Athens, Greece
Panos Georgiou, National Technical University of Athens, Greece
Konstantina Georgouli, National Technical University of Athens, Greece
Konstantinos Gkyrtis, National Technical University of Athens, Greece
Christina Plati, National Technical University of Athens, Greece

& the Conference Secretariat (responsible for registration, accommodation and venue matters)

Triaena Tours & Congress. (http://www.triaenatours.gr)
Conference Sponsors

HELLASTRON

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ATHENS INTERNATIONAL AIRPORT
ELEFHERIOS VENIZELOS

HELMA S.A.

HESPER

HELENIC SOCIETY FOR PAVEMENT ENGINEERING RESEARCH

BCRRA 2017 Athens, Greece
WELCOME TO GREECE

One day post conference tours to 1)Argolis and 2) a Three Island Cruise - Athens
Accompanying person tour to Acropolis Museum and the Plaka area

& Welcome to Athens.......
On behalf of the Organizing Committee

I would like to wish everyone a wonderful stay in Athens and a productive and memorable BCRRA 2017.
A special thanks to the Co-Chairs

**Professor Andreas Loizos**
*National Technical University of Athens, Greece*

**Professor Imad Al-Qadi**
*University of Illinois at Urbana-Champaign, USA*

**Professor A.(Tom) Scarpas**
*Delft University of Technology, The Netherlands*