

# THE ENVIRONMENT

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An illustration infographic book by Ruby Chen

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# **Polluted Planet**

What is the link between air pollution and human health? Why are plastics our constant companions? This section focuses on four pollution-related problems and the challenges they bring.



Silent Killer How does air pollution affect our health?

**Grilled Planet** How does global warming change the environment?

**Invasions Everywhere** How do plastics impact our life at different stages of their life?

Melting Future What are the past, present and future of earth'st sea levels?

# How does air pollution affect our health? Silent Killer



### **Indoor air pollution**

Indoor air pollution occurs due to burning solid fuels like crop waste, dung, charcoal, and coal for cooking and heating. This produces harmful particulate matter, especially risky for respiratory diseases. Such burning in small enclosed spaces elevates disease risks.

### 7 million deaths annually linked to both sources of air pollution.

It contributes to 11.65% of global deaths.

### Disease burden by top 10 risk factors

Air pollution is one of the leading risk factors for disease burden.

High blood pressure	235.42 million
Air pollution (outdoor & indoor)	213.28 million
Smoking	199.79 million
High blood sugar	172.07 million
Obesity	160.27 million
Outdoor particulate matter pollution 118.22 million	
High cholesterol 98	3.62 million
Indoor air pollution 91.4	17 million
Child wasting 83.53 million	
Unsafe water source 65.1 million	

Who is most affected by air pollution? Death rates from air pollution are highest in low-to-middle income countries.

### Death rate from air pollution, 2019



### How are death rates from air pollution changing?

Death rates from air pollution are falling, mainly due to improvements in indoor pollution.

**Outdoor** air pollution

The fine particles that pollute our air mostly

come from human actions like burning

transportation, agriculture (leading to

Natural sources encompass volcanic

chemical/mining sectors.

fossil fuels for power, waste incineration,

methane and ammonia emissions), and

eruptions, sea spray, soil dust, and lightning.

# Death rate from air pollution, World, 1990 to 2019 Air pollution (total) 140 120 100 Indoor air pollution 60 Outdoor particulate matter 40 20 Outdoor ozone pollution 0 1990 1995 2000 2005 2010 2015

### How does global warming change the environment?

# **Grilled Planet**

### **Global Temperature Trends**

In recent decades, global temperatures rose significantly, approximately 0.7°C higher than our 1961-1990 baseline. Extending back to 1850, temperatures were 0.4°C colder than the baseline, resulting in an average rise of 1.1°C.

### The tipping point of Climate Change

Global warming of 1.5°C represents an average across the planet, some regions, like the Arctic, warm much faster, up to 2-3 times. Crossing 1.5°C risks climate tipping points, like Coral Reefs Die-Off and Permafrost.



# **Climate-related disasters frequency**

The effects of global warming are far-reaching, including rising sea levels, glacier retreat, changes in the timing of seasonal events (plants flowering, migration patterns), and a rise in the frequency and severity of extreme weather events. This graph depicts the trend in these climate-related disasters over time.



### How safe and clean is each energy source?

The chart shows that nuclear and renewables emit fewer greenhouse gases than coal, oil, and gas. Despite this, fossil fuels still dominate the global electricity mix. Transitioning to nuclear and renewables can combat climate change and reduce deaths from accidents and air pollution, benefiting both current and future generations.



# **Invasions Everywhere**

### **Before use**

Humans are exposed to a large variety of toxic chemicals at the stages of extraction, transportation, refining and manufacture.



How much plastic does the world produce? The World generates **400 million tonnes** of plastic waste a year.



The Great Pyramid of Giza (5.9 million tonnes)

# Use

Other than toxic chemicals, humans are exposed to toxic microplastics. Scientists have raised concerns that micro plastic exposure can cause: Inflammation, genotoxicity, chronic diseases autoimmune diseases



### Which sectors produce the most plastic?

Plastic can be found everywhere, this chart shows the plastic waste by sectors.



**50%** of consumer plastics is single-use due to the global shift from reusable to single-use containers, making **plastic packaging** the largest sector in plastic production.

## After use

After plastic items are consumed or used, they may follow several routes.



Some are collected and sorted through formal or informal waste management schemes or by manufacturers, recycled into plastic pellets or flakes, and reused. Others are incinerated, burned openly, sent to landfills/dumpsites, or end up in the environment.

### How do we dispose of our plastic?

Globally, 25.5% is incinerated and 55% is mismanaged while only 19.5% of plastic waste is recycled.



1980 1985 1990 1995 2000 2005 2010 2015

### Impact

Every piece of plastic ever produced still exists today, and two-thirds of it has been released back into the environment.



### What are the past, present and future of earth's sea levels?

# **Melting Future**

Sea level rise is the increase in the level of the world's oceans and it has a significant impact on human populations, particularly those living in coastal areas.

### The key impacts including:

Coastal Flooding, Displacement and Migration, Saltwater Intrusion, Ecosystem Disruption, Infrastructure Vulnerability, Economic Implications, Health Risks.

# Main factors

Two main factors of sea level rise over the past 25 years are both related to global warming:



### Ice sheets mass variation







By 2050, "moderate" (typically damaging) flooding is expected to occur, on average, more than 10 times as often as it does today, and can be intensified by local factors. By 2150, global sea levels will rise by **1.4 meters** if temperatures continue to rise at the current pace, storm surges likely will be at least twice as high as they are today.



# **Fading Biodiversity**

What is the meaning of biodiversity? What are the causes of its decline? This section introduces four topics related to biodiversity, helping you understand the subtle balance between humans and the ecosystem.



Nature Crisis What is the state of biodiversity loss around the world?

Wooden Cake What are the impacts and the current state of forest loss?

**Invisible Catastrophe** What does ocean acidification do?

**Treasure in the Oceans** What is the connection between overfishing and human life?

# What is the state of global biodiversity loss? Nature Crisis

### What is biodiversity?

Biodiversity encompasses all life forms on Earth, from bacteria to animals and plants. Currently, about 1.6 million species are known, but it likely represents only a small fraction of Earth's total diversity.

### Main drivers of biodiversity loss

- 1. Changes in land and sea use
- 2. Exploitation of natural resources
- 3. Global warming
- 4. Pollution
- 5. Invasive species

### Why is it important?

Biodiversity is vital for sustaining life on Earth, including humans. Species and organisms in ecosystems work together like an intricate web to maintain balance and provide food, clean water, medicine, and shelter. Loss of biodiversity is alarming, with serious risks for societies, economies, and the health of the planet and its inhabitants.

### Implications for human health Infectious disease

Biodiversity loss raises infectious disease risks as wildlife-human contacts increase.

### Food and nutrition

Habitat destruction and biodiversity loss threaten food availability and human health.

### Medicines supply and research

Biodiversity loss endangers medicinal resources, impacting drug development.

### Wellbeing and pleasure

Biodiversity loss affects holistic wellbeing, including mental health and learning.



45%

51%

Biologists often use the metric biomass, this means that each animal is measured in tonnes of carbon, the fundamental building block of life.



### What does ocean acidification do? **Invisible CatastropHe**

### What is ocean acidification?

Ocean acidification, a global threat to oceans, estuaries, and waterways, is often termed "climate change's evil twin." It will worsen with record-high carbon dioxide emissions.



### The pH scale

Between 1986 and 2020, the ocean surface pH dropped from 8.11 to **8.05**. The pH scale's logarithmic nature means this change equals around a 30% increase in acidity.

# Impacts on humans/ Expected socioeconomic impacts from ecosystem service declin

### Food

Ocean acidification affects food security, impacting commercially and ecologically vital marine species differently.

### Coastal protection

Coral reefs shield shorelines from cyclones, preventing loss of life and property damage, valued at US\$9 billion annually.

### Tourism

Ocean acidification's impact on marine ecosystems could severely affect the industry. Australia's Great Barrier Reef attracts 1.9 million visits annually, generating over A\$5.4 billion to the economy.

### Carbon storage and climate regulation

As ocean acidification intensifies, the ocean's CO2 absorption capacity declines, reducing its role in mitigating climate change.

### How does it happen?

The ocean absorbs 30% of atmospheric CO2 released by humans. As CO<sub>2</sub> levels rise, more is absorbed, leading to increased hydrogen ion concentration. This process affects the ocean and its inhabitants.



### Swimmina?

Ocean acidification may throw off the delicate balance of the myriad minute organisms that live in every drop of seawater, but it won't make the water unsafe to swim in.

Jellvfish

### The food web

All varieties of marine life affect each other through complex food webs. Changes in one species can ripple through others, as they are all interlinked in the ecosystem.

Quaternary consumers

Tertiary consumers



Secondary consumers



rimary consumers

Species benefit from ocean acidification Some organisms, like certain sea grasses, might benefit from ocean acidification.

Jellyfish appear resistant but not immune to acidification. Researchers believe the selectivity of this damage leads to the rise of jellyfish. As their competitors and prey become less fit, jellyfish capitalise by increasing their consumption.

Sea drasses

### **Directly affected species**

Many ocean plants and animals build shells and skeletons out of calcium and carbonate. Rising acidity hinders growth and can even dissolve structures faster than they form.



What is the connection between overfishing and human life?

# **Treasure in the Oceans**

### What are the most threatened fishes?



Overfishing caused a 70% decline in sharks in 50 years. Factors like bycatch, climate change, pollution, habitat loss, prey depletion, and human disturbance are pushing over a third of global shark species towards extinction.

# What does overfishing mean?

Overfishing occurs when humans take fish from the marine and freshwater sources at a rate faster than fish can repopulate.

### **Depletion**>Replacement

Overexploitation upsets marine food webs, causing cascading effects on various species and impacting the environment's delicate balance.



### European eel

Habitat degradation, overfishing, pollution, and climate change threaten the European eel with extinction by the end of the century.



Atlantic bluefin tuna Both Eastern and Western Atlantic bluefin tuna stocks have declined at least 50% since 1970.

How much of the world's fish is managed sustainably? Sustainable fishing means catching the right amount to avoid overfishing or underutilizing resources. In 2017, one-third of global fish stocks were overfished, two-thirds were biologically sustainable, with 60% maximally fished and 6% underfished.





Most people consume approximately twice as much food as they did 50 years ago and there are four times as many people on earth as there were at the close of the 1960s.



Most harmful methods of fishing Most fishing techniques have environmental impacts, like burning fuel, unintentional bycatch, and gear remnants.

Dredging and bottom trawling have the most significant negative impact. These methods drag structures along the seabed, dislodging crustaceans, and are efficient but environmentally costly. About one-quarter of the world's fish are caught using these methods.



Over

illion

12% of the world **relies upon fisheries** in some form or another, with 90% of these being small-scale fishermen.

Globally, 17% of our animal protein comes from seafood.

In some countries, seafood dominates. It accounts for more than 70% of animal protein in Cambodia; 60% in Bangladesh and the Maldives.

Fish is the main protein source for more than 3 billion people worldwide.

Food fish consumption grew at 3.1% annually from 1961 to 2017, outpacing meat and dairy. This strains fish stocks worldwide.

200 million tonnes of fish and sea food is produced every year Global seafood production quadrupled in the last 50 years to meet rising fish demand.



# **Changing Human Life**

Delicious food, convenient lifestyle and fashionable clothing, as our daily lives get better and better, the changes also happen to the environment. This section examines life as it is lived by people and shows the less glamorous aspects.



Unbalanced Plate Do we have too much or not enough food?

Water Crisis Why are we facing water shortages?

**Game of Development** What are the past, present and future of urbanisation?

**Life of Fabric** What are the effects of fast fashion?

# Do we have too much or not enough food? Unbalanced Plate

### Where and why is food lost and wasted?



### Farms

Farms plant surplus to tackle pests and weather. Unharvested food due to weather, pests, and disease. Market conditions lead to edible food waste.

### **Fishing Boats**

8% of the world's marine catch is discarded. Discards are unretained fish, often returned dead into the water.



### **Manufacturing Facilities**

Most waste at manufacturing and processing facilities is from trimming off edible portions, resulting in about two billion pounds of wasted food.

### Transportation and Distribution Networks

Perishable food in transit faces risks, especially in developing nations with limited access to refrigeration and transportation, leading to significant losses.



### **Retail Businesses** Perishables (baked goods, produce, meat, seafood, prepared meals) contribute to most retail losses.

### **Restaurants and Institutions**

Restaurants waste 4-10% of purchased food before it reaches consumers.

### Households

Households cause the most food waste due to spoilage, over-preparing, date label confusion, overbuying, and poor planning.

### How much food is lost?

### **One-third** of food is wasted or lost

Hunger in the world

Roughly one-third of the food produced that is intended for human consumption every yeararound **1.3 billion tons** is wasted or lost. This is enough to feed **3 billion people**.



Food waste is especially staggering when you consider that **2.3 billion people** are moderately or severely food insecure –

**29% of the global population** is moderately or severely food insecure



If the world's wasted food was given to all these people, it would provide each person with 2,536 meals per year, which is seven meals per day.

### Food waste by area

The food currently wasted in-Europe could feed **200 million** people Latin America could feed **300 million** people Africa could feed **300 million** people.

### Food waste by group

Cereals

30%

Breaking it down by food group, losses, and waste per year are roughly -





Oil seed, meat and dairy 20%

35%

### Impacts of food production and waste



Fresh water Agriculture's water demand strains regions with water stress. It pollutes water bodies with nutrients. Food waste squanders 25% of our water supply, equaling USD\$172 billion.



### Greenhouse gas emissions

Food waste is a major climate change driver, accounting for about 25% of greenhouse gas emissions. In landfills, food produces methane, up to 86 times more potent than carbon dioxide. If food waste were a country, it would rank third in greenhouse gas emissions after China and the US.



Land use Half of the world's habitable land is used for agriculture, leading to the loss of forests and wildlands, reducing biodiversity. Restoring natural lands can aid wildlife rebounding.

# Why are we facing water shortages? Water Crisis

2 types of water scarcity

Physical water scarcity Physical water scarcity is where there is not enough water to meet all demands, including that needed for ecosystems to function.

Economic water scarcity Economic water scarcity is the result of a lack of investment in infrastructure or technology to draw water from rivers, aquifers, or other water sources, or insufficient human capacity to meet the demand for water.

What is water scarcity?

Water scarcity is the lack of

the standard water demand.

fresh water resources to meet

### 2.5% Freshwater

Including 1.75-2% frozen in glaciers, ice and snow, 0.5–0.75% as fresh groundwater and soil moisture, and less than 0.01% of it as surface water in lakes, swamps and rivers. Fresh and unpolluted water only accounts for 0.003% of total water available globally.

### Water distribution on Earth

### 97.5% Saline water -

Including 96.5% saline water in oceans and 0.93% saline groundwater Saline water can only be used for certain purposes. The main use is for thermoelectric power-plant cooling. About 5 % of water used for industrial purposes is saline, and about 53 % of all water used for mining purposes is saline.

# **Causes of water scarcity**

### Pollution

Water pollution comes from pesticides, fertilizers, untreated human wastewater, and industrial waste. It leads to harmful bacteria in water, making it unsafe for consumption and recreation.

### Agriculture

Agriculture consumes 70% of accessible freshwater, but 60% is wasted due to leaky irrigation systems, inefficient methods, and growing water-intensive crops.

### Water stressed life

Water stress occurs when water demand depletes a significant portion of renewable water resources, less severe than water scarcity.



2.3 billion people live in water-stressed countries, with 733 million in high and critically stressed areas.

**3.2 billion people** face high to very high water shortages in agricultural areas.













It defines water stress categories based on this percentage (% of withdrawals to renewable resources) as follows: <10% = low stress 10-20% = low-to-medium stress 20-40% = medium-to-high stress 40-80% = high stress >80% = extremely high stress



Population growth

severe scarcity.

In the last 50 years, the global human

population has doubled, transforming

water ecosystems and causing a



# What are the effects of fast fashion? Life of Fabric

# Yesterday

Manufacturers are generally based in **developing countries**, the factory workers experience **inhumane working conditions** as clothing businesses chase cheaper costs to increase profit.

# Today

\*Cheap

Fast fashion benefits consumers with prompt access to desired clothes, making fashion affordable and stylish for all, irrespective of income, democratizing the fashion industry.

\*Fast

#Trends

#Low\_quality

#Buy\_more



The influence of social media From influencer collaborations to TikTok hauls and curated feeds where you'll never see the same outfit twice, overconsumption is glorified.



### Unsafe workplaces

Employees usually work with no ventilation, breathing in toxic substances, inhaling fiber dust or blasted sand in unsafe buildings. Accidents, fires, injuries, and disease are very frequent occurrences on textile production sites.

### Low wages

The fast fashion industry employs approximately **75 million factory workers** worldwide, of these workers**less than 2%** make a living wage



We now buy **60% more clothes** than in 2000.





**Tomorrow** 

While making trendy clothes more affordable, fast fashion is damaging the environment, not only in terms of the production, but also the poor textile management, here are just some of the impacts-

### Greenhouse gas emission

Textile production worsens climate change more than aviation and shipping combined.



Water and plastic pollution Washing some types of clothes releases microplastics.

**500 thousand tonnes** of microplastic ends up in the ocean every year.

= 50 billion plastic bottles

On average, clothes are only worn  $7\,times$ 

before being discarded.



60% of clothes is thrown away in the first year. **100 billion** items are produced,

85% are thrown away every year,

some of them can take up to

200 years to decompose.



### A highly-engaging infographic book that narrates major environmental issues and how they are related to humans.

Learning about the environment is essential for everyone, but it can be challenging for young minds to engage with. Dealing with topics ranging from biodiversity to human life, this book is bursting with vibrant illustrations and clear textual content to activate the subject for readers.

