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| **Keywords:** | Report; FG-AI4EE |
| **Abstract:** | This document contains the report of the second meeting of Focus Group on Environmental Efficiency for AI and other Emerging Technologies (FG-AI4EE) held virtually on 10 December 2020. |

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# 1 Organization of e-meeting

The second meeting of Focus Group on Environmental Efficiency for AI and other Emerging Technologies took place virtually, on 10 December 2020. The meeting was preceded by the first virtual Workshop on Artificial Intelligence and Environmental Efficiency that also took place virtually, on 09 December 2020. The programme of the virtual Workshop can be found [here](https://www.itu.int/en/ITU-T/climatechange/Pages/20201209.aspx).

The meeting was chaired by Mr Paolo Gemma (Huawei Technologies Co., Ltd, China), Co-Chairman of FG-AI4EE, assisted by Ms Charlyne Restivo (TSB, FG-AI4EE Advisor) and Mr Manuel Adrián Soriano (TSB, FG-AI4EE Assistant).

A total of 67 remote participants attended the meeting remotely. The list of participants is available in document [FG-AI4EE-O-003](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/output/FG-AI4EE-O-003.zip). The meeting was hosted on ITU remote participation platform, MyMeetings, <https://remote.itu.int>.

## 1.1 Meeting agenda

The agenda discussed at the meeting can be found at [[FG-AI4EE-I-032-R1](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B7B3C03B8-4272-46E8-9AEC-98F8B8BF89E5%7D&file=FG-AI4EE-I-032-R1.docx&action=default)]. The agenda was approved as presented.

## 1.2 Meeting documents

Documents considered at this meeting are listed as part of the agenda. All documents are available on the [SharePoint site](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/SitePages/Home.aspx?InitialTabId=Ribbon%2ERead&VisibilityContext=WSSTabPersistence) accessible from the FG-AI4EE [homepage](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx).

# 2 Key meeting results

## 2.1 Key results

The meeting presented the work on the deliverables in progress and collected useful inputs and guidance from participants.

All Working Groups (WGs) agreed on next steps and time plans.

## 2.2 Liaisons Statements

A total of 8 incoming Liaison Statements were reviewed.

The meeting agreed to send one reply to the Liaison Statement (LS) from ITU-T Study Group 13 on the invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information. This LS will be approved by correspondence by the Focus Group Co-Chairmen.

# 3 Summary of discussions

## 3.1 Opening session

### 3.1.1 Welcome remarks and meeting objective

TSB Director, Dr. Chaesub Lee, opened the meeting and provided some welcome remarks. Dr. Lee thanked all participants for joining the virtual meeting under the special circumstances of teleworking due to the persisting COVID-19 pandemic.

In his opening remarks, FG-AI4EE Co-Chairman, Mr Paolo Gemma, indicated that the Focus Group currently is working on 24 deliverables which are expected to be completed by December 2021.

The objective of this second meeting was to present the progress on the deliverables from the 3 Working Groups, call for experts’ contributions, and discuss the deliverables timeline and way forward for the Focus Group.

### 3.1.2 Agenda:

The draft agenda was approved, as contained in document [FG-AI4EE-I-032-R1](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B7B3C03B8-4272-46E8-9AEC-98F8B8BF89E5%7D&file=FG-AI4EE-I-032-R1.docx&action=default).

### 3.1.3 Author's Guide for drafting ITU-T Recommendations:

ITU explained that the Focus Group deliverables aimed as future ITU-T Recommendations or Supplements should follow the Author's Guide for drafting ITU-T Recommendations and their content must have content that is expected for ITU-T Recommendations or Supplements. ITU stressed that the quality of deliverables was essential for the effectiveness of the group, and that ensuring quality is a shared responsibility. ITU pointed to the following useful [resources](https://www.itu.int/en/ITU-T/info/Pages/resources.aspx) contained in document [FG-AI4EE-I-046](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-046.zip):

• [Rapporteurs/Editors manual](https://handle.itu.int/11.1002/plink/4329501768)

• [Author’s guide for drafting ITU-T Recommendations](https://www.itu.int/oth/T0A0F000004/en).

### 3.1.4 IPR call

Mr Gemma explained the ITU Intellectual Property Rights (IPR) policy and read out the IPR call. There were no requests or objections from the floor in response to the IPR call contained in document [FG-AI4EE-I-035](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B8C8BD173-C4CC-4D69-B250-769D7B1FE2FE%7D&file=FG-AI4EE-I-035.docx&action=default).

### 3.1.5 Approval of previous meeting report (December 2019)

The report of the first meeting of the Focus Group (Vienna, 12 December 2019) was approved as contained in document [AI4EE-O-001](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B111E60E9-0339-4D29-BC3D-157FA2F70ED1%7D&file=AI4EE-O-001.docx&action=default).

## 3.2 Report from the Workshop on AI & Environmental Efficiency

The FG-AI4EE meeting was preceded by a 2-hour virtual workshop held on 09 December 2020. The event was held on [MyMeetings](https://remote.itu.int) and was attended by 95 remote participants.

ITU/TSB Advisor, Ms Charlyne Restivo, and Working Group 3 Co-Chair, Mr Stefano Nativi briefly summarized and presented the main outcomes of this workshop.

A slide summary of the main takeaways is available in document [FG-AI4EE-I-040](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-040.zip).

The material presented is available at <https://www.itu.int/en/ITU-T/climatechange/Pages/20201209.aspx>.

The video recording is available at: <https://www.itu.int/webcast/archive/t2020WorkshopAIEE>.

## 3.3 Input Contributions

A total of 7 Contributions were received since the kick-off meetings of the 3 Working Groups in September 2020. An overview is available in document [FG-AI4EE-I-047](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-047.zip). All contributions can be found on [SharePoint](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/SitePages/Home.aspx?InitialTabId=Ribbon%2ERead&VisibilityContext=WSSTabPersistence).

### 3.3.1 Research on taxonomy and proposed actions on AI4EE, (Barbara Kolm & Rüdiger Stix, Austria)

Dr. Rüdiger Stix (Sigmund Freud University, Austria) presented a research on taxonomy and proposed actions on AI4EE as contained in document [FG-AI4EE-I-033](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-033.docx). A condensed version of this paper is available in the form of a PowerPoint presentation in document [FG-AI4EE-I-045](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-045.zip). The proposal is to have a common denominator for terminology to be used in all Focus Group’s deliverables.

It was agreed to use this contribution as a base for drafting deliverable D.WG1-01 “Standardized glossary of terms” that will define all common terms and phrases for the Focus Group. It was noted that work had not yet started on this item.

It was agreed to use pre-existing terminologies as much as possible and look at the definitions used by other ITU-T groups.

It was also suggested to link Machine-to-Machine (M2M) domain taxonomy, as it is a topic under development.

### 3.3.2 Other Contributions

A summary of all other Contributions received since September 2020 was displayed in a slide contained in document [FG-AI4EE-I-047](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-047.zip). ITU explained that these Contributions fed into specific deliverables. Because they have already been discussed or will be discussed at specific WG meeting, it was decided not to present these Contributions at the Focus Group meeting.

# 4 Working Group 1 progress report

Working Group 1 Co-Chair, Mr Joel Alexander Mills (AugmentCity AS, Norway) chaired this session and presented the progress on WG1 deliverables.

WG1 is working on a set of 11 deliverables relating to the requirements of AI and other emerging technologies to ensure environmental efficiency. The list of WG1 deliverables can be found online at: <https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/WG1deliverables.aspx>, and is accessible from the [Focus Group homepage](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx).

## 4.1 Deliverables in progress

WG1’s overall progress, next steps and timeline are summarized in presentation [FG-AI4EE-I-041](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-041.zip).

A brief presentation on the 3 deliverables currently in progress was provided.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Provisional # | Deliverable title | Priority | Leader | Status |
| D.WG1-01 | Standardized Glossary of Terms | LOW | Neil Sahota | Not started |
| D.WG1-02 | Scorecard to identify enhanced eco-friendly business processes  | MEDIUM | Neil Sahota | Not started |
| D.WG1-03 | Solution scorecard on environmental behavioural influencers  | MEDIUM | Neil Sahota | Not started |
| D.WG1-04 | List of KPIs/metrics | HIGH | Annik Magerholm Fet | In progress |
| D.WG1-05 | Reporting templates on AI, AR and ML | HIGH | Annik Magerholm Fet | Not started |
| D.WG1-06 | High-Level Qualitative Impact Matrix of Artificial Intelligence and Blockchain on Sustainable Development Goals and on environmental efficiency | HIGH | Barbara Kolm | Not started |
| D.WG1-07 | Visions of Best Practices on Artificial Intelligence and Blockchain in 2025 | MEDIUM | Barbara Kolm | Not started |
| D.WG1-08 | Connecting Environmental Efficiency of Digital Technologies to the Sustainable Development Goals | MEDIUM | Paolo Gemma | Not started |
| D.WG1-09 | A method for Intuitive Human interaction with Data model (ML & AI etc) | HIGH | Joel Alexander Mills | In progress |
| D.WG1-10 | Guidelines on applying U4SSC KPIs in a digital twin city using ML, AR & AI for better climate mitigation solutions | HIGH | Joel Alexander Mills | In progress |

## 4.2 Discussions

The discussions mainly related to the scope of the deliverables presented. It was suggested to:

• Tackle the issue of how to make AI more efficient in order to ensure more sustainable future standards

– Although this it out of scope for the deliverables in progress, this aspect could fit in other deliverables in WG1 or in other WGs.

• Study how to make AI more sustainable by looking at how to apply AI to the appropriate extend (i.e. optimum use vs. full extend).

The discussions further clarified the expectations on inputs needed on Smart Cities:

• There is a need for inputs from experts on case study examples of Smart Cities where AI and energy efficiency have already shown return on investments.

## 4.3 Actions

Mr Mills invited the experts to send their contributions to progress the work on the deliverables on:

• Smart Cities use cases for deliverable D.WG1-09.

– Mr Kishor N. Narang (Telecom Centres of Excellence, India) to check with his team to provide use cases.

• Mr Narang to propose a couple of paragraphs on the need to optimize AI use for D.WG1-10.

• Mrs Caitlin Kraft-Buchman (Women@theTable, Switzerland) to propose a contribution to all WGs on the need to make AI more efficient to reduce the environmental impacts.

# 5 Working Group 2 progress report

Working Group 2 Co-chair, Prof. Leonidas Anthopoulos, (University of Thessaly, Greece) chaired this session and presented the progress on WG2 deliverables.

Working Group 2 is working on a set of 6 deliverables relating to the assessment and measurement of the environmental efficiency of AI and emerging technologies.

The list of WG 2 deliverables can be found online at: <https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/WG2deliverables.aspx>, and is accessible from the [Focus Group homepage](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx).

## 5.1 Deliverables in progress

WG2’s overall progress and next steps are summarized in presentation [FG-AI4EE-I-042](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-042.zip). A brief presentation on the 6 deliverables currently in progress was provided by each of the deliverable leaders.

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| --- | --- | --- | --- | --- |
| Provisional # | Deliverable title | Priority | Leader | Status |
| D.WG2-2 | Computer Processing, Data management and Energy perspective | MEDIUM | Stefano Nativi | In progress |
| D.WG2-3 | Requirements on energy efficiency measurement models and the role of AI and big data | MEDIUM | Leonidas Anthopoulos | In progress |
| D.WG2-4 | Guidelines on Evaluating and Measuring the Impacts of Artificial Intelligence and Blockchain on Environmental Efficiency  | HIGH | Barbara Kolm | In progress |
| D.WG2-5 | Guidelines on Energy Efficient Blockchain Systems | MEDIUM | Leonidas Anthopoulos | In progress |
| D.WG2-6 | Assessment of Environmentally Efficient Data Centre and Cloud Computing in the framework of the Sustainable Development Goals | HIGH | Xiao Wang | In progress |

## 5.2 Discussions

Clarifications were sought on the scope of deliverable D.WG2-6. The deliverable leader indicated that the purpose of this report was to explain policy issues better to encourage industry to promote green data centres.

## 5.3 Actions

Mr. Mason Malcolm (UK) offered to contribute on deep learning frameworks and to send in a contribution to all 3 Working Groups.

# 6 Working Group 3 progress report

Working Group 3 Co-Chair, Mr Stefano Nativi (European Commission – Joint Research Center, Italy), chaired this session and presented the progress on WG3 deliverables.

Working Group 3 is working on a set of 7 deliverables relating to the implementation guidelines of AI and emerging technologies for environmental efficiency.

The list of WG 3 deliverables can be found online at <https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/WG3deliverables.aspx>, and is accessible from the [Focus Group homepage](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx).

## 6.1 Deliverables in progress

A brief presentation on the 2 deliverables currently in progress was provided by each of the deliverable leaders. WG3’s overall progress and next steps are summarized in the presentation available in document [FG-AI4EE-I-043](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/input/FG-AI4EE-I-043.zip).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Provisional # | Deliverable title | Priority | Leader | Status |
| D.WG3-1 | Guidelines on the implementation of eco-friendly criterias for AI and other emerging technologies | HIGH | Bosen Liu | In progress |
| D.WG3-2 | Smart Energy Saving of 5G Base Station: Based on AI and other emerging technologies to forecast and optimize the management of 5G wireless network energy consumption | HIGH | Rumeng Tan | Starts on15 Dec. 20 |
| D.WG3-3 | Application of AI technology in improving energy efficiency of telecom equipment rooms and IDC infrastructure | MEDIUM | Ying Shi | Not started |
| D.WG3-4 | Methodology for Supporting the Implementation of Artificial Intelligence and Blockchain Solutions at the Government Level | LOW | Barbara Kolm | Not started |
| D.WG3-5 | Best Practice Catalogue on Environmentally Efficient Artificial Intelligence and Blockchain Application | MEDIUM | To be defined | Not started |
| D.WG3-6 | Guidelines on the Environmental Efficiency of 5G Usage in Smart Water Management | LOW | To be defined | Not started |
| D.WG3-7 | Guidelines on the Environmental Efficiency of Machine Learning Processes in Supply Chain Management | HIGH | Claudio Bianco | In progress |

## 6.2 Discussions

There was no question asked from the audience.

## 6.3 Actions

WG3 Co-Chairman, Mr Nativi, called for experts’ contributions to progress the work on the deliverables. The drafts will be circulated for review and comments early 2021, with the aim to approve the 2 deliverables currently in progress at the 3rd Focus Group meeting in spring 2021.

# 7 Incoming and Outgoing Liaison statements

## 7.1 Incoming Liaison statements

Eight Liaison Statements (LS) were included in the meeting’s agenda as follows:

• FG-AI4EE-I-LS-006: LS/i on how to engage students in ITU’s work? Lessons learnt from FG ML5G [from: FG ML5G]

– This LS contains information on how to engage students in ITU’s work based on FG ML5G’s experience.

– This LS was noted by the group and it was agreed that no reply was needed.

• [FG-AI4EE-I-LS-007](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-007.zip): LS/i/r on invitation to review AI Standardization Roadmap and provide missing or updated information (reply to [SG13-LS174](https://www.itu.int/ifa/t/2017/ls/sg13/sp16-sg13-oLS-00174.zip)) [from: FG-AI4AD]

– This LS contains a reply from FG-AI4AD to ITU-T Study Group 13 on the invitation to review AI Standardization Roadmap and provide missing or updated information.

– This LS was noted by the group and it was agreed that no reply was needed.

• [FG-AI4EE-I-LS-008](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B5EB2083E-A874-4B82-9216-9A629B034490%7D&file=FG-AI4EE-I-LS-008.docx&action=default): LS/i/r on the first meeting of ITU-T FG-AI4EE (Reply to [AI4EE-O-LS-002](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7BDE2D069B-ADA4-4AF0-A012-85DFCE19E1C2%7D&file=AI4EE-O-LS-002.docx&action=default)) [from: ITU-R Study Group 6]

– This LS contains the reply of ITU-R Study Group 6 on the outcomes of the first meeting of ITU-T FG-AI4EE and indicates some of its Working Parties’ work relate to AI and energy efficiency.

– This LS was noted by the group and it was agreed that no reply was needed.

• [FG-AI4EE-I-LS-009](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B82F67D86-C486-4F97-8FA4-6F87E25BA0DE%7D&file=FG-AI4EE-I-LS-009.docx&action=default): LS/i/r on the first meeting of ITU-T FG-AI4EE (Reply to [FG AI4EE-LS1](http://handle.itu.int/11.1002/ls/sp16-fgai4ee-oLS-00001.docx) and [FG AI4EE-LS2](http://handle.itu.int/11.1002/ls/sp16-fgai4ee-oLS-00002.docx)) [ITU-T Study Group 5]

– This LS contains the reply from ITU-T Study Group 5 on the outcomes of the first meeting first meeting of ITU-T FG-AI4EE, and formally approves the nomination of its Co-Chairman and proposed new Vice Chairmen.

– This LS was noted by the group and it was agreed that no reply was needed.

• [FG-AI4EE-I-LS-010](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-010.zip): LS/i on new Recommendation ITU-T Y.3531 "Cloud computing – Functional requirements for machine learning as a service" [from: ITU-T Study Group 13]

– This LS from ITU-T Study Group 13 contains updates on cloud computing related standardisation work and requests FG-AI4EE to keep them informed on its ongoing work on machine learning service and framework.

– This LS was noted by the group and it was agreed that no reply was needed.

– It was suggested that Study Group 13 definition on machine learning be used when drafting deliverable D.WG1.01 “Glossary of terms”.

• [FG-AI4EE-I-LS-011](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-011.zip): LS/i on invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information [from: ITU-T SG 13]

– This LS contains an invitation from ITU-T SG 13 to review Artificial Intelligence Standardization Roadmap and provide missing or updated information.

– It was agreed to prepare a reply to this LS updating SG 13 on FG-AI4EE current work items by attaching FG-AI4EE workplan and proposing to offer more information as necessary.

• [FG-AI4EE-I-LS-012](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/liaison/FG-AI4EE-I-LS-012.zip): LS/i on progress of SG17 activities on security aspects for DLT [from: ITU-T SG 17]

– This LS from ITU-T SG 17 contains some updates on progress on security aspects for DLT activities and request for feedback, comments or suggestions.

– It was pointed out that some of Working Group 3 deliverables focus on blockchain, a popular application of DLT.

– It was agreed to consider a reply to this LS and engage with SG17 on this matter at a later stage once the work on WG3 deliverables focusing on blockchain has been initiated.

• [FG-AI4EE-I-LS-013](https://extranet.itu.int/sites/itu-t/focusgroups/ai4ee/_layouts/15/WopiFrame.aspx?sourcedoc=%7B738E5164-C1AE-4D1F-8BCB-5CD4246B3607%7D&file=FG-AI4EE-I-LS-013.docx&action=default): LS/i on the first meeting of ITU-T FG-AI4EE (reply to [FG AI4EE-LS2](http://handle.itu.int/11.1002/ls/sp16-fgai4ee-oLS-00002.docx)) [from: ITU-T SG 20]

– This LS contains a reply from ITU-T SG 20 on the creation and first meeting of ITU-T FG-AI4EE.

– This LS was noted by the group and it was agreed that no reply was needed.

## 7.2 Outgoing Liaison statements

It was agreed to send one reply to the Liaison Statement from ITU-T SG 13 on the invitation to review Artificial Intelligence Standardization Roadmap and provide missing or updated information. This liaison statement will be approved by correspondence by the Focus Group Co-Chairmen.

# 8 Future Meetings

The next Focus Group meeting will take place virtually in early April 2021. Once the dates are confirmed, the meeting information will be communicated through the mailing-list.

The objectives of the third Focus Group meeting will be to approve the first round of high priority deliverables. Once approved by the Focus Group meeting, the deliverables will be sent to the parent group, ITU-T Study Group 5 for final approval.

As per clause 3.3.3 of Recommendation ITU-T A.1, “deliverables shall be published a TDs of the parent group no later than 4 calendar weeks before the meeting of the parent group”.

The next meeting of ITU-T Study Group 5 will take place virtually on 11-20 May 2021.

The Focus Group will hold a final meeting in December 2021 to approve the remaining deliverables, consider any new work items, and discuss way forward.

During the meeting, Dr Barbara Kolm invited the Focus Group to come back to Vienna in December 2021 if the sanitary situation allows.

# 9 Closing & acknowledgements

In closing, Mr Gemma reminded participants to send their written contributions to ITU Secretariat (tsbfgai4ee@itu.int) regardless of the format. Contributions are key to help advance the work on the deliverables.

FG-AI4EE Co-Chairman, Mr Paolo Gemma, thanked FG-AI4EE Co-Chairman, Vice-Chairmen, Working Group co-Chairmen, editors, contributors, and extended his appreciation to Ms Charlyne Restivo, Advisor (TSB) and FG-AI4EE Secretariat for their assistance. Mr Gemma also thanks all participants for their active participation, contributions and commitment to advance the work of the Focus Group.

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