

AI and sustainability

ISO/IEC JTC 1/SC 39 and SC 42 Joint Advisory Group

4 June 2024



Harm Ellens



Phil Isaak



SC 42 – Artificial Intelligence

Environmental sustainability force fields

Guidance on social responsibility

Practices for integrating social responsibility throughout an organization

ISO 26000

Maximizing an organization's contribution to sustainable development

SDG 6 - Clean water and sanitation

SDG 7 - Affordable and clean energy

SDG 12 - Responsible consumption and production

SDG 13 - Climate action

United Nations'
Sustainable Development Goals

Artificial Intelligence sustainability

ISO

London Declaration

"Foster the active consideration of climate science and associated transitions in the development of all new and revised International Standards and publications"

Guidelines for addressing sustainability in standards

A methodology address sustainability on a subject-specific basis.

ISO Guide 82

Enacted emerging legislation regulation

ESG Reporting
Carbon accounting
European Green Deal
EU AI Act

AI Sustainability



NEWS

AI can be sustainability enabler, but cost is steep

In this Q&A, Kumar Parakala of GHD Digital explains some of the benefits of using GenAI in sustainability initiatives, as well as the issues that must be addressed.

By [Jim O'Donnell](#), News Writer

Enterprise AI is a double-edged sword

ChatGPT needs to 'drink' a water bottle's worth of fresh water for every 20 to 50 questions you ask, researchers say

Will Gendron Apr 15, 2023, 2:00 AM AEST



ChatGPT is estimated to consume a standard 16.9 oz bottle of water for every 20 to 50 questions you ask, researchers say. Maharian/NurPhoto via Getty Images



INFORMATION TECHNOLOGY STANDARDS

SC 42 – Artificial Intelligence

ChatGPT: What is the carbon footprint of generative AI models?



Warning AI industry could use as much energy as the Netherlands

10 October

Climate



AI drives up data centre power requirements

Business news | October 11, 2023

By Nick Flaherty

AI

POWER MANAGEMENT



Beneficial AI



Climate change

▼



Combat world hunger

▼



Fight fake news

▼



Healthcare

▲



Wildlife conservation

▼



Medical imaging

▼

Healthcare

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magnimindacademy.com

healthcare

Healthcare systems create volumes of data that would go unused without the support of artificial intelligence and machine learning. Not only does artificial ...

<https://www.forbes.com> › ... › ...

8 Powerful Examples Of AI For Good

Healthcare. A predictive estimate from CBInsights shows that 86% of health organizations are going to use artificial intelligence technology in the near ...

<https://www.clickworker.com> ...

Benefits of Artificial Intelligence: How it Cont...

The use of Artificial Intelligence solutions in the **healthcare** sector is becoming increasingly popular these days. Remote patient monitoring technology, for ...

<https://10xds.com> › blog › be...

Top 10 Benefits of Artificial Intelligence (AI)...



Chatbots

▼



Cybersecurity

▼



Personalization

▼

15 more ▼

Feedback

Sustainability, IT and data centres

ISO/IEC JTC 1/SC 39

Standardization of assessment methods, design practices, operation and management aspects to support:

- Resource efficiency
- Resilience, and
- Environmental sustainability

for and by information technology, data centres and other facilities and infrastructure necessary for service provisioning.

Work Group 1

Resource Efficient Data Centers, including the Key Performance Indicators Series 30134

Work Group 3

Sustainable Facilities & Infrastructures

Work Group 4

Eco-Design of Digital Services

Artificial intelligence

ISO/IEC JTC 1/SC 42

Standardization in the area of Artificial Intelligence

Serve as the focus and proponent for JTC 1's standardization program on Artificial Intelligence

Provide guidance to JTC 1, IEC, and ISO committees developing Artificial Intelligence applications

Work Group 1

Foundational standards

Work Group 2

Data

Work Group 3

Trustworthiness

Work Group 4

Use cases and applications

Work Group 5

Computational approaches

AI sustainability and beneficiality

International
Standard



Technical
Specification



Technical
Report

Key Performance Indicators Series 30134

TS 20125 WD

Digital Services Ecodesign

ISO/IEC TR 20226 CD

Environmental sustainability aspects of AI systems

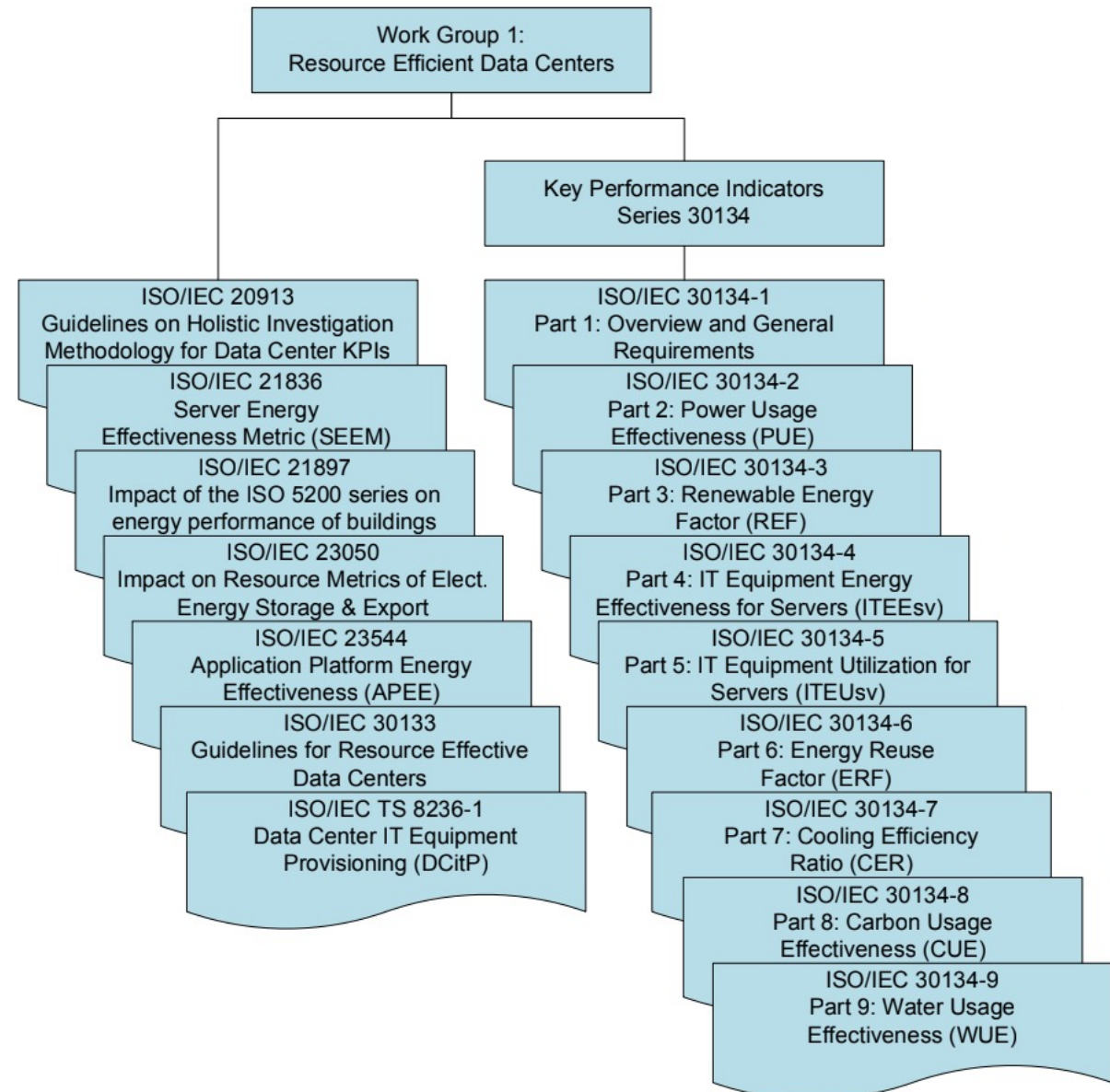
ISO/IEC TR 21221 CD

Beneficial AI systems

Key Performance Indicators Series

ISO/IEC 30134-1 to 9

- General requirements
- Energy Reuse Factor
- Renewable Energy Factor
- Power Usage Effectiveness
- Carbon Usage Effectiveness
- Water Usage Effectiveness
- Cooling Efficiency Ratio
- IT equipment energy effectiveness for servers



Digital services ecodesign - Ecopractices for life cycle stages

TS 20125 WD

Requirements and recommendations applicable for design, implementation, operations and termination in order to minimize adverse environmental impacts during all stages of the service life cycle.

Common language and understanding on this subject, primarily for project teams of private and public organizations.

digital service

<information technology> a set of electronic devices, software, and telecommunications networks interacting to provide one or several functions to users.

Note 1 : a digital service may use other digital services. In this case, requirements and recommendations apply to all services under control of the organization performing

ecodesign

systematic approach that considers environmental aspects in design and development with the aim to reduce adverse environmental impacts throughout the life cycle of a product.

Note 1: Other terminology used worldwide includes “environmentally conscious design (ECD)”, “design for environment (DfE)”, “green design” and “environmentally sustainable design”

Beneficial AI systems

ISO/IEC TR 21221 CD

An AI system is perceived as beneficial when it functions as designed, is trustworthy and is purposefully and responsibly applied to create positive value and *impact* for its stakeholders.

Functional	Societal
Economic	Cultural
Environmental	Intellectual
Social	Personal

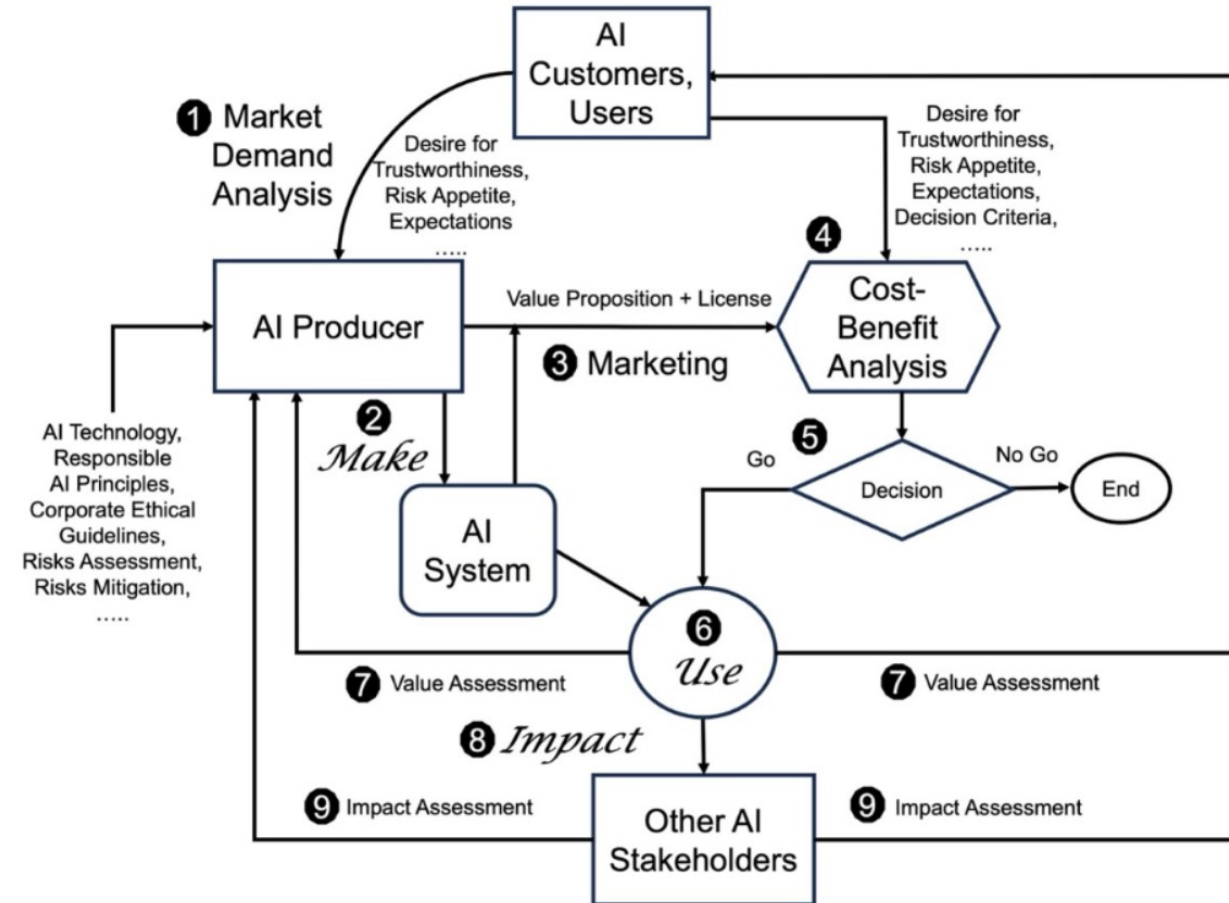
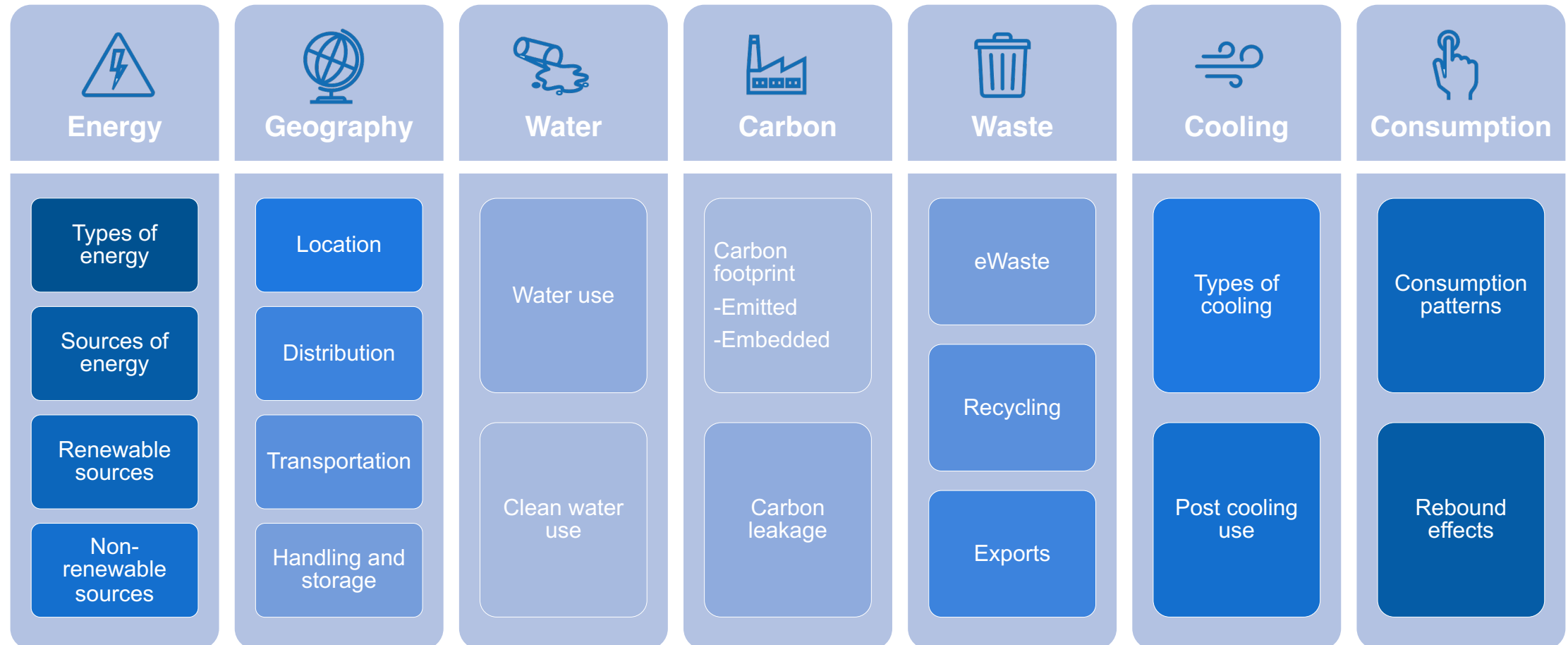


Figure 1 — Creation of AI system value

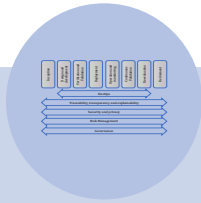
Environmental sustainability aspects of AI systems

ISO/IEC TR20226 CD



Approaches to reducing environmental sustainability impacts

ISO metric



AI system ecosystem

Geographic location

Carbon aware scheduling

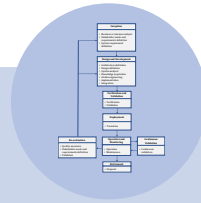
Carbon aware pausing

Generative AI

Synthetic data

Adapting a foundation model

Transfer learning



AI system lifecycle

Carbon-aware Core SDK

Computationally efficient algorithms

Use pretrained models

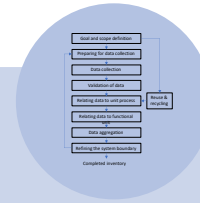
Automated ML

Federated learning models

Customized processors

Energy efficient reinforcement learning

Public APIs



AI system supply chain

Certification of hardware and data centres

Using recycled rare earth elements in AI specific hardware

Applying circular economy concepts and principles

Terms of Reference

SC 42 Joint Advisory Group on AI and sustainability with SC 39

Noting the

- increasing importance of AI and Sustainability
- the existing work and collaboration between SC 42 and SC 39
- the application of AI for sustainability
- the need for sustainable AI systems
- AI systems are deployed in topologies on devices, at the edge / node, cloud / data center and everything in between

The advisory group is tasked with roadmapping in this area and providing recommendations for potential new projects.



Join us

Image source: Microsoft

Contacts:

Fumihiro Maruyama (WG4 convenor): maruyama@gakushikai.jp

Harm Ellens (project editor): harm.ellens@virtual-ink.com.au



SC 42 – Artificial Intelligence

Measuring environmental sustainability of AI systems

ISO metric

SC39: Sustainability, data centers and IT systems

AI system ecosystem

GPU energy

Energy consumption

Energy efficiency

Power usage effectiveness

Renewable energy factor

Water usage effectiveness

Carbon usage effectiveness

Energy efficiency improvement

AI system lifecycle

Energy-precision ratio

AI system supply chain

Raw material extraction method

Transportation of materials

Material hazard and environmental leaching risk

Material sustainability

Transportation emissions

Water use

Other

Carbon intensity of a machine learning model

Software Carbon Intensity (SCI)

Operational carbon emissions

Embodied carbon emissions

ISO/IEC DIS 21031