# Final Project Worksheet

| ***Explain the goal of the project and why the goal is important generally and for your target audience. 100 words*** |
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| The goal of this project is to educate upper high school and early college students about the environmental impacts of electronic waste and carbon emissions, and to empower them to make informed, sustainable technology decisions. These issues directly affect students because they are the major consumers of digital devices, yet are often unaware of the environmental consequences of manufacturing, using, and disposing of electronics. This project encourages students to think critically about consumption, recognize environmental injustice in global e-waste flows, and adopt responsible behaviors. The goal is important because informed young people can influence cultural norms, promote sustainable practices, and advocate for systemic change. |
| ***Identify the target audience for the message and explain why y*****ou selected them and how you will reach them*****. 50 words*** |
| The target audience is students in grades 11-14, including high school juniors/seniors and early college learners. They were selected because they are heavy users of digital technology and are beginning to form independent consumption habits. The project reaches them through a structured lesson plan, presentation materials, and a mini-lecture delivered in a classroom or online learning environment. |
| ***Describe how the project met the goals. 50 words*** |
| The project met its goals by presenting clear explanations of e-waste and carbon emissions through interdisciplinary frameworks, engaging students through visuals and discussion, and offering practical solutions for sustainable tech use. The lesson plan, mini-lecture, and applied themes connect everyday device habits to global environmental impacts, encouraging informed, responsible behavior and critical thinking. |
| ***Discuss the three disciplines being used and why they were selected. 100 words*** |
| Environmental science, economics, and political science were selected because together they offer a comprehensive understanding of e-waste and carbon emissions. Environmental science explains toxic materials, pollution pathways, and climate impacts. Economics reveals how supply chains, market demand, and consumer behavior drive overproduction and short device lifespans. Political science examines regulatory failures, global waste agreements, and policy strategies for extended producer responsibility. Using these disciplines strengthens the project by showing how environmental problems emerge from intersecting systems rather than isolated factors. Additional disciplines, such as sociology or ethics, could further enhance the analysis by exploring cultural norms and moral responsibility. |
| ***Explain how the project has allowed you to add new competencies to your ePortfolio. 50 words*** |
| This project strengthened competencies in interdisciplinary analysis, sustainable practices, educational communication, and problem-solving. Creating a lesson plan and mini-lecture improved my ability to translate complex environmental issues for diverse audiences. The |

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| project also demonstrates my capacity to integrate research, evaluate environmental risks, and propose actionable solutions, key competencies for professional and academic settings. |
| ***Demonstrate that you have added the project to your ePortfolio—add a link to your ePortfolio, with proof the project was added. 10 words.*** |
| https://www.b-rathjen.com/ |

**Interdisciplinary Lesson Plan on E-Waste, Carbon Emissions, and Sustainable Technology Education**

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The University of Arizona Global Campus

LIB 315: The Environment & The Human Spirit

Instructor: Scott Maxon

November 23, 2025

Interdisciplinary Lesson Plan on E-Waste, Carbon Emissions, and Sustainable Technology Education

## Introduction

Understanding modern environmental issues requires interdisciplinary thinking because technological systems connect economic, political, scientific, and cultural forces. This project presents a comprehensive lesson plan and mini-lecture designed for upper high school and early college students, addressing two major environmental issues discussed in Environment and Society: electronic waste and carbon dioxide emissions. These issues are tightly linked to everyday technology consumption and provide an opportunity for students to recognize how personal choices interact with global systems. This project's goal is to educate students about the environmental impacts of digital technology and empower them to adopt sustainable practices, evaluate corporate claims critically, and advocate for responsible tech production and disposal.

## Defining Nature and Environment

In environmental studies, nature refers to ecosystems, living organisms, and physical processes that exist independently of human design. The environment encompasses both natural systems and human-built structures, including the social, technological, and economic conditions shaping daily life (Robbins et al., 2022). These definitions matter because e-waste and emissions

demonstrate how human-built technological environments directly affect natural systems through pollution, extraction, and carbon production.

## Environmental Issues Addressed

### 1. Electronic Waste (E-Waste)

E-waste is one of the fastest-growing global waste streams (United Nations, 2023). Devices contain toxic metals such as lead, mercury, cadmium, and brominated flame retardants that contaminate soil and groundwater when improperly discarded. Only about 17% of global e-waste is formally recycled. Most is exported to low-income countries, where informal recycling exposes communities, often children, to extreme health risks.

Students are major users of personal digital devices, making this issue highly relevant to their lived experiences.

### 2. Carbon Dioxide Emissions

The technology sector generates significant $CO_2$ emissions through manufacturing, data centers, global shipping, and short device life cycles. Smartphone production alone emits millions of tons of carbon annually (World Economic Forum, 2024). Understanding these impacts helps students connect everyday device use to climate change.

Understanding these impacts helps students connect everyday device use to climate change.

## Academic Disciplines Integrated

1. Environmental Science examines pollutants, toxicology, and ecological impacts.
2. Economics explains supply chains, consumer behavior, and market incentives that drive technology overconsumption.
3. Political Science considers environmental regulations, international waste agreements, and extended producer responsibility laws.

## Course Themes Applied

• Means of Production - Manufacturing processes and global supply chains generate emissions and waste; tech growth relies on resource extraction.

• Ideologies – Capitalist ideologies normalize constant upgrading, convenience, and consumption.

• Environmental Justice - Toxic waste disproportionately harms low-income and Global South communities.

• Risk and Uncertainty – Consumers remain unaware of hidden risks associated with electronics production and disposal.

• Greenwashing – Tech companies use sustainability marketing that often exaggerates environmental benefits.

## Cultural Factors

Technology culture shapes environmental outcomes. In the U.S., rapid upgrade cycles and social preferences for new devices motivate overconsumption. In contrast, many low-income countries face the cultural burden of becoming global dumping sites. Understanding these cultural dimensions helps explain unequal environmental impacts and why international cooperation is needed.

## Working Toward Solutions

Solutions include extending device lifespan, responsible recycling, supporting transparent companies, advocating EPR policies, and reducing digital carbon footprints through conscious technology use.

Students can engage in solutions including:

- Extending device lifespan
- Participating in certified e-waste recycling
- Supporting companies with transparent environmental policies
- Advocating for EPR laws
- Reducing cloud storage waste and energy consumption
- Educating peers and families about responsible tech use

Systemic solutions require policy reform and corporate accountability, supported by informed citizens.

## Importance of the Interdisciplinary Perspective

E-waste and $CO_2$ emissions cannot be understood from a single perspective. Environmental science identifies the physical harm; economics explains consumption patterns; political science addresses failures in regulation; cultural studies reveal how values drive behavior. Using multiple disciplines helps students critically evaluate technology systems and understand why environmental issues persist.

## 10–12 Minute Lesson Plan (Grades 11–14)

### Learning Objectives

Students will be able to:

1. Identify environmental impacts of e-waste and carbon emissions.
2. Explain connections between technology use and environmental harm.
3. Apply interdisciplinary analysis to real-world issues.
4. Propose sustainable technology practices.
5. Critically evaluate corporate sustainability claims.

### Lesson Sequence (12 Minutes Total)

#### Minute 0–1: Hook

Show an image of an Agbogbloshie e-waste burning site.

Ask: “Where do you think your old phone went?”

#### Minute 1–3: Definitions

Define nature, environment, e-waste, and digital carbon footprints.

Minute 3–6: Environmental Science Perspective

Explain toxicity, greenhouse gases, and ecological harms using quick infographics.

Minute 6–8: Economics + Political Science

Discuss upgrade culture, global supply chains, and weak waste regulations.

Minute 8–10: Course Themes

Apply ideologies, means of production, greenwashing, environmental justice, and risk.

Minute 10–11: Solutions + Call to Action

Give practical steps students can take today.

Minute 11–12: Exit Reflection

Students answer: “What is one change you can make to reduce your tech footprint?”

## Mini-Lecture Script

“Today we’re exploring how the devices we use every day, our phones, laptops, tablets, shape the environment in ways we rarely see. Electronic waste is now one of the fastest-growing global waste streams, and most discarded electronics are never safely recycled. Instead, they are shipped to low-income communities, where toxic materials contaminate soil, water, and air.”

“At the same time, manufacturing these devices creates significant carbon emissions. From mining metals to running data centers, our digital habits have a real carbon cost. A single smartphone produces most of its lifetime emissions before you ever turn it on.”

"To understand this issue fully, we need multiple disciplines. Environmental science explains pollution. Economics helps us understand why companies design devices to be replaced quickly. Political science shows us why international agreements often fail to prevent e-waste dumping."

"Course themes help us dig deeper. Ideologies like consumerism encourage constant upgrades. Greenwashing hides environmental damage behind marketing. Environmental justice reveals how harms fall disproportionately on marginalized communities."

"But we can act. By keeping devices longer, recycling responsibly, using energy-saving settings, and supporting companies with transparent sustainability practices, we can reduce our impact. And by sharing this knowledge, we help create a culture that values responsible technology use."

## Conclusion

E-waste and $CO_2$ emissions offer an important opportunity for students to connect personal behavior to global environmental systems. Through this interdisciplinary lesson plan and mini-lecture, students learn how technology consumption influences natural and social environments, how corporations and governments shape outcomes, and how they can become active participants in sustainable change. Environmental education equips young people to make informed decisions and to engage in solutions that support a healthier and more equitable planet.

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# E-Waste, Carbon Emissions, and Sustainable Technology

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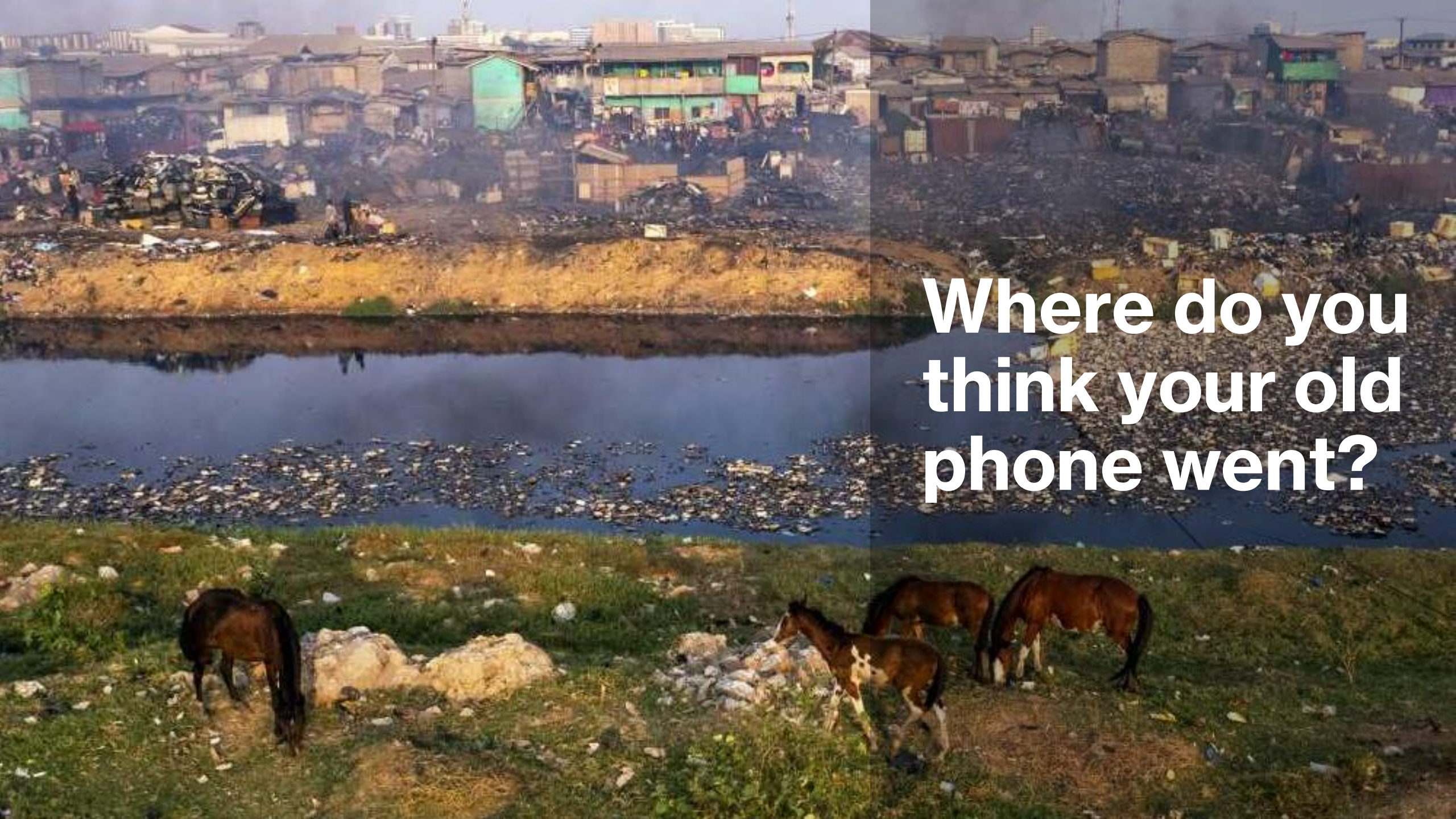
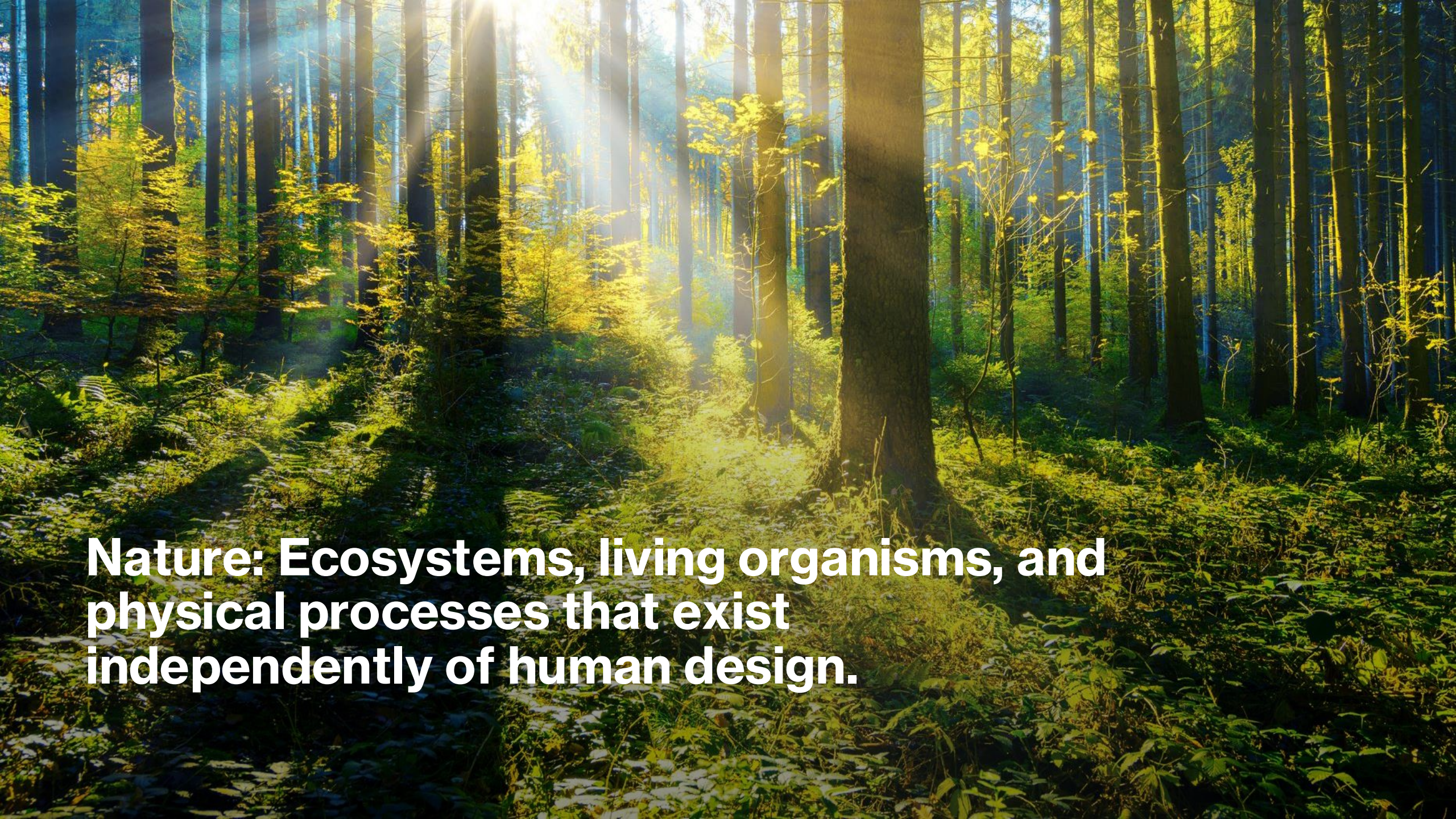
LIB 315: The Environment & The Human Spirit

Instructor: Scott Maxon

November 23, 2025


Where do you think your old phone went?


Nature: Ecosystems, living organisms, and physical processes that exist independently of human design.

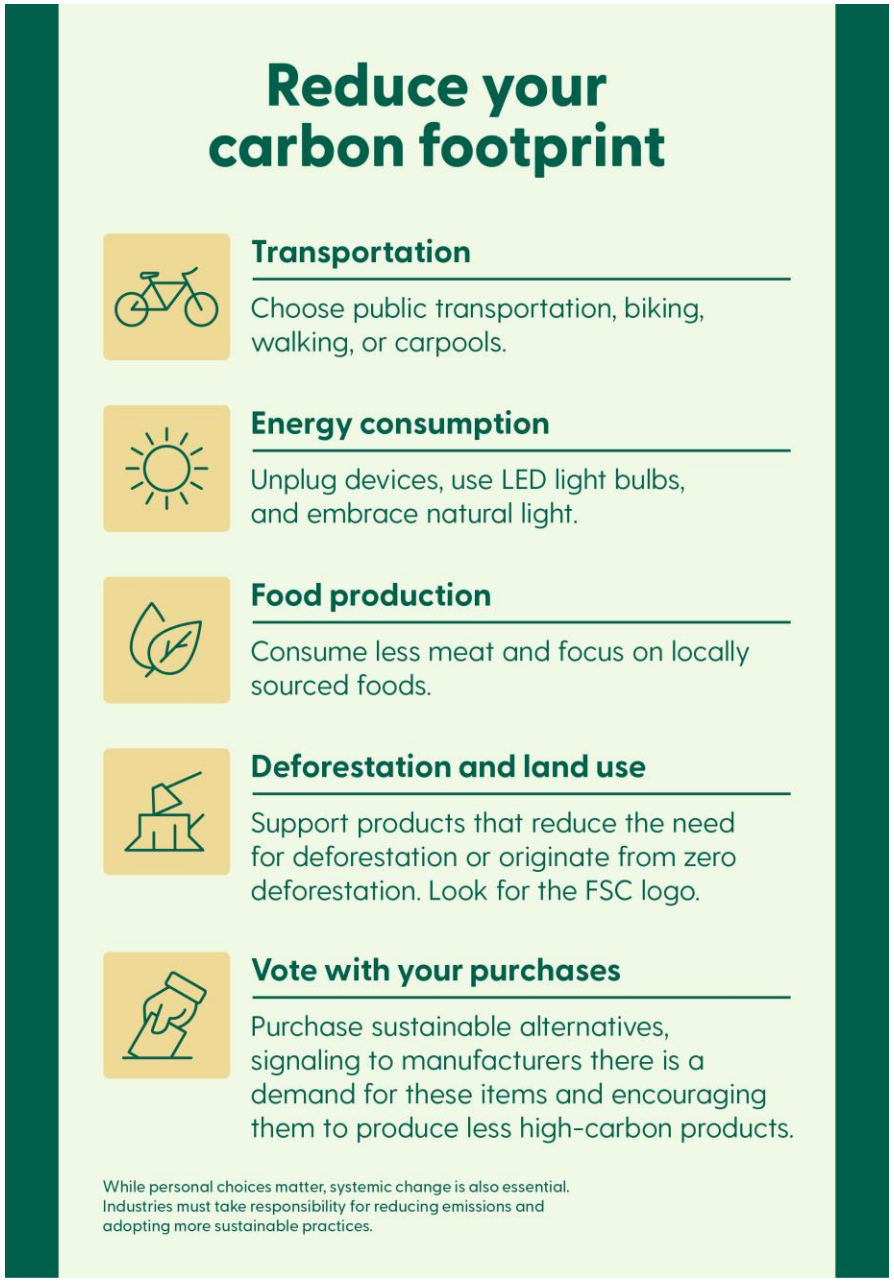
# Environment: Natural and man-made structures

# What is E-Waste?

E-Waste refers to any electronic devices that are broken, old, or no longer in use and need to be recycled.

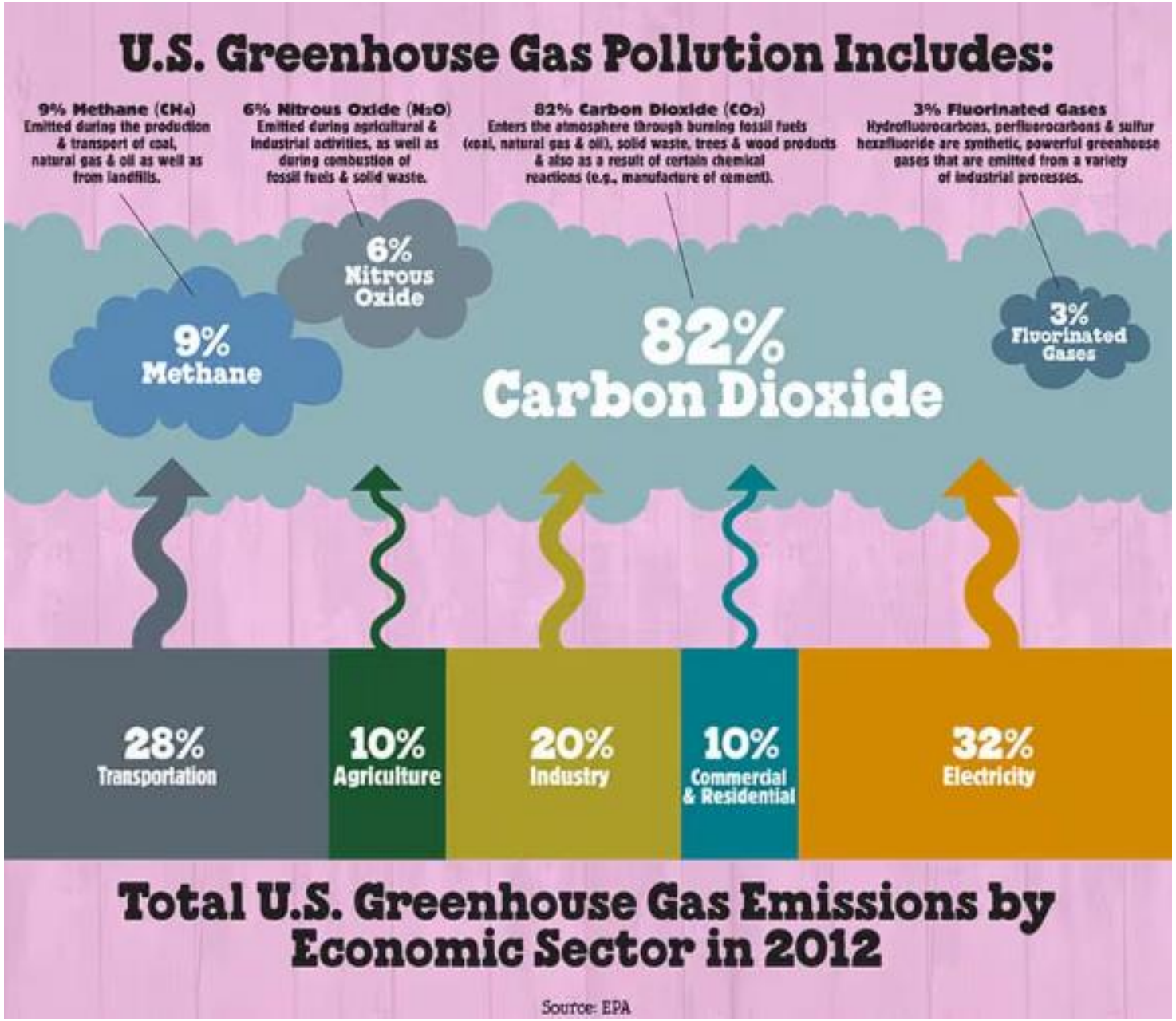
# Common E-Waste Items:

- Smartphones
- Laptops
- Tablets
- Servers
- Switches
- Routers
- Monitors
- Microwaves
- TVs
- Speakers
- Printers
- Copiers
- IT servers
- Defibrillators




**Carbon Footprint: The total amount of greenhouse gases generated by an individual, organization, event, or product.**

# Greenhouse Gases



# THE ENVIRONMENTAL IMPACT OF ewaste

E-waste poses significant environmental threats due to improper disposal methods, leading to environmental pollution. Toxic substances such as lead, mercury, and cadmium, found in electronic devices, can leach into the environment, contaminating ecosystems and posing health risks to humans and wildlife alike. Effective e-waste management strategies are crucial to mitigate these impacts and promote environmental sustainability.

## ENVIRONMENTAL POLLUTION FROM E-WASTE

### Soil Pollution

The contamination of soil with harmful substances.

The improper disposal of electronic devices leads to toxic substances leaching into the soil, including heavy metals.

### Water Pollution

The discharge of toxic substances into water bodies.

Improper disposal methods release toxic substances into water bodies, contaminating aquatic ecosystems.

### Air Pollution

The release of harmful chemicals and particles into the air.

Processes such as incineration, where chemicals are released into the atmosphere, lead to air pollution.

## TOXIC SUBSTANCES GENERATED BY E-WAS INTO THE ENVIRONME

### Heavy Metals

Lead, mercury, cadmium, and chromium

### Organic Pollutants

Polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs

### Chlorofluorocarbons and Hydro CFCs

Found in refrigerants and foam insulatio

### Polyvinyl Chloride (PVC

Present in cables, wires, and casings

### Phthalates

Used in plastics for flexibility

### Toxic Gases

Released during incineration processes

## HEALTH RISKS ASSOCIATED WITH E-WASTE

- Exposure to hazardous substances for workers in informal recycling sectors
- Increased incidence of respiratory problems, skin diseases, and other occupational hazards
- Exposure of nearby communities to e-waste pollution, leading to adverse health effects
- Increased risk of cancer, neurological disorders, and reproductive issues among residents exposed to e-waste contaminants

## HOW TO REDUCE THE ENVIRONMENTAL IMPACT OF E-WASTE?

### Repair and Reuse

Extend the lifespan of electronic devices by repairing and reusing

### Donate Electronics

Give working electronic devices to those in need, reducing the demand for

### Recycle Responsibly

Properly recycle electronic devices at certified centers to prevent hazardous

# So what should you do? Recycle your phone, tablet, computer etc


What is one way you can reduce your tech footprint starting today?