

## The IEEE Earth Lab

### Industry Connections Activity Initiation Document (ICAID)

Version: 1.0, 28 August 2020

IC20-015-01 Approved by IE&SS SMDC 8 October 2020

#### Instructions

- Instructions on how to fill out this form are shown in red. It is recommended to leave the instructions in the final document and simply add the requested information where indicated.
- **Shaded Text** indicates a placeholder that should be replaced with information specific to this ICAID, and the shading removed.
- Completed forms, in Word format, or any questions should be sent to the IEEE Standards Association (IEEE-SA) Industry Connections Committee (ICCom) Administrator at the following address: [industryconnections@ieee.org](mailto:industryconnections@ieee.org).
- The version number above, along with the date, may be used by the submitter to distinguish successive updates of this document. A separate, unique Industry Connections (IC) Activity Number will be assigned when the document is submitted to the ICCom Administrator.

#### 1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

**Name:** Andre Uhl

**Email Address:** andreuhl@g.harvard.edu

**Employer:**

**Affiliation:** The Council on Extended Intelligence

IEEE collects personal data on this form, which is made publicly available, to allow communication by materially interested parties and with Activity Oversight Committee and Activity officers who are responsible for IEEE work items.

#### 2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

individual-based

### 3. Purpose

#### 3.1 Motivation and Goal

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

The tech-industry is at a pivotal moment: although advancements in Artificial Intelligence Systems (AIS) are rapidly expanding our knowledge and capacities, the successes of the Fourth Industrial Revolution are overshadowed by accelerating climate change.

In recent years, governments and corporations around the world have recognized the need for concerted climate action under the United Nations Framework Convention on Climate Change, resulting in landmark ratifications such as the Kyoto Protocol, the Paris Agreement, and the UN 2030 Agenda. Many of these climate goals depend, however, on a rapid adoption of evolving technological solutions and infrastructures, thus emphasizing an increased demand for open-innovation ecosystems that integrate concurrent sustainability research and technology development in an agile public-private-people partnership. With over 420,000 members in more than 160 countries worldwide, and the substantial work advanced by its technical societies and work streams, the IEEE has the opportunity to be a catalyst in bridging these frontiers.

IEEE-SA's Konstantinos Karachalios, Nick Stern and John C. Havens emphasize that AIS in particular can aid the implementation of sustainable development goals, as long as a renewed systemic approach to AIS governance is developed in support of socially, environmentally and economically inclusive growth:

*“Artificial Intelligence systems can provide key enabling solutions to address the systems level changes required for humanity to stem the tide of global warming and restore a symbiotic flourishing between earth and its inhabitants.”<sup>1</sup>*

The goal of the IEEE Earth Lab is to develop a *Green Guide to AIS* that will serve as a pragmatic roadmap for engineers, corporate organizations and policy makers to **leverage AIS innovation for an effective transition to a green economy**. We will achieve this goal by developing and supporting a global network of Living Labs<sup>2</sup> that deploy ecologically aligned AIS for efficient, livable cities, low-carbon, equitable and resilient infrastructures, and thriving ecosystems for and with communities most impacted by the effects of global warming.

Work streams will focus on the IEEE's fields of interest, in particular, computing, electrical and electronic systems, information and communications technologies (ICT), smart urban environments, transportation, power

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<sup>1</sup> Karachalios, Havens and Stern, “Measuring What Matters in the Era of Global Warming and the Age of Algorithmic Promises,” 2019

<sup>2</sup> The term ‘Living Lab’ emerged at the Massachusetts Institute of Technology in the 2010s to describe a user-centric research methodology focused on sensing, prototyping, validating and refining complex solutions in multiple and evolving real-life contexts.

and energy, and are designed to enhance the IEEE’s public presence for new cross-sector collaborations through workshops and publications.

### **3.2 Related Work**

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

Several organizations and initiatives are exploring AIS applications to support the delivery of climate goals, including the reduction of greenhouse gas emissions and waste as well as the restoration and conservation of ecosystems. A selected few are listed below:

[2030Vision](#)

[AI For Climate, Element AI](#)

[AI For Earth Project, Microsoft](#)

[AI For Good](#)

[AI, People and Planet Initiative](#)

[Climate Change AI Initiative](#)

[Council on Extended Intelligence](#)

[Fourth Industrial Revolution for the Earth Project, World Economic Forum](#)

[Future Earth](#)

[Global Enabling Sustainability Initiative \(GeSI\)](#)

Existing work streams within the IEEE, including:

- IC program: AI Systems Governance for Cities
- IC16-002 The Global Initiative on Ethics of Autonomous and Intelligent Systems (*Relevant works – [“Measuring What Matters in the Era of Global Warming and The Age of Algorithmic Promises”](#) – [“A/IS for Sustainable Development”](#)*)

**The objective of the IEEE Earth Lab is to collaborate with these and more initiatives to catalyze and complement, not duplicate, their efforts.**

### **3.3 Previously Published Material**

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

No previously published material has been selected for inclusion in any of the deliverables at this time. Previously published material will be referenced as a first choice. Appropriate permissions will be sought for any previously published material that is included in the deliverables.

### **3.4 Potential Markets Served**

Indicate the main beneficiaries of this work, and what the potential impact might be.

- **multilateral organizations, governments, cities, and policy makers**, who explore the adaptation and finance of green economy principles
- **corporations, entrepreneurs and consulting agencies**, who shape the research, design, manufacture, and messaging around AIS and new economic practices
- **faculty, researchers and students**, who explore, integrate and advance technically sound designs aligned with the IC activity's core themes in curricula and research activities
- **non-profits, environmental movements and conservationists**, who explore innovative technological solutions to accelerate global climate action
- **aspiring innovators and entrepreneurs**, who are looking for opportunities to serve communities and ecosystems impacted by the effects of global warming
- **citizen-scientists and Indigenous peoples**, who are protecting and mediating trust and value of community-based ecosystem guardianship

### **3.5 How will the activity benefit the IEEE?**

The IEEE Earth Lab is a response to recent calls to climate action that have united diverse stakeholders across the globe - from heads of states to youth activists, from industrial nations to the developing world. With over 420,000 members in more than 160 countries worldwide, the IEEE has the opportunity to serve as a global leader in AIS-augmented climate innovation, putting its expertise, resources and global reach to service for the well-being of our shared planet and the next generations that will inhabit it.

IEEE benefits are expected to include:

a) Helping to satisfy the 24 November 2019 IEEE Board of Directors resolution calling on IEEE Operating Units to create frameworks to foster global cooperation within and across disciplines to develop and promote technically feasible and economically viable solutions to sustainability in IEEE's fields of interest:

- *“a) develop professional and educational programs supporting capacity building for the development of engineering and technical professionals in parts of the world lacking strong technical communities; and*

- *b) promote technically feasible, economically viable solutions and sustainable development practices in IEEE’s fields of interest, in particular in the domains of sustainable Information and Communications Technologies (ICT), smart urban environments, transportation, buildings, and all aspects of power and energy (from generation to efficiencies in consumption), in partnership with global organizations working to advance sustainable development.”*

b) providing opportunities for existing technical societies and work streams, such as the IEEE Sustainable ICT, IEEE Smart Cities, and the Global Initiative on Ethics of Autonomous and Intelligent Systems to operationalize their findings in action research projects.

c) providing incentives for new tools development, certification and standards projects

#### **4. Estimated Timeframe**

Indicate approximately how long you expect this activity to operate to achieve its proposed results (e.g., time to completion of all deliverables).

**Expected Completion Date:** 09/2022

IC activities are chartered for two years at a time. Activities are eligible for extension upon request and review by ICom and the IEEE-SA Standards Board. Should an extension be required, please notify the ICom Administrator prior to the two-year mark.

#### **5. Proposed Deliverables**

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

Deliverables for the first term of this IC Activity include:

##### **1) Workshops**

We will host a series of (virtual) workshops with leading innovators in industry, multilateral organizations, academic institutions and IEEE technical societies to crowdsource principles and best practices of ecologically aligned design with AIS, including, but not limited to, the following themes:

1. **ADAPTIVE:** AIS-based protocols and processes for climate impact projection – deploy AIS to improve decision making processes related to climate change adaptation
2. **NET-ZERO:** AIS-based protocols and processes for secure, renewable and equitable energy systems and infrastructures – deploy AIS to minimize the carbon footprint of buildings, machines and devices
3. **CIRCULAR:** AIS-based protocols and processes for material production - deploy AIS to maximize recycling and upcycling practices for waste and pollution eradication

4. **RESTORATIVE:** AIS-based protocols and processes for natural resource management – deploy AIS to enhance strategies for ecosystem conservation and restoration

The output of these and other sessions will inform the IC Activity's *Green Guide to AIS*.

Work streams include:

- recruit participants and design workshop format and agenda - [Oct 2020 – Mar 2021]
- host the workshops - [monthly, Apr 2021 - ongoing]
- develop work plans for further action [2-4 weeks after each workshop]

## 2) Publication

We will publish a report documenting and reviewing the workshop outputs in a *Green Guide to AIS*. The goal is to provide a compelling and pragmatic guide for engineers, corporate leaders and policy makers to harness AIS for an effective transition to a green economy.

Work streams include:

- form editorial team (and project-specific working groups, if needed) [Oct 2020 – Dec 2020]
- working sessions – the editorial team will convene for focused work sessions once a month, project-specific working groups will be scheduled on a case by case basis [Jan 2021 – ongoing]
- publication of first edition for public review - [Dec 2021]
- publication of first edition with Creative Commons release [Mar 2022]

These work streams may evolve into a PARS depending on participants' interests and contributions.

## 3) Living Labs

We will host a series of workshops with regional governments, companies, nonprofits and academic institutions to promote the IC Activity's *Green Guide to AIS* and co-create participatory action research projects that implement its principles for and with communities most impacted by the effects of global warming. The goal is to grow a global network of Living Labs committed to operationalizing the IC Activity's *Green Guide to AIS*.

Work streams include:

- recruit participants and design workshop format and agenda - [Oct 2021 – Mar 2022]
- host the workshops - [monthly, Apr 2022 – ongoing]
- develop work plans for further action [2-4 weeks after each workshop]

The IC Activity launches with participants pursuing pilot projects in Bali (Southeast Asia), Mali (Africa) and Hawaii (Pacific Region). Incoming participants will be encouraged to propose and establish further Living Labs in other regions, in accordance with the IC Activity's mission of inclusive and collaborative open innovation.

### **5.1 Open Source Software Development**

*Indicate whether this IC Activity will develop or incorporate open source software in the deliverables. All contributions of open source software for use in Industry Connections activities shall be accompanied by an approved IEEE Contributor License Agreement (CLA) appropriate for the open source license under which the Work Product will be made available. CLAs, once accepted, are irrevocable.*

Will the activity develop or incorporate open source software (either normatively or informatively) in the deliverables?: None identified at this time.

### **6. Funding Requirements**

*Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government or other grants, etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICom.*

This IC Activity will be self-funded, with IEEE SA staff support. It will also seek outside contributions from other partners in the Initiative when additional funds are needed for identified work products.

### **7. Management and Procedures**

#### **7.1 Activity Oversight Committee**

*Indicate whether an IEEE committee of some form (e.g., a Standards committee) has agreed to oversee this activity and its procedures.*

**Has an IEEE committee agreed to oversee this activity?:** No

*If yes, indicate the IEEE committee's name and its chair's contact information.*

**IEEE Committee Name:** -

**Chair's Name:** -

**Chair's Email Address:** -

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#### **7.2 Activity Management**

If no Activity Oversight Committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc).

The Activity will be managed by an Executive Committee, per the Baseline IC Activity Policies and Procedures.

### **7.3 Procedures**

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures*, (b) Standards Committee policies and procedures accepted by the IEEE-SA Standards Board, or (c) Working Group policies and procedures accepted by the Working Group's Standards Committee. If option (a) is chosen, then ICom review and approval of the P&P is required. If option (b) or (c) is chosen, then ICom approval of the use of the P&P is required.

Baseline Industry Connections Activity Policies and Procedures

## **8. Participants**

### **8.1 Stakeholder Communities**

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity, and will be invited to participate.

- Governments, Cities, Policy Makers
- Engineers, Data Scientists and System Architects
- Social Entrepreneurs and Innovators
- Designers, Ethicists, Ecologists and Conservationists
- Environmental Groups and NGOs
- Academia and K-12 Education
- Citizens, Activists, and Indigenous Communities
- Relevant IEEE Societies and Initiatives

### **8.2 Expected Number of Participants**

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

The IEEE Earth Lab is envisioned to engage thousand+ collaborators, including participants from industry, multilateral organizations, national and local governments, nonprofits and academic institutions, as well as public audiences. The IC Activity will be launched with a core team of 10-20 active members, who will be mobilizing their respective networks for the realization of the stated goals and deliverables.

### **8.3 Initial Participants**

Provide a number of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an



entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

Use the following table for an entity-based activity:

<b>Entity</b>	<b>Primary Contact</b>	<b>Additional Representatives</b>
Entity Name	Contact Name	Name

Use the following table for an individual-based activity:

<b>Individual</b>	<b>Affiliation</b>
Andre Uhl	The Council on Extended Intelligence
Prathima Muniyappa	MIT Media Lab
Keolu Fox	UC San Diego
Emilie Parry	Schumacher Institute
Benjamin Koo	Tsinghua University
Lili Xu	U.Lab China
Cokorda Istri Dewi	Kura Kura Bali
Luke Dallafior	Abundant Ocean Ventures
Yanick Kemayou	Kabakoo Academies
Amy Luers	Future Earth
Buffy Price	Element AI
Raja Chatila	The IEEE Global Initiative