

Scientific and Spiritual Dimensions of Climate Change

Unit 3

Global Warming and its Impacts on the Climate

Section 1: What is Climate Change?

Often, the terms global warming and climate change can be used interchangeably. Depending on the context though, one of them is sometimes more accurate. *Global warming* describes the global average increase in the Earth's surface temperature, while *climate change* is used to describe the effects – the impacts - of that warming on the Earth's climate.

- In 2023, the global average temperatures were 1.48°C warmer since the Industrial Revolution.¹ It was by far the warmest year on record.²
- 2020 is tied with 2016 as the second warmest year on record.³
- The 20 warmest years on record have been in the past 21 years.⁴

“Whether one year is a record or not is not really that important — the important things are long-term trends. With these trends, and as the human impact on the climate increases, we have to expect that records will continue to be broken.”⁵

The reasons for the warming are anthropogenic – caused by humans: The burning of fossil fuels (oil, coal, and natural gas), deforestation and other economic activities are adding more greenhouse gases into the atmosphere. We will discuss the causes of global warming in the next Unit. Here, we will focus on its impacts on the climate.

It is important to know the **difference between weather and climate**:

“*Weather* is what the forecasters on the TV news predict each day. They tell people about the temperature, cloudiness, humidity, and whether a storm is likely in the next few days. Weather is the mix of events that happens each day in our atmosphere.

“*Climate* is the average weather in a place over many years. While the weather can change in just a few hours, climate usually takes hundreds, thousands, even millions of years to change.”⁶

Summarized in everyday language one could say “Climate is what you expect; weather is what you get.”

Many *regional temperature changes* have been observed: Since 1950, in many regions of the world, records show a decrease in the number of very cold days and nights and an increase in the number of extremely hot days and warm nights. Spring starts earlier in the Northern Hemisphere than it used to a few decades ago.⁷

Although climate change is a reality all over the globe, the *warming is not evenly distributed*. At the poles, for example, climate change is occurring at an accelerating pace.

In the Arctic, annual average surface air temperature over land is now 3.5°C warmer than at the beginning of the 20th century.⁸ The Arctic region continues to warm almost four times the global average.⁹

Even on a warming planet we may still encounter some cold spells and hard winters. With more water vapor in the atmosphere, the occurrence of very heavy snowfalls is also expected to increase.

All over the globe, people have observed, and scientists have studied many changes in the climate including more frequent extreme weather events such as stronger storms, more severe droughts, and floods. These climatic changes have serious long-term consequences, especially for low-lying areas and poor countries, but in the near future also for all of humanity.

Section 2: Heat Waves

Abnormally severe heat waves are increasing in many parts of the world and are causing much human suffering. In 2013, Australian Forecasters had to add new colors to their temperature charts to adequately show their record heat.¹⁰

In early summer 2017, temperatures in Southern Italy exceeded 40°C.¹¹ Pakistan probably suffered the most that summer with temperatures up to 54°C.¹²

In 2021, “hundreds of North Americans ... have died of heat-related illness. The unprecedented death toll is the result of a heat onslaught more intense by some measures than anything in global records, yet very much in line with the expected impacts of a human-warmed climate.”¹³

The year 2022 brought devastating heat waves to India¹⁴ and Pakistan, Europe including the United Kingdom, and North America.

“The summer of 2023 was Earth’s hottest since global records began in 1880.”¹⁵

Section 3: Climate Change and its Impacts on the Water Cycle

A warmer atmosphere can hold more water. This has major consequences for the climate:

- Water vapor is a natural greenhouse gas and contributes significantly to further global warming.
- There is more precipitation on a global average. This plays out mostly in heavier precipitation – more water (or snow) is coming down at once. That's one reason why we see an increase in severe flooding events, including river flooding, dam breaks, and mud slides.
- Precipitation patterns are changing. Therefore, droughts are worsening, and rainfall is becoming less predictable.
- The polar ice and glaciers are melting.
- Sea levels are rising because of thermal expansion and the additional freshwater from the melting land ice.
- Ocean currents have begun to weaken which will likely have serious implications for the climate in the future.

“Climate change will affect the availability, quality and quantity of water for basic human needs, threatening the effective enjoyment of the human rights to water and sanitation for potentially billions of people. The alteration of the water cycle will also pose risks for energy production, food security, human health, economic development and poverty reduction, thus seriously jeopardizing the achievement of the Sustainable Development Goals.”¹⁶

Section 4: Melting of Glaciers and the Polar Ice Caps

Due to warmer temperatures, mountain glaciers all over the world are receding. The rate of melting has also dramatically increased.¹⁷

Melting glaciers pose multiple dangers: Initially, the increasing amount of meltwater can have a positive effect for hydropower. However, emerging glacial lakes have the potential of sudden drainage that can cause devastating floods.¹⁸ In the longer term, severe water shortages can be expected when there will be no or only very little ice left to melt in the summer. The time frame for this to happen varies greatly depending on the geographic location; it may be a matter of just a few years, decades, or, in the case of the Himalayas, several centuries. Mountain glaciers feed the rivers and provide water for billions of people downstream. This water is essential for agriculture, hydropower, and local ecosystems.

Most worrisome is that the *polar ice caps* began melting as well. The accelerating speed of their melting has even surprised scientists who predicted the thawing.

The *Greenland ice sheet* alone holds enough water to raise sea levels worldwide by 6m (almost 20 feet).¹⁹

The *decline of the summer sea ice in the Arctic Ocean* has been dramatic, and even on the coldest continent, *Antarctica*, the effects of global warming have set in.

Why are the polar ice caps melting so fast? The major reason is the *albedo* (reflectivity) effect: Snow and ice are the best reflectors of solar radiation. They reflect about 70% of the sun's radiation (and absorb 30%). Water on the other hand is a poor reflector. It reflects only 6% of the sun's radiation and absorbs most of the heat (94%). The intense thawing of ice and snow creates more water surfaces. The warming of the water contributes to the regional rise in temperature, which again causes more ice to melt. This ice - albedo feedback is believed to be the major reason why the Arctic is warming so rapidly.²⁰

Section 5: Sea Level Rise

There are *two major reasons why sea levels have been rising*:

- When water warms up, its volume increases. This is called *thermal expansion*.
- The melting of glaciers adds huge amounts of *freshwater* to the oceans.

Sea levels are not even around the world. In some regions, they are rising faster than in others, in some areas they are even sinking. The reasons for the regional variations are geophysical forces and varying ocean currents that determine mean sea level at

different places on the Earth's surface.

The melting North Pole does not contribute to sea level rise because its ice is over water. However, the ice from Greenland and Antarctica, which is over land, is of great concern.

The *rate* of global average sea level rise has been increasing.²¹

Experts with the United Nations University estimate that rising sea levels and environmental deterioration have already displaced about 50 million people. The greatest cost of rising sea levels will not be measurable. It is the inevitable disruption of communities and cultures that cannot be replicated elsewhere.²²

However, in the not very distant future, that is later on this century and beyond, hundreds of millions of people will become displaced if sea levels will rise a few meters.

People on small island such as the Marshall Islands and Tuvalu will lose their country, and the future of their entire culture and language is at risk when they will be forced to emigrate.

Many large cities especially in Asia and North America will be flooded such as Guangzhou and Tianjin (China), Mumbai and Kolkata (India), New York, NY, Tampa, FL, and Boston, MA (USA), and Abidjan (Ivory Coast).²³ Many important, historical cities around the world like Venice (Italy), New Orleans USA), and Amsterdam (Netherlands) will be lost to the ocean.

Section 6: Water Scarcity

In our physical existence, water is essential for life. That's one of the reasons why, in nearly all the world's major religions, water plays an important role as a symbol and in ceremonies.

“Water-related ecosystems and the environment have always provided natural sites for human settlements and civilizations, bringing benefits such as transportation, natural purification, irrigation, flood protection and habitats for biodiversity. However, population growth, agricultural intensification, urbanization, industrial production and pollution, and climate change are beginning to overwhelm and undermine nature's ability to provide key functions and services.”²⁴

The amount of freshwater is finite while demand is increasing.

“844 million people still lack even a basic water service. 2.1 billion people lack water accessible on premises, available when needed and free from contamination.”²⁵ Many millions of people face a daily struggle to secure safe water for their basic needs.”²⁶

“One-in-four people in the world so not have access to safe drinking water. This is major health risk. Unsafe water is responsible for more than a million deaths each year.”²⁷

In many parts of the world, *lakes* are shrinking or disappearing, and *rivers* are running dry. The main causes are the diversion of water for irrigation and less rainfall because of climate change.

“Roughly half of the world’s population currently experience severe water scarcity for at least some part of the year due to climatic and non-climatic drivers.”²⁸

Poor and marginalized populations are disproportionately affected, further exacerbating rising inequalities.²⁹

Global warming is changing the *precipitation patterns*. In general, areas that are already dry experience less rain fall. Extreme droughts are increasing, and we have seen disastrous droughts in Australia, the US, and in Africa in the past years. Hotter temperatures cause more evaporation, and any moisture in the soil is also evaporating quickly. This has a huge detrimental impact on agriculture, people's livelihoods, and food security.

The timing and amount of rain are very important for crops. Due to the changes in precipitation patterns, farmers need to adapt and learn how to do things differently, for example plant different seeds, or different crops, or plant them at different times of the year.

Ice and snow are huge water reservoirs, which feed rivers during the summer. Therefore, the disappearance of glaciers is an extremely serious threat to the water supply all over the world, from the Andes in South America to the Himalayas.

Section 7: Droughts

Climate change exacerbates droughts by making them more frequent, longer, and more severe.³⁰

Drought frequency and duration has increased by nearly a third since 2000. The worsening droughts are “not only affecting human societies but also the ecological systems upon which the survival of all life depends, including that of our own species”.³¹

“In pre-1970s Kenya, there was a serious drought around once every ten years. By the 1980s, this had doubled to once every five years. Today, there are droughts almost every other year.”³²

Droughts inflict the greatest suffering on women and girls in developing countries, in terms of education, nutrition, health, sanitation, and safety. 72 per cent of women and nine per cent of girls are burdened with collecting water, in some cases spending as much as 40 per cent of their calorific intake carrying it.³³

The United Nations report that, unless action is stepped up:

- By 2030, an estimated 700 million people will be at risk of being displaced by drought.
- By 2040, an estimated one in four children will live in areas with extreme water shortages.
- By 2050, droughts may affect over three-quarters of the world’s population, and an estimated 4.8-5.7 billion people will live in areas that are water-scarce for at least one month each year, up from 3.6 billion today.³⁴

Should global warming reach 3°C by 2100, drought losses could be five times higher than they are today, with the largest increase in the Mediterranean and the Atlantic regions of Europe.³⁵

Section 8: Climate Impacts on Soil and Agriculture

"The thin layer of topsoil that covers the planet's land surface is the foundation of civilization. This soil was formed over long stretches of geological time as new soil formation exceeded the natural rate of erosion. As soil accumulated over the eons, it provided a medium in which plants could grow. In turn, plants protect the soil from erosion. Human activity is disrupting this relationship."³⁶ Overgrazing, deforestation, and agricultural expansion onto marginal land result in soil erosion. Heat waves and droughts contribute to the problem.

"The 2 to 3 billion tons of fine soil particles that leave Africa each year in dust storms are slowly draining the continent of its fertility and, hence, its biological productivity. In addition, dust storms leaving Africa travel westward across the Atlantic, depositing so much dust in the Caribbean that they cloud the water and damage coral reefs there."³⁷

Climate change will exacerbate soil degradation in many parts of the world. In drier areas, climate change is expected to lead to salinization and desertification of agricultural land.³⁸

Higher temperatures take a great toll on agriculture. Crop yields greatly diminish with high temperatures. Rice production is especially at risk.

Although higher harvests can be expected in some areas of higher latitude because of milder temperatures and the fertilization effect of more CO₂, world-wide, agriculture will be severely affected and global food production will decline. The world's food security is also at risk because of environmental degradation of agricultural lands, declining fisheries, the diversion of good agricultural land to grow plants for bio-fuels, and last, but not least, climate change impacts, especially droughts, heat waves, floods, sea-level rise, and unpredictable changes in precipitation patterns.

Section 9: Extreme Weather Events – Storms and Floods

The severity of *extreme weather conditions* is increasing. Storms are getting stronger and more devastating. There are two major reasons for that:

1. Winds pick up energy from warmer ocean waters. This makes storms stronger.
2. Warmer air holds more water. So, with more water vapor in the atmosphere, the occurrence of very heavy rain is also increasing.

Therefore, storms bring stronger winds and more precipitation.

Under some circumstances, there are two additional reasons why storms are becoming more devastating:

3. In coastal areas, storm surges are more destructive because of higher sea-levels.

4. The warming Arctic affects the jet stream by slowing down its East to West winds. Because of a slow-down of this polar vortex, storms sometimes linger longer over a certain area and therefore cause more devastation. The speed of the jet stream is determined “by the temperature difference between the Arctic and the equator. When the temperature difference is small, weather patterns move more slowly. But climate change is causing the Arctic to warm fast, making that temperature difference smaller. As a result, weather events in the northern hemisphere stay in place for longer. When it’s wet, it stays wet, feeding and plumping plant growth. And when it’s hot, it stays hot, sucking more and more moisture out of those same plants.”³⁹

It is impossible to report on the increasing incidents of devastating storms and floods around the world. So, just a few examples:

- With Cyclone Haiyan (2013), the Philippines experienced the strongest storm ever measured to make land fall.⁴⁰
- In the summer of 2022, “unprecedented flooding, triggered by severe monsoon rains, submerged a third of Pakistan and resulted in some 1,700 deaths.”⁴¹ 33 million people were affected in what is widely regarded to have been Pakistan’s greatest climate disaster. Villages have reportedly been turned into islands, with many children orphaned and families living under scraps of plastic freezing conditions.⁴²
- In September 2023, ten countries and territories saw severe flooding in just 12 days.⁴³

Section 10: Forests

Forests that have so far escaped deforestation are now threatened by climate change: In many regions of the world, more trees will die because of increasing insect infestations and forest fires.⁴⁴ (More insects are surviving milder winters.)

Tropical rainforests, rich in biodiversity, are suffering from warmer temperatures and less rainfall, both caused by climate change. In the past, rainforests were a sink for CO₂. Now with hotter temperatures, their growth is impeded, and some are actually emitting CO₂.⁴⁵

If climate change is not mitigated, rainforests will not be able to survive. “If the IPCC’s most severe projection comes true, much of the Amazon rainforest will transform into savannah.”⁴⁶

Many of the world’s remaining forests are threatened by logging, climate change, and wildfires (see next section).

Section 11: Wildfires

Climate change makes hot and dry conditions more common and severe. The dry areas of the world are becoming increasingly drier. There is less precipitation, and the heat dries out the vegetation. The dead brush and dry trees are very flammable. Earlier

snowmelt in the spring, caused by warmer temperatures, contributes to dryer conditions in many areas. Lightning storms, which often ignite fires, are also on the increase.

We can already see that in many parts of the world, wildfires have become more frequent, larger, and more devastating. The pace at which fire weather conditions are increasing is accelerating faster than climate models predicted.⁴⁷ The wildfire season has significantly extended, especially in the Western US.

The slow-down of the jet stream (see section 5) contributes to the lingering of hot and dry conditions, increasing the severity and duration of wildfires.

Forest fires directly affect the lives of people.

One of the world's deadliest wildfire destroyed the historic resort town of [Lahaina](#), on Maui, Hawaii, in August 2023. About 100 people were killed and almost 3,000 structures were reported to have been either damaged or destroyed by the fire.⁴⁸

Wildfires are getting increasingly worse around the globe and are now also affecting new areas such as Sweden, Finland, and Latvia.

Of course, wildfires are also affecting the climate itself. They emit carbon dioxide and other greenhouse gases and thus increase the carbon concentrations in the atmosphere which worsens the heating up of the Earth. At the same time, wildfires destroy the forests that used to remove CO₂ from the air which further contributes to global warming.

Section 12: Loss of Biodiversity, Degradation of Ecosystems

*Nature in its essence is the embodiment of My Name, the Maker, the Creator. Its manifestations are diversified by varying causes, and in this diversity there are signs for men of discernment.*⁴⁹

Bahá'u'lláh

*Consider the world of created beings, how varied and diverse they are in species, yet with one sole origin. All the differences that appear are those of outward form and color. This diversity of type is apparent throughout the whole of nature.*⁵⁰

'Abdu'l-Bahá

All over the world, people and scientists have observed a dramatic decline of diversity of plants and animals. Loss of biodiversity means both the decline of the abundance of plants and animals and the extinction of species.

Here are a few points from the IPBES *Global Assessment Report on Biodiversity and Ecosystem Services*:

- The global biomass of wild mammals has declined by 82% since prehistory.⁵¹
- The global rate of species extinction is at least tens to hundreds of times higher than the average rate over the past 10 million years and is accelerating.
- Globally, local varieties and breeds of domesticated plants and animals are

disappearing. This loss of diversity, including genetic diversity, poses a serious risk to global food security by undermining the resilience of many agricultural systems to threats such as pests, pathogens and climate change.⁵²

The Living Planet Index (LPI)—which tracks populations of mammals, birds, fish, reptiles, and amphibians reports:

- an average 69% decrease in monitored wildlife populations since 1970.⁵³
- Latin America shows the greatest regional decline in average population abundance (94%).⁵⁴
- Freshwater species populations have seen the greatest overall global decline (83%).⁵⁵
- Around 1 million species already face extinction, many within decades, unless action is taken to reduce the intensity of drivers of biodiversity loss.

Insects have been disappearing world-wide. Insects are essential for pollination and as a food source for birds, amphibians, and mammals.

“The human domination of the planet has also meant that livestock and humans far outweigh wild animals. Of mammals, which make up a tiny portion of the overall figure, livestock comprise 60%, humans 36% and wild animals just 4%.⁵⁶

“Nature is generally declining less rapidly in indigenous peoples’ land than in other lands, but is nevertheless declining, as is the knowledge of how to manage it.”⁵⁷

The direct drivers of change in nature with the largest global impact have been, (starting with those with most impact):

1. changes in land and sea use;
2. direct exploitation of organisms; (for example by over-fishing and over-hunting and poaching).
3. climate change;
4. pollution of many kinds;
5. and invasion of alien species.⁵⁸

Of course, this order of the drivers of changes in biodiversity varies in different parts of the world.

Until now, the major reason for species decline and extinction was the loss of habitat. Now, climate change poses an even greater threat. “Unless we limit warming to 1.5°C, climate change is likely to become the dominant cause of biodiversity loss in the coming decades.”⁵⁹

We can already observe how species are moving towards the poles or up the mountains where temperatures are cooler. “Approximately half of the species assessed globally have shifted polewards or, on land, also to higher elevations.⁶⁰ Many plants and animals cannot move or evolve quickly enough to adjust to the new climate conditions; so they die out.

Increasing heatwaves and droughts are driving mass mortality events in trees, birds, bats, and fish.⁶¹

Each extinct species is a loss for humanity. We will not be able to use these species for the development of new crops or for the research of new medicines and treatments. Furthermore, species extinctions create holes in the web of life, which disrupt the ecological balance and have far-reaching negative impacts on directly and indirectly connected species. Moreover, each species has intrinsic value that cannot be measured by a one-sided utilitarian approach. Our extermination of our fellow inhabitants of Earth raises strong moral questions.

Not all species are suffering from climate change. Beetles and moths that attack northern forests are surviving better in warmer winters and producing more generations per year with the longer growing season, causing mass die-offs of trees in the northern temperate and boreal zones of North America and Europe. Many insects and worms that cause diseases in both wildlife and humans have moved into new areas and are causing new diseases to emerge in the high Arctic and Himalayan highlands.⁶²

The ecosystems that are most threatened by climate change are wetlands, mountainous regions, coral reefs, mangroves, and tropical rain forests. In the long term, all ecosystems will be affected by climate change.

Section 13: Ocean Acidification

Ocean acidification is not an impact of climate change, but we mention it here for two reasons.

First, it has the same root cause as global warming, namely anthropogenic (human-caused) emissions of carbon dioxide.

Second, the oceans are a very important carbon sink. Oceans have absorbed at least a quarter of our carbon dioxide emissions and, as a recent study shows, possibly much more.⁶³ This absorption of CO₂ has been very helpful for the climate because it reduced CO₂ in the atmosphere and, as a consequence, reduced the warming we have witnessed so far.

However, as the gas dissolves in the water it produces carbonic acid. “The acidity of ocean surface waters has increased by 30 percent since the 17th century.”⁶⁴ In addition, “ocean warming enhances the decline in pH.”⁶⁵

Such a change in ocean chemistry is significant and has long-term effects:

“Typically, seawater is heavily saturated with dissolved calcium carbonate from eroded limestone. This neutralizes any acid that forms from CO₂ and leaves plenty of carbonate for marine creatures to use for shell- and reef-building. But as oceans absorb increasing amounts of CO₂ from fossil fuels, their stores of calcium carbonate dip. Over time, this reduces carbonate available for marine creatures. Shell and coral formation slows.”⁶⁶ Existing shells can even dissolve. Many ocean creatures depend on calcium carbonate. The most spectacular ones are the corals, which will not be able to survive if the current trend of acidification continues. This problem may have even wider implications, because some zooplanktons are also affected. They are at the basis of the marine food web. This means that many fish and other animals are also threatened by the increasing acidification of the oceans.

Section 14: Impact on Ocean Currents

The melting of ice also has an impact on the Atlantic Meridional Overturning Circulation, usually abbreviated as AMOC. Europeans call it the Gulf Stream, the current that brings warmer tropical water to Central and North America, Western Europe and Britain which results in a warmer climate in these regions than it would otherwise be.

The driving force of the AMOC is the salt-rich water in the North Atlantic, which sinks to the ocean floor. Due to the melting of the Greenland ice sheet, more freshwater is entering the ocean which reduces its salinity and density. This makes the water lighter and less able to sink.

Scientists have observed a weakening of the Gulf stream⁶⁷, and there is even the possibility that it will come to a halt sometime in the future.⁶⁸

Section 15: Effects on Human Health

There are several direct and many indirect effects of climate change on human health. Extreme heat is the most dangerous.

“In the past 20 years, heat-related mortality among people over 65 years of age has increased by more than 50%. Higher temperatures have brought increased dehydration and renal function loss, dermatological malignancies, tropical infections, adverse mental health outcomes, pregnancy complications, allergies, and cardiovascular and pulmonary morbidity and mortality. Harms disproportionately affect the most vulnerable, including children, older populations, ethnic minorities, poorer communities, and those with underlying health problems.”⁶⁹

More than half of the world's population is living in cities, and this trend of urbanization is continuing. A city's concrete, asphalt, brick, glass, and steel absorb and retain heat. Cities are heat islands, and summers are getting increasingly unbearable, even dangerous, especially for the elderly and other vulnerable people.

Vector borne diseases are becoming more widespread because more insects survive the milder winters. Lyme disease is spreading, and so is malaria. Malaria transmitting mosquitoes are multiplying in areas that get more rain and floods, and they are spreading to higher altitudes and latitudes because of warmer temperatures. Allergy causing ragweed is producing more pollen because of warmer temperature and the fertilization effect of CO₂.

A majority of human diseases are zoonotic diseases – they come from wild animals. Scientists have warned us for a long time about new zoonotic diseases that could cause pandemics. Rats and some bats are strongly linked to the spread of zoonotic diseases. They thrive in degraded natural habitats such as disturbed forests.⁷⁰ When you destroy or degrade an ecosystem, it ends up with fewer species. The species that survive are in a better position to multiply because they have more food and space, and their predators are gone. A larger number of one species crowded together is a good breeding ground for pathogens. These pathogens can then cross from animals to humans.

The biggest effect on global health are likely the more indirect effects of climate change

on water, food security, and economic and social instability.

The 2022 IPCC report summarizes the effects of climate change on human health:

“Climate change has adversely affected physical health of people globally and mental health of people In all regions extreme heat events have resulted in human mortality The occurrence of climate-related food-borne and water-borne diseases has increased. The incidence of vector-borne diseases has increased ... Animal and human diseases, including zoonoses, are emerging in new areas. Water and food-borne disease risks have increased Although diarrheal diseases have decreased globally, higher temperatures, increased rain and flooding have increased the occurrence of diarrheal diseases, including cholera and other gastrointestinal infections. ... some mental health challenges are associated with increasing temperatures, trauma from weather and climate extreme events, and loss of livelihoods and culture. Increased exposure to wildfire smoke, atmospheric dust, and aeroallergens have been associated with climate-sensitive cardiovascular and respiratory distress.”⁷¹

Section 16: Impacts on Energy Supply

Hydropower is a clean energy source and, if built socially and environmentally responsibly, an excellent source of clean energy. Hydropower used to be very reliable, however, its reliability is decreasing now because of the loss of ice that feeds the rivers and lakes, and because of more frequent droughts in some areas.

Nuclear power depends on river water for cooling. When there is less water in rivers and temperatures are hot because of global warming, rivers are warming up. When nuclear power plants use this water for cooling, it warms up even more which results in a drop of oxygen levels, and mass die-offs of fish can occur. In Europe, in recent summers, nuclear power plants had to be shut off frequently during heatwaves.

Section 17: Multiple Stresses

Often, a plant, an animal or a whole ecosystem is affected by more than one problem. Let's look at the example of coral reefs: They have been suffering from chemical runoff from agriculture, mainly fertilizers and pesticides. Then marine pollution has been an additional burden. Now with global warming, water temperatures are increasing. Corals are very sensitive to temperature rises. On top of that comes the acidification of the ocean. All these factors combined have contributed to coral bleaching (dying of coral reefs). “75% of reefs are currently threatened, and this figure is anticipated to climb to 90% by 2030.”⁷²

Not only plants and animals are affected by a combination of environmental stresses. Unfortunately, people are also suffering from multiple stresses in many parts of the world, for example from the combined disasters of soil erosion, water scarcity and poverty.

The most recent IPCC Report makes the following scientific projection for the future: “Climate change impacts and risks are becoming increasingly complex and more difficult to manage. Multiple climate hazards will occur simultaneously, and multiple

climatic and non-climatic risks will interact, resulting in compounding overall risk and risks cascading across sectors and regions.”⁷³

Section 18: Displacement and Migration

According to the United Nations, “... up to 216 million people could be forced to migrate by 2050, largely due to drought in combination with other factors including water scarcity, declining crop productivity, sea-level rise, and overpopulation.”⁷⁴

In June 2012, before the large increase of refugees trying to get to Europe, the Baha'i-inspired International Environment Forum wrote a statement on *Preparing for Environmental Migration*:

“With accelerating climate change, sea level rise, resource degradation and water shortages, the projected scale of forced environmental migration in coming decades will exceed anything previously experienced, with estimates of 100-500 million people or more permanently displaced. This will be traumatic for those displaced, and represents an enormous challenge for the receiving countries and communities where immigration is presently a major source of political, economic and social tension and human rights violations.”⁷⁵

A March 2018 report by the World Bank focuses on internal migration in three regions - Sub-Saharan Africa, South Asia, and Latin America. It finds that

“climate change will push tens of millions of people to migrate within their countries by 2050. It projects that without concrete climate and development action, just over 143 million people could be forced to move within their own countries to escape the slow-onset impacts of climate change. They will migrate from less viable areas with lower water availability and crop productivity and from areas affected by rising sea level and storm surges. The poorest and most climatevulnerable areas will be hardest hit. The report finds that internal climate migration will likely rise through 2050 and then accelerate unless there are significant cuts in greenhouse gas emissions and robust development action.”⁷⁶

The previously cited statement by the International Environment Forum concludes with a call for the application of ethics:

“Faith-based groups should explore the implications of their teachings welcoming guests and strangers. The aim should be to replace the present rejection of immigrants by solidarity with the victims of climate change and other environmental disasters, and a welcoming of displaced persons as new protagonists in building diverse and sustainable communities.”⁷⁷

Section 19: Conflicts over Natural Resources

Degradation of freshwaters, decline in food production, energy issues, increase in storm and flood disasters and environmentally induced migration are all potential causes for conflict.⁷⁸ “A global population predicted to increase to about 9 billion by the mid-21st century, combined with stresses on water, land, and food resources could create the

'perfect storm.'"⁷⁹

Climate change does not “automatically lead to more fragility and conflict.” Rather, it is often a threat multiplier that “interacts and converges” with other existing risks and pressures in a given context and “can increase the likelihood of fragility or violent conflict.”⁸⁰

Many countries could face war for scarce land, food and water as global warming increases. Many nations, mainly in the Global South have existing tensions exacerbated by the struggle for diminishing resources. It is quite possible that others now at peace could be plunged into conflict. Even those not directly affected will be threatened by a flood of hundreds of millions of environmental refugees, another potential cause for conflict.

Being more familiar with the impacts of climate change we can understand that climate change is not “merely” an environmental problem, but a catastrophe for humankind, - but we can do something about it: See the next units!

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