



**LCM 2024
WORKSHOP**
— iaLcce —



October 6-8 2024, Fortress Island IJmuiden



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Introduction

The second IALCCE Workshop on Life-Cycle Management (LCM) 2024 will take place on a Fortress Island near the city of IJmuiden from the 6th to the 8th of October. The workshop aims to facilitate a vibrant LCM community that brings together sectoral and disciplinary perspectives and expertise to drive a transition towards Life-Cycle thinking and acting. The workshop provides an excellent opportunity to share experiences and discuss relevant LCM topics.

Why Life-Cycle Management?

Life-Cycle thinking and acting have become increasingly important for anyone who takes part in designing, building, maintaining and operating civil structures and networks. After a period of industrialisation with huge developments of all kinds of large-scale construction projects in the post-war period in the last century, the ageing of the civil assets has become a significant concern. While society is mainly dependent on these assets, they are gradually strained by the passage of time and changing societal demands, making them technically and functionally obsolete. The tremendous investments needed are an economic challenge and an environmental burden. The scarcity of human labour and material resources and the cultural value of several civil structures add to the challenge. LCM addresses this complex and dynamic interplay of performance, risks and cost over the Life-Cycle of civil structures. Life-Cycle thinking and acting are vital to ensure that civil structures are fit for future needs, resilient to expected and unexpected events, and cost-effective over time.

Why this LCM workshop?

The need for LCM is clear. The path to practical application remains challenging. The focus is still primarily on addressing immediate problems, meeting current requirements, and managing risks in the present. There is a need for a comprehensive and sector-wide breakthrough. The workshop aims to provide a platform for bringing together LCM initiatives, approaches, ideas and experiences from various civil engineering sectors to enlarge and strengthen the LCM community and drive this transition.



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Why should you attend?

You experience the complexity of current challenges: the cost-efficient, resilient, and environmentally friendly renewal and renovation of our aged infrastructure under a scarcity of human labour and material resources? You would like to learn from research, best practices, exchange of ideas and knowledge in a vibrant LCM-community, in order to enlarge and strengthen yourself and the community? Then expect to be inspired by the workshop and its location, an early 20th-century fortress, isolated on an island, facing the North Sea on the west, and the largest sea lock in the world to the east. This sea lock also houses Europe's largest pumping station, which is crucial for water defence in the Netherlands. Find out how this place combines challenges from the past, today and the future, and let us discuss the implication for LCM.

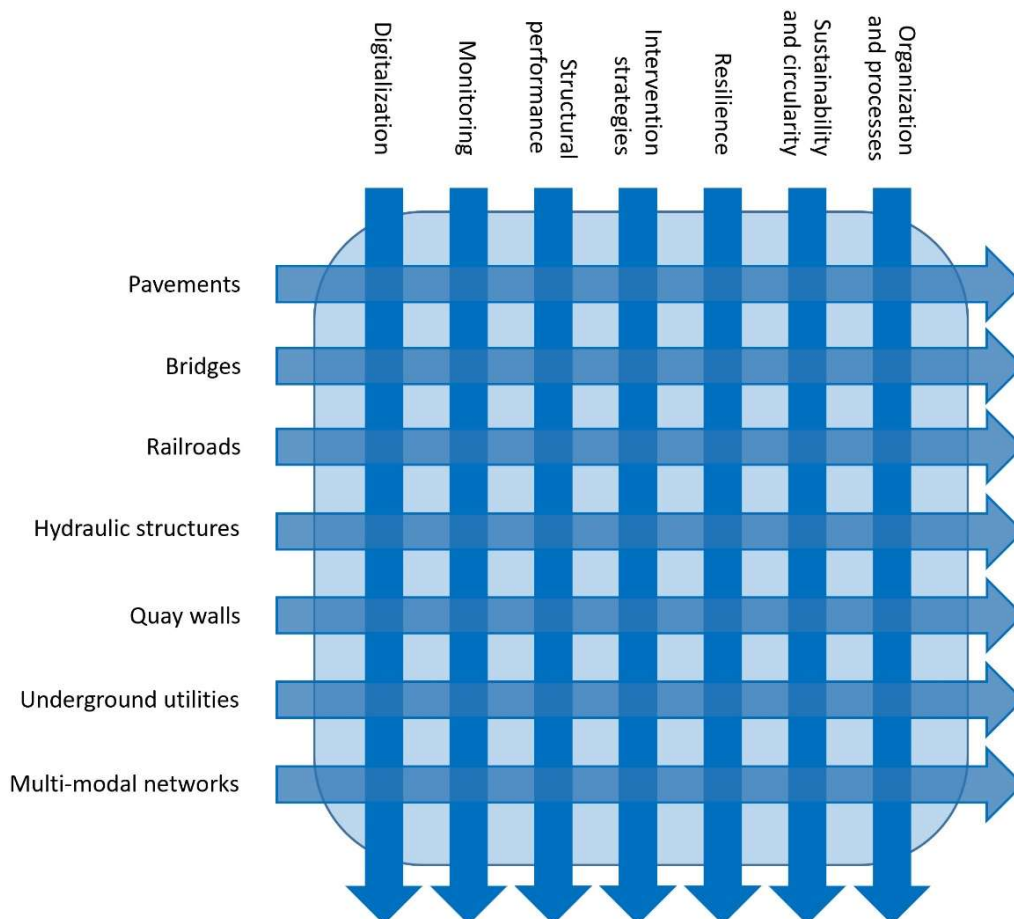
Workshop topics and field of interests

During the LCM workshop, practitioners and scientists will exchange ideas and views on Life-Cycle Management. Workshop means interaction, active listening, and inspiring discussions. We offer the opportunity to organise science-to-practice sessions in which scientific LCM knowledge is made accessible for practice. This may include serious games, interactive simulations, or tool demonstrations.

In the workshop, we will address relevant LCM topics around Life-Cycle cost, Life-Cycle risk and Life-Cycle performance.



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The objective of the International Association for Life-Cycle Civil Engineering, founded in 2006, is to promote international cooperation in the field of life-cycle civil engineering for the purpose of enhancing the welfare of society. Its mission is to become the premier international organization for the advancement of the state-of-the-art in the field of life-cycle civil engineering.

IALCCE encompasses all aspects of life-cycle assessment, design, maintenance, rehabilitation and monitoring of civil engineering systems. So far, IALCCE has organized eight International Symposia on Life-Cycle Civil Engineering. The next symposium will be held in Melbourne, Australia in 2025.



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About the organizers

The IALCCE LCM-workshop 2024 is organized on behalf of the IALCCE under the auspices of IALCCE-NL.

The first IALCCE LCM-workshop was organized in 2019 in Rotterdam by InfraQuest, a collaboration between the TU-Delft, TNO and Rijkswaterstaat.

The organizing committee of the second IALCCE LCM-workshop 2024 is formed by Rijkswaterstaat, the Province of North Holland, the University of Delft and the University of Twente.

workshop2024@ialcce-lcm.org



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Symposium chairs



Dan M. Frangopol

Lehigh University,
Bethlehem, PA,
USA



Fabio Biondini,

Politecnico di Milano,
Milan,
Italy



Jaap Bakker

Rijkswaterstaat,
Utrecht,
The Netherlands

Organizing committee

Jaap Bakker, Rijkswaterstaat, General coordination/chairman

Alexander Bakker, Rijkswaterstaat/TU Delft, Technical program and venue

Andreas Hartmann, University Twente, Coordination technical program

Han Roebers, Provincie Noord-Holland, Chairman local organizing committee

Anna van Soest, Rijkswaterstaat, Program coordinator

Jos Wessels, Provincie, Provincie Noord-Holland, Communication



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General information

Addresses

Leonardo Hotel	Kennemerboulevard 250 1976 EG IJmuiden
Boat crossing start and end of the conference day	Marina Seaport IJmuiden Kennemerboulevard 540 1976 EM IJmuiden
Boat crossing during the day	Restaurant Kop van de Haven Sluisplein 80 1975 AG IJmuiden

Boat assembly and departure information

Monday 7 October

Morning assembly (incl. registration)	08:15
Morning departure	09:00
Evening departure	20:00

Tuesday 8 October

Morning assembly	08:15
Morning departure	08:45
Evening departure	16:45

Contacts organization committee

If you have any questions and cannot find any of the committee members, you can contact one of us on the phone numbers provided below. You can either call or text.

Anna van Soest	06 – 25 15 15 13
Jos Wessels	06 – 11 59 31 27

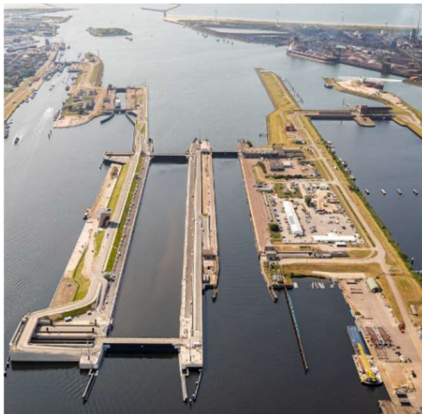


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Venue

Fortress Island: Forteiland 10, 1976 DZ IJmuiden

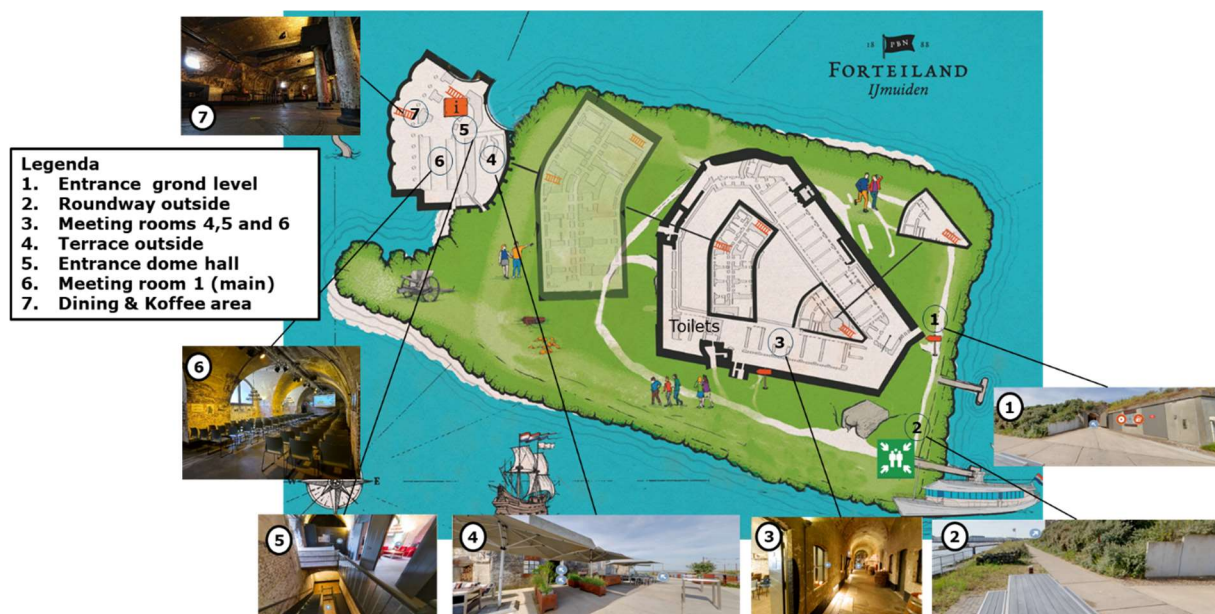
Fort IJmuiden has been built between 1881 and 1888. With three floors, 72 classrooms and a largely underground corridor system of 585 metres, the fort is the largest in the "Stelling van Amsterdam" (Defence Line of Amsterdam). Since 1996, the fort has been a UNESCO World Heritage Site.





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Ground plan Fortress Island



All plenary sessions, breaks, lunches and dinner will be held at the top floor of the fortress (the dome hall). There are 3 session rooms for the parallel session on the ground floor.

The top-floor entrance is from the side of the fortress. The ground floor can be reached from the entrance closest to the boat dock. There are stair connections between the ground floor and the top floor. For those who find it hard to climb the stairs, there is a caddy driving up and down along the outside of the fortress between both entrances.



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Workshop dinner

Monday evening there will be a workshop dinner. This will be held at Fortress Island at the armor gallery of the dome hall at the top floor of the fortress.





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Leonardo hotel IJmuiden



Sleeps

The Leonardo hotel offers sleeping rooms for the workshops. Reservations can be made at the Leonardo hotel IJmuiden seaport beach website:

<https://www.leonardo-hotels.com/ijmuiden/leonardo-hotel-ijmuiden-seaport-beach>

Reception at the Leonardo Hotel

On Sunday, upon arrival there will be a welcome reception held in the foyer on the 4th floor of the hotel. You can register at the registration desk and connect with colleagues over a nice drink whilst enjoying the view of the port of IJmuiden. The reception and registration desk will be held from 17:00-19:00.

Gathering place for to the boat transport

On Monday and Tuesday there will be a boat transport from the harbor near the Leonardo Hotel. Delegates can wait in front of the Leonardo hotel, from where we will go to the boat in a group. There will also be a possibility to register, form 30 minutes before the boat leaves.

Throughout the day boats to- and from the island leave from "Restaurant Kop van de Haven", Sluisplein 80, 1975 AG IJmuiden. This is a 55 minutes walk from the Leonardo hotel or 10 minutes by taxi.



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Main Program

Sunday 6 October 2024 (Leonardo Hotel IJmuiden)

- 17.00-19.00 Registration
- 17.00-19.00 Welcome reception (link to location)

Monday 7 October 2024 (Fortress Island)

- 08.15-09.00 Registration and gathering in front of Leonardo hotel
- 09.00-09.15 Ferry to Fortress Island
- 09.30-10.00 Opening
- 10.00-10.15 Introduction on Fortress Island
- 10.15-10.45 Keynote
- 10.45-11.00 Break
- 11.00-12.00 Theme session A
- 12.00-13.00 Lunch
- 13.00-14.30 Theme session B
- 14.30-14.45 Break
- 14.45-16.15 Theme session C
- 16.30-17.00 Discussion day 1
- 17.00-20.00 Drinks and dinner
- 20.00-20.15 Ferry to hotel

Tuesday 8 October 2024 (Fortress Island)

- 08.15-08.45 Gathering in front of Leonardo hotel
- 08.45-10.15 Excursion IJmuiden by boat
- 10.15-10.30 Arrival Forteiland and break
- 10.30-11.15 Issues sluices IJmuiden & Discussion
- 11.15-11.30 Break
- 11.30-13.00 Theme session D
- 13.00-14.00 Lunch
- 14.00-15.30 Theme session E
- 15.30-15.45 Break
- 15.45-16.15 Discussion day 2
- 16.15-16.45 Closing ceremony
- 16.45-17.00 Ferry to hotel



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Special sessions

Keynote (Monday, 10.15 AM)

Paul Chun, KLM, the Netherlands



After a remarkable 43-year journey, Paul Chün has recently retired from KLM, leaving behind a legacy characterized by innovation and dedication. In his final role, he fostered a collaborative environment that united KLM Engineering & Maintenance (E&M) with educational institutions, both domestically and internationally. Paul's commitment to merging advanced technology with the enthusiasm of emerging talent has significantly contributed to KLM E&M's success in a competitive aviation landscape. Throughout his career, Paul held essential positions, including Vice President of KLM Engine Services, where he played a vital role in the introduction of next-generation engines for the Boeing 787. His extensive experience across different divisions of KLM has equipped him with a deep understanding of both technical and managerial challenges.

Lifecycle management in aviation

Lifecycle management in aviation is pivotal for ensuring both operational efficiency and safety. Given the substantial investments required for aircraft and their extended operational lifespans, optimizing the total cost of ownership while advancing sustainability is of utmost importance. KLM is at the forefront of this effort, employing prognostic maintenance to anticipate and address potential issues before they arise. This approach not only curtails operational costs but also minimizes environmental impact. In an era where environmental responsibility and sustainable practices are under increasing scrutiny, KLM's dedication to robust lifecycle management is essential for upholding its license to operate and aligning with societal expectations.

His keynote will focus on 3 main themes: Value management, Smart maintenance and Changing requirements. Paul will finalize his presentation with a list of challenges. We will compare these challenges to the challenges we are facing for infrastructure. Monday, at the end of the day, he will reflect on the findings in the theme sessions and his experience.



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Boat excursion & discussion (Tuesday 08.30 AM)

We have organized a boat tour to the world's largest sea lock, the Sea Lock IJmuiden and to Europe's largest pumping station and discharge sluices. The discharge sluices and the pumping station together ensure the discharge of 3 billion m³ of water annually, keeping the Netherlands from flooding.



After the boat tour, two presentations will introduce the interactive discussion on Life-Cycle perspectives.



Marieke Engelsman & Alexander Bakker, Rijkswaterstaat, The Netherlands

Presentations:

1. Life-Cycle Management issues for the sluices and pumping station IJmuiden (Marieke Engelsman, Tuesday 10.30 AM)
2. A broader view on the issue of climate change (Alexander Bakker, Tuesday, 11.00 AM)



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Special activities within the theme sessions

System dynamics simulation for infrastructure replacement programs (Monday A3, 11.00-12.00)

The replacement challenge of bridges is not an isolated task. Although highly challenging in itself, the concurrence of other tasks and interaction with externalities makes it really complex. System-dynamic modelling can efficiently help us scrutinise different acceleration strategies under many different circumstances for robust and futureproof decision-making. In this workshop we will give a hint of how this is done for the bridge replacement challenge in the Netherlands.

Multi-modal game (Monday B3, 13.00 - 14.30 and C3, 14.45 - 15.15)

Infrastructure networks are an essential part of our daily lives. They are so self-evident that we mainly notice them when they stop functioning. In this game, you are the manager of a transport infrastructure network, and it is your challenge to keep it functioning. You must monitor the ageing, performance, finances, satisfaction, and potential expansion of the network. To make it even more complicated, you will also face developments in the surrounding networks. Networks are increasingly interconnected, and developments in the rail network, for example, affect the highway network and vice versa. These interdependencies are often seen as difficult and complex but offer excellent collaboration opportunities. How will you keep your network alive?

Antea Masterclass (Tuesday E3, 14.00 - 15:30)

In this mini masterclass, we give a vision on the implementation of Life-Cycle Management: because despite the fact that the added value of LCM is seen in managing organizations, the real change that is needed for this often does not materialize. In this masterclass, we will show positive practical experiences and discuss how you can get started with Life-Cycle Management in small steps and how this contributes to pride in the maintenance management profession.



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Theme Sessions

Monday Session A 11.00 - 12.00

A1 Monitoring (Dome Hall, Room 1)

Henk Akkermans (Tilburg University, The Netherlands)

Monitoring will enable us to predict future behavior of infrastructures, to ensure safety and to predict optimal intervention moments for maintenance and replacement. New technologies on data collection, sensing and monitoring techniques are presented and their role in Life-Cycle management is discussed.

1. 3D measurement method using stereo matching of 2D images taken by infrastructure monitoring systems *Tomohiko Hayakawa, Yushi Moko, Yuka Hiruma, Yoshimasa Onishi, Masatoshi Ishikawa*
2. Pilot data-driven maintenance on the Zeelandbrug *Thijs Verbeek, Pádraig Naughton, Mischa Beckers, Steven Mookhoek*
3. Life-Cycle management in heritage structures in case of perpetuating structural damage *Eleni Smyrou, İhsan Engin Bal, Kamer Özdemir*

A2 digitalisation for aging bridges (Room 5)

Bart Luiten (TNO, The Netherlands), Jens Sandager Jensen (COWI, Denmark)

A major part of the assets in civil infrastructure has been built during the 1965-1975 construction peak. Many of the bridges from that period are at the end of their structural, economical and/or functional end of life. Asset owners are faced with the challenge to accelerate the future proving of these aging bridges in a safe, sustainable and efficient way. In this session we will explore opportunities digitalisation of asset management processes offers to cope with this challenge.

1. Digital innovations for aging infrastructure in the Netherlands *Caroline den Besten, Bart Luiten*
2. The digital transition in asset management of bridges and civil structures in Denmark – Advantages and challenges *Jens Sandager Jensen*

A3 Mini-workshop: System dynamics simulation for infrastructure replacement programs (Room 6)

Arjen Ros, Michel Kuijjer, Arjen Schaper, (Copernicos, the Netherlands)

The replacement challenge of bridges is not an isolated task. Although highly challenging in itself, the concurrence of other tasks and interaction with externalities makes it really complex. System-dynamic modelling can efficiently help us scrutinise different acceleration strategies under many different circumstances for robust and futureproof decision-making. In this workshop we will give a hint of how this is done for the bridge replacement challenge in the Netherlands.



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Monday Session B 13.00 - 14.30

B1 Monitoring (Room 4)

Henk Akkermans (Tilburg University, The Netherlands)

Monitoring will enable us to predict future behavior of infrastructures, to ensure safety and to predict optimal intervention moments for maintenance and replacement. New technologies on data collection, sensing and monitoring techniques are presented and their role in Life-Cycle management is discussed.

1. Improving infrastructure and its maintenance through condition-based maintenance *Henk Akkermans, Willem van Groenendaal*
2. Monitoring of maintenance contracts: Learning-to-contract in a digitalised world *Tom Aben, Wendy van der Valk, Henk Akkermans*
3. Monitoring assets in the North Sea: A system of systems approach *David Wodak*
4. Towards shared service control towers for Life-Cycle management of integrated infrastructure systems *Henk Akkermans, Leentje Volker*

B2 Quay walls (Room 5)

Martine van den Boomen (Rotterdam University of Applied Sciences / TU Delft, The Netherlands), Mandy Korff (Deltares / TU Delft, The Netherlands)

Quay walls are indispensable for a liveable society and a thriving economy. These capital-intensive structures with long lifespans, have a long history and much variety. The themed session on quay walls welcomes a broad spectrum of topics focused on the lifecycle management of quay walls. This includes construction, maintenance, life extension, and replacement of quay walls with subjects such as monitoring, data analysis, decision-making, asset management, failure mechanisms, condition degradation, structural innovations, structural safety, and sustainable construction. We encourage professionals and scholars to present their applied research, innovations and best practices.

1. Smart quay walls & trends in quay-wall engineering *Alfred Roubos*
2. Reliability updating for Inner-city quay walls *Bram van den Eijnden, Mark van der Krogt, Mandy Korff, Pantelis Karamitopoulos*
3. A decision support tool for optimal observation points determination in remote sensing: Case study of Amsterdam's quay wall *Hao Kuai, Valentina Macchiarulo, Satyadhrik Sharma, Pantelis Karamitopoulos, Francesco Messali, Alice Cicirello, Giorgia Giardina*
4. Application of AI-based automatic crack detection to the quay walls in Amsterdam *İhsan Bal, Eleni Smyrou, Rozemarijn Veenstra, Ömer Türkmen, Boy de Vries*
5. A decision-making framework for large-scale maintenance in cities: Application to urban quay walls in Amsterdam *Lisa Swaalf, Andrés Martínez Colán, Rajat Sinha, Paolo de Heer*
6. Life-Cycle portfolio management for quay walls using a Markov Chain modelling approach *Martine van den Boomen*



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B3 Interactive game: Multi-modal networks (Room 6)

Robin Neef, Tim Busscher (University of Groningen, The Netherlands)

Infrastructure networks are an essential part of our daily lives. They are so self-evident that we mainly notice them when they stop functioning. In this game, you are the manager of a transport infrastructure network, and it is your challenge to keep it functioning. You must monitor the ageing, performance, finances, satisfaction, and potential expansion of the network. To make it even more complicated, you will also face developments in the surrounding networks. Networks are increasingly interconnected, and developments in the rail network, for example, affect the highway network and vice versa. These interdependencies are often seen as difficult and complex but offer excellent collaboration opportunities. How will you keep your network alive?

B4 Bridges (Dome Hall, Room 1)

Fabio Biondini (Politecnico di Milano, Italy)

Asset management of bridges and infrastructure systems is a high priority for public authorities and managing bodies due to the detrimental impact of aging and deterioration processes and exposure to multiple hazards under climate change. This theme session deals with multi-disciplinary risk-based life-cycle-oriented criteria, methodologies, and tools to inform the decision-making process for rational allocation of limited resources and efficient prioritization of bridge maintenance and repair interventions at infrastructure scale.

1. BRIDGE|50: Large-scale experimental tests and numerical investigations to advance life-cycle management of bridges *Fabio Biondini, Francesco Tondolo, Sergio Manto, Carlo Beltrami*
2. Estimation of remaining life of a 128-Year-old railway bridge using digital twin *Alkım Yaşar Kurtuluş, Ahmet Derya Ateş*
3. Modular bridge building in reach? *Paul Waarts*
4. Post-tensioned reinforced concrete bridges in Italy: Myths and fallacies vs need of a Life-Cycle approach *Carlo Beltrami*
5. Climate resilience infrastructure *Alfred Strauss, Helder Sousa*



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Monday Session C 14.45 - 16.15

C1 Storm surge barriers (Room 4)

Alexander Bakker (RWS/TU Delft, The Netherlands), Martine van den Boomen (Rotterdam University of Applied Sciences / TU Delft, The Netherlands)

A storm surge barrier is a movable barrier that can be closed temporarily to prevent the water levels behind to exceed certain dangerous levels. Typically, strict requirements are applied for the operational and structural reliability to guarantee the safety of the area behind against flooding. Meeting these strict requirements can however be challenging because of the sometimes limited maintenance windows, the infrequent operation and the fact that many barriers are unique-in-its-kind. Besides, as a result of sea level rise and socio-economic developments, requirements and hydraulic loadings can substantially change during the life time of the barrier. This session welcomes all topics related to the Life-Cycle management of storm surge barriers, such as maintenance, asset and knowledge management, risk assessment and life time extension.

1. Opportunities for improving knowledge continuity in long-lived complex infrastructure *Merlijn Kamps*
2. Synergies and conflicts in climate adaptation, large scale transitions and renewal of infrastructure: Case study for the Southwest of the Netherlands *Noor ten Harmsen van der Beek, Renske de Winter, Esther van Baaren, Marjolijn Haasnoot*
3. A systematic coarse-to-fine approach to establish the probability of a failed closure of a storm surge barrier *Leslie Mooyaart, Alexander Bakker*
4. Managing asset management performance *Yara Kharoubi, Martine van den Boomen, Johan van den Bogaard, Marcel Hertogh*
5. Life-Cycle optimisation of storm surge barrier regulated water systems *Alexander Bakker*

C2 Sustainability (Room 5)

Henk Jonkers (TU Delft, The Netherlands), Mitsuyoshi Akiyama (Wasada University, Japan)

The growth in welfare in the past decades had an enormous impact on the environment and on our natural resources. It is a great challenge to find new ways to reduce the impact to the planet in the future. This session deals with possibilities to reduce the impact to our planet and to become more sustainable.

1. Sustainability in prolonging the longevity of structures and infrastructure systems through disaster mitigation, climate change adaptation, and life-cycle management *Mitsuyoshi Akiyama, Dan M. Frangopol*
2. Innovative production technology for sustainable carbon neutral concrete utilizing Mg-based CO₂-sequestered cement *Maho Kaizaki, Sopokhem Lim, Chi Chen, Mitsuyoshi Akiyama*
3. Life-cycle and sustainability of structures and infrastructures: ReLUI collaborative research project *Fabio Biondini, Alessandra Marini*
4. Retrieving high-quality residual cementitious fines – Insights in the processing approach of end-of-life concrete *Anna Alberda van Ekenstein, Henk Jonkers, Marc Ottel *
5. Steering on the Environmental Cost Indicator (MKI) of concrete can negatively affect its quality and life time performance *Marc Ottel , Henk Jonkers*



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C3 Interactive game: Multi-modal networks (Room 6)

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C4 LCM tooling (Dome Hall, Room 1)

Jaap Bakker (RWS, The Netherlands), Rob Treiture (RWS, The Netherlands)

Implementation of LCC: There are many good examples on how to support decisions using LCC. Most of these examples are the results of pilots, research projects and theoretical papers. But which of these tools and methodologies reach the operational processes? We will ask this question to different client organizations.

1. Implementation of the economical end of life indicator *Jaap Bakker, Govertine de Raat*
2. Incorporation of LCC in the renewed asset management system for Rijkswaterstaat *Rob Treiture, Jaap Bakker*
3. Implementation issues on LCC-tenders *Jaap Bakker, Rob Treiture*
4. LCC life prediction of galvanized steel guard rails *Dirk-Jan Molenaar, Jaap Bakker, Rob Treiture*
5. Service life predicting asphalt model *Bernardo Lontra, Gina Torres-Alves, Shang-Jen Wang*



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Tuesday Session D 11.30 - 13.00

D1 Pavements (Room 4)

Mirella Vianella (RWS, The Netherlands)

This session deals with Life-Cycle management of pavement. Aspects like life time prediction and modeling, Life-Cycle optimal maintenance strategies, and reduction of environmental impact on pavementworks are discussed in this session.

1. How to procure a circular pavement? *Avishreshth Singh, Aikaterini Ververi*
2. SPOT - Sustainable pavement oversight and transparency *Joao Santos, Miriam Frosi, Jan van de Water, Marco Oosterveld, Seirgei Miller*
3. Information needs for analyses of pavement behavior in retrospective *Peter Verdonschot, Jaap Bakker*

D2 Underground utilities (Room 5)

Leon Older – Scholtenhuis (University of Twente, The Netherlands)

Many infrastructure assets are exposed to harsh conditions that influence the integrity of materials, limit accessibility for inspection, and create uncertainties in planning maintenance activities. Although buried infrastructure networks for eg. energy, telecommunication, water and sanitation, are generally simpler compared to large civil engineering assets, the key challenge for these networks arises from their invisibility. Disparate networks have been deployed over many decades, and are owned by different operators. Loss of data about locations and functional conditions hampers sound decision making about construction and replacement, while the underground environment becomes even more congested due to construction of new energy and broadband networks. This further complicates the situation and increases the risk of damage to existing infrastructure. This session invites professionals and asset managers for presentations and a closing panel discussion about how contemporary (digital) technology could support Life-Cycle management of utilities. Technologies such as real-time network monitoring, pipe condition assessment, advanced detection and registration, and data-driven tools for utility strike avoidance are addressed and placed in the perspectives of authorities that are responsible for integrated Life-Cycle coordination and ensuring public safety.

1. Predicting energy network damage based on historical data and machine learning: the case of Enexis *Dirk Kusters*
2. Investigating the correlation between a leaking buried pipe and road surface anomalies *Reza Movahedifar, Mehran Eskandari Torbaghan, Alexander Royal*
3. Data-driven inspection of sewer lines: linking data with methods *Hengameh Noshahri*
4. As-built registration of utility trenches using handheld devices: a prototype technology *Leon olde Scholtenhuis, Nima Zarrinpanjeh*



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D3 LCM tooling (Dome Hall, Room 1)

Jaap Bakker (RWS, The Netherlands), Rob Treiture (RWS, The Netherlands)

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1. Risk-based maintenance strategy for small culverts *Bernardo M. Lontra*, Ece Ozer, Wim Courage*
2. Investments and transitions *Arjen Ros, Arjen Schaper*
3. A comprehensive digital framework for effective asset Life-Cycle performance management *Leo van Ruijven, Sander van Ruijven*
4. Real options analysis for uncertainty management in the Dutch infra projects *Ahmed AL Drawish*



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Tuesday Session E 14.00 - 15.30

E1 Resilience (Dome Hall, Room 1)

Agnieszka Bigaj van Vliet (TNO, The Netherlands), Diego Allaix (TNO, The Netherlands)

Resilience of infrastructure to changes in exposition and natural hazards during the lifecycle of a structure becomes an increasingly important issue. Ageing structures may no longer be used in a manner that was expected during design. Natural hazards, for instance due to climate change, may induce loads on structures that were not anticipated during design. Resilience is an important topic these days, and progress needs to be made to deal with the challenges of today and the challenges in the near future.

1. Design requirements for infrastructure resilience *Nisrine Makhoul*
2. Resilience-guided infrastructure risk management approach for road networks *Diego Allaix, Agnieszka Bigaj-van Vliet*
3. Enhancing the resilience of critical infrastructures through sustainable service life extension *Alfred Strauss*
4. Improving climate resilience of vulnerable infrastructure through nature-based solutions *Igor Gjorgjiev, Marija Vitanova, Mohamed Eldessouki, Panagiotis Spyridis, Slavko Milevski*
5. How to incorporate the effects of climate change in the strategic lifecycle modelling of civil infrastructure? *Gareth Calvert*
6. Mainstreaming innovation for climate resilience: the case of nature-based solutions addressing urban sustainability challenges *Hade Dorst*

E2 Hydraulic structures (Room 5)

Esra Bektas (TNO, The Netherlands), Martijn de Jong (RWS, The Netherlands)

This theme session is co-organized by TNO and Rijkswaterstaat to explore together what the current major challenges mean specifically for Hydraulic structures and to what extent they can be transformed to major innovations or collaboration opportunities. Challenges are such as End of Life Decision Making, Climate Change, Digitalisation, or any other that you would like to bring to the table on hydraulic structures. We start with a short presentation on our on-going knowledge project, where we aim to create portfolio knowledge of navigation locks based on available data through utilizing the Semantic Web technologies to support prioritization for replacement and renovation program of Rijkswaterstaat. We use this as an opening presentation learn from colleagues working on abovementioned challenges and to make connections between organisations for further collaboration opportunities.



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1. Weirs – renovation of the Maas weirs scenario *Marloes Baijens*
2. Determining and scheduling long term maintenance efforts for weirs and locks *Zorana Duric, Sophie Ochs*
3. SAFE: Advancing Life-Cycle management of hydraulic structures through satellite technology and artificial intelligence *Ece Oze, Jorge Melo, Arta Dilo, Kay Koster, Ioannis Zouros*
4. Rule checking model for locks *Esra Bektas, Martijn de jong*

E3 Antea master class (Room 6)

Giel Klanker (Antea Group, The Netherlands), Mozafar Said (Municipality of Rotterdam, The Netherlands)

In this mini masterclass, we give a vision on the implementation of Life-Cycle Management: because despite the fact that the added value of LCM is seen in managing organizations, the real change that is needed for this often does not materialize. In this masterclass, we will show positive practical experiences and discuss how you can get started with Life-Cycle Management in small steps and how this contributes to pride in the maintenance management profession.



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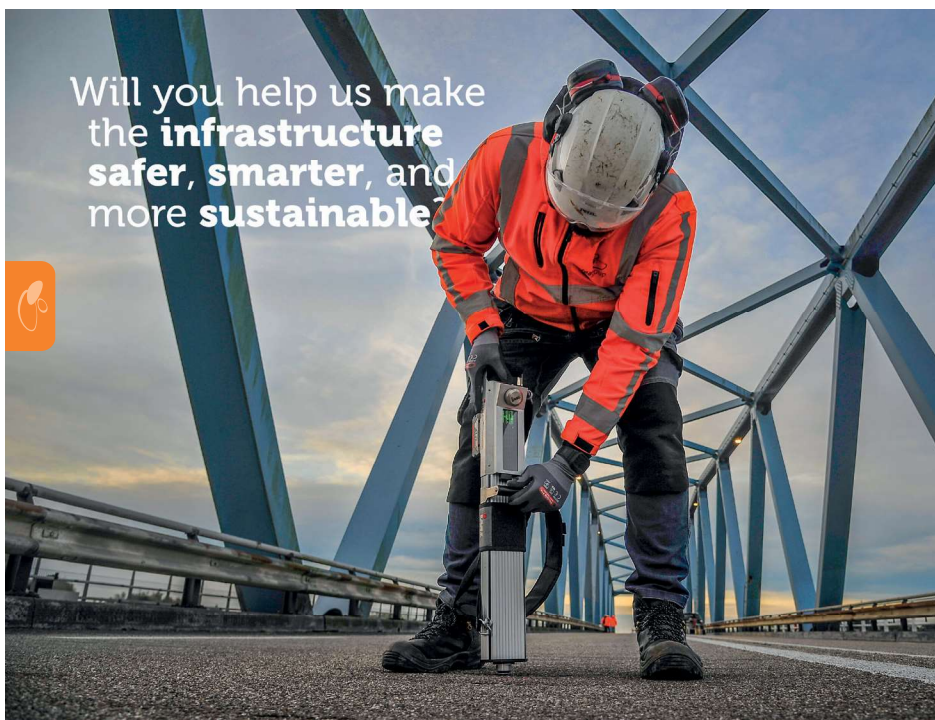


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**International Association for
Life – Cycle Civil Engineering**



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www.ialcce.org

IALCCE

The International Association for Life-Cycle Civil Engineering (IALCCE) was founded in Seoul, Korea, in October 2006. Complete and updated information about IALCCE is available on the official website of the Association: www.ialcce.org.

FIELD OF ACTIVITY

The activities of the Association will cover all aspects of life-cycle assessment, design, maintenance, rehabilitation and monitoring of civil engineering systems.

MISSION

The mission of the Association is to be the premier international organization for the advancement of the state-of-the-art in the field of life-cycle civil engineering.

OBJECTIVE

The objective of the Association is to promote international cooperation in the field of life-cycle civil engineering for the purpose of enhancing the welfare of society.

ACTIVITIES

In order to fulfill its mission and objective, the Association will organize congresses, conferences, symposia, workshops, seminars, and short courses on the related topics. The Association intends to cooperate with other organizations, including AASHTO, ACI, AISC, ASCE, CERRA, ESRA, fib, IABMAS, IABSE, IASSAR, ICE, IFIP, JCSS, PIARC, and RILEM, having interest in the field of activity of IALCCE. The list of events sponsored by IALCCE is available on the website of the Association: www.ialcce.org.

MEMBERSHIP INFORMATION

Membership will include individual members and collective members. An individual member of IALCCE shall be a person who is involved in the areas of activity covered by the Association, possesses appropriate knowledge and is willing to support the mission and objective of the Association. A collective member of IALCCE shall be an organization having technical or scientific interest in the Association, such as institutions, universities, qualified firms, and libraries.

JOIN IALCCE

To apply to become a member of IALCCE, please visit the IALCCE website at www.ialcce.org, choose the appropriate online application form (individual or collective) and submit all the requested information to IALCCE Secretariat.



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