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# Effective and Ethical Use of AI for Environmental Scientists

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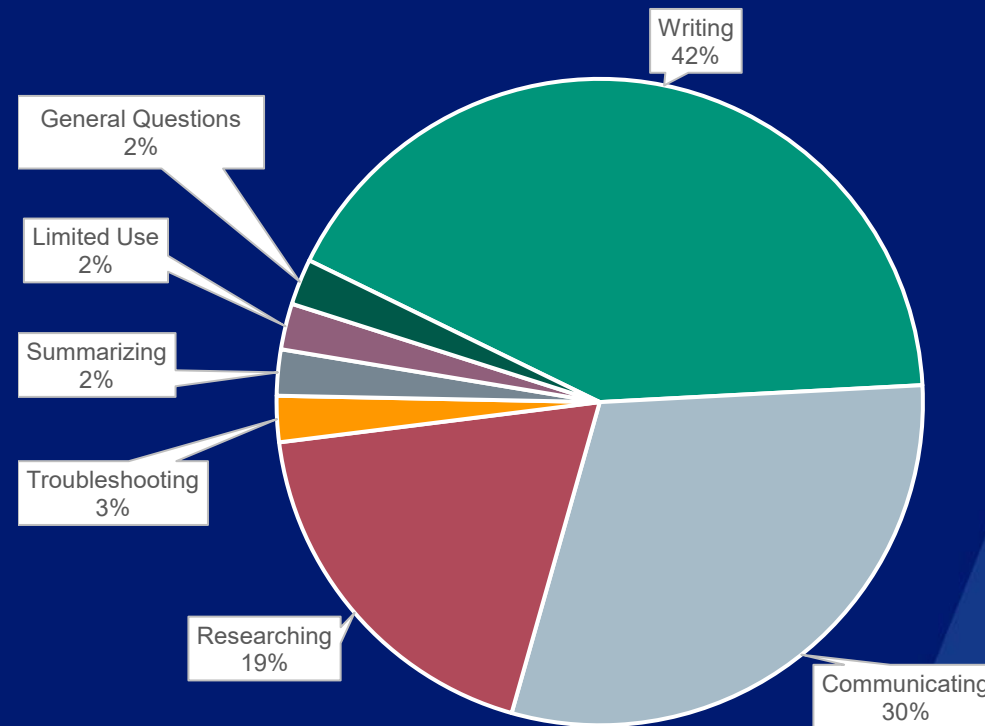
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## Outline

1. Introduction
2. Definition of Terms
3. How Might Environmental Scientists Use AI?
4. Potential Benefits
5. Potential Risks/Costs
6. Intentionality and Guardrails
7. Transparency
8. Reflections and Questions

# Introduction

- Why are we here?
- Trace Associates Inc. (Trace) AI Guidance Policy in development



# Definition of Terms

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- Effective
  - Make our work products better
  - Save time, effort, and money; outsource repetitive tasks
- Ethical
  - Personal ethics
  - Professional ethics (company, professional organization)
- Artificial Intelligence (AI)
  - #notall AI
  - Grammarly, voice to text, data management and manipulation

# Definition of Terms


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- AI – “intelligence” is a metaphor; AI is not sentient and has no intentionality
- Large language model (LLM) (Copilot, ChatGPT, Gemini, Claude, etc.)
  - Generative AI (GenAI) / Generative Pretrained Transformer (GPT) → chatbots
  - Draws on a vast body of pre-loaded text (“training”) to predict which word will come next in a text sequence to “sound right”
  - Similar process for generating images (image datasets)
  - Can be incomplete, wrong, or outdated, depending on what it is fed and when
  - Input = prompt → output

# How Might Environmental Scientists Use AI?


1. Researching
2. Simplifying summaries
3. Writing prompts
4. Generating images

how can I use AI

 Copilot ⓘ

Great question, Sheila! AI can be used in many ways depending on your goals, interests, and field of work. Since you're an **Environmental Scientist**, here are a few tailored examples of how you might use AI:

what is confirmation of ultimate beneficial ownership

 Copilot ⓘ

In Canada, **confirmation of ultimate beneficial ownership (UBO)** refers to the process of identifying and verifying the individuals who ultimately own or control a legal entity, such as a corporation or trust. This is a key requirement under Canada's **Proceeds of Crime (Money Laundering) and Terrorist Financing Act (PCMLTFA)**.

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write 5 bullets to describe methods to install a drive point piezometer

 Copilot ⓘ

Here are five concise bullet points describing common methods for installing a drive point piezometer:


- **Direct Push Method:** A steel drive point with a porous tip is driven into the ground using a hand-held hammer, slide hammer, or mechanical rig, allowing for rapid installation in unconsolidated soils.
- **Pre-drilled Hole Installation:** A borehole is drilled to the desired depth using an auger or rotary drill, then the piezometer is lowered into place and the annular space is backfilled with sand and sealed with bentonite.
- **Vibratory Driving:** In coarse or dense soils, a vibratory hammer can be used to drive the piezometer to depth, minimizing soil disturbance and improving installation efficiency.
- **Jetting Method:** Water or air is used to fluidize the soil ahead of the drive point, easing penetration in fine-grained or compacted soils and reducing the risk of damage to the piezometer tip.



# How Might Environmental Scientists Use AI?

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what is the volume of water in a cylinder 1 m long with a 1 inch radius?

 Copilot ⓘ

To calculate the volume of water in a cylinder, we use the formula for the volume of a cylinder:

$$V = \pi r^2 h$$

Where:

- $r$  is the radius
- $h$  is the height (or length, in this case)
- $\pi \approx 3.1416$

**Given:**


- Length  $h = 1$  meter
- Radius  $r = 1$  inch = **0.0254 meters**

# How Might Environmental Scientists Use AI?

## 1. Researching

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what is the volume of water in a cylinder 1 m long with a 1 inch radius?

 Copilot ⓘ

Plugging in the values:

$$V = \pi(0.0254)^2 \times 1 \approx 3.1416 \times 0.00064516 \approx 0.002026 \text{ cubic meters}$$

Converting to liters:

Since 1 cubic meter = 1000 liters:

$$0.002026 \text{ m}^3 \times 1000 = 2.026 \text{ liters}$$

✅ **Final Answer:**

Approximately 2.03 liters of water can fit in a cylinder that is 1 meter long with a 1 inch radius.

Would you like help visualizing this or converting it to other units like gallons?

# How Might Environmental Scientists Use AI?

## 1. Researching

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what questions can i expect from an audit by a regulator of professional engineers and geoscientists

 Copilot ⓘ

When you're audited by a regulator like **Engineers and Geoscientists BC (EGBC)** or a similar provincial body in Canada, the audit typically focuses on verifying that you're meeting your professional obligations under the **Professional Governance Act** and relevant bylaws. Here are the types of questions and areas you can expect to be covered during such an audit <sup>1</sup>:

### General Areas of Inquiry

#### 1. Professional Practice

- Are you currently practising engineering or geoscience?
- What types of projects have you worked on recently?
- Are you working within your area of competence?

# How Might Environmental Scientists Use AI?

1. Researching
- 2. Simplifying summaries**
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To prompt Copilot for a summary, provide a clear goal, context, and specify any expectations, such as format (bulleted list, abstract) or focus (sales, specific data). For instance, use prompts like: "Summarize the key points from the email sent by John Smith on January 5th" or "Give me a concise summary of recent news about Product X". Providing more detail about the desired outcome and the source material helps Copilot generate a more precise and useful summary. [🔗](#)

## Key elements of an effective summary prompt

- **Goal:** State what you want Copilot to do, like "summarize," "draft," or "analyze". [🔗](#)
- **Context:** Provide background information, such as the sender of an email, the subject of a document, or the specific project you're working on. [🔗](#)
- **Source:** Specify the document, email thread, or data you want summarized, like "this email thread," "this report," or "emails from Sam in the past two weeks". [🔗](#)
- **Expectations:** Define the desired format (e.g., bulleted list, session abstract), the target audience, the tone, or a specific focus (e.g., "focus on sales," "highlight discrepancies"). [🔗](#)

# How Might Environmental Scientists Use AI?

"Summarize action items for me from this chat:"

Here's a summary of the key action items from your Teams chat last week:

## ✓ Meeting Coordination

- Team Meeting Rescheduled:
  - New time: 3:30 PM on September 27 (instead of 3:00 PM).
  - Note: Brendan is off at 4:00 PM, so the meeting will need to be efficient.

## 📄 AI Policy

- Deadline Reminder:
  - AI policy needs to be completed by September 12, 2025.

## 📊 AI Survey & Data Access

- Survey Responses Access:
  - Sheila asked how to view AI survey responses.
  - Katy and Brendan suggested saving the link and adding it to **OneNote**.
  - Sheila shared a visualization tool that can turn written responses into charts.

## 🧠 AI Tech Talk Presentation

- Presentation Review:
  - Katy noted Sheila hadn't reviewed the draft yet.
  - Brendan agreed to review the presentation and provide input.
  - File location: P:\Data\Trace Community\For Sheila\AI Presentation

# How Might Environmental Scientists Use AI?

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1. Researching
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“Draft an executive summary for this document”

“Write this in a more professional tone”

“Make this more concise”

“Create a PowerPoint presentation from this document”

“Develop a continuing education plan to improve technical analysis skills according to this document”

“Prepare a company-wide email to notify of updates to this Standard Operating Procedure”

# How Might Environmental Scientists Use AI?

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how do I answer this question: What are the performance metrics you monitor and report on?

 Copilot ⓘ

To answer the question “What are the performance metrics you monitor and report on?”, you’ll want to tailor your response to your role as an **Environmental Scientist**. Here’s a structured way to approach it:

## ✓ 1. Start with the Context

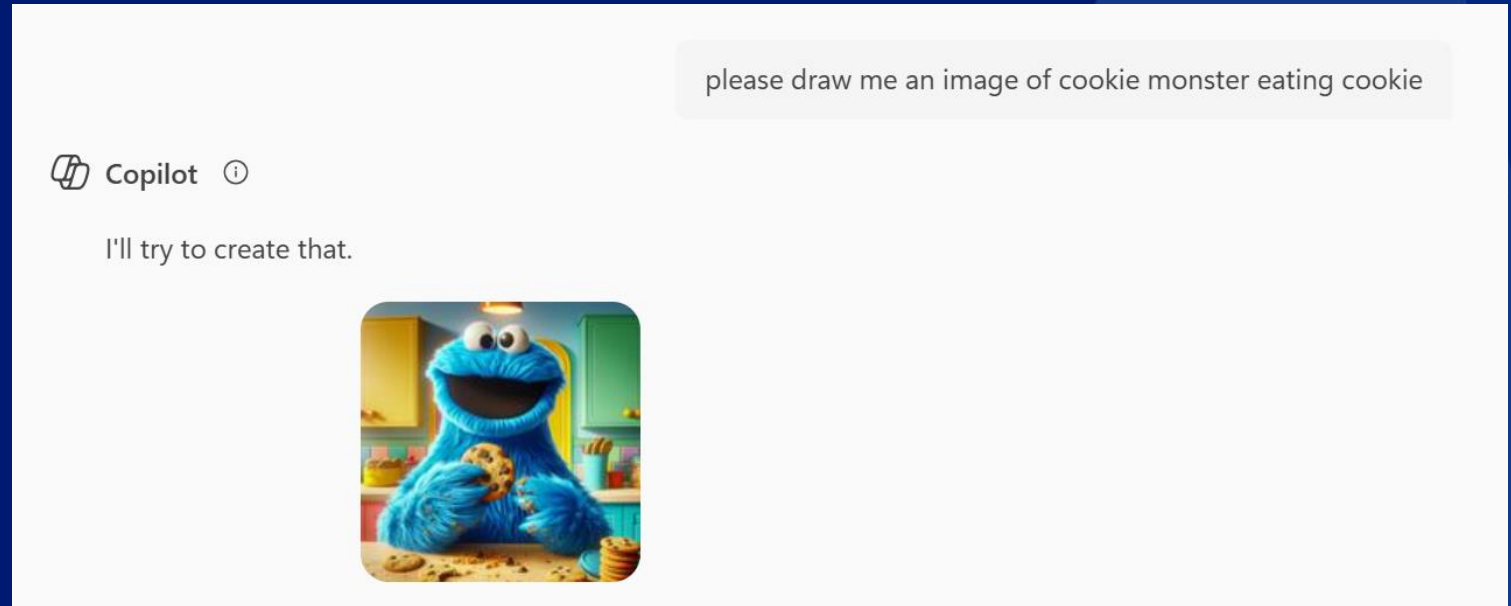
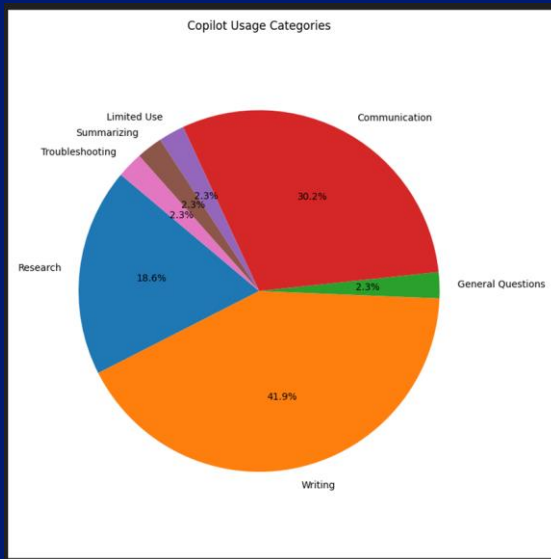
Briefly describe your role and the purpose of monitoring performance metrics.

*“As an Environmental Scientist, I monitor and report on key metrics to ensure compliance with environmental regulations, assess project impacts, and support sustainability goals.”*



# How Might Environmental Scientists Use AI?

1. Researching
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# Potential Benefits

- Quickly digest data and format it for use (speed = \$\$\$)
- Brainstorming, get started when you are stuck
- Support performance: help with wording, proofreading, drafting/review
- Compilation of research for easy comprehension
- Meeting summary / transcript / action items
- Data visualization (survey results)
- Unique images for presentations
- Excel formula troubleshooting



Microsoft Copilot image prompt: a cartoon drilling machine (2024)

# Potential Risks/Costs

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- Inaccuracy / hallucinations / out-of-date materials
  - Content and even citations must be checked for accuracy
  - “Truthiness” – plausible but wrong
- Privacy risks – security of personal or company information
  - Prompts and other information entered can become public
- Reputational risk – why hire a consultant who is using a robot instead of people? (or why hire a consultant who is not using current technology?)
  - Companies with sustainability and social responsibility policies must balance the ethical downsides with potential gains
- Reproduction of source bias, stereotyping

# Potential Risks/Costs

- Environmental harms
  - High cost of development, use, afterlife (water, emissions, energy)
  - 10 x more energy use and 340 x more emissions generated in a search?
  - Lack of transparency to make ethical decisions (“black box”)



Microsoft Copilot image prompt: three raccoons in a trenchcoat (2025)

# Potential Risks/Costs

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- Skill loss in individual users – accumulation of cognitive debt
- Job losses (graphic designers, coders, writers, junior professionals – where will the senior professionals come from?)
- Moral objections – AI has been trained on stolen copyrighted material, harm to human AI trainers/checkers
- Social objections – potential LLM misinformation seeding by bad actors
- “Enshittification” (Cory Doctorow) of the Internet – deepfakes, AI slop, “workslop,” AI tells (terrible writing)

# Potential Risks/Costs



[Why AI-generated hands are the stuff of nightmares, explained by a scientist - BBC Science Focus Magazine](#)

# Intentionality and Guardrails

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- Company Guidance (people, processes, tools)
  - Use of a secure AI tool for privacy (Microsoft Copilot freemium at Trace)
  - Copilot uses ChatGPT LLMs from OpenAI, with Microsoft's Copilot serving as a user interface layered on top
- Professional Organization Guidance
  - Association of Professional Engineers and Geoscientists of Alberta (APEGA) has a detailed AI use policy; others have ethical guidelines that are relevant
- Professional and personal competence (gut check)
- Active choice to use (or not)
  - Search without using the AI Overview

# Intentionality and Guardrails

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- Follow internal (company) and external (professional organization) guidelines
- Use critical thinking and professional judgment
- Always ask for sources/citations and scrutinize all citations
- Review at least as thoroughly as you would material that has not been generated by AI (so does it actually save time?)
- Ideally use for drafting, not for production of final deliverable

# Transparency

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- Citation: APA 7th ed.
  - In-text citation: (Microsoft, 2026)
  - Use a signal phrase describing the prompt and naming Copilot
  - Reference list: Microsoft (2026). *Copilot* (GPT-4). [Large language model]. <https://copilot.microsoft.com/>
  - Microsoft Copilot image prompt: text of prompt (yyyy)
- Include a sentence outlining the use of AI tools in introduction, conclusion, or methods section (“Microsoft Copilot was used to brainstorm ideas for this scenario.”)
- Methods appendix
- Optional: full text of prompt and output in an appendix

# Reflections . . .

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Microsoft Copilot image prompt: a computer looking at its own reflection in a woodland pool (2025)



# QUESTIONS?

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We're Here to Help.

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**TRACE**  
ASSOCIATES

We exist to help you have a great life.