IABSE Conference Geneva 2015
Scientific and Technical Outcome—Session Highlights and Further Activities

Introduction

This report has the objective to highlight the conference output for implementation in future IABSE activities. The conference objectives and how they were achieved are outlined. Furthermore, it is shown how the Scientific Committee proceeded, how the animated sessions were organised and realised, and what was new from the scientific and technical point of views. Finally, it is explained how it was possible to gather the major outcomes of the conference including 15 proposals for creating new IABSE Working Groups, 13 proposals for adapting and enhancing activities within existing IABSE Working Commissions, and proposals for topics at future IABSE Conferences, Workshops and new SEDs.

What were the general objectives and how were they achieved?

The IABSE Geneva 2015 Conference was about “Structural Engineering—Providing Solutions to the Global Challenges”. Sustainable growth of our society shall be ensured by providing a high-quality built environment. To achieve this first conference objective, the global themes were introduced by keynote lectures and keypanels, and their relevance to structural engineering was discussed in several sessions.

Transdisciplinary projects, social issues related to structural engineering, professional responsibilities and ethical issues were debated. Original methods and technologies that were to become novel structural engineering technologies were presented, and state-of-knowledge was consolidated.

The second general objective was to introduce a new conference style that allows for knowledge sharing and to foster a maximum number of interactions between active conference participants. This was achieved by actively animated sessions. In several sessions, debates or panel discussions were organised after short paper presentations. In general, a strict time management was followed allowing significant time to discuss the contents of the presented papers and to highlight the important topics to be developed further.

How did the SC proceed?

The SC was composed of the Board, including Eugen Brühwiler (chair), Christian Cremona (IABSE TC chair), Philippe Van Bogaert, Joan Casas and Malena Bastien Masse, and 60 members. The SC completed the reviews of abstracts and full papers in short time intervals.

The “Call for Contributions” was open during September and October 2014 and resulted in 135 entries submitted by IABSE Working Commissions, Working Groups and individual members. These proposals allowed defining the themes for the Scientific and Technical Sessions of the conference. The subsequent call for abstracts resulted in almost 500 abstracts on 31 December 2014. The contributors had to select between the predefined session topics but certain abstracts called for additional sessions. The “bottom-up” input from the call for contributions was thus directly implemented in the conference programme and complemented “top-down” by the SC Board with further session topics responding to additional demands. Based on the submitted abstracts, a first tentative programme defining session topics could be established and first session facilitators could be invited. This tentative scientific and technical conference content was published in SEI 02/2015 together with a detailed description of the overall conference programme.

Meanwhile, authors with an accepted abstract were invited to submit their full paper by May 31, 2015. The authors of papers for Technical Sessions had the possibility to submit a short four-page paper, whereas the authors of Scientific Papers had to submit the conventional eight-page papers. Only about 5% of all submitted papers were short papers. Overall, all 331
submitted full papers were reviewed by two members of the SC; of these, 310 papers were accepted, one-third without revisions and two-thirds asking for revisions. In case of opposed reviews, a third review was conducted by the SC Board.

Accepted papers with no registered presenting authors were removed, which finally resulted in the 285 final papers. A first draft of the Final Conference Programme was published on the conference website on 28 July 2015. The final papers were allocated to the four global themes as follows: 14% to “Climate Change and the Energy Challenge”, 35% to “Global Engineering Challenges”, 38% to “Breakthrough Technologies” and 13% to “Urbanisation and Growth”.

During August 2015, the conference proceedings were produced, the programme was consolidated and the detailed procedure of the sessions was organised.

How were animated sessions organised?

General instructions were issued by the SC Board to the Session Facilitators of each session who were—within certain constraints—free to arrange their session. Novel formats such as debates, panel discussions or discussion of prepared questions were encouraged by the SC Board. By all means, sessions had to be actively animated by the session facilitators who also had the assignment to challenge—if needed—the presenting authors with questions. By September 4, all Session Facilitators had chosen the appropriate session format and gave instructions to their presenting authors. In this manner, both presenting authors and Session Facilitators could prepare accordingly for their performance in the forefront of the conference.

From the overall 54 conducted sessions, 28 sessions contained less than the usual six papers for a session duration of 90 minutes. The “classic format” consisting of 12 minutes of presentation and 3 minutes of questions/answers was chosen in 28 sessions; these were often scientific sessions where this format may have its relevance. In 26 sessions, a new style was adopted fostering interaction between presenting authors and the audience.

How was the conference output gathered?

The Session Facilitators were asked to establish a short Session Highlights Report (including original and novel topics and results as well as potential future IABSE activities including names of persons willing to invest themselves). Therefore, the majority of the sessions concluded with a discussion on topical themes for further IABSE activities and on the role of IABSE in general. Most Session Facilitators submitted their Session Highlights Report within 24 hours to the SC chair.

This way, it was possible for the SC and TC chairmen to present the major outcomes of the conference under the title “Session highlights and further activities” at the last plenary session.

What is the conference outcome?

Based on the Session Highlights Reports received from all the sessions, the following topical themes as well as novel engineering methods and technologies could be gathered/compiled as keywords:

**Global Theme 1: Climate change and the energy challenge**
- Sustainability in civil construction including methodologies to measure sustainability in structural engineering
- Sustainable construction materials including hybrid construction (timber-concrete), environmental impact of various materials and carbon footprint of new and existing structures
- Multi-functional energy-efficient building envelopes including issues such as insulation, indoor air quality, energy harvesting and aesthetics
- Structures for renewable energy production including the role of structural engineering in a multi-disciplinary team
- Extreme environmental actions and hazards on structures including probabilistic modelling of extreme climatic actions, aerodynamic control measures, effect of Tsunami action on structures and mitigation measures, risk-based framework for bridge design and examination methods against multiple hazards and monitoring of exposed structures.

**Global Theme 2: Global engineering challenges**
- Structural engineers as global leaders including the triangle of research,
education, practice as well as the importance of soft skills (creativity and general culture) that make the difference

- *Aesthetics in structural engineering* including evaluation and effect of aesthetic quality of designs and of existing structures as well as best practices to achieve high visual appeal
- *Structural engineering and architecture* including the relationship between structural form and architectural expression as well as the importance of the conceptual design
- *Heritage structures and construction history* including how knowledge and awareness of cultural values influence intervention projects
- *Codes and standards* and the challenge of incoherent and contradicting results due to disparity between international codes and standards
- *Forensic structural engineering* and the structural engineer as expert and its relationship with attorneys
- *Structural safety and risk assessment* including robustness methodologies in structural design and assessment as well as structural fire engineering
- *LCA and LCC analysis in infrastructure asset management* including the use of monitoring and inspection data as well as the performance of prediction models and cross-asset management optimisation for maintenance
- *BIM/CAAD & Co* as novel tools for engineers.

**Global Theme 3: Breakthrough technologies**

- *Performance of existing structures* including guidance for comprehensive examination (assessment) of existing structures as well as probabilistic methods
- *Structural health monitoring technologies* for damage detection and structural identification using technologies such as unmanned aerial systems, strain-sensing sheets, wireless sensor networks, model falsification as well as implementation of monitoring data for structural and fatigue safety evaluation
- *Non-linear structural analysis tools and safety formats* including best engineering practices in non-linear modelling of structural behaviour
- *Improving existing bridges* including novel strengthening techniques using UHPFRC, cold strengthening methods for steel structures or FRP lamellas
- *Improvement of structures subjected to seismic action* including technologies on improving and strengthening of RC piers or RC columns
- *Smart and active vibration control* using semi-active and active damping devices
- *Joints and bearings* including assessment guidelines, optimisation of life cycle cost and maintenance management as well as friction-based systems for energy dissipation in seismic applications
- *Long span bridges* including validation of software for the computation of the bridge response to turbulent wind
- *Construction methods using novel materials and numerical tools* referring to craftsmanship from the past that can be revitalised by the use of modern (digital) technology
- *Fibre reinforced polymer (FRP) composites* for structures including the review of several thousand FRP structures installed worldwide as well as FRP for very long span bridges
- *UHPFRC structures* including properties of locally developed UHPFRC, hybrid application of UHPFRC with other materials and connections of UHPC members.

**Global Theme 4: Urbanisation and growth**

- *Design of buildings and infrastructure in confined and complex spaces* including tools enhancing the decision process of decision makers (e.g. taking into account carbon emissions and embodied carbon)
- *Resilient and smart cities* as a multi-disciplinary theme including methodologies to model cities and their development depending on new technologies (like driverless vehicles)
- *Sustainable infrastructure for developing economies* including appropriate solutions for housing as part of urbanisation and urban transformation
- *Engineering in developing countries* including original approaches such as the “living root bridges approach” and the importance of identification of the local community and culture with their structures and civil works.

The scientific and technical content of the IABSE Geneva 2015 conference indicated a clear trend from “craftsmanship structural engineering” to “modern structural engineering” with focusing and responding targeted on societal needs while consolidating
technical competence through novel technologies. Professional issues such as responsibilities and the structural engineer as partner of other technologies as well as ethical aspects of our achievements were prominently discussed during sessions and also during coffee breaks.

The Session Highlights Reports contained overall 15 proposals for creating new IABSE Working Groups, 13 proposals for adapting and enhancing activities within currently existing IABSE Working Commissions and Working Groups as well as 12 other proposals such as sessions at future IABSE Conferences, topical IABSE Workshops, new SEDs and updating of existing SEDs.

Firm interests in creating new IABSE Working Groups were expressed by designated volunteering persons for the following themes: “Sustainable construction materials”, “Environmental hazard on structures”, “Performance of existing structures”, “Non-code conform structures”, “Implementation of structural health monitoring in structural engineering”, “Asset and infrastructure management”, “Lifecycle performance of structures and civil works”, “Resilient and smart cities”, “Structural response to fire” and “Long span bridge response to turbulent wind”.

**What are the next steps?**

Persons volunteering to establish and contribute to new IABSE activities will be contacted in the coming weeks in order to establish the assignments comprising four parts: (1) context and motivation; (2) objectives; (3) working format and (4) expected outcome. New activities shall finally be adopted by the IABSE TC by the end of 2015. These novel activities have the general objective to make IABSE activities different to activities of more specialised associations in the domain of structural engineering. Also, the outcome from these activities needs to be really useful for implementation in practical structural engineering.

Ideally, at next IABSE Annual Conferences, the Annual Meetings should take place after (and not before) the conference such that the conference outcome can be implemented “on the spot” by the IABSE WC and WGs, a rational and pragmatic proposal expressed by Klaus Ostenfeld, chair of the Lead Team.

**And finally: What was really new from the scientific and technical viewpoints?**

IABSE Geneva 2015 featured several new or novel items:

- Through the call for contributions, sessions and session topics were defined by a bottom-up approach leading to some original session themes
- Scientific and Technical Sessions were distinguished, thereby allowing short papers for Technical Sessions
- Session facilitators were introduced and received assignments to design their sessions (using—if appropriate—novel formats and styles), to actively animate their session and to produce a short report with the major outcomes
- Most sessions were lively and animated, which is due to the focused and more thorough preparation of both the session facilitators and presenting authors in the forefront of the conference
- This conference produced conclusions with a significant output for further IABSE activities and developments.

Overall, the conference revealed a clear trend from “craftsmanship structural engineering” to “modern structural engineering” respecting societal needs. This trend will most likely increase again the relevance and visibility of Structural Engineering globally.

**Eugen Brühwiler**
Chair Scientific Committee
IABSE Conference Geneva 2015