STC

237 STC 17 E
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NATO Parliamentary Assembly

SUMMARY

of the meeting of the Science and Technology Committee

Sala N Balcescu
The Parliament (Senate and Chamber of Deputies)
Bucharest, Romania

Sunday 8 October 2017

ATTENDANCE LIST

General Rapporteur	Thomas MARINO (United States)
Acting Special Rapporteur	Maria MARTENS (Netherlands)
Sub-Committee on Energy and Environmental Security Rapporteur	Matej TONIN (Slovenia)
President of the NATO PA	Paolo ALLI (Italy)
Secretary General of the NATO PA	David HOBBS

Member delegations

Belgium	Georges DALLEMAGNE
	Sébastian PIRLOT
	Veli YÜKSEL
Bulgaria	Nikolay TSONKOV
Canada	Leona ALLESLEV
	Joseph A. DAY
	Marc SERRÉ
Czech Republic	Anna PUTNOVA
Estonia	Eero HEINALUOMA
	Mikko SAVOLA
France	Jean-Christophe LAGARDE
	Philippe MICHEL-KLEISBAUER
Greece	Marios SALMAS
Hungary	Tamas HARANGOZO
Italy	Lorenzo BATTISTA
	Emilio FLORIS
	Domenico SCILIPOTI ISGRO
	Luciano URAS
Latvia	Ivans KLEMENTJEVS
Luxembourg	Alexander KRIEPS
Montenegro	Genci NIMANBEGU
Netherlands	Bastiaan van APELDOORN
Norway	Ingunn FOSS
Poland	Waldemar ANDZEL
	Pawel BEJDA
	Przemyslaw CZARNECKI
	Waldemar SLUGOCKI
	Pawel SZRAMKA
Portugal	Bruno VITORINO
Romania	Ovidiu Florin ORTAN
Slovenia	Matej TONIN
Spain	Ramon MORENO
Turkey	Ziya PIR
United Kingdom	Kevan JONES
	Lord JOPLING
	Baroness RAMSAY of CARTVALE
United States	James SENSENBRENNER
	Michael R. TURNER

Associate delegations

Armenia	Suren MANUKYAN Koryun NAHAPETYAN
Azerbaijan	Malahat IBRAHIMGIZI
Sweden	Göran PETTERSSON
Switzerland	Isidor BAUMANN
Ukraine	Iryno FRIZ

Regional Partner and Mediterranean Associate Member Delegations

Jordan	Hussein MAJALI
Morocco	Mohammed AZRI

Parliamentary Observers

Australia	Ross HART
Egypt	Khaled MEGAHED
Palestinian National Council	Abdelrahim BARHAM Mohammed HEGAZI
Republic of Korea	Sang Don LEE

Speakers

Thomas H. KILLION
NATO Chief Scientist

Tim WEBB
Head, Capability Delivery Section, Strategy Directorate, Defence Investment Division, NATO

Martin HILL
Chairman, NATO Industrial Advisory Group (NIAG)

Stefan-Ciprian ARSENI
Lt. eng., Scientific Researcher, Military Equipment and Technologies Research Agency, Romania

Committee Secretary David SLATER

International Secretariat
Henrik BLIDDAL, Director
Anne-Laure BLEUSE, Coordinator
Constance HUBERT, Research Assistant

I. Opening remarks by Bruno VITORINO (Portugal), Vice-Chairperson

1. **Bruno Vitorino** (PT), the Committee Vice-Chairperson, reminded delegates that the position of Chairperson of the STC was vacant, as Philippe Vitel lost his seat in the French National Assembly elections. Mr Vitorino conveyed Mr Vitel's warmest regards to the Committee. He would be greatly missed, Mr Vitorino added, as he championed several key topics in the STC, including climate change and security, cyber defence and energy security. Going forward, the Committee would need to build on his commitment and determination, Mr Vitorino argued.

II. Adoption of the draft Agenda [173 STC 17 E]

2. **The draft Agenda [173 STC 17 E] was adopted.**

III. Adoption of the Summary of the Meeting of the Science and Technology Committee held in Tbilisi (Georgia), on Saturday 27 May 2017 [142 STC 17 E]

3. **The summary of the meeting of the Science and Technology Committee held in Tbilisi (Georgia), on Saturday 27 May 2017 [142 STC 17 E] was adopted**.

IV. Procedure for amendments to the draft Resolution *Maintaining NATO's Technological Edge* [190 STC 17 E]

4. The Vice-Chairperson reminded the delegates of the procedure for amendments.

V. Panel discussion on *Maintaining NATO's Technological Edge* with presentations by:

- **Thomas H. Killion**, NATO Chief Scientist on *NATO Science and Technology*
- **Tim Webb**, Head, Capability Delivery Section, Strategy Directorate, Defence Investment Division, NATO, on *The Role of NATO's Defence Investment Division in Maintaining a Technological Edge*
- **Martin Hill**, Chairman, NATO Industrial Advisory Group (NIAG) on *The State of Defence Industrial Cooperation in the Alliance and the Work of NIAG*

5. NATO Chief Scientist, **Thomas H. Killion,** welcomed the STC's report on *Maintaining NATO's Technological Edge: Strategic Adaptation and Defence Research & Development* [174 STC 17 E], which was discussed later in the day. For decades, NATO's technological edge was taken for granted. However, this advantage was eroding or had already eroded, due to the fact that the bulk of investment in Research and Development (R&D) was now made in the commercial sector, vastly surpassing government R&D investments. This was a threat to NATO's technological advantage, he argued. He acknowledged the economic pressure Allied countries had been under in the past decade, but hoped for a renewed commitment of resources to R&D and capability development.

6. Mr Killion outlined that change was increasing in a range of technologies appearing in the market place, for example in Artificial Intelligence (AI) or the Internet of Things. The increasing technological changes are largely driven by commercial investments in these areas. The Chief Scientist singled out the cyber domain as a technology sector where the NATO community was challenged every day because of accelerating change: as everything was becoming connected, everything was also becoming more vulnerable. It was a challenge to keep up with the ways in

which people could interfere in the operation of connected systems, as they were all becoming software-based, Mr Killion cautioned.

7. While the commercial sector was catching up or overtaking the military in many sectors, it still had leadership in key areas such as electronic warfare, hypersonic technology, advanced weapons or energetics. To a large degree, however, NATO had to depend on advancements in the commercial sector, which was why the industry had to be a key partner in helping NATO integrate such technologies.

8. Mr Killion told delegates that NATO was currently updating the NATO Science and Technology Strategy, because the strategic and technological environment had changed since 2012 when the first Strategy was released. NATO's primary assets were the scientists and engineers working on science and technology (S&T) within NATO, he underlined. Going forward, NATO S&T had to have a robust and agile programme to respond to developments in the private sector and to look at emerging areas of interest. The NATO Science and Technology Board was also looking at enhancing its engagement with the European Union (EU), the European Defence Agency and others to bring more coherence to investments and programmes in the Euro-Atlantic area, he added. Finally, Mr Killion called upon parliamentarians to support the next generation of scientists and engineers through reforming and championing an excellent education sector, in particular in science, technology, engineering and mathematics.

9. **Tim Webb**, Head of the Capability Delivery Section at NATO, began his presentation by reminding delegates how the Euro-Atlantic community got to where it was today: after the fall of the Berlin Wall, societies and governments expected a peace dividend and the end of the arms race. Naturally, this led to a shrinking of defence budgets and underinvestment in defence programmes. Today, NATO was facing significant challenges again. He welcomed the commitment of Allies to increase defence spending at the Wales Summit, noting also the European Defence Action Plan, which would help European Allies. He pointed out that the aggregated defence budget of European Allies increased by EUR 40bn in 2016. Increasing budgets gave NATO tremendous opportunities, but Allies had to continue to coordinate and spend better. These additional resources had to be channelled into the most strategic areas, which was where NATO had a key role to play.

10. He then presented the capability architecture approach, an example of how NATO was pursuing this goal. The approach provided an overarching capability architecture in which Allies could plug in their own national and multinational contributions. The result was much more versatile, responsive and flexible. The strategy was being implemented in the context of ballistic missile defence (BMD) command and control as well as joint intelligence, surveillance and reconnaissance. NATO's recognition of cyber as an operational domain made the cyber defence and security sector another prime candidate for such an integrated approach, he argued.

11. Allies were also increasingly appreciating the benefits of pooling capabilities. For example, in June 2017, six defence ministers agreed to cooperatively develop new maritime patrol aircraft capabilities, in order to link up synergies and gather collective intelligence with their fellow Allies. Allies needed to take a novel approach in the way they thought about replacing ageing equipment as well. For far too long, the approach had been to replace an airborne platform like NATO's AWACS planes by a new, albeit better, plane. Allies needed to take a step back and think about the specific effect they were trying to achieve. They thus did not need to rush into developing a specific solution for a Future Alliance Surveillance and Control system prescribed by poorly written military requirements. Allies needed to clearly define the problems that they were trying to solve before writing requirements. In this way, the industry could react in a much more flexible and innovative way.

12. Developing capabilities from the research phase through delivery took decades, Mr Webb reminded delegates. Allies had to start thinking about the replacement of those capabilities whose lifespan would end over the middle- or long-term through broader approaches. This was also in line

with ongoing efforts to promote and foster innovation within the Alliance: how would NATO use autonomous systems and robots in future missions or virtual reality, for example? The NATO Science and Technology Organization (STO) and Allied Command Transformation (ACT) had been working closely to identify measures that NATO could take to facilitate innovation within the Alliance, including working with non-traditional actors such as start-ups.

13. All these efforts necessitated a cultural change in defence planning and priority setting. Allies needed to engage with industry much earlier in the capability development process. They had to reach out to the commercial, non-traditional industry. And they needed to innovate, act and think differently. It was time to embrace the technology revolution of today, Mr Webb argued.

14. The Chairman of the NATO Industrial Group (NIAG), **Martin Hill**, first outlined that NIAG worked closely with the NATO STO – about 15% of the STO work was done by industry experts. NIAG and the STO did not duplicate work, but created synergies from each other's work. They converted ideas into something useful, thus building capabilities.

15. According to Mr Hill, the industry was really good at cooperation, including in S&T, support and production, and thus had to be brought into the process early on. The industry also understood the ramifications of what it could do, what industrial cooperation involved, who would be potentially good partners, what technologies would work well together and many other issues.

16. He warned parliamentarians that if they did not invest today, in particular in S&T and production, they would not have a defence industrial base in 20 years. Systems in use today were designed 30-40 years ago, built 20-30 years ago and would perhaps only last 20 more years. Civil companies had vast amounts of money to invest in new technologies, but their goal was to maximise their market return. Global returns meant a competitive price, which meant cutting out the security element. The relationship between civil companies and the classic defence companies had not yet been explored thoroughly, but it was going to be critical for capability development.

17. Martin Hill also emphasised the question of skillsets: there were not enough engineers being trained for the industry. Governments had to look at education so that the high-tech industry could keep running.

18. Finally, Mr Hill also touched upon basic problems with cooperative programmes:

- lack of harmony of requirements, which was a military issue;
- the difficulty of workshare distribution across several countries, which was a political issue; and
- the problem of industry under-pricing and promising unrealistic timelines to win programmes, which was an industry issue.

19. During a lively discussion period, delegates touched upon a variety of issues and delved deeper into the question on how to maintain NATO's technological edge. Topics included:

- the definition of "technological edge";
- the potential impact of major technological disruption;
- the need for quicker adaptation to new technologies;
- technology and training
- cyber space, security and defence, including an international treaty on cyber security;
- artificial intelligence;
- autonomous systems;
- the impact of a changing demographic in the defence sector;
- fostering a new generation of scientists and military personnel; and
- the involvement of partner states in NATO S&T programmes.

20. Addressing the accelerating speed of innovation, Mr Killion told delegates that equipment had to be more upgradable through software, even if the physical platform remained the same. Mr Hill confirmed that defence production cycles were very long. Allies had to look at a completely new way of upgrading systems and to divide up the acquisition process into several steps and define when the customer expected updates and upgrades to take place. Mr Killion emphasised that innovation was also about how people innovated *using* technology – not only about innovation *in* technology. Regarding cultural change when it comes to S&T adaptation, Mr Killion argued that cultures were not changing fast enough and more needed to be done to provide incentives to programme managers to take risks and insert technology quickly – and be willing to fail sometimes. Mr Hill underlined that technology sometimes upset the military hierarchy in the field because junior people could use technology better than their leaders.

21. Mr Webb confirmed that the recognition of cyber space as an operational theatre was a big step for NATO, but that it was difficult to address cyber threats through an international treaty, as it was hard to know where cyberattacks emanated from. The necessary threat perception, however, was present in the Alliance, and Allies were working internationally and nationally to address the challenges of cyber space. He admitted that they could do more, which was made more difficult as the threat was changing daily. Mr Hill confirmed that, from an industry point of view, the Euro-Atlantic community was aware of the threat and that private companies spent a lot of money in protecting their own software. However, to commercialise government-level cyber security would cost consumers a lot of money. Mr Killion highlighted the political character of a ban on cyber weapons. At some point, a cyber crisis could, however, occur as everything was becoming connected. He also argued that the only way to ensure safety in the face of cyber threats was to stay ahead of the threat.

22. Addressing artificial intelligence and virtual reality, Mr Webb argued that for now humans were *in* the loop (i.e. humans made the vital decisions), which could perhaps slow down progress in AI development. However, the trend was towards humans *on* the loop (i.e. supervising the decisions made by technological systems). Mr Killion argued that it was a challenge to develop a regime of trust for intelligent systems. The key was that these systems had to be self-training. He also argued that Allies needed to be much smarter about how to evaluate autonomous systems so that machines could evaluate situations like humans would. Developing strategies to do so needed to move at a much quicker pace.

23. All speakers underlined the important role that partner states could play in maintaining NATO's technological edge. From an industrial perspective, there were only political limits to cooperation. Mr Webb argued that partner states already played an essential role. The increasing importance of software in defence systems meant that even smaller partner states could contribute with vital updates.

VI. Consideration of the draft General Report *Maintaining NATO's Technological Edge: Strategic Adaptation and Defence Research & Development* [174 STC 17 E] presented by Thomas Marino (United States), General Rapporteur

24. General Rapporteur **Thomas Marino** (US) began by bluntly outlining that NATO's technological edge was eroding and the Allies had to do something about it. NATO was confronting a new strategic reality, and monumental changes in science and technology were taking place that could disrupt the strategic balance. Innovation in many sectors was predominantly driven by the private sector, and Allied armed forces often struggled to keep up with the pace of innovation. While R&D budgets were rising again, he encouraged the delegates to rethink how they approached and organised defence R&D to adapt to the new S&T landscape. New ways to approach defence innovation were therefore a key part of his report. It was fundamental to increase the sharing of information concerning experiences, best practices and lessons learned.

25. The General Rapporteur highlighted that improved coordination of defence R&D initiatives between Allies was essential to avoid redundancies, inefficiencies and producing additional technological gaps within the Alliance. To maintain NATO's technological edge, a transatlantic fingerprint on S&T adaptation, innovation and modernisation was needed as well.
26. Finally, he also put an emphasis on burden sharing and the unfair burden carried by the United States. He warned delegates that if Allies did not live up to the Wales Pledge, the Alliance would fall behind in terms of its technological edge. He also welcomed EU efforts in restoring the health of the European defence industrial base, insofar as they did not compete with or duplicate NATO efforts.

27. During the discussions with Committee members, Mr Marino argued that legislators had to convince the leadership of their countries to reach out to the private sector and bring them into the political arena, to show them that they needed their ingenuity and creativity to stay one step ahead of international competitors. He also outlined the importance of education in giving the next generation the tools to come up with solutions to maintain a technological edge.

28. **The draft report [174 STC 17 E] was adopted unanimously.**

VII. Consideration of the Draft Special Report *Food and Water Security in the Middle East and North Africa* [176 STC 17 E] presented by Maria Martens (Netherlands), Acting Special Rapporteur

29. The Acting Special Rapporteur **Maria Martens** (NL) reminded the delegates that NATO was not just a military organisation, but that it had also been a key player in shaping a more holistic approach to conflict prevention for decades. Projecting stability in the Southern neighbourhood was a priority.

30. The Middle East and North Africa (MENA) region was particularly vulnerable to food and water insecurity, especially in the face of climate change. To illustrate the challenges outlined in the report, Maria Martens used the example of Yemen – a textbook case of large-scale armed conflict where resource scarcity, linked to climate change and natural resource mismanagement, played an important role. Below sectarian tensions and political competition lay a more basic tension: water. The main causes of Yemen's water crisis were as follows: high population growth, misguided agricultural development, weak governance and climate vulnerability. Deeply intertwined with water scarcity was food insecurity. Food and water resources were used as tools in the Yemeni civil war as well.

31. However, the roots of violence went beyond food and water, Ms Martens said. Climate change was a threat multiplier and should be taken very seriously as a trigger of instability as terrorist groups thrived in an environment of state collapse and a security vacuum.

32. The Acting Special Rapporteur concluded that promoting mitigation and adaptation measures to food and water insecurity should be a priority. There were supply-oriented solutions, including the promotion of sustainable agricultural practices and water recycling and re-use, and market-oriented ones, for example water-pricing policy reforms and the optimisation of food imports.

33. During the discussions, delegates, *inter alia*, argued that food and water good practices in the MENA region would serve the purpose of reducing migration and the need for military interventions. Water crises could destabilise neighbouring regions such as the Sahel and thus have dramatic consequences on Europe. They also debated the merits of desalination plants and other advanced technologies in food and water security as well as the use of water as a political tool in conflicts. Ms Martens welcomed the tackling of non-military issues within the STC. Technological possibilities were available, but adoption also required political will in the

international community and within national governments. She outlined that a lot of technological knowledge was available to address food and water scarcity, and echoed the link with migration.

34. **The draft report [176 STC 17 E] was adopted unanimously.**

VIII. Election of Committee and Sub-Committee Officers

35. The following officers were elected:

Science and Technology Committee (STC)

Chairperson	Maria MARTENS (NL)
Vice-Chairperson	Domenico SCILIPOTI ISGRO (IT)
	Ziya PIR (TR)
	Bruno VITORINO (PT)
General Rapporteur	Susan DAVIS (US)
Special Rapporteur	Leona ALLESLEV (CA)

Sub-Committee on Technology Trends and Security (STCTTS)

Chairperson	Hannes HANSO (EE)
Vice-Chairperson	Jean-Christophe LAGARDE (FR)
	Roberto MORRASUT (IT)
	Kevan JONES (UK)
Rapporteur	Matej TONIN (Sl)

Ukraine-NATO Interparliamentary Council (UNIC)

STC Representatives	Domenico SCILIPOTI ISGRO (IT)
	Philippe MICHEL-KLEISBAUER (FR)
Alternates	Antonin SEDA (CZ)

IX. Consideration of amendments and vote on the Resolution *Maintaining NATO's Technological Edge* [190 STC 17 E] presented by Thomas Marino (United States), General Rapporteur

36. Thomas Marino introduced the main recommendations in the draft resolution, which urged member governments and parliaments of NATO:

- to live up to the Wales Defence Investment Pledge
- to adapt defence R&D and innovation to strategic and technological realities;
- to share more information on defence R&D and innovation initiatives within the Alliance, among Allies and with the NATO Parliamentary Assembly;
- to improve coordination of defence R&D and innovation initiatives within the Alliance;
- to take further concrete steps to facilitate defence innovation within NATO;

37. The resolution also urged the EU to move towards the swift adoption and implementation of an ambitious European Defence Fund and to engage in regular information exchanges and coordination with NATO on how the European Defence Fund will complement, but not compete with or duplicate, NATO efforts.

38. The General Rapporteur opposed amendment n°7 on §15.a. presented by Domenico Scilipoti Isgro (IT), Ramon Moreno (ES) and Waldemar Slugocki (PL) on the ground that it would maintain the undesirable status quo. After a brief discussion of the amendment, it was withdrawn by its authors.

39. Amendments n°3, 4, 5, 6 were not moved by their author and therefore withdrawn.

40. Thomas Marino also opposed amendments n°1 and n°2 on §16.b. presented by Ahmet Berat Conkar (TR) and Ziya Pir (TR) on the ground that this resolution was about NATO and not about the EU. After a brief discussion of the amendments, they were withdrawn by the authors.

41. **The draft resolution [190 STC 17 E] was adopted unanimously.**

X. Panel discussion on The Internet of Things:

- Consideration of the Draft Report of the Sub-Committee on Technology Trends and Security *The Internet of Things: Promises and Perils of a Disruptive Technology* [175 STCTTS 17 E] presented by **Matej Tonin** (Slovenia)
- Presentation by **Stefan-Ciprian Arseni**, Lt. eng., Scientific Researcher, Military Equipment and Technologies Research Agency, Romania, on *Military Applications of the Internet of Things*

42. The Sub-Committee Rapporteur **Matej Tonin** reminded the delegates that the Internet of Things (IoT) was becoming part of everyday life, with an estimated 80 billion smart devices connected worldwide by 2025. There was enormous potential for this technology. It would transform lives in direct ways, but also in less observable ways, for example in smart electricity grids. The IoT would also play a critical role for and in our armed forces.

43. As highlighted by Mr Tonin, consumer adoption of IoT systems was accelerating and service providers were catching on. However, where there were opportunities for consumers, there were also challenges and risks. Hacking and glitching were unavoidable, and security concerns in the consumer market were a real threat. State and non-state actors were increasingly hacking systems for data and control. The safety and security of critical infrastructure was of particular concern. Commercial software security firms had picked up on the vulnerabilities within IoT networks and were beginning to offer product solutions. Although slowly, governments were indeed moving on IoT privacy and security, for example the IoT Cybersecurity Improvement Act introduced by the US Senate in August 2017. However, there was no EU-level legislation yet, he pointed out.

44. The rapporteur proposed five key principles to keep in mind for the future:

- to find the right balance between making the IoT reliable, secure and private and providing enough incentives for companies to invest in the technology
- to vigorously promote standardisation of IoT technologies
- to fund more IoT research and development to enable the large-scale adoption of IoT
- to change the way we adapt to emerging technologies in general; and
- to redouble our efforts on cyber defence and security and on critical infrastructure protection.

45. **Stefan-Ciprian Arseni** presented the work of NATO's IST-147 Research Task Group on the Internet of Military Things, which was comprised of experts from both the military and private sectors. The Group examined a range of topics relevant to the application of IoT technologies and concepts to the military domain. The primary objectives were to:

- define scenarios for applications of the IoT in the military significant operations and define the architectures that needed to exist in order to integrate these capabilities
- assess benefits and risks of IoT applications and their impact on the integrated perspective of the battlefield
- build technically advanced demonstrators and make annual demonstrations to disseminate the collected information; and
- facilitate discussions on the topic by taking into account both the military and the civilian aspects of IoT

46. The Research Task Group had presented its research activities in the form of a first practical implementation of a scenario that was held during the International Conference on Military Communications and Information Systems in May 2017. The Group decided to propose architectures and develop solutions to potential areas of military application of the IoT, such as logistics, situational awareness and medical care. The chosen scenario was the defence of a smart city, with a focus on examples of how the tactical-operational processes of a military operation could benefit from interacting with civilian and military IoT devices.

47. During the discussion period, **Sang Don Lee** (KR) pointed out that the Euro-Atlantic Community should recognise the danger posed by North Korea's cyber-attack capabilities. South Korea had been implementing IoT-related technology such as smart homes and public transportation, but it remained at the infancy stage for military applications. He warned the delegates of the vulnerability generated by greater connectivity provided by the IoT, even more so as military components became connected. Mr Tonin acknowledged the dangers of North Korea's offensive cyber capabilities, adding that the isolation of their information system made it difficult to infiltrate their own capabilities.

48. **The draft report [175 STCTTS 17 E] was adopted unanimously.**

XI. Summary of the future activities of the Science and Technology Committee and the Sub-Committee on Technology Trends and Security

49. Maria Martens reviewed the past and upcoming visits, starting with the two successful visits to Israel and the Palestinian territories (February 2017) and to Canada (September 2017). One more visit was planned for 2017 – to Germany in November.

50. With regards to the 2018 visits, the full committee was planning a visit to Silicon Valley and San Diego in the United States, which could become a joint visit with the Political Committee's Sub-Committee on Transatlantic Relations (PCTR). The STCTTS planned a visit to the United Arab Emirates, which was a joint visit with the Mediterranean and Middle East Special Group, as well as a visit to Norway with the Sub-Committee on Democratic Governance of the Committee on the Civil Dimension of Security.

XII. Any other business

51. No other business was raised.

XIII. Date and place of next meeting

52. The STC would next convene in Warsaw, Poland, where the Spring Session would take place from 25-28 May 2018.

XIV. Closing remarks

53. Maria Martens concluded the meeting of the STC and thanked the guest speakers, observers, interpreters, the NATO PA Secretariat and hosts from the Romanian Parliament.