

The Story of Earth

Through the Eyes of Terra





SCIENCE NERDS



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TABLE OF CONTENT

CH 1	THE WATCHER ABOVE
CH 2	THE BREATH OF THE EARTH
CH 3	FROZEN ECHOES THE ARCTIC'S CRY
CH 4	THE HIDDEN POISON POLLUTION ON THE RISE
CH 5	BLUE HEART THE CHANGING OCEANS
CH 6	WHEN THE EARTH TREMBLES DISASTERS FROM SPACE
CH 7	THE HUMAN SHADOW OUR LASTING IMPACT
CH 8	THE FUTURE IN OUR HANDS

CHAPTER : ONE

A new eye in the sky

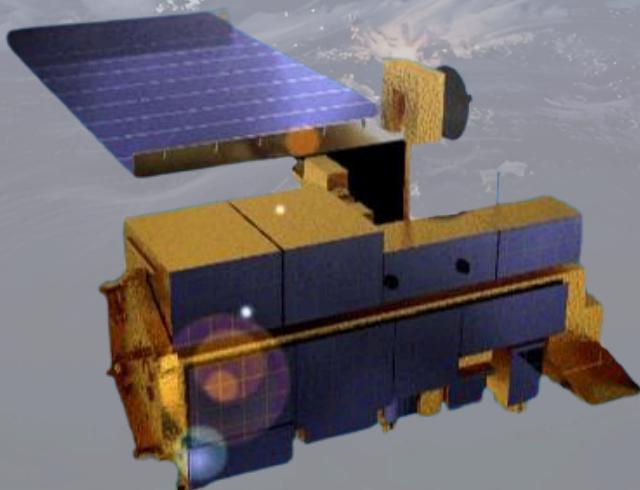


"Every story of change begins with a witness. For Earth, that witness was born in 1999."

On December 18, 1999, NASA launched the Terra satellite, part of the Earth Observing System (EOS). Terra orbits at an altitude of 705 kilometers, crossing the equator every morning at about 10:30 a.m. local time. This timing is not random it allows Terra to capture data under consistent sunlight, making comparisons accurate across days, months, and even decades.

Terra is equipped with five scientific instruments, each designed to "sense" a different part of Earth's system:

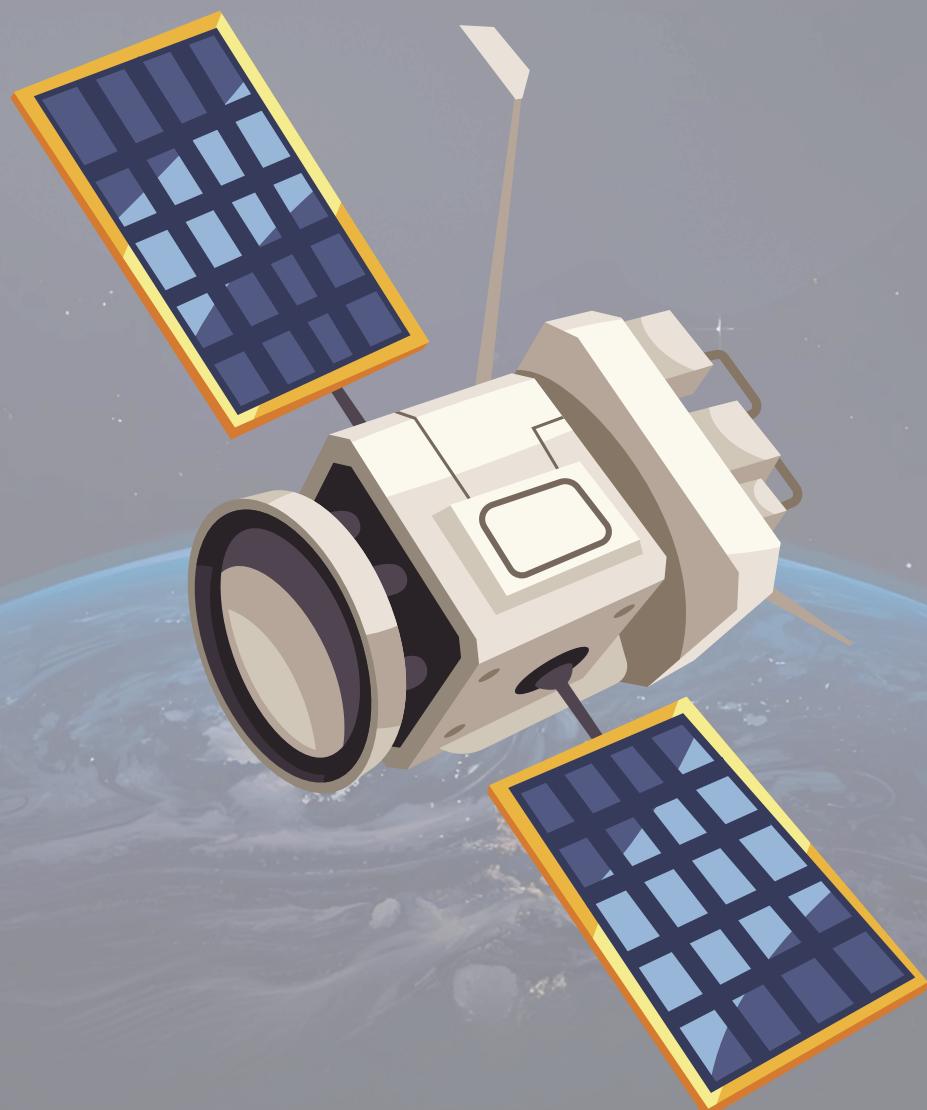
- _ MODIS (Moderate Resolution Imaging Spectroradiometer): captures images of land, oceans, and atmosphere every 1–2 days, showing vegetation growth, snow cover, clouds, and wildfires.**
- _ ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer): provides detailed images of Earth's surface, mapping volcanoes, glaciers, and urban growth.**
- _ CERES (Clouds and the Earth's Radiant Energy System): measures Earth's energy balance the sunlight we absorb and the heat we release back into space.**
- _ MISR (Multi-angle Imaging SpectroRadiometer): looks at the planet from nine angles to study clouds, aerosols, and surface reflectance.**
- _ MOPITT (Measurements of Pollution in the Troposphere): tracks carbon monoxide and other pollutants moving through our atmosphere.**

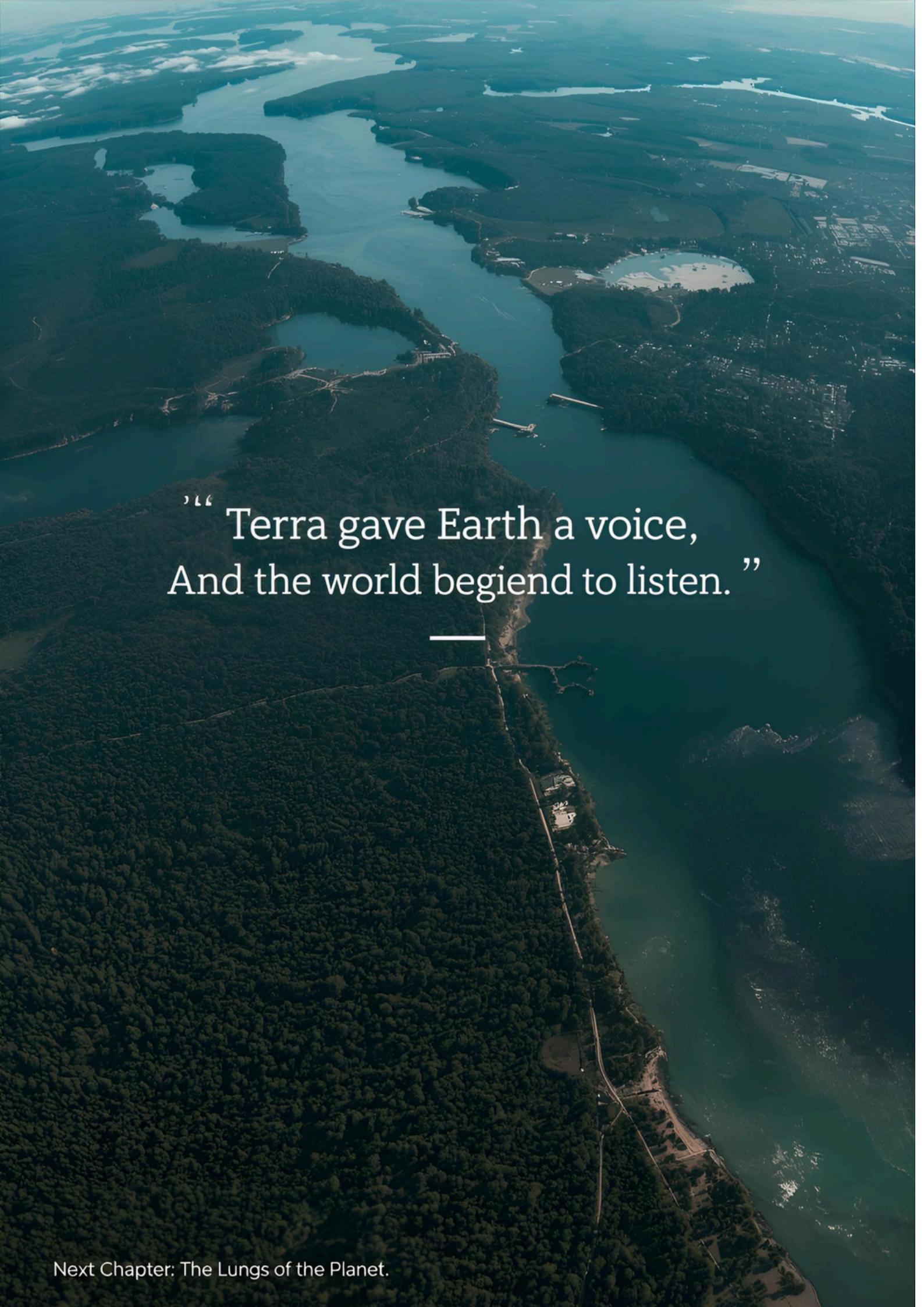


**Together, these instruments make Terra more than just a satellite
it's like a doctor's toolkit for Earth, constantly monitoring the
planet's vital signs.**

**For over two decades, Terra has given us a daily diary of Earth:
the greening and browning of forests, the whitening and melting
of ice caps, the shifting of deserts, the clouds drifting across
oceans, and the pollution spreading through the skies.**

**Terra's story is the beginning of our story how humanity learns to
understand the changes shaping our only home.**



An aerial photograph showing a river flowing through a dense forest. The river has many curves and small tributaries. In the upper right, there is a large industrial facility with several large white buildings. The surrounding land is a mix of green forests and some agricultural fields.

“Terra gave Earth a voice,
And the world began to listen.”



CHAPTER : TWO

“When the forest
frames, the Earth lives.
When it falls silent, we we
all suffer.”

THE LUNGS OF THE
PLANET

The Lungs of the Planet

The Amazon: Earth's Green Heart

From space, the Amazon appears as an endless ocean of green, the largest rainforest on Earth, stretching between 5.5 and 6 million square kilometers almost twice the size of India and comparable to the entire United States. It is called the lungs of the planet because it produces about 20% of the world's oxygen and stores nearly 100 billion tons of carbon in its trees and soils. Within this vast canopy lives one in every five known species, making it the richest biodiversity hotspot on Earth. More than thirty million people, including over 350 Indigenous groups, depend on its rivers and forests for food, medicine, culture, and survival.

"From above, the forest breathes like a living heart, keeping the planet alive."

Terra's Watchful Eye

Since its launch in 1999, NASA's Terra satellite has silently observed the Amazon's transformation. MODIS sensors revealed the spread of brown scars where dense forests once thrived.

ASTER images captured the glow of massive fires stretching for hundreds of kilometers. CERES showed how cleared land absorbed more sunlight, heating and drying the soil. MISR tracked plumes of smoke rising high into the atmosphere, traveling far across borders and even to other continents.

Between 2000 and 2020, more than 450,000 square kilometers of forest were lost an area larger than Sweden and by 2023, scientists estimated that 17% of the Amazon had been destroyed. Most of this deforestation was for cattle ranching, responsible for around 80%, followed by large scale soy farming and logging.

"Year after year, Terra saw the green ocean shrinking, replaced by scars of fire and dust.



A Shifting Balance

The destruction of the Amazon has begun to alter its role in the global climate. Once a powerful carbon sink, parts of the rainforest now release more carbon dioxide than they absorb. Wildfires in 2005, 2010, and 2019 filled the skies with smoke, causing health crises in cities thousands of kilometers away. Illegal mining released mercury into rivers, poisoning fish and endangering communities. The Amazon's "flying rivers" streams of water vapor created by transpiration have weakened, leading to reduced rainfall across Brazil, Peru, and Bolivia, and even affecting weather patterns as far away as Argentina and North America.

"What was once a shield against climate change is becoming a source of the problem."

Human and Ecological Consequences

The impact of this decline is both global and personal. Billions of tons of carbon released into the atmosphere accelerate global warming. Unique species such as jaguars, giant river otters, and pink river dolphins lose their habitats, pushing them toward extinction and erasing untapped medical and ecological knowledge. For local communities, forests that once provided food and medicine are vanishing, rivers are polluted, and rising temperatures threaten their survival. Smoke-filled air increases respiratory diseases, while cultural heritage tied to the forest is slowly disappearing.

"For the people of the Amazon, the crisis is not a statistic it is daily life."

A Planet Gasping for Air

Piece by piece, Terra has watched the vast green ocean shrink, replaced by silence, fire, and dust. The story it tells is not only about trees being lost, but about a planet struggling to breathe. The Amazon's fate is a warning: if the lungs of the Earth collapse, humanity itself will gasp for air.

"When the forest breathes, the Earth lives. When it falls silent, we all suffer."



**AS THE AMAZON
BREATHES, THE PLANET
LIVES AND WITH EVERY
SCAR IT BEARS, HUMANITY
SHARES THE PAIN.**



CHAPTER : THREE

THE FROZEN MIRROR THE ARCTIC

Chapter 3: The Melting Poles

The Frozen Guardians of Earth

At the edges of our planet lie the Arctic and Antarctic vast frozen worlds that reflect sunlight and keep Earth's climate in balance.

The Arctic Ocean is covered by sea ice that grows in winter and melts in summer.

Antarctica, the coldest place on Earth, locks away 70% of the world's freshwater in its ice sheets.

From space, these poles look like gleaming shields of white, guarding the planet from overheating.

What Terra Saw from Space

Since 1999, Terra has been recording the slow unraveling of these frozen shields:

Sea Ice Decline: MODIS images showed the Arctic losing nearly 13% of its ice per decade since 2000.

Melting Glaciers: ASTER's high-resolution maps captured glaciers retreating kilometer by kilometer.

Energy Imbalance: CERES data revealed how shrinking ice meant less sunlight reflected back warming oceans further.

Atmospheric Changes: MISR tracked plumes of water vapor and shifting wind patterns caused by ice melt.

From orbit, Terra watched the white brilliance fade, replaced by dark ocean waters absorbing heat.

Impact on People and the Planet

The melting poles are not isolated events they ripple across the entire globe:

Rising Seas: Melting ice sheets contribute to global sea level rise, threatening coastal cities.

Extreme Weather: Warmer Arctic conditions disturb the jet stream, leading to heatwaves, floods, and storms worldwide.

Ecosystem Collapse: Polar bears, penguins, and countless cold-adapted species struggle as their icy homes vanish.

Freshwater Crisis: Antarctica's meltwater is reshaping ocean currents, changing rainfall patterns globally.

The frozen guardians are retreating and with them, the stability of Earth's climate slips away.

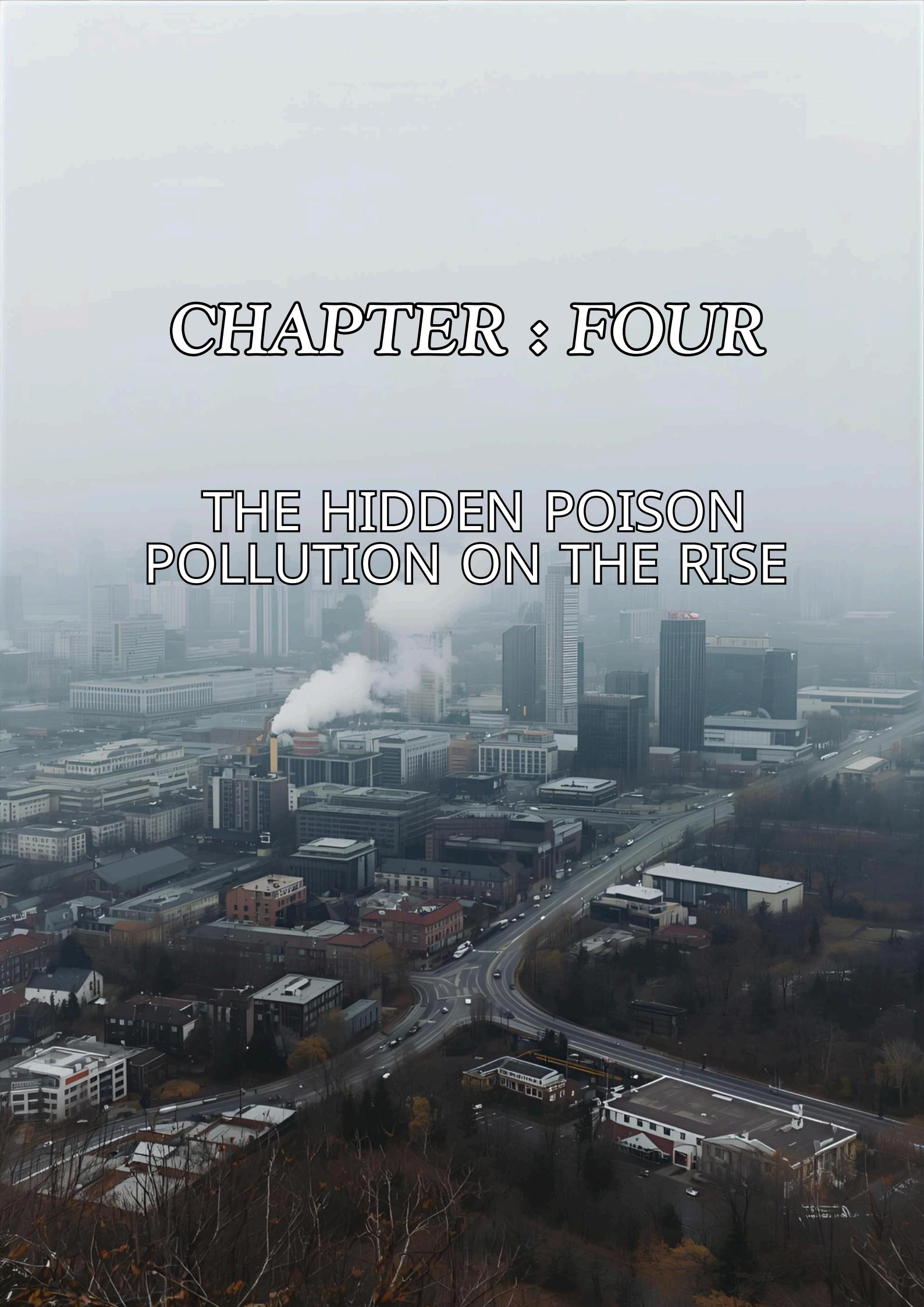


" AS THE ICE MELTS, THE EARTH FORGETS HOW TO REFLECT AND BEGINS TO ABSORB ITS OWN SORROW."



CHAPTER : FOUR

THE HIDDEN POISON POLLUTION ON THE RISE



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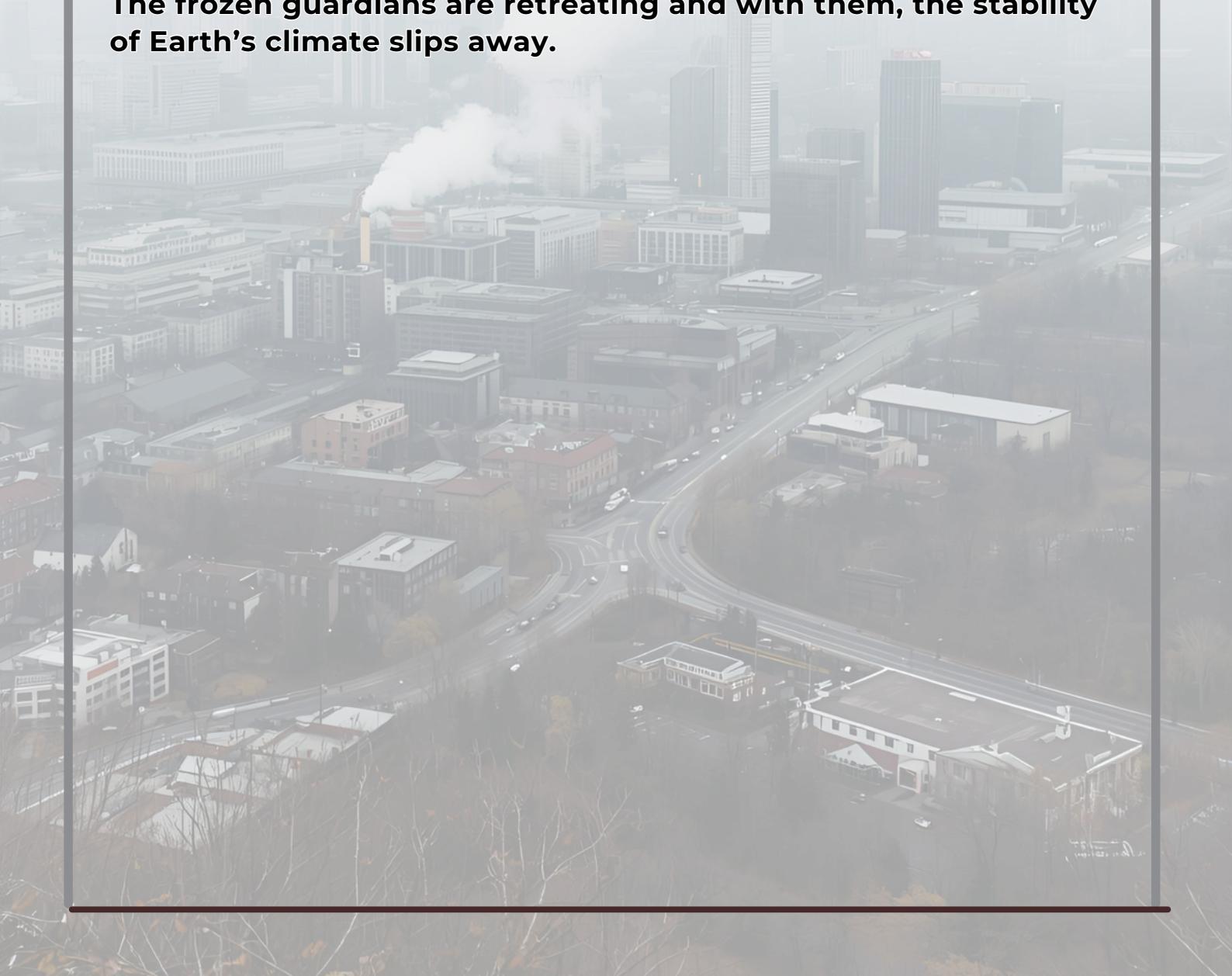
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CHAPTER : FIVE

BLUE HEART THE CHANGING OCEANS

Chapter 5: The Changing Oceans The Blue Heart of the Planet

Oceans cover more than 70% of Earth's surface, regulating climate, absorbing carbon, and feeding billions of people. They are the true engines of life, moving heat around the globe through powerful currents and providing half the oxygen we breathe.

From space, Earth looks like a blue marble the oceans are its defining feature, shimmering with light and motion.

What Terra Saw from Space

Terra's instruments have been crucial in monitoring ocean health:

MODIS sensors tracked phytoplankton blooms, the tiny plants that form the base of marine food chains.

CERES data revealed how warming seas absorb and redistribute heat, fueling stronger hurricanes.

MISR instruments observed shifting cloud patterns linked to changing sea surface temperatures.

ASTER imagery detected coastal changes erosion, coral reef bleaching, and pollution outflows.

The satellite revealed oceans not as silent waters, but as dynamic systems responding rapidly to climate change.

Impact on People and the Planet

Changes in the oceans are changes in our own survival:

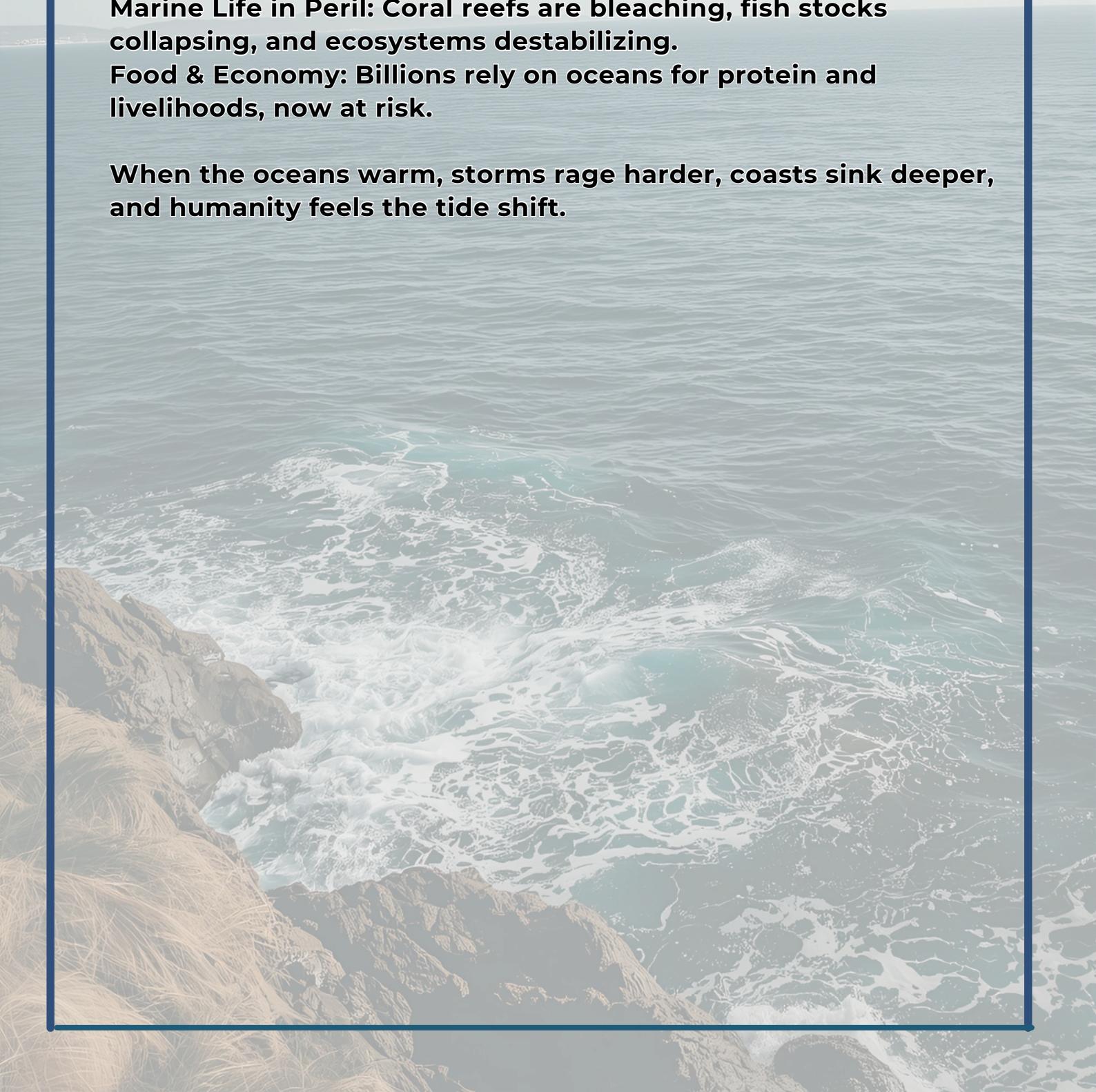
Rising Seas: Thermal expansion and melting ice are flooding coastal regions, threatening millions.

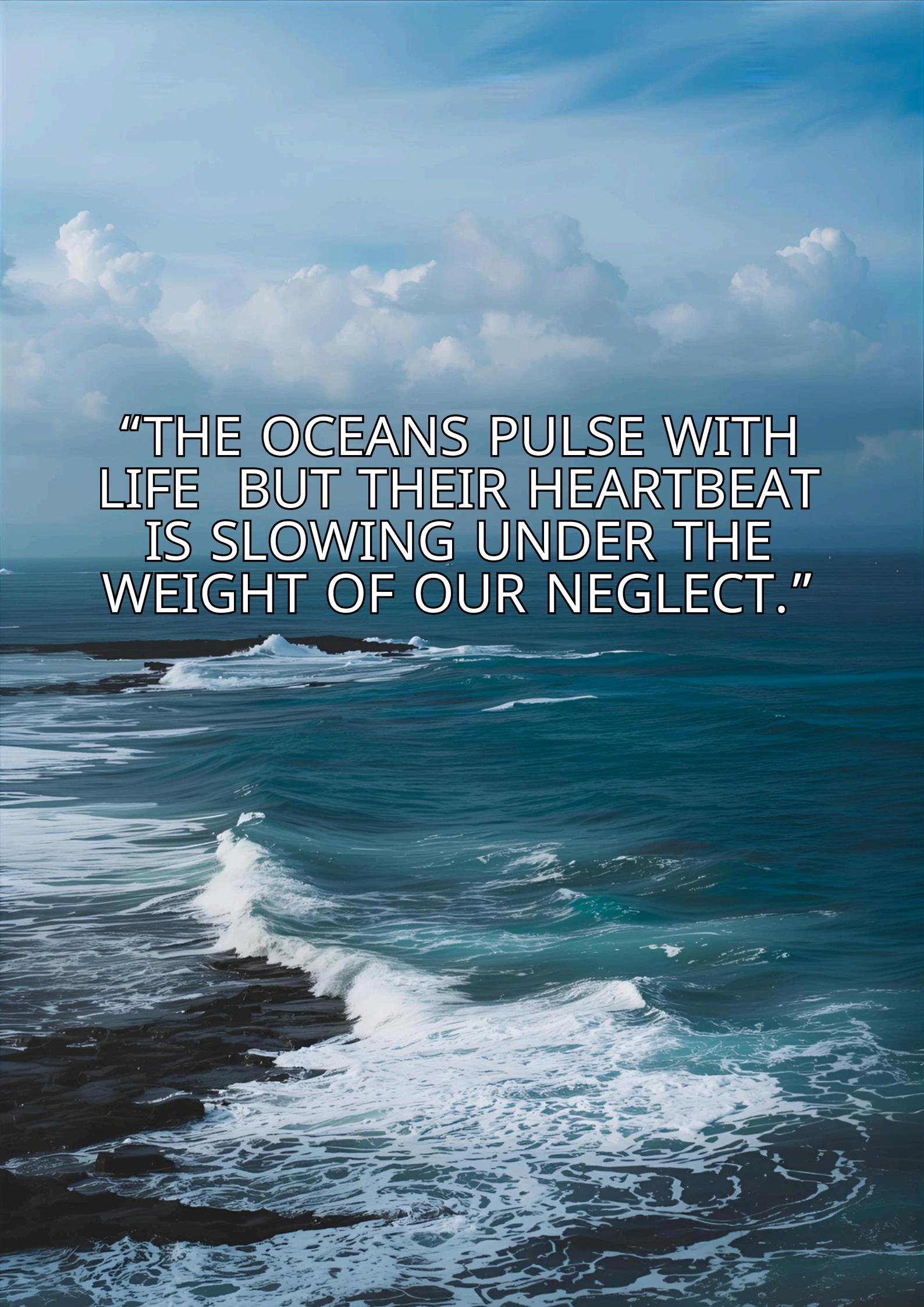
Stronger Storms: Warmer seas power more intense hurricanes and typhoons.

Marine Life in Peril: Coral reefs are bleaching, fish stocks collapsing, and ecosystems destabilizing.

Food & Economy: Billions rely on oceans for protein and livelihoods, now at risk.

When the oceans warm, storms rage harder, coasts sink deeper, and humanity feels the tide shift.





**"THE OCEANS PULSE WITH
LIFE BUT THEIR HEARTBEAT
IS SLOWING UNDER THE
WEIGHT OF OUR NEGLECT."**

CHAPTER : SEX

WHEN THE EARTH TREMBLES

DISASTERS FROM SPACE

Chapter 6: Natural Disasters from Space

Earth in Motion

Our planet is alive. Mountains rise, oceans crash, storms rage, and deep beneath the crust, fire stirs.

Natural disasters remind us that Earth is powerful and fragile.

From orbit, Terra became a silent witness to volcanoes erupting, forests burning, and storms spiraling across oceans.

What Terra Saw from Space

Volcanoes :

ASTER's thermal sensors detected heat from erupting volcanoes, even before visible eruptions.

Monitored ash plumes spreading across skies, threatening aviation routes.

Wildfires :

MODIS instruments mapped global fire hotspots daily. Provided near real-time data to firefighters and policymakers.

Hurricanes & Storms :

MISR cameras captured 3D cloud structures of hurricanes, helping improve storm tracking.

CERES data measured how massive storms affect Earth's energy balance.

Through Terra's eyes, natural disasters were no longer sudden surprises, but monitored events with data guiding response and recovery.

Impact on People and the Planet

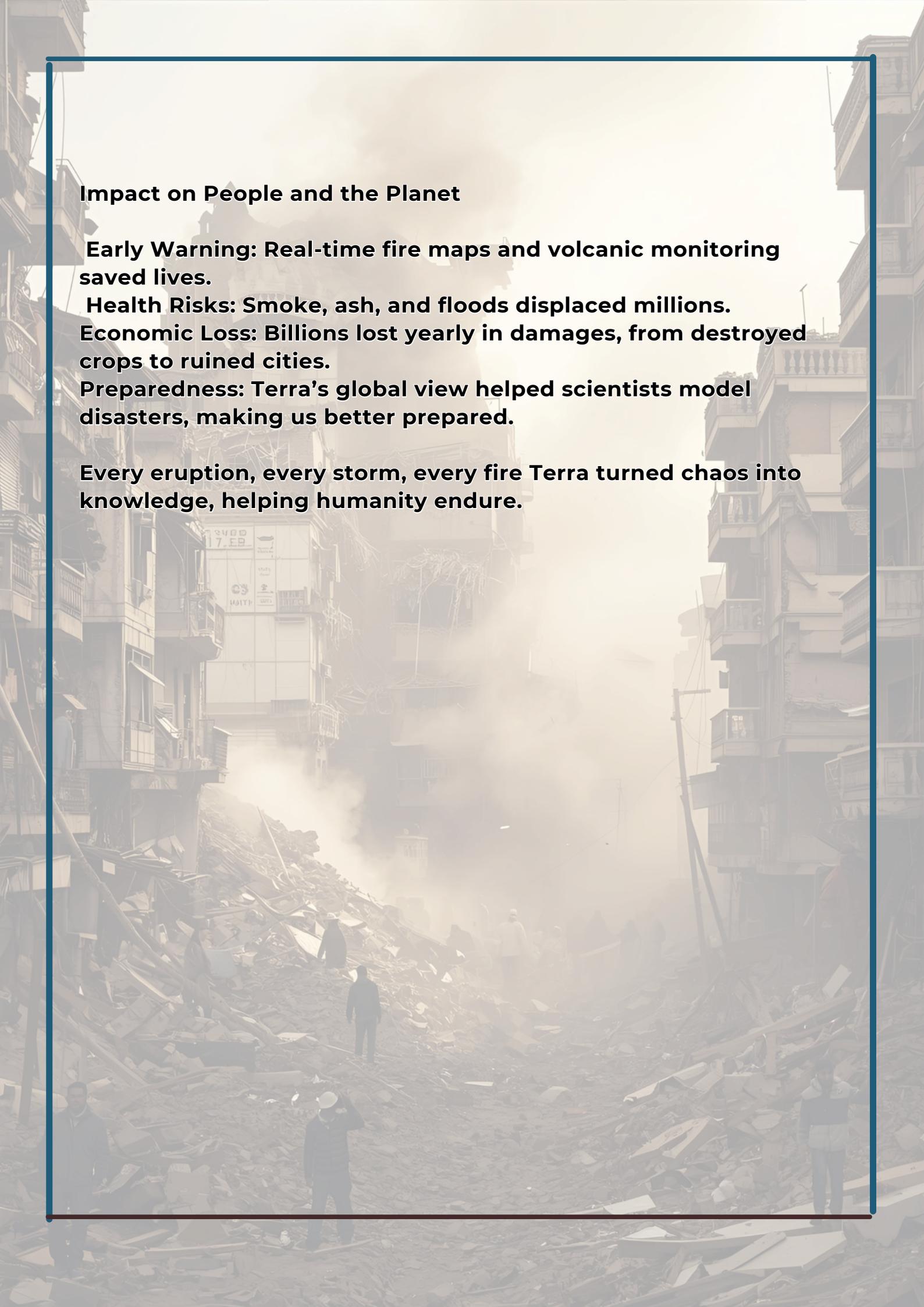
Early Warning: Real-time fire maps and volcanic monitoring saved lives.

Health Risks: Smoke, ash, and floods displaced millions.

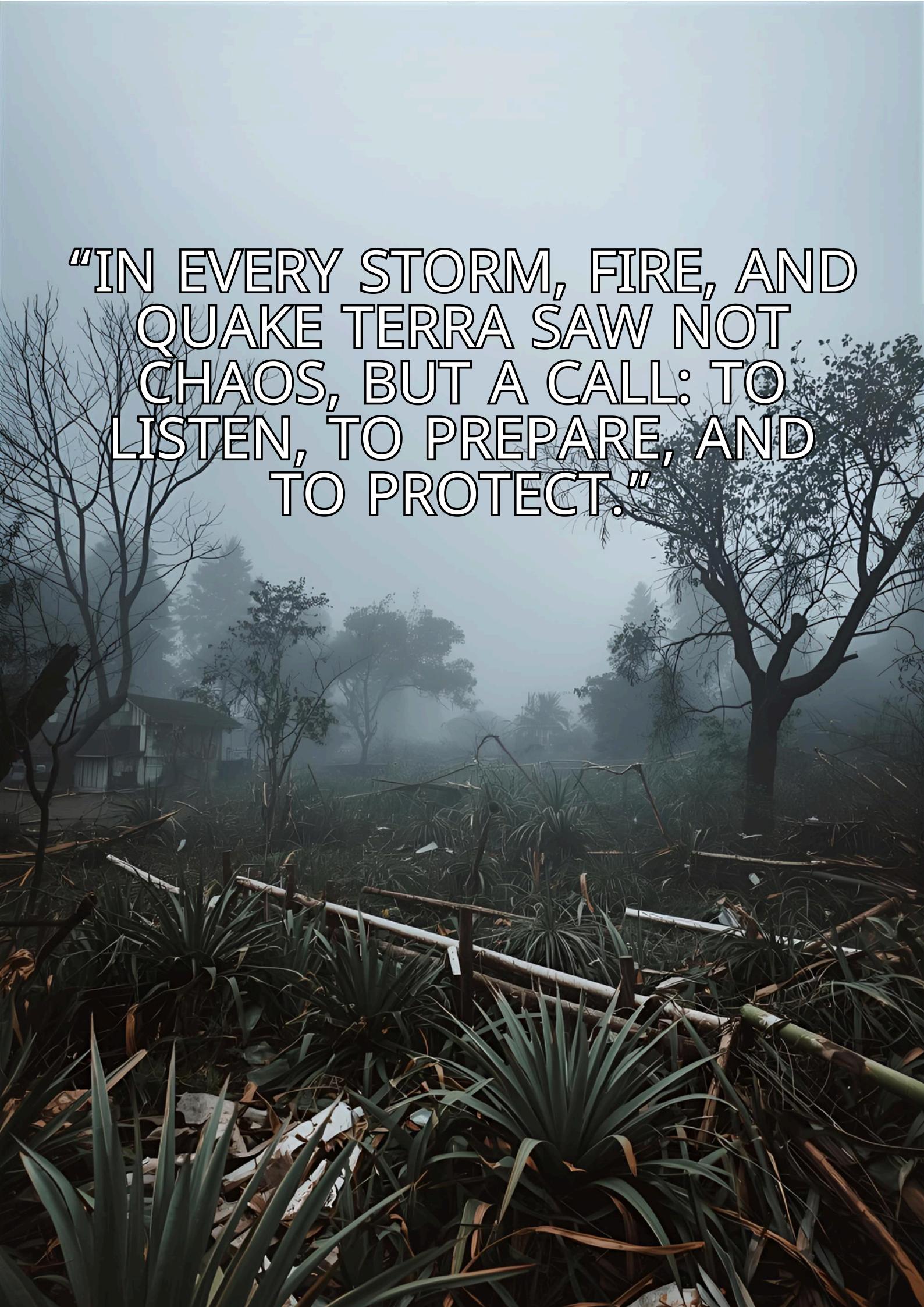
Economic Loss: Billions lost yearly in damages, from destroyed crops to ruined cities.

Preparedness: Terra's global view helped scientists model disasters, making us better prepared.

Every eruption, every storm, every fire Terra turned chaos into knowledge, helping humanity endure.



**"IN EVERY STORM, FIRE, AND
QUAKE TERRA SAW NOT
CHAOS, BUT A CALL: TO
LISTEN, TO PREPARE, AND
TO PROTECT."**



CHAPTER : SEVEN

THE HUMAN SHADOW OUR LASTING IMPACT



Chapter 7: The Human Footprint

A Planet Shaped by Us

Every forest cleared, every city built, every field planted humanity has left its mark on Earth.

From orbit, Terra doesn't just see nature; it sees the story of people, reshaping the planet at an unprecedented scale.

The satellite's lens captured the expansion of cities glowing at night, farmlands spreading like patchwork, and smoke drifting from industrial zones.

What Terra Saw from Space

Urban Growth :

MODIS revealed city sprawl, as megacities doubled or tripled in size within two decades.

Heat island effects detected cities running hotter than surrounding regions.

Agriculture :

Expansion of croplands into forests, especially in the Amazon and Southeast Asia.

MISR tracked smoke from seasonal burning to clear farmland.

Industry & Pollution :

ASTER mapped industrial zones, showing thermal signatures of factories and power plants.

Air pollution hotspots identified, linking directly to human activity.

Night Lights :

Terra captured how human lights outline continents visible signs of progress, but also pressure on ecosystems.

From above, humanity's footprint looked like scars and sparks proof of both creation and destruction.

Impact on People and the Planet

Resources under strain: Deforestation, overfishing, and pollution threaten long term survival.

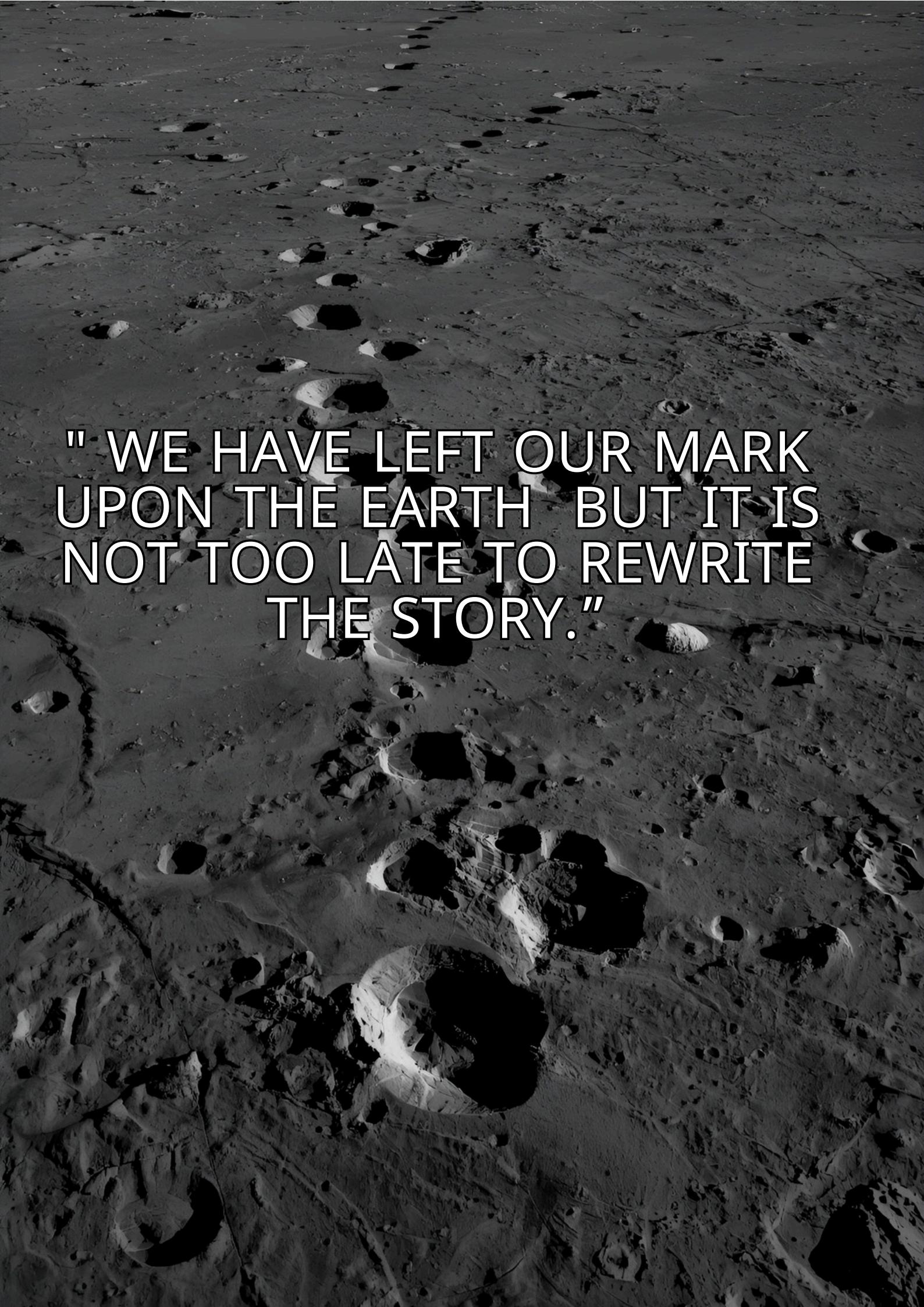
Climate drivers: Human emissions remain the largest force behind global warming.

Social inequalities: Environmental damage often hits vulnerable communities hardest.

Hope through knowledge: Terra's data empowers governments, scientists, and citizens to make better choices.

Our choices write the story of Earth's future line by line, city by city, forest by forest.



A black and white photograph of the Moon's surface, showing numerous craters and rocky terrain.

"WE HAVE LEFT OUR MARK
UPON THE EARTH BUT IT IS
NOT TOO LATE TO REWRITE
THE STORY."

The background of the image is a detailed, futuristic cityscape set against a backdrop of a massive, detailed Earth. The city features a mix of traditional and advanced architecture, with intricate road networks and green spaces. The sky is filled with soft, white clouds.

CHAPTER : EIGHT

THE FUTURE IN OUR HANDS

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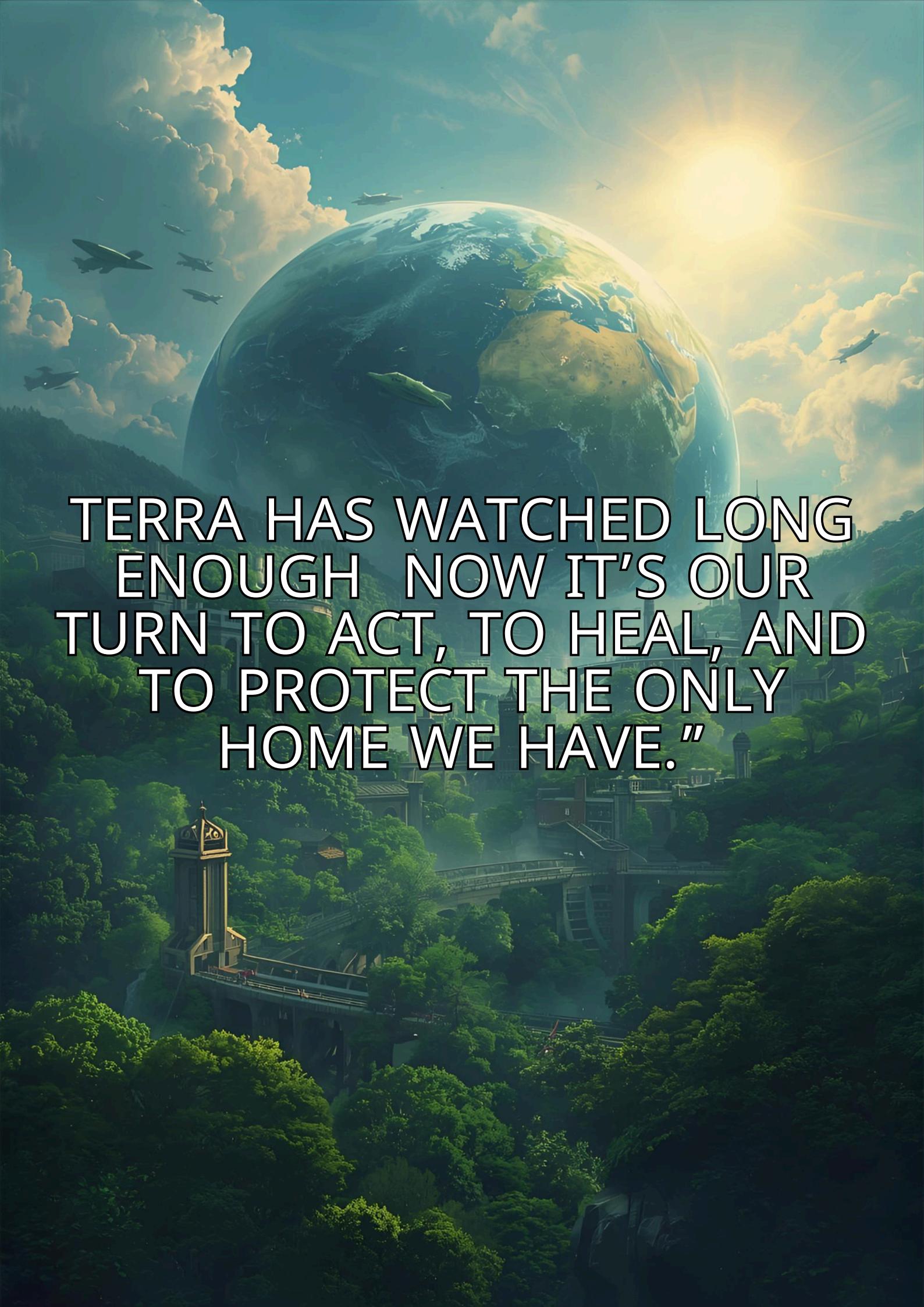
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