Sustainable AI Project Guide
Focus 1: Designing Better Data Centers

Name(s): **Date:**

Design Scenario

You and your team run a sustainable design firm that develops innovative technology processes. You are looking more closely at the systems that develop artificial intelligence (AI), the infrastructure that supports them, and the resources that they require. Your team will use your skills as communicators, researchers, collaborators, and creative

Design Problem

Develop an idea for reducing AI's impact on the environment. Your solution could fit into the system at an individual, community, or global level.

As you complete this project you will use the Innovation Design Process.

1.Understand the Design Problem (pg 2-3):

- Read the background information for your focus area.
- Take notes on the problem and the approaches others are taking.

2. Brainstorm and Create (pg 4) :

- Use the template to brainstorm ideas.
- Be creative! Think of as many wild ideas as possible.
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3. Share Your Ideas (pg 5):

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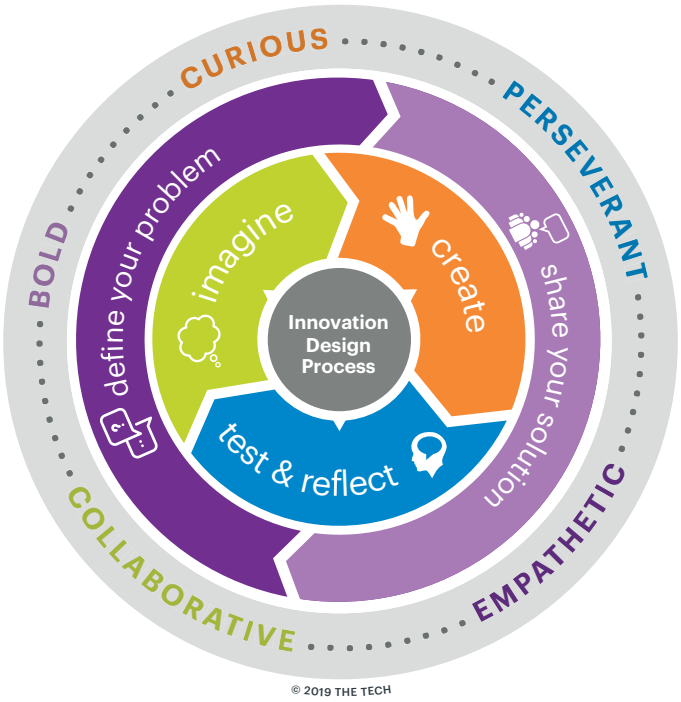

Understand the Design Problem

What problems are caused by growing Artificial Intelligence (AI) use?

The race to develop AI is demanding immense energy. Companies are in a hurry to be the first to build AI systems that will be reliable and profitable. In the state of Virginia, 25% of all power produced goes to **data centers.**[1] In 2023, data centers used about 50 gallons of water for each U.S. resident[2]—nearly half of what we each drink annually. This amount is expected to increase exponentially in only a few years.

Demand is growing so fast because AI requires greater storage on the **cloud** (remote servers); expanded computing infrastructure to handle huge amounts of data; faster processing; and quick cooling of these faster, more powerful machines. Because most of the energy that we use still comes from non-renewable sources, the result is unsustainable and threatens the climate.

Meanwhile, concerns about sustainability are growing. Local communities are becoming more wary of data centers. Their electricity and water bills are going up with the added demand for power. Noise and light pollution has negative health effects, and threatens birds and animals.

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Take notes on the problem

Focus 1: Designing Better Data Centers

What are people doing to reduce AI's negative effects on the environment?

Experts are using several different approaches to increase the sustainability of AI data centers and reduce their negative impact on the environment.

Designing Better Data Centers

Researchers are trying to design data centers that use less energy and don't rely on water cooling. For example, some designs are testing **submersion cooling,** where infrastructure is immersed in fluid that doesn't conduct electricity. Another approach underway is to build data centers in space, which is also cold and has no risk of fire, since there is no oxygen. There is increasing demand to process data collected from satellites in space.

The city of Stockholm, in Sweden, is linking its 30 data centers to its electricity grid—recovering enough heat to warm 31,000 homes sustainably. Because the climate is cold and warmth is needed, the city expects to use the heat created by the data centers to become fossil free by the year 2040. Underneath the city is an existing network of underground pipes that are used for heating homes and other buildings. Finland and Norway have similar projects underway.

Vocabulary

Term	Definition
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Equitable	To be just and fair, often in a way that accounts for existing disparities
Submersion cooling	Cooling systems that immerse data center infrastructure into liquid that does not conduct electricity.
Data center	Cooling systems that immerse data center infrastructure into liquid that does not conduct electricity.

Learn More

Video: Finland's Big Idea: Turning Data Center Waste Into Heat, Bloomberg Television *(11:14 mins)*

Read More: The Nordics' Quiet Revolution: Turning Server Heat into City-Scale Warmth, Global Data Center Hub, May 24, 2025

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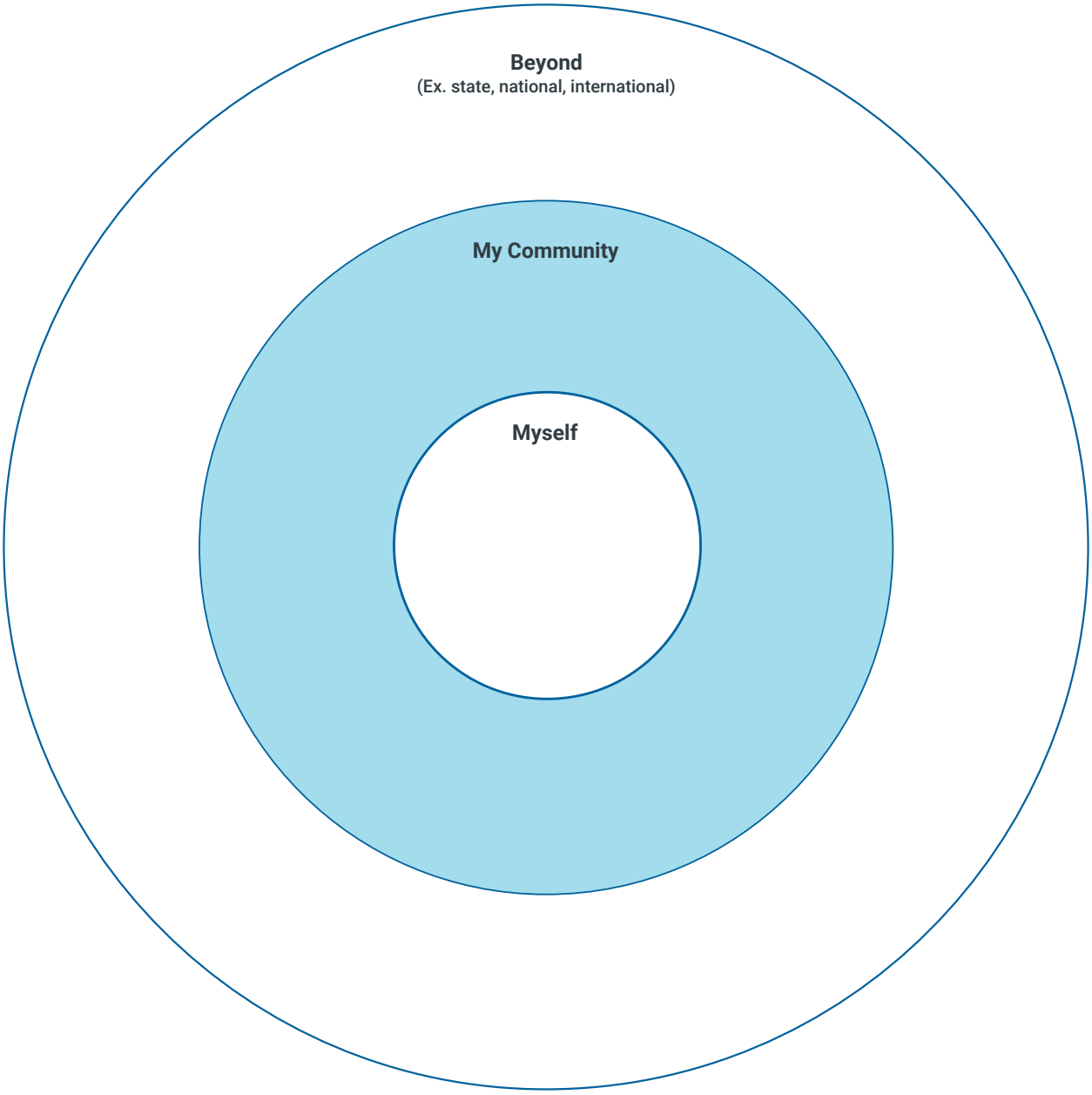

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Share Your Ideas

- What ideas have inspired you so far?
- Looking at the design of AI systems, what areas have the most potential for greater change towards sustainability?

Choose a few ideas to share with others.

Sustainable AI Project Guide
Focus 2: Tracking Data Center Energy Use

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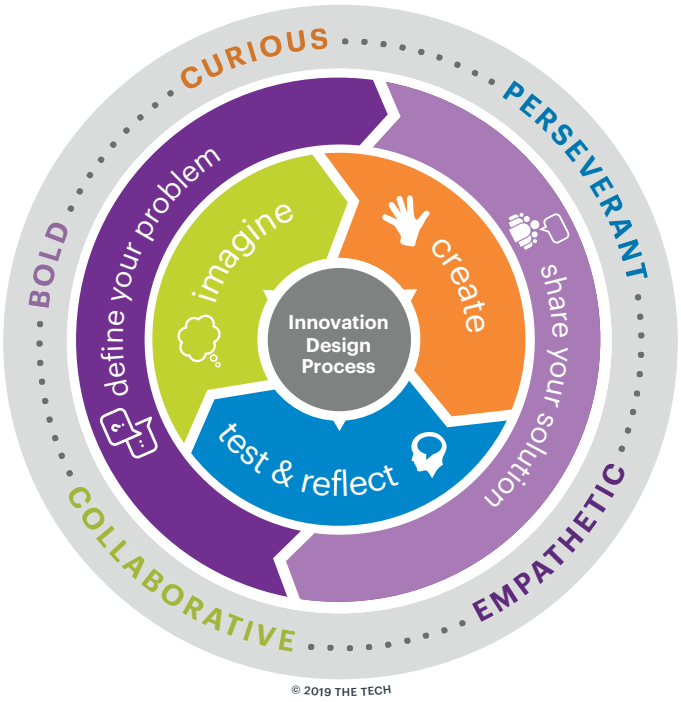

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Take notes on the problem

Focus 2: Tracking Data Center Energy Use

What are people doing to reduce AI's negative effects on the environment?

Experts are using several different approaches to increase the sustainability of AI **data centers** and reduce their negative impact on the environment.

Tracking Data Center Energy Use

Open source communities and researchers are developing tools for tracking AI model's sustainability and impact on the environment. Companies are competing to create AI systems and may not want to share their proprietary data, so it is helpful to have independent actors to track sustainability.

Hugging Face global community has developed a rating system for scoring both open source and corporate AI models for sustainability. The community maintains an AI Energy Score and leader board where AI models are given energy efficiency ratings, one to five stars, similar to efficiency ratings that you find on a new dishwasher or refrigerator. This is **crowdsourced** data, where anyone can submit results to contribute to the ratings system. It builds an international community working towards AI sustainability and helps people to feel that they can contribute to solving AI's sustainability problem.

Vocabulary

Term	Definition
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Cloud	Storage, servers, and applications that exist on the internet, instead of locally on your computer or local server.
Crowdsourcing	Obtaining services, ideas, or content from a large group of people
Data center	Cooling systems that immerse data center infrastructure into liquid that does not conduct electricity.
Equitable	To be just and fair, often in a way that accounts for existing disparities

Learn More

Video: "What is Hugging Face? (in about a minute)," *Eye on Tech, (1:26)*

See Who's Ahead: AI Energy Score Leaderboard

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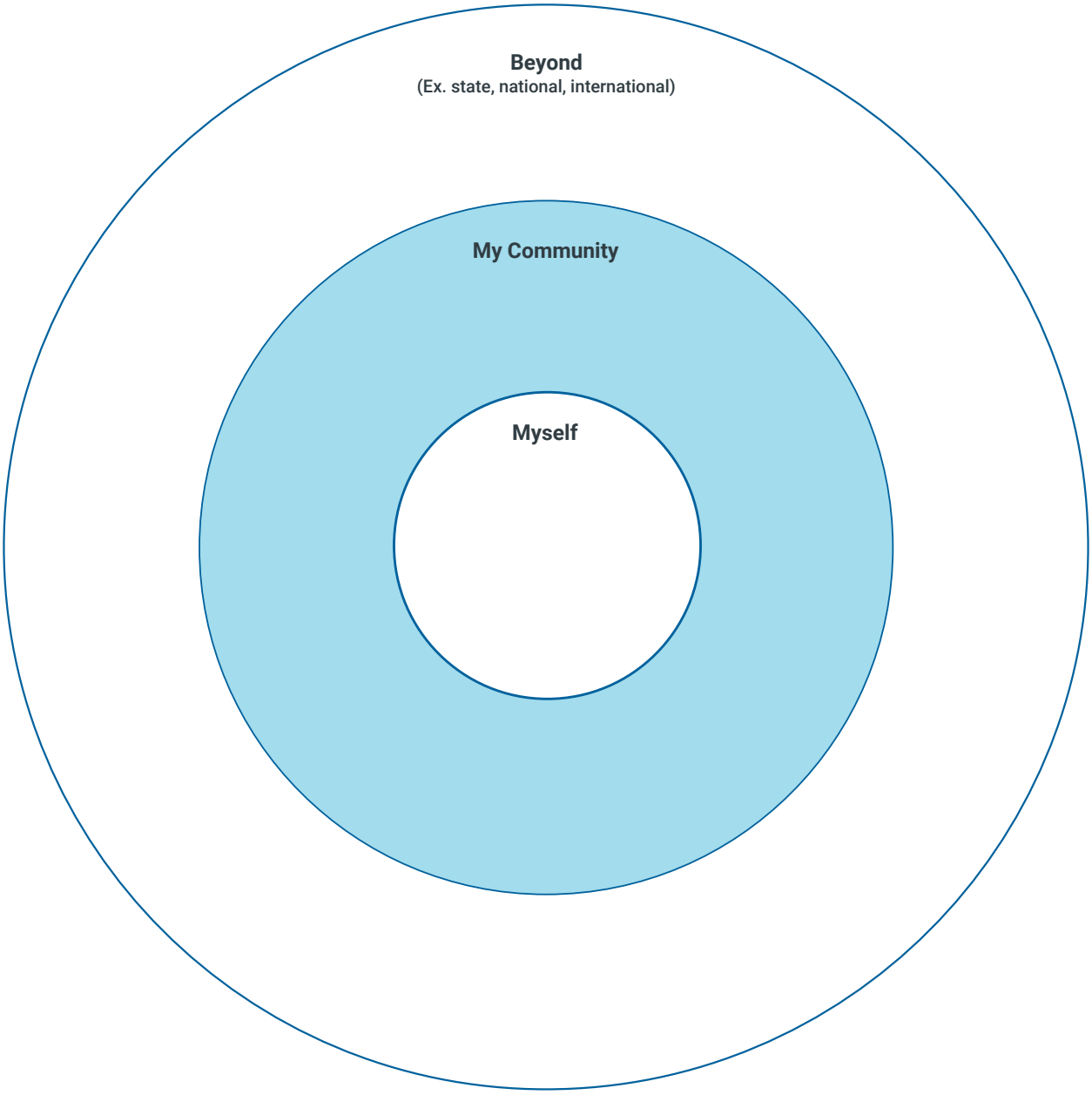

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Sustainable AI Project Guide
Focus 3: Improving AI Inputs and Outputs

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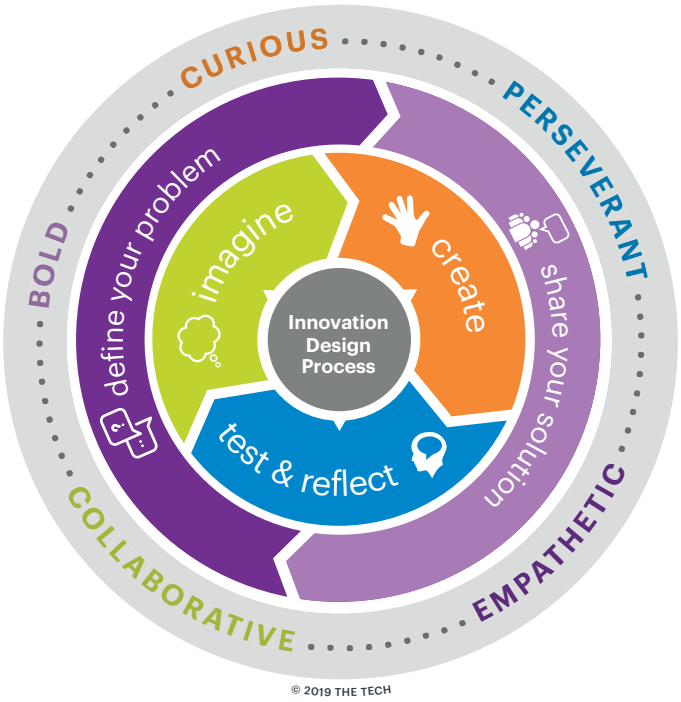

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Focus 3: Improving AI Inputs and Outputs

What are people doing to reduce AI's negative effects on the environment?

Experts are using several different approaches to increase the sustainability of AI data centers and reduce their negative impact on the environment.

Improving AI Inputs and Outputs

Researchers are looking at ways to reduce the energy that it takes to process AI's complex math equations. This might mean simplifying the equations or using more efficient models to train AI systems on data, which makes up a significant proportion of their energy consumption. **Large Language Models (LLMs)** are trained continuously on vast amounts of data to produce their responses. Sustainability might mean limiting the length of the responses of an LLM chatbot to its users.

Darren Nguyen, Harsh Malik, and Vishnuvardhan Kandala, three undergraduate students at the University of Washington Bothell, won a hackathon prize by creating a prototype for a Green AI app that allows users to turn on a setting asking their AI chatbot to provide 80% shorter answers. "Small tweaks at the code level can lead to giant impacts globally," the team said in their presentation.

Vocabulary

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Equitable	To be just and fair, often in a way that accounts for existing disparities
Large Language Models (LLMs)	A language model AI trained with self-supervised machine learning on vast amounts of text.

Learn More

Read more: "A Shared Passion for Sustainability in Tech Generates 'Green AI'," University of Washington Bothell, Sept. 3, 2025

Try Their App: Green AI, DevPost (use the QR code on the last slide of their presentation to open the Green AI app)

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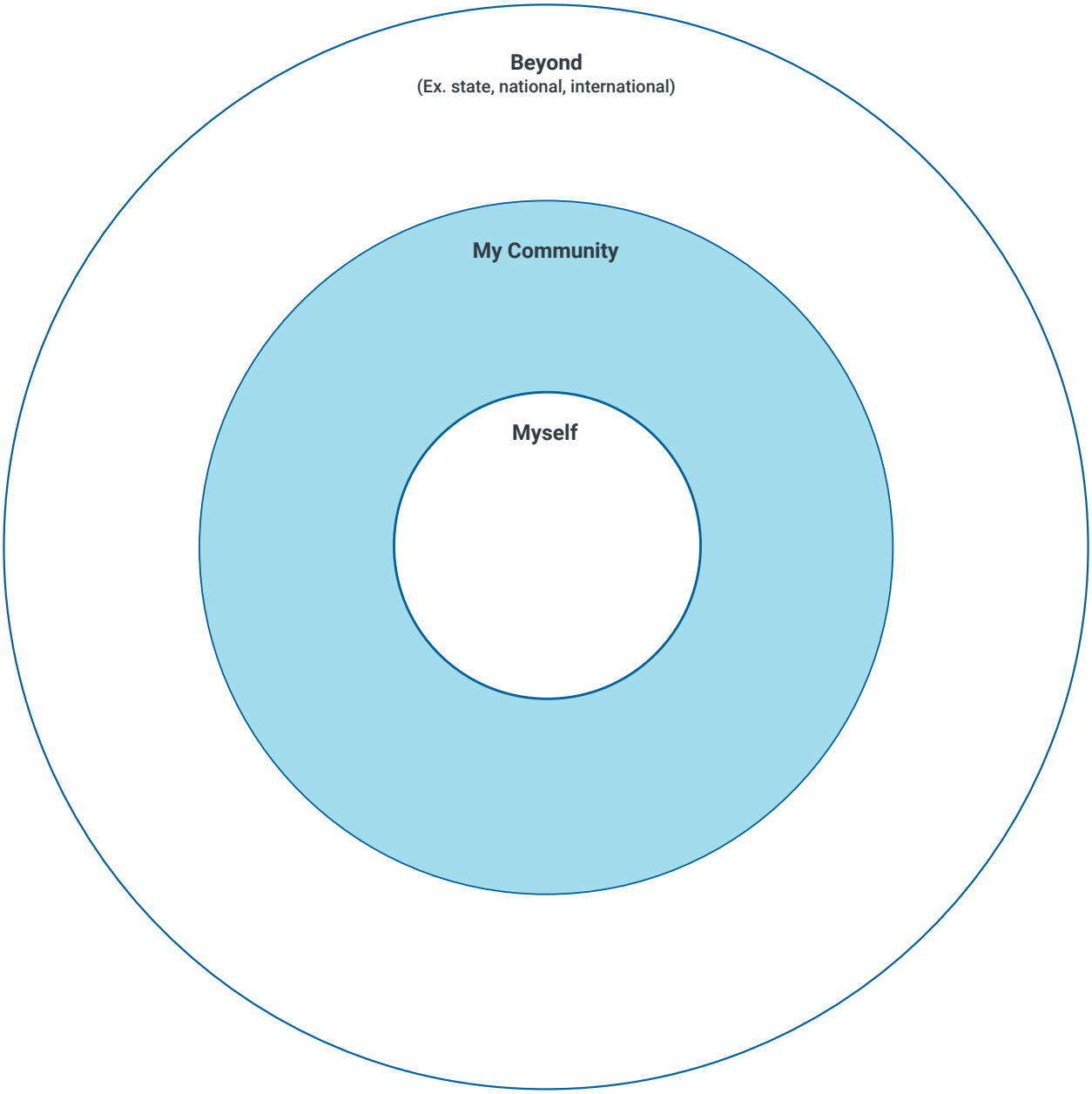

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Sustainable AI Project Guide

Focus 4: Reducing Data Center Noise and Light Pollution

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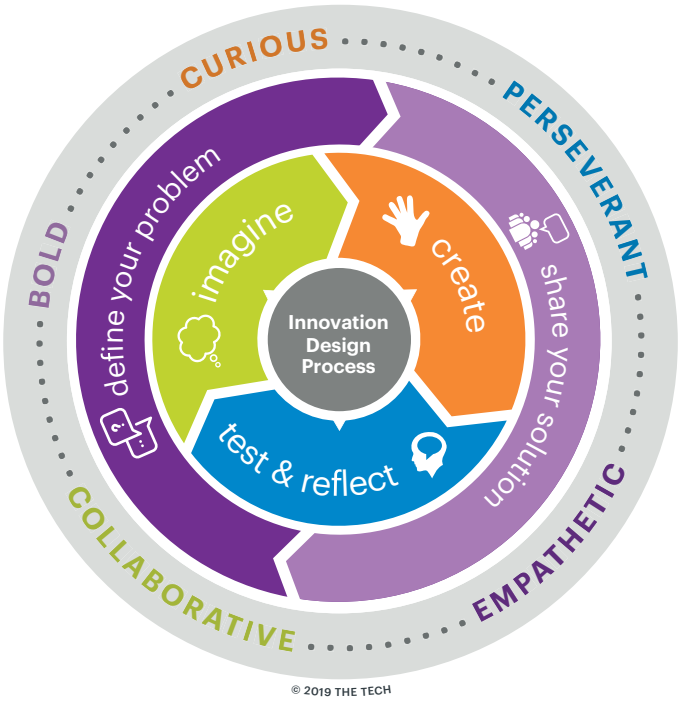

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Take notes on the problem

Focus 4: Reducing Data Center Noise and Light Pollution

What are people doing to reduce AI's negative effects on the environment?

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Reducing Data Center Noise and Light Pollution

Communities are frustrated by annoying noise and light pollution from data centers. Existing regulations don't usually ban the low humming noise produced by processors, cooling fans, and other moving parts. Lights from data centers are too strong and disrupt bird migration. People living nearby suffer health problems and their homes are harder to sell.

Now when a data center is being planned, residents attend municipal meetings to express their concerns. Local officials are doing research to make sure that they draft regulations that protect the community. In Hampden Township, Pennsylvania, local leaders consulted environmental engineers and researchers to make sure they thought of all the ordinances required to reduce the data center's negative footprint. They set guidelines for engineers to build the data center to meet expectations, keeping within certain noise and vibration limitations. They also restricted the center's night-time lighting and glare reflecting offsite. Finally, officials built in safeguards to keep the data center's owners accountable to citizens.

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Learn More

Read more: Case Studies: Hampden Township's Experience," Pennsylvania Municipal League, Feb. 24, 2026

Video: "Walls Up at Data Center Near Williston, But Residents Say Noise Issues Remain," KYUR-TV *(2:21)*

In The News: "Elon Musk's Makeshift AI Power Plant Generates Sound and Fury in Mississippi," NBC News, Feb. 26, 2026

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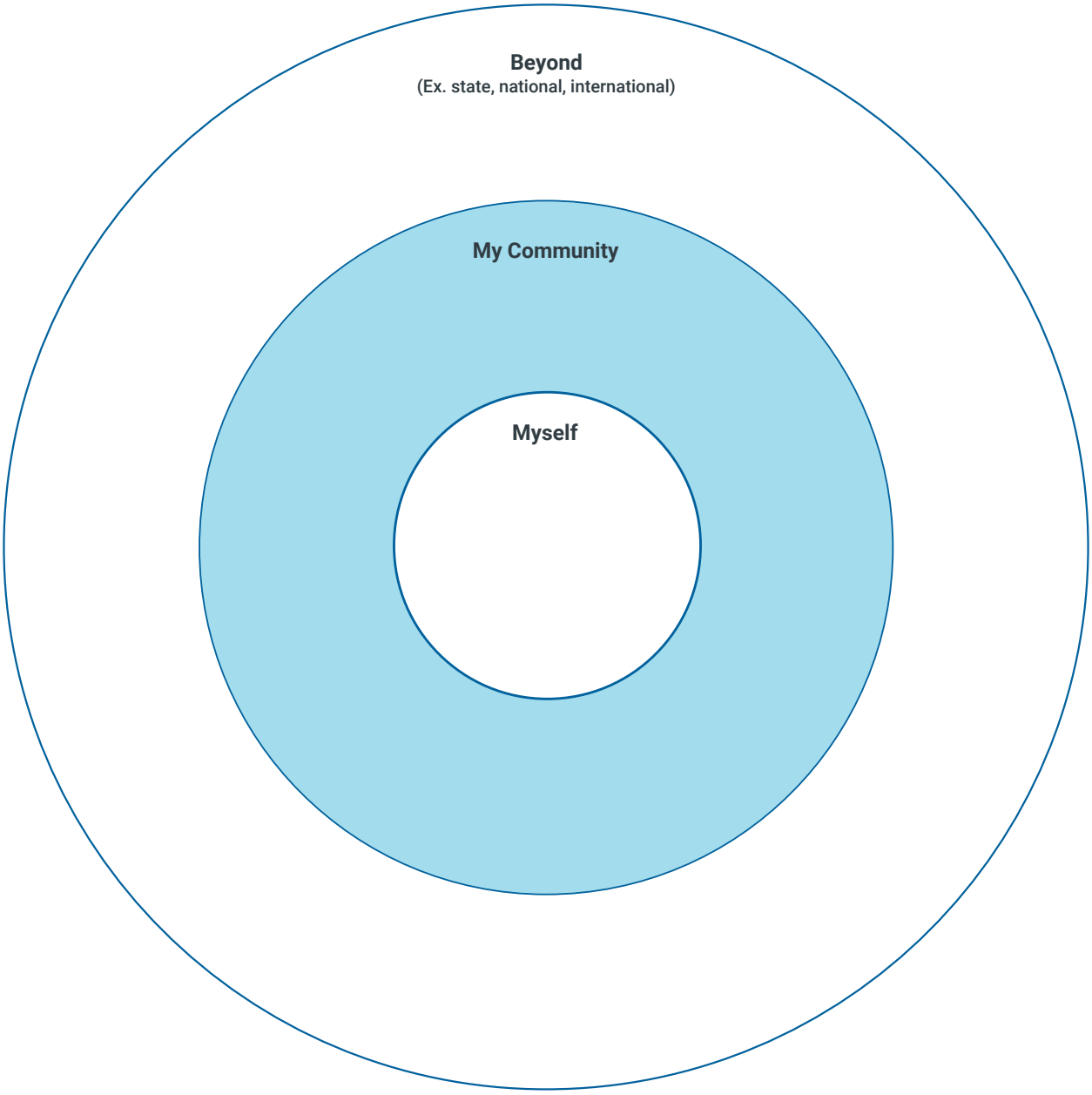

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