

Strong Sustainability by Design

**PRIORITIZING ECOSYSTEM AND HUMAN FLOURISHING
WITH TECHNOLOGY-BASED SOLUTIONS**

SUSTAINABILITY COMMONS



Strong Sustainability by Design

This Compendium has been created by committees of the IEEE Planet Positive 2030 Initiative supported by the IEEE Standards Association (IEEE SA). The IEEE Planet Positive 2030 Initiative community is composed of several hundred participants from six continents, who are thought leaders from academia, industry, civil society, policy and government in the related technical and humanistic disciplines. At least one hundred seventy members of this community from about thirty countries have contributed directly to this Compendium and have worked to identify and find consensus on timely issues.

The Compendium's purpose is to identify specific issues and recommendations regarding sustainability and climate change challenges to achieve "Planet Positivity" by 2030, defined as the process of [transforming society and infrastructure by 2030 to:](#)

- Reduce Greenhouse Gas (GHG) emissions to 50% of 2005 GHG emissions by 2030.
- Significantly increase regeneration and resilience of the Earth's ecosystems.
- Be well on the path to achieving net zero GHG emissions by 2050 and negative GHG emissions beyond 2050.
- Continue to widely deploy appropriate technology as well as design and implement new technological solutions in support of achieving technological solutions designed and deployed to achieve "Planet Positivity."

In identifying specific issues and pragmatic recommendations, the Compendium:

- Provides a scenario-based challenge (how to achieve "Planet Positivity by 2030") as a tool to inspire readers to get engaged.
- Advances a public discussion about how to build from a "Net Zero" mentality to a "Net or Planet Positive" ("do more good," that is, doing "more" than "don't harm") societal mandate for all technology and policy.
- Continues to build a diverse and inclusive community for the IEEE Planet Positive 2030 Initiative, prioritizing the voices of indigenous and marginalized members whose insights are acutely needed to help make technology and other solutions more valuable for all. Of keen interest is how to encourage more in-depth participatory design in these processes.
- Inspires the creation of technical solutions that can be developed into technical recommendations (for example IEEE SA recommended practice for addressing sustainability, environmental stewardship and climate change challenges in professional practice, [IEEE P7800™](#)) and associated certification programs.
- Facilitates the emergence of policies and recommendations that could potentially be intraoperative between different jurisdictions (e.g., countries).

By inviting the general public to read and utilize *Strong Sustainability by Design*, the IEEE Planet Positive 2030 community provides the opportunity to bring multiple voices from the related scientific and engineering communities together with the general public to identify and find broad consensus on technology to address pressing environmental and social issues and proposed recommendations regarding development, implementations and deployment of these technologies. You are invited to Join related IEEE activities, such as standards development and initiatives across the organization.

- For further information, learn more at the [IEEE Planet Positive 2030 Initiative website](#)
- Get in touch at: PlanetPositive2030@ieee.org to get connected to and engaged with the IEEE Planet Positive 2030 community.
- Please, [subscribe to the IEEE Planet Positive 2030 newsletter here](#).

If you're a journalist and would like to know more about the IEEE Planet Positive 2030 Initiative, please contact: Standards-pr@ieee.org.

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Strong Sustainability by Design was created in two versions ("draft" and this current edition) that were iterated over the course of two years. The IEEE Planet Positive 2030 Initiative follows a specific consensus building process where members contributing content identify specific potential issues and proposed recommendations.

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IEEE Planet Positive 2030, an initiative supported by the IEEE Standards Association as part of the Industry Connections Program, [Sustainable Infrastructures and Community Development program](#) (SICDP), currently has more than four hundred experts involved, and remains eager for new voices and perspectives to join in this work.

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SUSTAINABILITY COMMONS

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SUSTAINABILITY COMMONS

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SUSTAINABILITY COMMONS

Future Vision

It is 2030.

The sustainability commons is now the go-to platform, a digital knowledge commons, for all things ClimateTech. It is always up to date thanks to an engaged contributors' base and is easily accessible by stakeholders around the world, facilitating discovery and adoption of climate solutions and enabling climate action decisions.

“Content is easily verifiable, and information about its quality is well captured, making the content trustworthy...People have access to valued, contextualized sustainability knowledge that is easily understood, can be trusted, and may be adopted to help enable the planet to get to net zero and thrive over the long term” (WSIS+20 High-Level Event 2024, “IEEE Knowledge Café: Knowledge Sharing for Sustainable Development”).

Sustainability knowledge is only important when put into use. Having and sharing knowledge is a foundation of influence and, therefore, of power to lead change. Desert communities in the Sahara have shared their clean energy, water, food solutions, and best practices with great success. Communications technologies for the arctic areas have been greatly advanced and shared on the commons to support better access to health care, education, and sharing resources. The progress made in achieving the IEEE Positive Planet 2030 vision has been possible by deploying effective models of knowledge and expertise sharing that has empowered communities to benefit from collective know-how worldwide.

Technology itself enabled an effective governance and organization model for the *sustainability commons*—a dynamic, ever-changing, contextualized sustainability data, information, knowledge, and solutions tool available online for communities to access, share, and adopt to enable the planet to thrive in the long term.

A key enabler of the commons took place in the mid-2020s when mechanisms like decentralized autonomous organizations, or DAOs¹, began to proliferate in response to the growing concern over the lack of regulation regarding emerging technologies such as those involved in generative artificial intelligence (AI) and the Metaverse (Connor, 2022). Rather than address these issues top down, countries, companies, and individuals around the world demanded personal data protection as represented in key laws like the European Union (EU) General Data Protection Regulation (GDPR), enabled with “personal agents” that functioned at an algorithmic level to represent all people’s individual identity, data, and choices at the same speed and context of algorithms (GDPR.EU, 2018).

The commercial web of early Internet data brokers, driven in large part by advertising, gave way to real-world, digital, and virtual communities whose members voted on projects with genuine agency, including the prioritizing of protecting the planet and all people above short-term profit and growth. This initiative, that is, growth in engaged digital and virtual communities, led to the greatest proliferation of innovation in modern times, in which it was only by fostering caring communities where all people knew their votes and voices counted that our modern sustainability commons was born. Commons that do not list the [Intergovernmental Panel on Climate Change \(IPCC\)](#) or [Paris Agreement](#) goals are immediately not trusted in both smaller or internationally oriented DAO-type settings (Reiff, 2023).

¹ In his article, “[DAOs Could Hold the Answer to Better Data Governance Guidelines](#),” Dan Connor explains: “In a DAO, contributors vote on the direction of projects, creating a feedback loop that doesn’t currently exist in AI-driven systems. Rather than simply honing complexity into simplicity, by asking humans whether they accept the internal decisions, DAOs bend the arc of data models toward community centricity.”

Introduction

Definition of sustainability commons

A digital sustainability commons refers to a dynamic mapping of who is doing what and where, in all climate and sustainability technologies (Heid et al., 2022).² The commons will be made available to all to enable and increase visibility of solutions and best practices, ultimately allowing governments, businesses, civil society organizations, and individuals to make the most effective decisions based on their circumstances.

In her 1990 book, *Governing the Commons: The Evolution of Institutions for Collective Action*, American political economist Elinor Ostrom describes the sustainability commons as "long-enduring, self-organized, and self-governed" (Ostrom, 1990, p. 58). Known for her work on the governance of common-pool resources, such as forests, fisheries, and water systems, Ostrom won the [Nobel Memorial Prize in Economic Sciences in 2009](#). *Governing the Commons* is considered a seminal work in the field of institutional analysis and the management of common-pool resources. In this book, Ostrom presents case studies of successful management of common-pool resources by communities around the world and proposes a set of design principles for the institutions that govern these resources. On page 58 of the book, Ostrom discusses the importance of "local knowledge" in the management of common-pool resources and argues that it is often more effective than external expertise or formal regulations.

Part of building the commons will be to highlight the requirements to sustain the commons over time, as well as its organization and governance mechanisms. The commons would be expert vetted and organized with proper contextualization on relevant climate and sustainability technologies and how they could be leveraged for the query at hand to help various stakeholders to decarbonize their sectors/industries.

Beyond the sharing of knowledge, the sustainability commons could be a platform to help gather information, regardless of whether this information is readability available (open source).

The sustainability ecosystem consists of academics, corporate leaders, policy makers, regulators, activist groups, and others who might have differing agendas, follow different frameworks and methodologies, and make claims/counterclaims that are difficult to verify. The sustainability commons will create a trusted and verifiable framework; methodology; catalog of models, tools, and platforms; and appropriate governance for the different stakeholders to contribute to, build on, and verify the claims. As an outcome of this initiative, the participants in the sustainability commons will evaluate metrics, rewards, business models, ownership, funding, resourcing, curation, and governance using other similar examples (e.g., Wikipedia, open-source communities, and DAO models).

² In their 2022 article, "Delivering the Climate Technologies Needed for Net Zero" in *McKinsey Sustainability*, authors Bernd Heid, Martin Linder, and Mart Patel identify "ten families of climate technologies" and explain: "Most climate technologies are viable only if other climate technologies are also implemented at the level of facilities, enterprises, regions, or value chains."

Issue 1: Thinking in silos

Background

Currently, sustainability knowledge and information is spread over a large number of stakeholders, each of them thinking and acting in their own ecosystems and disciplines. This problem, however, is not limited to scientific disciplines; it can also be found with gender-balance concerns, inclusion of local/Indigenous groups, and consideration for the big picture of environmental, social, and governance issues within the sustainability fields.

Recommendation

1. **Enhance trusted information flow between various thematic and geographic areas, as well as between stakeholder groups to help with faster uptake of sustainability solutions.**
-

Issue 2: Lack of long-term viability of previous “commons” projects

Background

Lots of commons-aligned projects, especially with a heavy focus on knowledge commons, tend to have a model of grant- or subsidy-funded operations. This model, however, can become a challenge in the long term as the projects are dependent on a constant funding stream from public entities, philanthropies, and other well-intentioned donors. Along those lines, the platform and overall project will have to prove its worth in the long run: through strong and coherent metrics, an innovative business model, shared ownership between all members of the sustainability commons, and other specific proof of the efficient use of resources.

Recommendations

1. **Develop the sustainability commons for long-term viability.**
2. **Develop an innovative business model that supports long-term viability and that includes shared ownership and efficient use of resources.**
3. **Secure resources—human resources, financial resources, and so on—that will support the sustainability commons.**
4. **Design a platform, interoperable platforms, and tools, including AI tools, so that they are flexible and can incorporate future technological enhancements.**
5. **Develop one or more technical standards for such a Sustainability Commons.** An example would be “[IEEE P7801 Recommended Practice for Technical Knowledge Commons Initiatives and Platforms](#),” currently under development). A technical standard should lead to interoperability between such sustainability commons and thus support a federation of commons.

Issue 3: Limited access to knowledge and expertise

Background

The free flow of knowledge and expertise is essential. In the sustainability commons, where different points of view and diverse solutions to common problems are encouraged, maintaining the integrity of content and platforms becomes crucial to prevent greenwashing, marketing, or other dubious activities. This balance between free-flowing knowledge and responsible content moderation is essential.

Fortunately, a key opportunity comes from EU regulation focused on climate and nature-based goals going into effect in 2024 (European Commission, "Nature Restoration Law"). U.S. reporting needs come from the U. S. Securities and Exchange Commission (U.S. SEC, 2022). Companies will be required to disclose their climate-related risks, such as the impact of climate change on their business operations and supply chains.

Greenwashing, or "greenwashing," arises from intentional or unintentional misrepresentation of company activities related to climate and planetary issues. To counter this issue, the concept of unified cooperation for stakeholder benefit and distributed cooperation becomes essential in the context of sustainability commons. Unified cooperation fosters collaboration and authentic action, promoting transparent reporting and knowledge sharing. Distributed cooperation recognizes the need for collective action across diverse actors, integrating different perspectives and expertise. By leveraging these approaches, the sustainability commons serve as a platform for shared resources, innovation, and collective problem-solving, empowering stakeholders to implement sustainable practices and contribute to a greener future.

Recommendations

1. **Design, develop, implement, and maintain the sustainability commons to serve as a platform for shared resources, data, innovation, and collective problem-solving.** Such a sustainability commons should serve to empower stakeholders to implement sustainable practices and contribute to a greener future.
2. **Help ensure the integrity of content and platforms.**
3. **Promote free flow of knowledge and expertise and encourage different points of view.**
4. **Provide for responsible and transparent content moderation.**
5. **Take measures to prevent "greenwashing" and similar such activities.**
6. **Promote transparent reporting.**
7. **Enable collaboration and cooperation, including distributed cooperation.**

Issue 4: Need for accessible common “language”

Background

Potential contributors to the sustainability commons will come from a variety of disciplines and geographies, each with its own language and terminology. The more different fields are gathered in one shared information space, the more important it will be to have a coherent and agreed set of concepts, definitions, and terms, representing the same idea in different areas of work. Setting up a commons-wide ontology will be crucial to support this issue. Also critical to this issue is the recognition that certain Indigenous and other traditions have oral cultures as a key means of communication, which beyond being honored provide the opportunity to recognize non-Western ideals of a commons to be explored and proliferated as part of the examination of a sustainability commons overall.

Recommendations

1. **Build and provide a commons-wide ontology based on an agreed-to set of concepts, definitions, and terms.**
 2. **Make assets on the commons accessible** (written language, visual, auditory).
-

Issue 5: Need for shareable and verifiable data and models

Background

Currently, various sustainability models have been built for specific domains and specific countries at different levels of granularity. These sustainability models have different sets of assumptions and different types of data sets, making verifiability of claims and the modular development of models a significant challenge. Having a hyper-catalog of data sets, a modular model architecture, and a repository for contributing, sharing, and building sustainability models will be a critical component of sustainability commons.

Recommendations

1. **Design and develop the following:**
 - a. **A hyper-catalog of data sets**
 - b. **A modular model architecture**
 - c. **A repository for contributing, sharing and maintaining trusted data, analyses and models**
 - d. **Sustainability models**

Issue 6: Need for transparent and inclusive governance

Background

As a public good, the sustainability commons need to adopt a governance model that respects voices from a variety of contributors and supporters—in terms of both the strategic direction of the overall commons and the curation and related decisions. Existing governance models might not even fit this type of activity, giving this effort the chance to invent or deploy innovative models instead.

Recommendations

- 1. Adopt a governance model that respects voices from a variety of contributors and supporters—in terms of both the strategic direction of the overall commons and the content curation and related decisions.**
-

Issue 7: Steps to help building a sustainability commons initiative

The following recommendations will help **initiate building a sustainability commons initiative**. These recommendations comprise both process guidelines and design principles.

Recommendations

2. **Map existing initiatives.** A key starting point will be to understand existing initiatives and the sustainability commons regarding climate technology. As a result, examples from universities, research centers, corporations, governments, startup accelerators, and others will be needed to recognize gaps in the existing landscape, learn lessons from prior attempts to address this need, and identify partners for implementation. For example, a model worth mentioning is [the shareholder commons](#)³, in which companies band together to address climate issues for the greater good, a form of "stakeholder" capitalism that could be more sustainable for a majority of stakeholders rather than just one small group of shareholders.
3. **Build a global repository with multi language support.** A true sustainability commons should be global by design, which means building in support for different languages from the beginning. But for this commitment to be truly global, the design should go beyond multilingual support to include building tools and an architecture that can be customized for various contexts by communities.
4. **Design to empower distributed communities.**
5. **The governance and ownership of such a sustainability commons should strike a balance to be both as inclusive as possible and retain effective decision-making.** Therefore, all stakeholders should be empowered, whether individuals or communities, and control should not be centralized. Various organizational and technological designs should be tested to achieve these objectives. For example, new technologies should be explored, such as setting up a DAO or working with more established legal structures like data trusts.⁴
6. **Design for easy access to maximize engagement.** The design of a sustainability commons should encourage the growth of a network of contributors, as well as should incentivize engagement by both contributors and consumers. Therefore, tools need to be in place for two-way interaction with the commons for access and contribution of content.
7. **Optimize for discoverability of relevant content.** Facilitating the discovery of relevant content must be critical to help ensure that the commons will be useful (and adopted) for potential users (customers). To do so, best practices should be employed to increase discoverability of data and content, as well as to build on ideas of gamification.

³ This information is given as an example of a for the convenience of users of this document and does not constitute an endorsement by the IEEE. Similar or equivalent products and services may also be available from other companies and organizations.

⁴ [The Climate Data Trust](#) is a data trust that was established in 2020 to help communities and businesses adapt to climate change by sharing data on climate change impacts and solutions. The trust has already been used to support a number of projects, including a study on the impact of sea level rise on coastal communities and a study on the effectiveness of renewable energy projects. This information is given as an example of a data trust for the convenience of users of this document and does not constitute an endorsement by the IEEE. Similar or equivalent products and services may also be available from other companies and organizations.

8. **Provide feedback loops and pathways for adoption.** A sustainability commons is only as useful as the solutions it helps deploy. Therefore, building simple pathways for adoption (how can content be linked to problem solving) and the right feedback loops (has content helped solve problems) must be considered.
9. **Build on what already exists.** The sustainability commons should leverage existing efforts, not reinvent a new solution. Likewise, when it is operational, it should facilitate sustainability innovation, enabling more reuse and rediscovery of existing solutions rather than reinvention and duplication.
10. **Start building with a specific focus area.** The organization(s) building a sustainability commons should focus on a specific area or problem sets as a starting point to build out a pilot and iterate before scaling it up further. This process could be determined by the organization launching such efforts in collaboration with first clients. The starting point should be carefully selected to showcase the potential for a technology commons by identifying an area that has both sufficient resources and demand (areas such as carbon removal, renewable energy, or circular economy).
11. **Provide incentives as keys for uptake.** A sustainability commons should be designed to encourage discovery, deployment, and documentation of content for reuse. The same principle applies to the design of products, processes, and incentives through the commons.
12. **Incorporate trustworthy quality control and content review.** Users need to trust that the content is genuine and ideally have value-added data that provide information or a rating on technologies, data, and documents in the sustainability content. Therefore, finding ways for users to receive existing metadata or reviews, as well as value-added assessments of content, is important.

Case Studies

This information is given solely for the convenience of users of this document as examples of case studies that were known at the time of publication, and does not constitute an endorsement of any company, product, service or organization by the IEEE or IEEE Standards Association (IEEE SA).

1. [California Climate Commons](#) (website).

Description quoted from the website:

*“**Science and data supporting climate change resilience in California.** The California Climate Commons digital library was launched in 2011 by the California Landscape Conservation Cooperative (The CA LCC, one of 22 LCCs in North America). It provided unprecedented access to climate change science for conservation practitioners, introducing innovative ways to understand and incorporate this emerging information.*

In 2018 the National Landscape Conservation Cooperative program was discontinued and is now the [California Landscape Conservation and Adaptation Partnership \(CAL CAP\)](#).

The Climate Commons digital library ceased being updated in 2018, but you may still search the archived Climate Commons catalogs and articles.”

2. [Creative Commons](#) (website).

Description quoted from the website:

“Creative Commons is an international nonprofit organization that empowers people to grow and sustain the thriving commons of shared knowledge and culture we need to address the world’s most pressing challenges and create a brighter future for all.”

3. [Crowdsourcing Sustainability](#) (website).

Description quoted from the website:

“Crowdsourcing Sustainability is unleashing the power of people everywhere to help reverse global heating as quickly and equitably as possible. Join our community of over 200,000 people from 150+ countries to rebuild a safe, healthy, and just world together!”

4. [Earth Journalism Network, Climate Commons](#) (website)

Description quoted from the website:

*“**Internews** initially developed the **Earth Journalism Network (EJN)** in 2004 to enable journalists from low- and middle-income countries to cover the environment more effectively. This is now a truly global network working with reporters and media outlets in virtually every region of the world. Following the mission to improve the quantity and quality of environmental reporting, EJN trains journalists to cover a wide variety of issues, develops innovative online environmental news sites and produces content for local media—including ground-breaking investigative reports. EJN also establishes networks of environmental journalists in countries where they don’t exist and builds their capacity where they do.”*

5. [Future Earth Networks. “Knowledge-Action Networks.”](#)

Description quoted from the website:

“The Future Earth Knowledge-Action Networks (KANs) bring together innovators from academia, policy, business, civil society and more to address the world’s most pressing sustainability challenges.

KANs are collaborative frameworks that facilitate highly integrative sustainability research on some of today’s [most pressing global environmental challenges](#). Their [aim](#) is to generate the multifaceted knowledge needed to inform solutions for complex societal issues.”

6. UN Climate Change. [“Global Climate Action.”](#)

Description quoted from the website:

“The Global Climate Action portal is an online platform where actors from around the globe - countries, regions, cities, companies, investors and other organizations - can register their commitments to act on climate change.

Launched by UN Climate Change, Peru and France in 2014, the portal was born of the realization that addressing climate change will take ambitious, broad-based action from all segments of society, public and private.”

7. [The Oxford Climate Tech Initiative's Real Time Crowdsourced R+D Systems Map](#).
8. [Shareholders Commons](#) (website).

Description quoted from the website:

"Founded in 2019, this is an independent, non-profit organization that addresses social and environmental issues from the perspective of shareholders who diversify their investments to optimize risk and return."

9. [UN Environment Programme \(UNEP\). "Publications and Data."](#)

Description quoted from the website:

"The UN Environment Programme offers more than 15,000 items, from [real-time data tools and platforms](#) to key reports, publications, fact sheets, interactives and more."

10. [WWF Climate Crowd](#) (website).

Description quoted from the website:

"Climate Crowd is a bottom-up community-driven initiative. Working with communities and local organizations in over 30 countries, Climate Crowd collects data on climate impacts to communities, analyzes the data, presents the data back to the communities, and works with them to develop, fund and implement on-the-ground solutions that help people and nature adapt to a changing climate."

Further resources

1. [Carbon Disclosure Project](#) (website)
2. [Climate Action 100+](#) (website).
3. [Community Climate Collaborative](#) (website).
4. Prime Coalition and Rho AI. [CRANE User Report 2021](#), 2021.
5. [Design for Change USA](#) (website).
6. [International Carbon Action Partnership](#) (website).
7. [IPCC, Links](#) (website).
Luiken, Maïke, and Alpesh Shah. [Policy Brief: Scaling Climate Goals Through the Use of Technical Experts and Digital Technical Knowledge Commons](#). T7 Task Force Climate and Environment. Think7, 22 Apr. 2022.
8. [Climate Mapping for Resilience and Adaptation](#) (website).
9. Wikipedia, s.v. "[List of Climate Change Initiatives](#)."

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1. [Climate Action Data Trust](#) (website).
 2. Connor, Dan. "[DAOs Could Hold the Answer to Better Data Governance Guidelines.](#)" VentureBeat, 8 May 2022.
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